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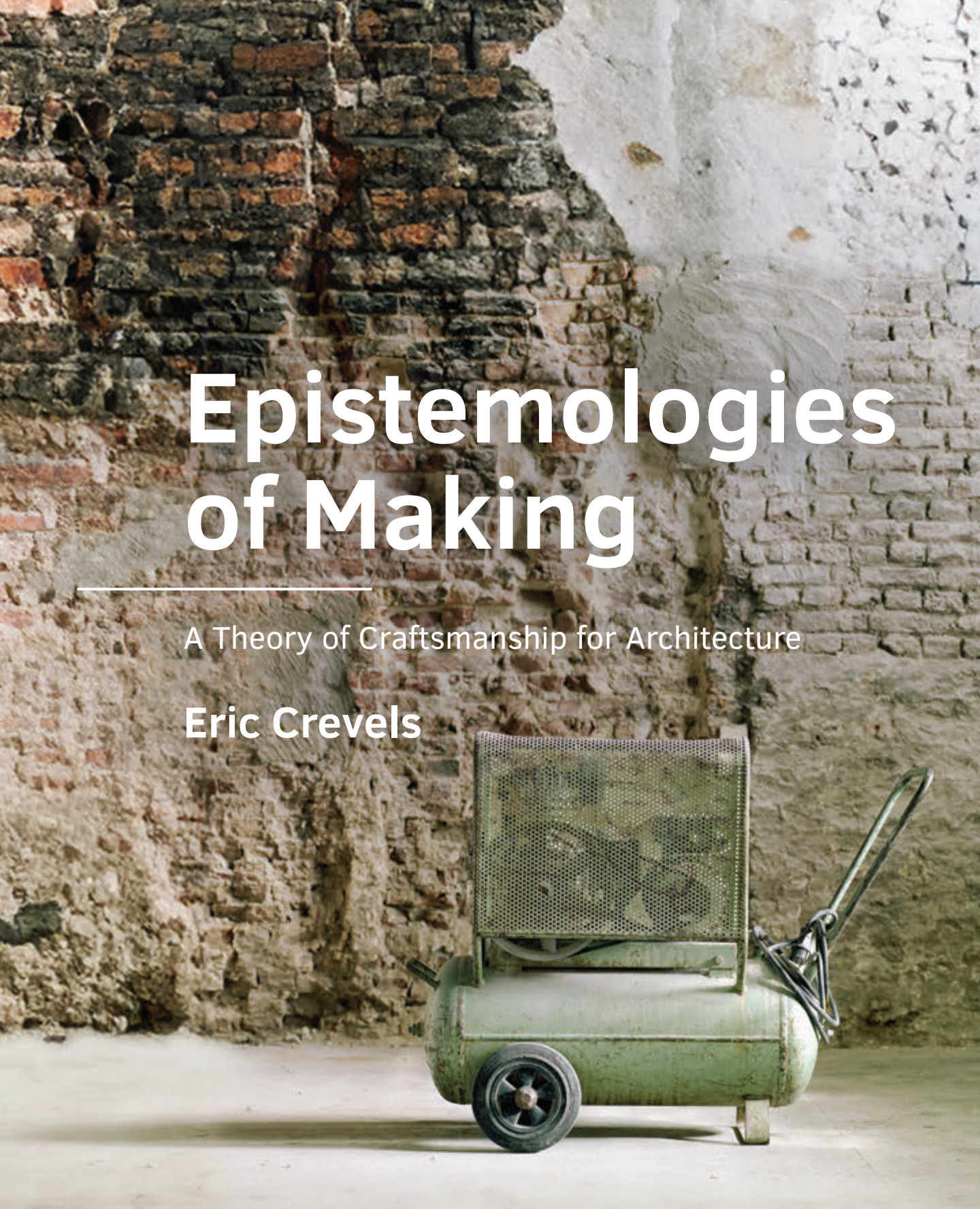

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Epistemologies of Making

A theory of craftsmanship for architecture

Dissertation

for the purpose of obtaining the degree of doctor
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by the authority of the Rector Magnificus, prof.dr.ir. T.H.J.J. van der Hagen
chair of the Board for Doctorates
to be defended publicly on
Tuesday 12 November 2024 at 10:00 o'clock

by

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Master of Architecture and Urbanism,
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This dissertation has been approved by the promotors.

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To Naomi, Elena and Amaia,

for you came to be together with this work,
and ever shall brighten the memory of it.

Preface

As part of the TACK/ Communities of Tacit Knowledge: Architecture and its Ways of Knowing Innovative Training Network, this research is inserted in the “Approaching Tacit Knowledge” cluster, whose proposal was to investigate the conceptualization of ‘tacit knowledge’ in different disciplines and fields of practice to provide insights to architecture. My response to this prompt was to explore other communities of practice with similar material entanglement, namely crafts. The impulse to pursue such research is connected to my experience as a craftsman, and my previous research explorations involving the topic.

I have always combined craft practice with research, exploring architecture from the perspective of labour, studying the social relations involved in design and construction. Therefore, the interfaces between craft and architecture have been central to my research, and I have systematically worked on the development of theoretical and empirical experiments based on this relationship. Partially, my interest in this connection arose from an estrangement felt in my studies, when noticing that the apprenticeship of architecture was much more removed from actual construction than I had previously imagined. I was always fascinated by creative practices and, as any prospect student of architecture, I naturally spend much of my time drawing, and was familiar with the notion of skill. My expectation was that, during my studies, I would further thread the path of skilled practice and have contact with all sorts of crafts, from carpentry to photography. These would provide a solid basis that, together with other studies, would inform my practice and grant me a general understanding of how things are built.

This fantasy turned out to be little more than that, fantasy. While some contact with crafts indeed happened, I discovered that the relationship between design and the knowledge of construction was nowhere near as fundamental as I had imagined. At the end of five years of study, I understood little of the materiality of architecture beyond some theoretical guidelines, general rules of thumb, some anecdotal facts about particular processes and one or another processual mistake that would lead to common constructive pathologies, as they were called. We learned about traditional and high-tech techniques, but always in overly abstract manner, from the premises of calculation or heritage preservation. Seldom did my hands get dirty and, even when they did, the experience was short-lived and disconnected from broader networks of practice. I made adobe bricks, but never stacked them in a wall; I plastered a panel with earth-based material; I made models; I helped the construction of a pizza oven and so on.

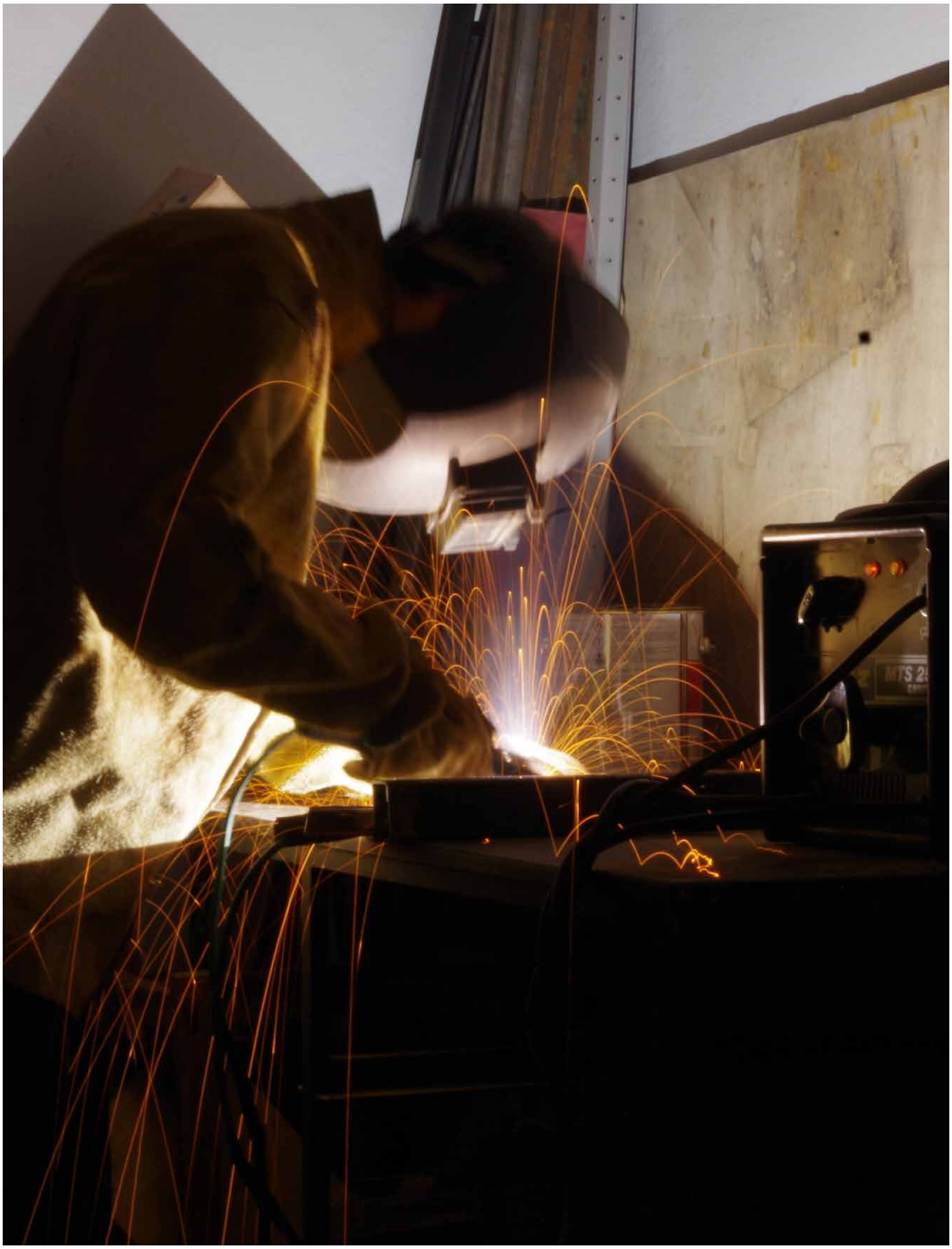
Working with bamboo. Source: author

To remedy this gap, I proposed an experiment in which I could participate in the actual production of architecture as my graduation project. I engaged in a partnership with the bamboo master craftsman Lućio Ventania and together we designed and built a small library for local children of a small, low-income district. Located thirty kilometres from Belo Horizonte, the state capital, The Milton Santos Library is rather simple in design. The majority of the construction took place during a two-week course on building with bamboo, in which I participated as an architectural designer and craft apprentice. The experience of learning a building craft proved fruitful in many aspects, but overall, it revealed to me the specific rationalities that steered the decision making of these craftspeople and how their ways of thinking were connected to the specific materiality of bamboo. Many of the technical solutions used in the design and construction of the library were decided as to provide the course attendees with the greater possible variety in their learned repertoire. The possibilities were mostly limited in terms of the techniques that could be employed with the available kinds of bamboo. In many moments, my design had to be changed because it clashed with the working of the bamboo, and my accounts of the trials and learning of the experience became the textual core of my thesis "*Autonomia e Construção: a Biblioteca Milton Santos*" afterwards. This experience marked the beginning of my relationship with crafts as a potential field of investigation for architecture, as well as a professional skillset.

Following my graduation, I joined metalworker and architect Bernardo Gardingo and founded the *No Prumo – Escritório Oficina*, a mix of architectural office and craft workshop, in an attempt to give a professional turn to my fascination with crafts. The scope of production we engaged during the following years is broad. Besides having little experience, our somewhat unusual business model required a lot of exploration, probing different practices and types of engagement.Evidently, we worked on architectural design projects, including the renovation of office spaces and apartments. In these, we sometimes added a craft layer by designing bespoke furniture. Sometimes we crafted these pieces ourselves. Other times, when the commission was too large for our small workshop, we managed the production in contact with other craftspeople. We also designed some houses, of which one stands out in particular. It was a project in a small community in the north of Minas Gerais, in a place with difficult access and very preserved traditions. We designed the house in close contact with local craftspeople, using their known techniques and working materials and skills found in the community. We were also commissioned the fabrication of art installations for local artists and organized and taught many courses in metalwork and welding, both to a general audience and to specific groups, with the example of the activists of the *Ocupação Luis Estrela* – a squatted heritage building turned cultural centre.

From the experiences teaching craft, I once again related crafts to my academic career, in the development of my Master's research. In this experience, I envisioned a practice where craft workshops could be thought of as an architectural practice, used as a pedagogical tool to address questions of alienated labour, autonomy and the self-production of the built environment. The idea was somewhat simple: working on the premise that, in Brazil, most architecture is built without any involvement of architects or engineers, I designed a series of craft workshops in low-income neighbourhoods and squatting communities. The idea was to offer craft knowledge that could improve the building practices already performed in these environments. I eventually taught in four workshops focusing on metalworking and welding, and established an 'open workshop' in the *Vila das Antenas*, a *favela* in Belo Horizonte, where the population could come and bring their demands (mostly small repair of furniture and some minor architectural maintenance) and I would teach and help them along the process. This research is described in the thesis "*Essays on Resistance: A practical architectural proposal from the perspective of labour*", exploring these potentialities of crafts, tacit knowledge and manual labour in the empowerment of individuals and communities. In spite of the validity of the research and the workshops, the outcomes fell short of my expectations, and proved that the realities of labour, craft and architecture are more complex than a purely Marxist approach would allow to describe. Although fascinated by its fundamental conceptual frameworks, I felt that a more nuanced approached provided by other contemporary theories would be beneficial to my understanding of the topic.

From this previous experience with craft both in research and in professional practice, I had ample contact with craftspeople and the reality of different workshops. Many of my friends and family are involved in crafts, including my twin brother, together with whom I reflect often over my findings. I developed a close relationship with different crafts, techniques and materials, professionally (most notably bamboo, metalworking and woodworking) and also in a hobby-like manner (including blacksmith, lutherie and pottery). I do not consider myself a master in any of them – nonetheless, crafts have been a part of my life and career for the last ten years, which some scholars count as the necessary time for the becoming a master.



Welding at No Prumo's workshop. Source: author

Yet, in all this time, I have never found a theory of craft knowledge that could properly explain and describe my experiences within craft and bridge them to architecture. As a consequence, my studies always relied on external or incomplete theoretical frameworks that could offer me some insights on the importance of craft, but that ultimately failed to provide a full description of the knowledge in the making of architecture, and on the kind of rationality I saw operating in my experience with skilled practice. Marxism went so far as denouncing alienated labour and pointing to the effacement of skill in the construction site, but failed to explain how exactly this skill was developed in crafts, and why it was so important. In the opposite direction, studies on craft often fell into a romanticised ode to expertise and ignored the social implications of craftwork, and did not provide a theory describing the operations of craft and the nature of craft knowledge consistent to my perceptions in practice. Moreover, these works proved of difficult application in situations other than the classical one-person craft practice, and so particularly problematic for complex creative industries such as architecture.

It was in the spirit of remedying this lack of a proper theory of craft knowledge applicable to architecture that I engaged with this PhD research, challenging myself to develop such a craft theory. Drawing from an ample conceptual framework, with many insights from anthropology, my expectations were that a shift to other, more contemporary approaches could provide better descriptions of craft reality without avoiding its complexity. The question of tacit knowledge in making was central to this endeavour, as crafts encompass skills, techniques, solutions and practices that, despite constituting a set of knowledge that greatly contributes to material culture and the built environment, remains mostly absent from the majority of epistemological studies.

Grinding lesson at the Casa Invisivel workshop. Source: author

This thesis thus represents the culmination of a long trajectory. Starting from an empirical drive, my explorations with craft assumed the general tone of my career as architect and research, and eventually led me to a thirst for a broader yet specific theoretical framework for craft knowing. The *Epistemologies of Making* presented here address this need. Even if far from exhausting it, I hope that they may provide the basis on which craft theory can move further and be adopted within architectural studies. Additionally, from their descriptions, perhaps new empirical drives can be now better grounded.

How much the poet would gain in his feeling of the beauties of nature,
how much better would he know the human heart,
if he met the rising sun amidst the tillers of the soil, himself a tiller;
if he fought against the storm with the sailors on board ship;
if he knew the poetry of labour and rest, sorrow and joy, struggle and conquest!

Petr Alekseevich Kropotkin, Fields, Factories, and Workshops;
or, Industry Combined with Agriculture and Brain Work with Manual Work

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Summary

This thesis presents the results of a research investigating the interfaces of craft and architecture, outlining a theory of knowledge in material production – a general epistemology of making – specifically designed to provide architectural students, scholars and practitioners with the proper conceptual tools to understand architecture in tandem with and within the realm of crafts.

Considering craft and architecture as communities of practice with a shared (and similar) focus on the production of physical objects that, however, extrapolate their material dimension and reproduce a cultural environment, the thesis brings insights from crafts studies to architecture, attempting to remedy the divide between mind and body in architectural production and scholarship, and providing a path for analysing architecture from the perspective of labour and skill. It addresses first the ways of knowing embedded into crafts, delving in the anthropological nature of crafts as productive, material practices and describing their particular way of knowing. It explains how the knowledge of craftspeople emerges from and influence the way they engage with material in practice. Moreover, the thesis describing how skills and techniques are developed in personal and embodied ways, through a process of material attunement. From the conceptualization of skill as the development of perceptive-active fields between maker and material, it argues that craftsmanship should be understood not as a quality in itself, but as an event. More specifically, craftsmanship is conceptualized as an agentic negotiation in which the subjectivity of the act of making is established. To navigate this turbulent encounter and deal with the material tendencies and affordances within, there is a directionality in the craft's ways of knowing. Craft's ways of knowing point towards the production side, contrary to other forms of knowledge that revolve around its objects, be they physical or conceptual.

The mode of knowing of crafts is an analytical translation process that turns objects into processes, shifting from a knowing what into a knowing how: a craftsperson understands their production primarily by the way in which it is made – as an encounter of tools, techniques, materials and so on. This focus on processes means that, in the epistemologies of making, the primary definition of things comes from their interactions, rather than by their physical properties or objective boundaries. These ***process-oriented ways of knowing*** operate together with, but in opposition to the more cartesian (or classic) forms of knowing that seek to classify and order

things based on their objective properties, and that could be described as object-oriented ways of knowing. Different fields of practice balance these dialectic notions and employ them in specific ways – In turn, these rationalities defines, to a great extent, the discourses inside these fields.

In light of this theoretical framework (and in order to appraise their value), three studies of architecture are developed. The first explores the findings in the Kortkenie Stuhlmacher Architecten office, investigating how a theory focused on material production can be used to analyse the design object and practice. Constructing a kaleidoscopic analysis of architectural craftsmanship, it introduces the notions of consistency, coherence and resonance as qualities to address and appraise architectural design.

The second study investigates how the interactions between draughtsmanship and craftsmanship are influenced by the codes, structures and hierarchies of architecture's disciplinary environment. It showcases this complexity in the history of the knooppunt, a complex joint that structures the wooden beams and cross-shaped columns of the 78 + construction system, developed by the design office of Claire Bataille and Paul Ibens during the 1980s, in Belgium.

Finally, the third study addresses the relationship between object- and process-oriented ways of knowing in the production of architectural discourses and theories, reconstructing how architects addressed the matter of material, techniques, labour and craftsmanship in their theories, historical analysis and designs.

In conclusion, this thesis builds a theory of craftsmanship for architecture. Addressing how different ways of making refer to and afford different ways of knowing, it explains how can these be understood in broader relationships between material production and knowledge; and to which degree this study can benefit architectural theory and practice. To address these questions, the thesis transposes the internal conceptual framework of crafts to architecture: understanding architecture as a form of craft as well, or, better yet, a constellation of crafts. This development re-conceptualizes architecture with concepts that better describe the material dimension of architectural production and the knowledge contained in it. Through these concepts, the thesis aims to help architectural designers and scholars to understand the practical and material dimensions of knowledge, or, in other words, the epistemologies of making and their general principles, rules and characteristics.

Samenvatting

Deze thesis presenteert de resultaten van een onderzoek naar de raakvlakken tussen ambacht en architectuur, en schetst een kennistheorie van materiële productie - een epistemologie van het maken - specifiek ontworpen om architectuurstudenten, onderzoekers, architecten en ambachtslieden te voorzien van gepaste conceptuele instrumenten om architectuur te begrijpen als ambacht en in relatie tot ambachtelijk werk. Ambacht en architectuur worden beiden beschouwt als praktijkgemeenschappen met een gedeelde en vergelijkbare focus op de productie van fysieke objecten, die zowel een afspiegeling zijn van de maatschappij als ook deze vormen. In architectuur praktijk en onderzoek is er echter vaak een kloof tussen lichaam en geest. Deze scriptie poogt echter deze kloof te overbruggen door inzichten vanuit de ambacht in te brengen in het vakgebied van architectuur. Het biedt een nieuwe richting voor de analyse van architectuur vanuit het perspectief van arbeid en vaardigheid.

De thesis behandelt eerst vormen van kennis in ambachten. Het gaat in op antropologische aard van ambachten als productieve, materiële praktijken en beschrijft specifieke vormen van weten in ambacht. Er wordt uitgelegd hoe de kennis van ambachtslieden ontstaat uit en invloed uitoefend op materie en materiaal in ambachtelijk werk, en hoe vaardigheden en technieken op persoonlijke en belichaamde wijze worden ontwikkeld, door een proces van material attunement. Vanuit het idee dat vaardigheid de continue ontwikkeling is van zintuigelijke relaties tussen maker en materiaal, wordt gesteld dat vakmanschap niet als een kwaliteit op zich moet worden begrepen, maar als een gebeurtenis, een agentic negotation, waarin de subjectiviteit van de handeling van het maken wordt vastgesteld. Om deze turbulente ontmoeting tussen de maker en de tendensen en handelingsmogelijkheden van materialen te navigeren, krijgt de kennis van het ambacht een richting. Deze is gericht op de productiekant, in tegenstelling tot andere vormen van kennis die draaien om objecten, fysiek of conceptueel. Kennis in ambachten is een analytisch vertaalproces waarin objecten omgezet worden in processen, een verschuiving van weten wat naar weten hoe: een ambachtspersoon begrijpt hun productie primair door de manier waarop deze is gemaakt - als een ontmoeting van gereedschappen, technieken, materialen, enzovoort. Deze focus op processen betekent dat, in epistemologieën van het maken, de primaire definitie van dingen voortkomt uit hun interacties, in plaats van hun fysieke eigenschappen of objectieve grenzen. Deze procesgerichte wijze van weten opereert samen met,

en in tegenstelling tot, objectgerichte wijzen van weten, de meer cartesiaanse of klassieke wijze van weten. Verschillende praktijkgemeenschappen zoeken ieder een eigen balans tussen deze dialectische noties en passen ze op specifieke manieren toe. Deze balans definiëert tegelijkertijd, in grote mate, het discourse binnen een praktijkgemeenschap.

Binnen de theorie van de epistemologie van het maken zijn drie architectuurstudies gedaan, waarin de theorie ook getest wordt. De eerste studie verkent de bevindingen van een ethnografische onderzoek gedaan bij Korteknie Stuhlmacher Architecten, waarbij wordt onderzocht hoe een theorie gericht op materiële productie kan worden gebruikt om het ontwerpobject en de praktijk te analyseren. Door een caleidoscopische analyse van architectonisch vakmanschap worden de begrippen consistentie, coherentie en resonantie geintrodueeerd als kwaliteiten om architectonisch ontwerp te beschrijven en te waarderen. De tweede studie onderzoekt hoe de interacties tussen tekenaarschap en vakmanschap worden beïnvloed door de codes, structuren en hiërarchieën van het architectuur discipline. Het toont deze complexiteit aan in de geschiedenis van het knooppunt. Dit is een complexe verbinding ontwikkeld in de jaren 80 door het Belgische ontwerpbureau van Claire Bataille en Paul Ibens. Het knooppunt bestaat uit houten balken en kruisvormige kolommen en is de belangrijkste bouwverbinding in hun 78+ bouwsysteem. De derde studie gaat ten slotte in op de relatie tussen object- en procesgerichte wijzen van weten in de productie van architectonische discoursen en theorieën, door te reconstrueren hoe architecten materiaal, technieken, arbeid en vakmanschap behandelen in hun theorieën, historische analyses en ontwerpen.

In conclusie, wordt in deze thesis een theorie van vakmanschap voor architectuur voorgesteld. In deze theorie wordt beschreven hoe verschillende manieren van maken verwijzen naar diverse wijzen van weten, en deze mogelijk maken; er wordt ingegaan op hoe deze kunnen worden begrepen in de relaties tussen materiële productie en kennis; en in welke mate deze studie ten goede kan komen aan de architectonische theorie en praktijk. Om deze vragen te beantwoorden, vervangt de scriptie het interne conceptuele kader van architectuur naar het kader ambacht; het begrip van architectuur als een vorm van ambacht, of beter gezegd, een constellatie van ambachten. Het is een experiment in de herconceptualisering van architectuur, door het voorstellen van concepten die beter de materiële dimensie van architectonische productie en de daarin vervatte kennis beschrijven. Met deze concepten beoogt de scriptie architectonische ontwerpers en onderzoekers te helpen om het praktische en materiële karakter van kennis te begrijpen; epistemologiëen van het maken en hun specifieke principes, regels en kenmerken.

1 Introduction

1.1 Building lenses

The existence of tacit knowledge was first described in such words by Hungarian scientist Michael Polanyi, writing over a phenomenon whose presence he noticed in scientific studies and laboratory work[1]. Contrary to what would be expected from the banner of objectivity defended in these environments, Polanyi recognized in them a way of knowing highly dependent on cultural and social contexts and the subjective character of the researcher. More importantly, this knowledge is somewhat hidden, meaning that, for example, researchers sometimes failed to replicate each other's experiments from methodological description alone, despite their abidance to scientific principles. This communicative gap, in his view, is related to the inexplicable and particular ways people appropriate knowledge and the personal engagement required for its application. In Polanyi's words, it seems that "we know more than we can tell"[2]. This is a form of knowledge that is not 'explicit', as scholars on the topic came to phrase it, and therefore cannot be directly or objectively transferred between individuals.

Polanyi's description, while perhaps pioneering in terms of focus, is not the first regarding this aspect of knowledge. Notably, his work draws heavily on Gilbert Ryle's distinction between "knowing that" and "knowing how"[3]. Outside of sciences, and particularly amongst the so-called 'creative industries', this form of knowing is anything but surprising. Practitioners (and scholars) of arts have long dwelt with notions of individual talent or 'genius' and, among crafts, the elusive figure of skill and its embodied character is utterly hegemonic. If not explaining its formation and principles, these notions can be understood as attempts to grasp and delineate the

1 Michael Polanyi, *The Tacit Dimension* (Chicago: University of Chicago Press, 2009), https://doi.org/10.1017/CBO9781107415324.004.

2 Polanyi. p. 4

3 Gilbert Ryle, *The Concept of Mind* (London: Hutchinson House, 1951). p. 27

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problem of tacit knowledge within their disciplinary fields; as forms of addressing and referring to a phenomenon whose existence is clear yet difficult to deal with. The problem of tacit knowledge, as the very thing it describes, seems to escape a firm grip. Thus, while recognized with certain ease, its operation, formation and transmission within particular disciplines remain mercurial, poorly explained theoretically and indirectly accounted in methodological developments.

This thesis is part of an Innovative Training Network[4] whose general goal is to understand tacit knowledge in architecture. Considering this, perhaps the first question referring to this topic that needs to be asked is: what is architecture? I say this because individually, most architects have ingrained what they consider it to be, although many times these definitions appear in blurred, confused terms, resembling themselves very much a form of tacit knowledge. At the roots of this curious phenomenon lies an important issue. The definition of architecture (and many other fields of knowledge and practice) is a social statement. As such, it carries values and practical significance that, evidently, will have an impact on both architectural theory and practice.

The term 'architecture' has many common uses. In English dictionaries, it refers to the "art and practice of designing and constructing buildings"[5], also phrased as its "art and science"[6]; the "style in which a building is made" or a particular "type of building"[7], addressing a recognizable category within the built environment, or the buildings themselves, as "architectural products of work" ; and, finally, the underlying, "unifying or coherent structure" that organizes a "formation or construction"[8], often (but not always) being "carefully designed"[9] or resulting "from a conscious act"[10] – which represents a more contemporary interpretation of the term with usage outside the scope of the built environment (mostly related to computer science).

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4 Communities of Tacit Knowledge: architecture and its ways of knowing (TACK) funded by the Marie Sklodowska-Curies Actions of the European Union's Program Horizons 2020.

5 Architecture. (n.d.) In *Lexico Dictionary* (powered by Oxford Dictionary) https://www.lexico.com/definition/architecture

6 Architecture. (n.d.) In *Merriam-Webster's collegiate dictionary*. https://www.merriam-webster.com/dictionary/architecture

7 Architecture. (n.d.) In *Lexico Dictionary* (powered by Oxford Dictionary) https://www.lexico.com/definition/architecture

8 Architecture. (n.d.) In *Merriam-Webster's collegiate dictionary*. https://www.merriam-webster.com/dictionary/architecture

9 Architecture. (n.d.) In *Lexico Dictionary* (powered by Oxford Dictionary) https://www.lexico.com/definition/architecture

10 Architecture. (n.d.) In *Merriam-Webster's collegiate dictionary*. https://www.merriam-webster.com/dictionary/architecture

The diversity of meaning surrounding the term and the nuances in its formulation by dictionaries, while somewhat simplistic, provide a good image of the complexity of the field. From these descriptions architecture can be understood simultaneously as the activities, the bodies of knowledge and the products of work involving the production of spaces for use – the building of the human environment. In other words, architecture describes the field that makes the built environment possible (knowledge and labour), but also what is (and was) made possible by it (styles, individual buildings, spatial solutions etc.). Silke Kapp summarizes this complexity stating that architecture can be understood as the transformation of the environment by human activity, since such definition encompasses all the needed ingredients for its realization[11]. Thus, 'architecture' can be understood as a field of practice that involves the design and construction of the built environment, focused mainly on the buildings people live, work and perform other social activities in.

Additionally, and more often than not, architecture also describes a condition at the crossroads between what is possible and what is made in modern society: a profession. A profession represents a parcel of society dedicated to a field, in this case, of knowledge and production (or theory and practice, although the parallel is not exactly symmetric) that follows socially established parameters of knowledge and action[12].

11 Silke Kapp and Ana Paula Baltazar, "Out of Conceived Space: For Another History of Architecture," in *The Proceedings of Spaces of History / Histories of Space: Emerging Approaches to the Study of the Built Environment A Conference at the University of California, Berkeley, April 30 & May 1*, (University of California, 2010).

12 One example of these social normative is the legal requirements of higher education for one to recognized as architect and to have the permission to practice the profession, usually including at least a Bachelor's degree but often (as in the case of countries that employ the Bologna model of higher education) a master degree or other sort of additional training (such as the RIBA in the United Kingdom).

The architect, from which the term 'architecture' supposedly stems[13], is generally considered as the professional at the core of this field. As such and as could be expected, architects are responsible for many aspects of this circular notion of architecture. The architect's expertise involves the knowledge on buildings and structures forming the built environment, and on how to design and to construct them.

Although this description is in itself truthful, it hides important imbalances in the constitution of such body of knowledge. In direct opposition to the etymological root of the term, the architect's knowledge nowadays does not encompass what could be considered the practical side of building knowledge in the same level as other forms of knowledge. In general, the knowledge of how to build in architectural practice is limited to the objective description of systems and techniques encoded in technical drawings and other normative documents[14]. In relation to the very first definition found in the dictionaries – the art and practice of designing and constructing buildings - the architect's practice and knowledge tends to be focused on the design part[15]. Construction is not considered the immediate and main responsibility of the architect, or even as its work's primary product. One may argue that the knowledge of architects on construction is limited to what allows them to design, and the details and practicalities of the processes of building are addressed by other professionals.

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13 The etymology of the term "architecture" is generally accepted as deriving from "architect", of complex origins. In short, it is usually interpreted as meaning "first builder", from the conjunction of the Greek words "*arché*", meaning "first" or "chief" and, with more uncertainty, "*tekton*", supposedly referent to carpentry or joinery, but also described as a more general "making" or "building". Another readings are possible, however, most tend to point that the conjunction "architect" stems from an occupational distinction amongst builders of some kind. The semantic similarity between the etymological construction of "architect" to "master craftsman" is interpreted often as a proof of the field's origin from inside the construction site or, more specifically, the Guilds of crafts of the middle ages. See Tim Ingold, *Making Anthropology, Archaeology, Art and Architecture*, *Making Anthropology, Archaeology, Art and Architecture*, 2013, https://doi.org/10.4324/9780203559055; Kenneth Frampton, "Studies in Tectonic Culture The Poetics of Construction in Nineteenth and Twentieth Century Architecture," *Model Perspectives: Structure, Architecture and Culture*, 2017, 9–13, https://doi.org/10.4324/9781315091105; Jonas Holst, "The Fall of the Tektōn and The Rise of the Architect: On The Greek Origins of Architectural Craftsmanship," *Architectural Histories* 5, no. 1 (2017): 1–12, https://doi.org/10.5334/ah.239 and John Senseney, *The Art of Building in The Classical World* (New York: Cambridge University Press, 2011)..

14 This shift to drawing in many material productions was perceived in Glenn Adamson, *The Invention of Craft* (London: Bloomsbury Visual Arts, 2013). Some more canonical interpretations of architectural history, however, propose this disciplinary focus as a sort of classical origin of the profession, dating it back to the writings of Vitruvius. See Senseney, *The Art of Building in The Classical World.* Sérgio Ferro´s recent *A Construção do Desenho Clássico* offers a critical and thorough account of the process in pre-modern Europe for Portuguese speakers, see Sérgio Ferro, *Construção Do Desenho Clássico* (Belo Horizonte: MOM edições, 2021).

15 An interesting clue to the this misbalance can be seen in the very curricula of most universities, comparing the amount of credits directed to the apprenticeship of design versus of technical (not necessarily practical) aspects of construction, that, as will be argued in this dissertation, still do not match exactly with building knowledge.

Nevertheless, be it considered as a form of art, a science, a discipline or a profession, architecture is entangled with material production. Architecture is related to building, in its two meanings: to the so-called *built* environment, and to the processes of building, the transformation of space[16]. Architecture is not only contemplative but interventionalist, practical: apart from analysing, understanding, theorizing (which can also be seen as practices in their own right), it is also in its scope to design and to build. It engages a material reality, from both theory and practice, whatever their distinction might be.

What that means is that architecture is also *concrete,* embodying the different meanings of the concept. Firstly, in the Hegelian meaning of concrete as "unity in diversity"[17], architecture is produced and owns much of its significance from this diversity of thoughts, skills, knowledge and arts. Many crafts contribute to its construction, and many materials compose its physical objectivity. Architecture represents and encompasses the given built environment, its constant (re) production and modification, and the knowledge and intellectual endeavours surrounding it, in both formal and informal contexts, including their unwanted or unforeseen consequences[18]. This *in-between* condition connecting the conception of a building, its construction and use, is an instance where theory and practice come together, through a vast network of agency and knowledge. Moreover, buildings,

16 On the argument that architecture is not only represented by buildings designed by architects but by *every space modified by human labour,* see Silke Kapp, "Por Que Teoria Crítica Da Arquitetura? Uma Explicação e Uma Aporia.," in *Cinco Textos Sobre Arquitetura*, ed. Maria Lucia Malard (Belo Horizonte: Editora UFMG, 2005).

17 The definition of 'concrete' is a complex matter, varying in different schools of thought in meaning and importance. The way it is presented here, however, owns its meaning to a Hegelian tradition, followed by Karl Marx in his materialist inversion of Hegel's dialectic. Amongst many other references, perhaps one of the clearer contributions explaining the term is given in C. J. Arthur, *Dialectics of Labour: Marx and His Relation to Hegel* (Oxford: Basil Blackwell, 1987), https://doi.org/10.1177/030981688703200114; and Herbert Marcuse, *Reason and Revolution: Hegel and the Rise of Social Theory* (London: Routledge & Kegan Paul Ltd, 1941). For a direct reading of Hegel's arguments on the matter, in Portuguese, see Charles Feitosa, "O Flerte Do Filósofo (O Ensaio Quem Pensa Abstratamente? De Hegel)," *Síntese Nova Fase* 22, no. 69 (1995): 225–34; Finally, I have written about the complexities on the matter and how this term (and its dialectical counterpart, abstraction) are used in Marx's definition of alienation. Portuguese speakers can find my grain of salt on the subject in Eric Crevels, "Aspectos Da Conceituação Do Trabalho Em Marx : A Alienação Como Abstração Concreta," *Marx e o Marxismo* 8, no. 14 (2020): 93–114.

18 Following this interpretation, architecture can be seen as simples as the fleeting drawing of a hopscotch on the ground – but also as problematic as the environmental changes of late; for the transformation of space is both tethered in the experience of space and its development in society. This radical interpretation of architecture can be significant especially in relation to theorization and critique. In practice, however, it clashes with the institutionalized realm of the discipline, encompassing many other professions and practices outside the scope and legal reach of the architect. This research can be seen as a small effort towards this interpretation, understanding that architecture is more than just design, although still limited primarily to buildings.

as products of architectural practice, are existing objects with both practical and symbolic function. In other words, what can be generally described as *artifact*, according to art anthropologist Alfred Gell[19] – considering this, questions arise: what knowledge do architects and other agents involved in its production share? What constitutes this common background? How are its contents negotiated between actors? Exploring how these encounters take place and what are their dynamics might provide insights on how knowledge is articulated and valued in the production of architecture, not only practically, but symbolically as well.

This research thus addresses the question of tacit knowledge in architecture and, given architecture's material entanglement, proposes to explore the subject from the point of view of material production. It acknowledges the importance of considering other agencies in its production, and that their specific perspectives may offer new ways of understanding architecture in its complexity beyond design. In other words, it addresses the question of making and proposes to look at architecture from the point of view of crafts. The goal: to develop a theory of (tacit) knowledge in material productions, and use to explore architectural knowledge in the production processes, engaging the epistemes of architecture as a material endeavour – as a craft.

Craft, in this quest, is a proxy. A complete theory of knowledge in material production escapes the scope of this thesis and its disciplinary setting, and represents an effort surpassing my skill. The proposal, therefore, is to develop it in a tentative manner, to a degree that allows the clarification of a particular dimension of tacit knowledge in architectural material production. For this endeavour, other categories such as industry and art could be equally clarifying, but craft poses a different question: instead of being ruled by the slippery notions of truth and beauty, rationality and aesthetics, crafts entangle these dichotomies in the very roots of practice. The focus on skill, hegemonic in craft studies, grounds these notions in the reality of the making activity.

As particular cultural fields of expertise in which making and thinking are inextricably linked, standing at the overlaps of cultural aesthetics, historical techniques and economic flows, crafts represent a rich case to study the perspective of knowledge in material productions. Crafts encompass knowledge of techniques, processes and materials dealing with their particular production, but they also incorporate

19 Alfred Gell, "Vogel's Net: Traps as Artworks and Artworks as Traps.," *Journal of Material Culture* 1, no. 1 (1996): 15–38.

knowledge that reflects a social and cultural environment, such as how are objects used, valued, and traded; what they mean, how they are perceived etc. In other words, crafts pose the question of knowledge not solely in a technical structure of production nor in the pure subjectivity of the maker, but in the relationship that binds them together in a particular moment in space and time. This moment is the moment of making, manifest in the activity of the maker working *together* with materials and tools. The moment where subjectivity cannot be fully isolated between these agents, human (in terms of co-workers, assistants, colleagues, clients, partners etc.) and non-human alike (materials, tools, techniques, spaces but also traditions, demands, influences, inspirations, skills etc).

If architecture can be understood as the transformation of space by human activity, encompassing its processes, products and reflexivity, therefore architecture is both socially and subjectively grounded, representing a culture and a craft in itself.[20] By investigating the dynamics of knowing, thinking and making in craft, it is possible to analyse architecture from the vantage point of its production through a different set of conceptual and theoretical tools proper to material practices. The detour through crafts to analyse architecture can be understood, as Roy Wagner suggests, as an "inverse" anthropology - or, to use Latour's concept, a "reverse" anthropology of architecture.[21] It is an inversion of the epistemological point of departure: the concepts through which architecture is analysed in this research are not those already familiar to architectural theory (like materiality, functionality, tectonics, space, form, design, sketch, model etc.)[22]. Instead, these become the objects of analysis, seen through the lenses of a conceptual framework developed to describe the knowledge employed in crafts, introducing it as a similar "regime of variation" as the one found through ethnography, described by the Brazilian anthropologist Eduardo Viveiros de Castro:

20 Kapp, "Por Que Teoria Crítica Da Arquitetura? Uma Explicação e Uma Aporia."

21 Roy Wagner, *The Invention of Culture* (Chicago: The University of Chicago Press, 1976), https://doi.org/10.2307/3032626; Bruno Latour, *We Have Never Been Modern*, *Configurations*, vol. 2 (Cambridge: Harvard University Press, 1994), https://doi.org/10.1353/con.1994.0041.

22 The examples shown here are merely illustrative and, evidently, are not exhaustive of architectural theory and practice. As worded here, they stem loosely from the classification put forth by Tom Avermaete, Klaske Havik, and Hans Teerds, *Architectural Positions: Architecture, Modernity and the Public Sphere*, ed. Tom Avermaete, Klaske Havik, and Hans Teerds, vol. 53 (Amsterdam: SUN publishers, 2009). Another classification can be found in Andrea Simitch and Val Warke, eds., *The Language of Architecture* (Beverly: Rockport Publishers, 2014). For a rather different approach showing the possibilities of new conceptualizations, see Klaske Havik, "Vademecum: 77 Minor Terms for Writing Urban Places," 2020.

> What every experience of another culture offers us is the occasion to make an experiment of our own culture; much more than an imaginary variation – it is the introduction of new variables and contents in our imagination – it is the very form, the structure of our conceptual imagination that must enter a regime of variation, assuming itself as the variant, version, transformation.[23]

The proposal, therefore, is to develop a theory of knowledge in material productions; describing the *epistemologies of making*. Central to this discussion are questions regarding the different rationalities embedded in making that may differ from techno-scientific, academic or designerly ones[24]. Concretely, this research explores the hypothesis that crafts produce and employ a *rationality* that is primarily related to the making processes, contrasting to other forms of knowledge that revolve around its objects – a *process-oriented way of knowing*.

From there, this investigation expands onto the testing the potential of a theory of craft knowledge in architectural studies, employing the concept of craft not only as a potential metaphor for architecture – as it has mostly been approached in similar studies – but as a theoretical tool that allows for its analysis and critical examination. Being fundamental to the materialization of architecture, these process-oriented ways of knowing are important tributaries to the formation of the built environment, both materially and discursively. Understanding the overlaps, rifts, and the difference between the knowing of craft and of architecture – embodied also in craftspeople and architects – can thus be considered as the secondary goal of this thesis.

In other words, the proposal is to outline a theoretical framework in which architecture can be analysed as a form of craft and from the perspective of crafts, employing its concepts and ways of thinking, rather than as a stand-alone discipline[25]. As such, this research can be understood as an epistemological study,

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23 Translated from the original, in Portuguese: "O que toda experiência de uma outra cultura nos oferece é a ocasião para se fazer uma experiência sobre a nossa própria cultura; muito mais que uma variação imaginária – a introdução de novas variáveis e conteúdos em nossa imaginação – é a própria forma, melhor dizendo, a estrutura de nossa imaginação conceitual que deve entrar em regime de variação, assumir-se como variante, versão, transformação." Eduardo Viveiros de Castro, *Metafísicas Canibais*, 1st ed. (São Paulo, 2015). p. 25

24 The concept of "designerly ways of knowing" is developed in Nigel Cross's book of the same name, in which he describes a particular form in which designers and architects engage with their practice, see Nigel Cross, *Designerly Ways of Knowing* (London: Springer, 2008), https://doi.org/10.1007/978-3-7643-8472-2_3..

25 In a way, this endeavour of finding this conceptual framework can be interpreted, as itself, as the initial processes of building a theoretical bridge between architecture and crafts – what Wagner (1981) describes as the *invention* of culture that, by contrast, exposes the anthropologist's own culture. See Wagner, *The Invention of Culture*.

given its particular focus on knowledge and its relationship with making. Following a Foucauldian perspective, *epistemes* represent sets of ideas that fundament knowledge in specific and historical ways, reflecting socio-economic and ontological particularities and defining its "conditions of possibility" in theory and practice[26]. The regime of thought in a historical environment that constitute an episteme is related to a particular material and symbolic reality. Thus, depending on the philosophical approach and the understanding of *logos*[27], 'epistemology' can be understood both as the *theory* concerned with these relations, or representing the relations themselves as the underlying structure of the epistemic manifestation. In other words, an episteme is a framework defining how knowledge is produced, organized and evaluated, while epistemology refers to the rationalities underlying different epistemes, or the study of these phenomena.

Acknowledging this dual meaning of epistemology as a field of study of epistemes and its background rationality, theorizing the different *epistemologies of making* challenges classical definitions of knowledge (particularly in the duality between intellectual and practical) and the boundaries of production practices. As in any re-conceptualization, it destabilizes accepted notions, ideas and concepts, seeking ultimately to foster debate and the inclusion of other voices in architectural discourse. Particularly, the perspective of production questions the hegemony of *design* in architectural thought and education, proposing an engagement from the point of view of material production. It acknowledges the importance of considering other agents in the constitution of architecture's body of knowledge, including in the development of design, understanding that their specific perspectives may offer new ways of thinking about architecture and its complexity.

26 Michel Foucault, *The Archaeology of Knowledge* (New York: Vintage Books, 2010).

27 Although Foucault often refers to epistemology as a disciplinary field concerned with the history of ideas, the term can also be understood as a concept that, rather than delineating a discipline, describes the rationality behind reasoning. The choice to reclaim to epistemology a greater conceptual reach is related to its more recent incorporations as a central concept in theories of post-colonialism, as present in the works of Aníbal Quijano, and feminism, in authors such as Donna Haraway.

1.2 The making of a theory of making

This thesis draws on the premise that, if architects have their own tacit ways of knowing (which is the overall theme of the Tack program), the same must be valid for other disciplines and communities of practice. Thus, it is useful to investigate the particular phenomenon of tacit knowledge elsewhere, in other fields and disciplines, and bring in the insights to architecture.

I have chosen to do so using the vantage point of crafts, as it is a field where tacit knowledge also famously plays a large role[28]. The hypothesis is that crafts operate in a particular epistemological regime: there is a directionality in craft's ways of thinking that is framed to and organized in the lexicon of production processes, oriented through the very act of making. Thus, in crafts, knowing turns objects into processes: a craftsperson, faced with a "thing" – a table, for example – seeks to understand it by the way in which it can be made – which tools to use, which techniques to employ, which materials to choose etc. In summary, how to articulate knowledge in order to perform a particular task. It is a process of shifting from a knowing what into a knowing how. My intention is that, describing this way of thinking (and knowing) and how it can correlate to the built environment, I can offer new theoretical horizons and provide a different perspective for architectural practice and reflection. One example: if craftspeople, as Tim Ingold suggests, know materials not by their substance, as objects characterized by their physical properties and boundaries, but by how they can be worked on, we may ask: how do architects see materials? What are the differences contained in between these notions of materiality and it influence architectural thought and practice?

Therefore, the idea is to develop a conceptual framework for crafts that explores the practical and material dimension of knowledge in a broader sense or, in other words, the epistemological side of making and its specific principles, rules and characteristics – the very beginnings of a general epistemology of making. Moreover, as an appraisal of its value, I use this theory to analyse architecture: understanding architecture as a form of craft as well. This could be thought of as an experience of re-conceptualizing (or re-tooling) architecture, using concepts that seek to

28 Sennett Richard, *The Craftsman* (London: Yale University Press, 2008); David Pye, *The Nature and Art of Workmanship* (London: Cambridge University Press, 1968); Glenn Adamson, *The Craft Reader* (London: Bloomsbury Visual Arts, 2019).

better describe its material dimension, and, especially, its production. In other words, I propose the development of a theory of knowing in crafts for the study of architectural production, focussing on practice as a source of insight into the tacit and arguing for the inclusion of a process-oriented rationale in the discussions of architectural practice.

To pursue this endeavour, I sought to understand architecture and crafts as "material discourses", drawing insights from the discursive take of Glen Adamson in his *The Invention of Craft*[29], where he argues the way crafts are understood today is a Victorian era invention constructed in opposition to the rise of industry. The specific definition of the concept of 'material discourses' is developed in chapter one, drawing from a deep dive into craft's ways of knowing and historical transformations.

Methodologically, this dive is performed taking advantage of the attention craft has attracted in later years, in which some scholars see the rise of a "craft theory"[30]. I realized an in-depth study of the main authors related to the topic, identifying the main concerns, concepts and especially the gaps in what would constitute such a theory[31]. As could be expected from an infant field of studies, this 'proto-canonical' literary review exposed mainly the multi-disciplinarity in which the topic is set. According to Adamson (who grew himself to be one of the leading authors in craft studies), there are three lines of investigation that dominate craft theory: *object-centric* definitions of craft, focusing on categorization, *labour theories* describing the socioeconomics of craft, and the *romantic* nostalgia that sees in craft the possibility of a reconnection between nature and culture, present and past etc.[32] – an interpretation I tend to agree with, but to which I would add a Simondonian line, based on his notion of individuation and the critique of hylomorphism, significantly influential in anthropology and archaeology (and admittedly the one I am most aligned with).

29 Adamson, *The Invention of Craft*.

30 Adamson, *The Craft Reader*. p. 24, 310, 621, 630.

31 These author include, for example, Richard Sennet, David Pye, Peter Dormer, Tim Ingold, Pamela Smith, Pamela O'Long, Trevor Marchand, Alexander Langlands, Gleen Adamson and many others that speak directly of the topic, but also those tangent to it, but whose contribution helped on building the basis on which these authors develop their thoughts, such as the leaders of the Arts and Crafts Movement and philosophers like Adorno, Simondon and Deleuze.

32 Adamson, *The Invention of Craft*.

This seemly irreconcilable composition of the field means that there are many rifts that permeate the discussion, when different lines of inquiry are comparatively analysed.[33]

These kinds of rifts, gaps and contradictions are a fertile ground for the further development of the field, and they pointed me a way forward. Understanding the infancy of this field of study, I directed my efforts towards the development of an encompassing conceptual framework. It was a bold endeavour – and its elaboration is far from complete, but it sufficiently established the groundwork required for performing the analysis of architecture from the perspective of material production. This leap was required because my hypothesis is that understanding crafts in the link between material and epistemological production offers the possibility of explaining tacit knowledge in other creative industries. Thus, the notion of material discourses.

To attend the broad rifts in craft theory, after addressing its main works and authors, I followed a different track, drawing from minor and tangent texts, mostly written by craftspeople themselves or reflecting ethnographical studies. Contrasting these different groups of literature allowed me to construct a process of shifting composition, in which I could place the canonical and the specific interchangeably as background or foreground. The traces of this groundwork exploration figure in the text in the form of many anecdotal and exemplary stories that dive into the practices of craftspeople or the particular knowledge in a material production. Throughout the thesis, they serve as landing sites, helping to ground abstract discussions or illuminate my arguments. Their importance, however, is anything but tangential, and if it so appears, much more the fault lies in my writing skills than in their own value.

The choice of employing this pluralistic method – joining extensive review the 'canons' of craft literature with specific readings – can be understood as an effort of finding meaning by bringing disparate things together. It allowed me to anchor the scholarly

33 For example, Sennett's shallow knowledge of Marxist theory is evident to whoever took the trouble to read Marx's work past the *Communist Manifesto*. Sennett dismisses the potential Marx imbues crafts as an opposite model of production to industry, and consequently a place less prone to the alienation of labour, by showing that, in many supposedly craft environments, the exploitative structure of divided labour was usual. This limited view of Marx's description of crafts and industry is, unfortunately, common-place in craft theorists and can be perceived in Glenn Adamson's work as well. What these scholars fail to acknowledge (despite their willingness to criticize the Marxist description), is that Marx postulates a third model of production, precisely in-between industry and crafts, that addresses the organization of labour in hierarchical and exploitative structures without the extensive use of machinery. This concept of "manufacture" in Marx's writings makes invalid most of their arguments that craft practices are also exploitative and pervasive of the capitalist mode of production. In any case, my argument in relation to this point is not that crafts are essentially anti-capitalist and non-exploitative, but that the readings that reconcile the two are often misguided and narrow, artificially dismissing the potential contributions a Marxist approach can bring to craft studies.

discussion in situated settings, maintaining the multifaceted existence and complexity of crafts, and its performance in different scales and social environments. In this attempt to envision an overall philosophical umbrella anchored to actual, concrete craft practices, evidently, my own experience as a craftsperson played a significant role[34].

From this initial, general exploration I've gathered both the main threads and the seemly chaotic constellation surrounding craft studies into a somewhat orderly manner – which allowed its further analysis. I organized the disparate references in three main lenses, or dimensions, involving different perspectives of analysis – and aligned each of these realms to studies of other fields, such as phenomenology, the critical theory of technology, anthropology of technique etc. The primary object remained to be an investigation on how craftspeople make things and its epistemic implications, but this was dealt with, as it were, through different lenses, or *sections*[35].

The first lens is the line of studies I referred to as *crafting identities.* It served to examine specifically the phenomenological dimensions involving material productions and their agents, focusing on how relationships are developed between artisans and their practice, and their influence in the emergence of identity and skill. Understanding the concept of identity as a dynamic and fluid negotiation between agency and contingency, individual and social, and perception and reality, this section explored the influence of the making experience in the craftsperson's construction of selfhood. It drives on the notion that experience arises from the enactment of the body in existence, that is, the process of existing as a temporally, spatially and materially founded body, encompassing the meanings of experience as: a process of discovering something; a participation in particular events or situations; a proximity throughout an extended period, usually surrounding a particular subject (e.g., "my experience as an architect tells me that…"). These different meanings are related and show how experience set the foundations for the understanding of the world, intertwining imagination, actions and memories. Is a continuous process of simultaneously being and becoming, integrating different scales (short, medium and long term) and dimensions (past, present and future) of time through the particular point of view of the individual. In that sense, one could argue that experience *is* also this particular point of view, from which individuals find themselves in the world

34 My experience in crafts is manifold and diverse, yet not focused or ever honed to the depths a master craftsperson would. It includes mainly furniture making, construction with bamboo and metalworking. The last two figure in some of my earlier writings. see Eric Crevels, *Autonomia e Construção*, (Belo Horizonte: UFMG, 2015) and Eric Crevels, *Ensaios de Resistência* (Belo HorizonteL: UFMG, 2018).

35 Not to be confused with textual sections or chapter in the dissertation, this division served research purposes only and is not translated directly in the thesis in terms of narrative or structure.

and to which they are anchored, being the only way they can relate to it. As such, a primary objective of study of this section was to understand the ways of making and knowing that craftspeople develop through their experience — mainly, exploring subjects regarding: *sensorial perception*[36] and the *body*; studies on *technique*[37], and, especially, their merging[38]. Departing from more individual perspectives towards general developments, I addressed skills as embodied developments within material production, and how they shape the relationships between craftspeople and their work, that in turn affect their positioning in relation to reality and identity[39].

The second lens, or section, I named as *crafting societies* and it explored crafts as collective endeavours and shared environments with cultural expression. Through it, I investigate the social dynamics underlying its everyday reality to understand the *symbolic economies of crafts*. Understanding crafts as cultural industries, the goal was to clarify the power flows and hierarchies structuring material productions, especially on the relations between different agents, professionals and stakeholders – in other words, understanding the *relationships* where these communities of practice are situated. It involved, on the one hand, clarifying the symbolic structures governing crafts circles, indicating the social relations permeating their *habitus* and its association with the socioeconomic and cultural backgrounds, while, on the other hand, addressing how these determinations influence their respective production and its objective characteristics, such as the division of labour. I addressed this topic by the analysis of the anthropology's take on the symbolic and social dimensions of

36 Maurice Merleau-Ponty, *Phenomenology of Perception* (London: Routledge, 2010). Phillip Vannini, Dennis Waskul, and Simon Gottschalk, *The Senses in Self Society and Culture: A Sociology of the Senses*, *The Senses in Self, Society, and Culture: A Sociology of the Senses*, 2013, https://doi.org/10.4324/9780203805985; David Le Breton, *A Sociologia Do Corpo*, ed. Editora Vozes (Petropolis, 2006).

37 Carlos Emanuel Sautchuk, "O Arpão e o Anzol: Técnica e Pessoa No Estuário Do Amazonas," 2007, 402; Fabio Mura and Carlos Emanuel Sautchuk, "Technique, Power, Transformation: Views from Brazilian Anthropology," *Vibrant Virtual Brazilian Anthropology* 16 (2019): 1–17, https://doi.org/10.1590/1809-43412019v16d451; Carlos Emanuel Sautchuk, "Ciência e Técnica," *Horizontes Das Ciências Sociais No Brasil: Antropologia*, 2010, 97–122; Philippe Descola, *Beyond Nature and Culture* (London: The University of Chicago Press, 2013); Bruno Latour, *Laboratory Life. The Contruction of Scientific Facts*, *European Journal of Philosophy*, vol. 2, 1991.

38 Tim Ingold, *Making Anthropology, Archaeology, Art and Architecture*, *Making Anthropology, Archaeology, Art and Architecture*, 2013, https://doi.org/10.4324/9780203559055.

39 Mihaly Csikszentmihalyi, "Flow: The Psychology of Optimal Experience: Steps toward Enhancing the Quality of Life," *Design Issues* 8, no. 1 (1991): 314.

objects and material productions, as present in the works of Bourdieu[40], Appadurai[41] and Descola[42], with insights from critical theory's development on the cultural industry[43] and technology[44].

The third lens, *crafting meaning,* performs a comprehensive synthesis of the previous two. It can be understood as a primary analytical bridge to clarify where individual and subjective relationships with production face the concrete reality of a social environment and create an integrated world (although marked by contradictions), and how these relations permeate and shape knowledge, constituting an epistemic territory. The idea was to investigate the craft experience in diverse, contradictory and complex networks, from the intersections of material production, and how that is related to knowledge. For this endeavour, other discussions were added and examined in light of previous developments, namely: the question of *art, artefacts* and *agency* present in Gell[45], its relationship with labour[46] and industry[47]; and the social construction of reality[48]. The main goal was to understand how the ways of knowing found in the ways people make things reflect in the perception of reality and how meaning is construed in craft, determining tendencies of action, thought and judgement in material productions.

For the development of these studies, two provisional concepts – *Practical stances* and *Practice-based knowledge* were developed and used to further engage the problem from their particular focuses. Practical stances refer to the specific ways in which craftspeople relate to and perform their practice – that is, how they face problems, demands, the everyday life of production; how they perceive and understand materials, tools and skills, and also their reflections on the roles of their craft in society, its relationship with

40 Pierre Bourdieu, *Razões Práticas* (Campinas: Papirus Editora, 2019), https://doi.org/10.1017/CBO9781107415324.004; Pierre Bourdieu, *A Economia Das Trocas Simbólicas* (São Paulo: Estudos, 1984); Pierre Bourdieu, "The Forms of Capital," *Readings in Economic Sociology*, no. 1 (2008): 280–91, https://doi.org/10.1002/9780470755679.ch15.

41 Arjun Appadurai, *The Social Life of Things*, ed. Arjun Appadurai (Cambridge: Cambridge University Press, 1986), https://doi.org/10.1017/cbo9780511819582.

42 Descola, *Beyond Nature and Culture.*

43 Max Horkheimer and Theodor W Adorno, *Dialéctica de La Ilustración* (Madrid: Editorial Trotta, 1998).

44 Andrew Feenberg, "Alternative Modernity: The Technical Turn in Philosophy and Social Theory," *Philosophy East and West* 47, no. 4 (1997): 605, https://doi.org/10.2307/1400309.

45 Alfred Gell, "The Art of Anthropology. Essays and Diagrams," *Homme: Revue Française d'antropologie*, 2001.

46 Marcuse, *Reason and Revolution: Hegel and the Rise of Social Theory*.but that its original insights endure. When it first appeared in 1940, Reason and Revolution by Herbert Marcuse (1898-1979

47 Adamson, *The Invention of Craft.*

48 Peter L. Berger and Thomas Luckmann, *A Construção Social Da Realidade: Tratado de Sociologia Do Conhecimento* (Petropolis: Editora Vozes, 2004); Descola, *Beyond Nature and Culture.*

tradition, culture, economy and so on. The practical stance of craftspeople is what allows them to translate external elements into the language of the craft – thus allowing them to actively take part and navigate it. *Practice-based knowledge,* on the other hand, refers to the sort of knowledge that can only be understood by practice, because it can only be accessed in practice and works uniquely in relation to it. It's the knowledge that informs craftspeople in the process of making, and that they have to deal with in the employment of skill, but that is localized in elements of a particular process. The knowledge, for example, that artisans have about the peculiarities of each of their tools – or that cyclists have about how fast they need to ride in order not to fall.

The concepts of *practical stances* and *practice-based knowledge* worked together to paint a more focused view on the way craftspeople make things and how knowledge is involved in this process. Through them, I was able to envision that there are different rationalities embedded in making, specific to their own setting, but sharing a common directionality that seems to point to the processes of making. In the case of crafts, it takes shape as socially constructed and accepted processes of articulating *practice-based knowledg*e to perform a particular task, constituting a *practical stance*, in a process that shifts a knowing *what* into a knowing *how.* Therefore, by understanding the *practical stances* and *practice-based knowledge* dimension in crafts, it became possible to reflect upon the epistemological regimes that rule their practices – and merge these two provisional concepts into the notion of *process-oriented ways of knowing.*[49]

In a very short summary, the endeavour allowed me to postulate that individual and subjective relationships with production face the concrete reality of society (with economic and cultural dimensions) and create an integrated world, and these relations permeate and shape knowledge, constituting an epistemic territory. The ways of knowing derived from the ways people make things reflect how reality is perceived and how meaning is construed in crafts, determining tendencies of action, thought and judgement in material productions. This is what I call a material discourse.

This conceptualization serves as the methodological background for the comparison of different fields and models of production in a general cluster of 'crafts'. An "archaeology" of material discourses addresses production in its complexity and historicity, gauging and describing its apparitions and its hold on society in the light of these conflictive,

49 The implication of this merger of "provisional", or "working" concepts, is that they do not figure in the main body of the dissertation, since, while necessary for the my development of the concept of process-oriented ways of knowing, they were initial attempts to understand the phenomena surrounding knowing in crafts. They have, on the course of the theory's development, proved flawed or fragile in many occasions, and created unnecessary difficulties when, for example, thought in tandem to craftsmanship, which grew to become one of the main tenets of the research.

contradictory manifestations[50]. Moreover, this approach acknowledges the relationship between material practices and knowledge – in fact, it recognizes the nature of crafts as epistemological practices, making possible to recognize how material productions are associated with and can be analysed from an epistemological perspective.

1.3 Methodology

1.3.1 A craft kaleidoscope for architectural design

Once established the general theoretical framework of the *epistemologies of making*, it is possible to apply it in face of concrete case studies, as a test to its validity and usefulness to architectural scholarship and practice. The first of these studies was realized as a five-month ethnographical research of the Rotterdam-based architectural office Korteknie Stuhlmacher Architecten (KSA), and it requires some methodological discussion. The format of this secondment was designed as a mandatory part of the TACK program, as a form of study of professional practice. Its contents and performance, however, were decided in an agreement between myself and the office partners, particularly Mechthild Stuhlmacher, founder partner of KSA, having in mind my skills, the overall objective of the experience and the possible contributions to their office. Starting from this premise, I drove my understanding of it from the notion of ethnography found in Roy Wagner's *The Invention of Culture* that, besides many other considerations, makes one aware, on the one hand, of the non-objective nature of ethnography (so as not to treat it as a fundamental truth immune to biases), and on the other hand, how it generates the potential to teach ethnographers about their own culture – by making these differences with the other reality visible and accessible to the ethnographer. Having this exposition in mind, my approach to the research involved the double agenda of simultaneously analysing their work and developing the tools needed to do so.

My study consisted initially of exploring external accounts on their works, written by scholars, jury members, journalists and clients, since I've been assigned to study this office by the TACK program – and thus was not particularly familiar with their works,

50 Foucault, *The Archaeology of Knowledge*.

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newly arrived from Brazil and somewhat removed from the study of professional offices. I noticed that colleagues and others familiar with their work would frequently point out what a great match it was for me to be placed in KSA. They seemed to recognize a 'craft character' in the work of Mechthild and Rien, especially on the *Predikheren*, the monastery in *Mechelen*, which made me curious. I wanted to find out why people had this perception and where did it come from. Evidently, it comes mainly from the buildings themselves, but at this moment, I was interested in understanding how was this was externalized: which were the terms, the qualities and the arguments that constructed this interpretation and connected craft and architecture so intimately?

This was a way of addressing how this recognition of a craft "aura" – to use Walter Benjamin's term[51] – in their work was being expressed in architectural parlance. Walking through these discourses, I went through multiple publications and writings talking about the work of KSA, trying to collect how the perception of my colleagues was being translated and explained, and understand what was the reasoning behind it and what aspects of this idea of craft were being recognized. These accounts can be found scattered between the office's website, articles published about their work in professional magazines, academic writings regarding the firm and other publications – including the *Vlaams Architectuurinstituut* yearbook and the *Predikheren Mechelen* tome[52] – and, lastly, in the office's archives. These allowed me to understand how the office is perceived by others or, in other words, how the office figures in the discipline's milieu, and to recognise that this discursive dimension of an architectural practice is not a purely intellectual endeavour, but rather the opposite. It means that the interpretation cannot be completely disassociated from its temporal-spatial apparition and its material environment, nor can it be disentangled with its cultural, social and historical dimension.

Adding to these formal discourses, and creating a parallel to it, I engaged in the experiences proper to the ethnographic study, coming from my presence within the office. These had many forms, interviews, informal talks with employees, private notes of my perceptions in a field journal and so on. From this encounter, I engaged in the conceptual development of a set of heuristic tools that could afford a deeper understanding of their practice, allowing all these external perceptions to resonate with my own knowledge of crafts and in light of their work. In concrete terms, it meant connecting what was being said to processes and notions that I recognized in the epismologies of making.

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51 Walter. Benjamin, "A Obra de Arte Na Era de Sua Reprodutibilidade Técnica," in *Walter Benjamin: Obras Selecionadas Magia e Tecnica, Arte e Politica* (Rio de Janeiro: Abril Cultural, 1987), 165–96.

52 Mechthild Stuhlmacher, Joeri de Bruin, *Het Predikheren Mechelen* (Antwerp: Public Space, 2019)

However, the reader will find these connections enmeshed together along the chapter, interwoven and presented in a somewhat parallel way. Tha is so because, from the aforementioned connections, I identified three aspects of craft – consistency, coherence and resonance – that could allow me to understand the works of KSA through the language (or lexicon) of crafts. As I present these three concepts that summarize KSA's approach to architecture, the chapter is structured according to this division.

Rather than focusing on a possible architectural craftsmanship directly, these three concepts intend to inform it and contribute to its formulation, without exhausting it. The reader will probably also perceive that the terms chosen as concepts have loose boundaries and are, to lesser and greater degrees, complementary to each other. This was a conscious decision, as a way to avoid the dissociation of their entanglement in the very practice of the office. This triple conceptualization of consistency, coherence and resonance is kaleidoscopic – turn one of them too much to one side, and its seemly solid structures and objects shift, acquiring new geometries that, not coincidentally, are those of one of its sisters. They are, after all, lenses. Heuristic lenses, to be precise, and they deal with the same object or universe. These are ways to understanding a particular craft that propose focuses, but only in a way to magnify and enlighten specific relations, framing them in these conceptual lines - they should not freeze reality under one solid frame.

The goal was to treat the phenomenon in its material and symbolic complexity without reducing it. Therefore, these concepts follow different thematic paths that, although less theoretically solid, seem to me as more familiar to the practice of making, and thus more empirically versatile. Specifically, these notions of consistency, coherence and resonance are concepts that indicate the positioning of architectural design within the epistemologies of making in relation to economic and symbolic dimensions, without focusing on any one separately.

In other words, the concepts presented here refer to crafts from particular angles. "Consistency" deals primarily with the processual and objective complexity of a production. What I call 'coherence' represents how every craft practice and production need to be understood within the scope of the social-economic context. The last concept – 'resonance' - comes loosely from the Spinozian notion of affect, and it denotes the ontological nature of things as ensembles of relationships – how things are defined by what affects them and what is affected by them, to be very simplistic.

This history of this study and these concepts is, evidently, not nearly as neat and linear as it sounds. I opted to present them as already formed, fully developed entities that, therefore, are up for use by others, understanding that this format would probably add the most of pedagogical value for the dissertation. It is worthy of mention, however, that this conceptualization was born strictly out of the ethnographic study and the position it put me in – and, in that way, it is an answer to a question posed by both the method and the objective substrate it lies on. Which means that they are specifically designed for an analysis of architectural practice from the perspective of crafts and should not be transferred lightly to other spheres. In this chapter, architecture and craft changed roles briefly in the research, and the former informed the later.

1.3.2 Grasping skill

In addition to the ethnographic study, I apply my theory in an historical study, during yet another five-month secondment within the archives of the *Vlaams Architectuurinstitut,* in Antwerp, Flanders.

Silke Kapp and Ana Baltazar argue that, in production studies, "[interviews] with builders and users, lived experience of the historian, and traces of use might be primary sources, while architectural drawings and discourses become secondary references".[53] The discursive problems this research deals with, however, together with the opportunity of studying an architectural archival collection from the inside, lead me to focus my second case study precisely on this secondary-reference exploration. The main goal was to analyse how the tools and processes particular to architects resonate with or overlap with the agency and knowledge of craftspeople. Therefore, I focused my attention to the construction phase of the architectural objects, studying the networks of actors involved in the entire production of an architectural artifact. By "architectural artifact" I mean any product that is involved in the conceptualization (including the socioeconomic flows that create the conditions and demand for its emergence), production and reception of architecture. In other words, any object that has an influence on the way spaces are designed, constructed and experienced.

This extended notion of artifact led me to seek such instances in the VAi archives. With the help of the institution's archivists and historians, I selected a few practitioners to explore further, in an initial framing. I scoured these architects

53 Kapp and Baltazar, "Out of Conceived Space: For Another History of Architecture." p. 7

collection and soon amassed a range of material for deeper scrutiny, in search for the rare occasion in which the documents would betray the agency of others or the negotiations of craftsmanship beyond the realm of pure design. Although remarkably hard to find within the sea of floorplans, section drawings and sketches, there were many of such instances that could help colour the productive history of buildings and give it a more concrete character, such as the letter between architects and contractors that detail what was being done and thus sketch the story of the construction process (one in particular caught my eye: a letter from a French jeweller, where he admitted that the plans that the architect sent were not part his usual way of working.).[54]

Following this deep dive in the archive, the chosen case study is the history of Bataille en Ibens's 78+ system, focused on the *knooppunt* model that had caught my attention from the very first day when I was introduced to the collection. It proved to have the most significant amount of information, materialized in a number of media, that would allow me not only to draw significant insights and construct a solid argument, but also to develop a proper historiographical study. In face of my position in the VAi, which included a counterpart contribution from me to the institution, it seemed as a more interesting form of partnership that I produced something related to their work. As hopefully becomes clear to the reader, the history of the 78+ system and the *knooppunt* was never properly written, and the research I made tried to address this absence. Additionally, it allowed me to engage in a form of research I had not previously attempted, delving in a scholarly practice outside my expertise which, in addition to the many insights it brough to this dissertation, was a pleasure in itself. This interpretation was tested with the presentation of the *knooppunt* story in the IX Annual Conference of the Construction History Society at the Queens College of Cambridge University, and its publication in the conference's book – in a previous and partial version to what is presented here – where I could expose the study to historians and other specialists.

54 These teleological constructs are particularly vocal for historiographic work, especially in relation to embodied knowledge. However, it is worth of notice that random, unforeseen and non-teleological agencies can also be traced in the production of architecture, and to extents that they should be thoroughly investigated in broader studies. The contribution of these phenomena makes explicit the encounter between intentionality and the concrete environment, with its specific affordances and contingencies – the *stubbornness* of material reality, as James would put it. At the interface between abstract and concrete, design, technology and other forms of knowledge often fail, revealing, in these unexpected encounters, the limits of their employment. As such, these unexpected events and agents serve as witnesses, especially in relation to what possibilities for knowledge development they presented and now represent – their virtual epistemological potential, started in the moment they become "visible" or "tangible" to the network of agents involved.

In hindsight, perhaps this return to the *knooppunt* model is more directly linked with the topic of this research than I was then aware. This ability to see, to become aware, or to "attune" to the non-explicit knowledge contained or reflected in the archival documents is itself personal, situated. Different researchers carry their own previous knowledge, and would possibly discover different things. Thus, I also reflect on my own lenses. The chain of thoughts I experienced when analysing the model showed me that concerns for aesthetics and material economy are somehow related in my perception. If it comes from my experience as an architect or craftsman, it is hard to say – these are intermingled, as well.[55]

This whole story is all the more significant given I was dealing with tacit, embodied knowledge – that by its very definition won't let itself be known at first glance. Being a sort of in-house researcher at the archives of the VAi enabled me to find it wherever it unveiled itself, through my particular lenses and situated resonances. The possibility to delve deep into the archives, without too much attachment to a predetermined object of study, but instead allowing these personal resonances to happen was crucial for my discoveries. It required time with the material, evidently, but also some wandering through it. The pictures of the prototype's interior, for example, were not particularly significant to my research; I was focused rather on the process of its construction, particularly through the *knooppunt* model. Yet, it was only through this adjacent document that I could become aware of and uncover a particular story in the development of the system and its wastefulness.

It is important to notice, as hopefully becomes clear throughout the chapter, that the interaction between different sets of knowledge and skill in the production of architecture is a complex and transdisciplinary environment, with manifold contributions. This exposition, therefore, is bound to be anything but exhaustive.

55 The phenomenon is intriguing, as it appears that one dimension of concern can trigger awareness in the other. In craft practice, these diverse lenses serve as connective tools that, activated by an attentive gaze, spontaneously drag other dimensions of concern to the surface. Having a lot of these dimensional, entangled analytical lenses is thus an important tributary of craftsmanship.

1.4 Content and Format

In regards to its format, the dissertation at hand can in general lines be described best as a theoretical work. More specifically, throughout the text I develop a theory and analyse its performance when faced with a particular object of study (in the case, architecture), driving insights from empirical, historical and theoretical research. Accordingly, it has a total of six chapters – excluding the preface, introduction and conclusion – which roughly circle from theoretical explorations and literature review to their analysis through the case studies and back. These chapters could be clustered into three sections, referring respectively to a triad of Theory – Analysis – Reflection, but I decided not to establish this division formally, given that not only such a format would be unbalanced, possessing the final session a single chapter, but also disregard the nature of the reflection that goes into every single chapter, including the three case studies. Additionally, a fair amount of theoretical discussion is developed in the analytical part, and small, anecdotal empirical or historical studies figure in the theoretical session, in such a way that a division as such would be somewhat misleading.

The format of the dissertation follows a narrative as well as a logical linearity which, nonetheless, might at points seem arbitrary and exceedingly divided by discipline for a text that admittedly aims at a breakage between such boundaries. This contradiction, unfortunately, could not be avoided, since my initial attempts of interweaving the developments on craft theory and epistemology throughout the architectural analysis and reflection resulted in both a complicated back-and-forth between topics and a chaotic progression of the conceptual developments I propose. Remnants of this approach can still be perceived but, in the structure of the thesis as a whole the format was abandoned in favour of clarity. Chapters with a strong theoretical content precede analytical ones and present linear narrative, generally progressing from a particular insight surrounding the main research questions towards more general definitions. Chapters based on case studies follow, drawing from the earlier developments and problematizing their concepts in face of empirical problems. Finally, in the last chapter, all threads are brought together in the reflexive act of the thesis. In short, the present text can be understood as follows: in the first two chapters I develop my theory of knowing in making and access the possibilities of its application as an epistemology; in the next chapters, I apply it and adjust it to analyse architecture and, finally, in the end of text, I reflect on the insights it brings to architectural studies.

Inaugurating this structure, the second chapter of this thesis presents a theoretical investigation on how craftspeople know things, what kind of knowledge allows them to do so and how it is created in their practice. The objective is to establish a coherent theory of knowing in crafts that can serve as an analytical lens through which, later in the dissertation, architecture can be framed under the conceptual terms of material productions, allowing thus an investigation of the distinct ways of knowing articulated in the production of architecture and their tacit dimension. It explores how crafts display and produce a particular way of knowing, a practical stance determining how people engage and conceptualize their practice – the way in which they approach problems and processes of their production – and that describe how they ultimately understand it. In other words, the chapter examines specifically how craftspeople know within their practice, *thinking in making*. The suggestion is that craftspeople frequently employ an epistemic rationality (or epistemology) that, in this research, will be referred to as a *process-oriented way of knowing*, and it might be understood as an opposition to more cartesian approaches, that seeks to classify and order things based on their objective properties: an *object-oriented way of knowing*. In this framework, different fields of practice balance these dialectic notions and employ them in very specific ways – thus, these rationalities define, to a great extent, the specific ways of knowing in particular fields of practice.

Contrasting conflictual points in the field of epistemology, the third chapter addresses the problem of how such a theory can be accessed and tested. It develops the hypothesis of how knowledge can be appraised by focusing on what it makes possible in its particular social and material environment, and how knowledge can be understood as the establishment of these horizons of possibility. To construct this interpretation, I explore the the development of the modern terminology of knowledge and science, to decode the classical understanding of knowledge as 'justified true belief'. Challenging instrumentalist methods of knowledge appraisal, faced with the problem of tacit knowing and skill, I argue that the requirement for justification expressed in classical epistemology is not only found in communicable, codified modes of information transfer (relying on notions of *bits* or similar packages of information) or in the establishment of a scientific status that supplants a broader definition of experience. Rather, justification can be pursued on the directionality of knowledge, through the exploration of an associated empirical potentiality established in the rationalization of information that configures knowledge.

In the fourth chapter I apply my theory, developed in chapter two, to construct a specific analysis of architectural craftsmanship, exploring the practice of *Korteknie Stuhlmacher Architecten*[56]. For this endeavour, I performed a five-month *secondment* in their firm, focusing on their ways of working and analysing four schools designed by them as case studies (in different phases of design at the time of the research, and encompassing many particular challenges and specific solutions). In this line, I test how well can the concept of craftsmanship inform and describe architectural practice in its most common form. In other words, it explores how my theory of knowing in making fares in what could be considered a typical study in the discipline of architecture.

As a second experimental application of my epistemology of making, in the fifth chapter I develop an archival research, using as a source the archives of the *Vlaams Architectuurinstitut*. It explores different forms of embodied and tacit knowledge present in the production of architecture by investigating the development of a construction system, and how architectural knowledge is inserted into architectural institutions and archives. In other words, this chapter presents an attempt of appraising the intrinsic connection between the built environment and the processes involving its material constitution, investigating how the interactions between draughtsmanship and craftsmanship are influenced by the codes, structures and hierarchies of architecture's disciplinary environment. Particularly, the chapter focuses on one main case study, developing a *building story* that investigates an object – the *knooppunt,* a complex joint that structures the wooden beams and cross-shaped columns of the 78 + construction system developed by Claire Bataille and Paul Ibens. By telling the story of the *knooppunt*, the stories of the building system and the people involved in its development are activated, showcasing the interplay between different agencies and knowledge orbiting the technological development of architecture. The case study showcases how a theory of craft knowledge can explain the interaction between different sets of knowledge, tools and skills in the production of architecture as a complex and transdisciplinary process.

56 Korteknie Stuhlmacher Architecten is an architectural firm based in Rotterdam, The Netherlands, led by Mechthild Stuhlmacher and Rien Korketnie. By the industry's standards, it is considered a small practice, counting with around twelve employees in the time of the research. Their work is varied, but mainly focused with the design of mid-scale projects such as schools, elderly homes, cultural centres and the like, located mostly in the Lowlands.

In the sixth chapter, I focus on the discourses of architecture, using my theory to describe the complex and contradictory relationship between object- and process-oriented ways of thinking in the production of architectural ways of knowing, pointing at its powers, contradictions and challenges. Informed by the epistemologies of making and their *process-oriented* ways of knowing, I investigate the depiction of craft and labour in canonical architectural discourse to address the relationship between architectural theory and the material engagement of construction. From this thread, I show how different ways of knowing and making are entangled in the so-called *discursive materiality* of architecture and how these reflect on the divergent relationship architects and builders have with the materials and processes of architecture. Finally, I use the epistemologies of making to access a contradiction between two representative of Marxist theory within architectural scholarship, showcasing the possible contributions of my theory within a materialistic approach.

In the seventh chapter, I derive insights from crafts to architectural theory, reflecting on the particular relationship between process and object-oriented ways of knowing within the production of architecture. The chapter focuses on the consequences of reconceptualizing architecture in view of the architect's own craft, analysing the symbolic economies of the construction site and exposing some of the hierarchies, structures and flow of symbolic value inside the production of architecture. The findings converge in an exposition of the craft of the architect, and the conflictive relationship between draughtsmanship and craftsmanship.

2 Coarse epistemes

Skill, craftsmanship and tacit knowledge in the grit of the world

An earlier version of the contents of this chapter were published in Eric Crevels, "Coarse Epistemes: Skill, Craftsmanship and Tacit Knowledge in the Grit of the World," in *Perspectives on Tacit Knowledge in Architecture* (TACK, 2023).

2.1 Introduction

In the words of Dutch archaeologist Maikel Kuijpers, in an interview to Todd Oppenheimer, craft is "a way of exploring and understanding the material world"[57]. This definition suggests that craft can be understood as a touchstone for a theory of knowledge in material production. By exploring the role of skill and craftsmanship in the processes of making and its epistemic correspondence on the general idea and historical formation of crafts, in this chapter I develop the conceptual framework used to understand the perceptive of making.

The argument is that the material, productive side of work deploys and operates a particular epistemological regime, based on types of practical engagement deeply related to the possibilities and contingencies of objective, concrete reality. In this sense, "making" means implicating oneself with the material world, embedding the body in the processes of transforming matter and partaking in the flows of forces that form things. Thus, the knowledge in the making – skill – can be understood as the invention or establishment of a new mode of perception through action that is enacted by tools, movements, techniques etc. That is, skill is as a

57 Todd Oppenheimer, *"The Future Is Handmade"* (Craftsmanship, LLC., n.d.).

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perceptive-cognitive enactment within the making process, a form of *attunement* with production. This practical perception acts as the foundational basis on which craftsmanship is performed, representing its conditions of possibility. The chapter then unravels the development of the ways of knowing craftspeople develop through their experience of skilled practice. Departing from more individual perspectives towards general phenomena, it addresses how embodied engagement within material production shape the relationships between craftspeople and their work, that in turn affect their positioning in relation to reality and identity[58]. Drawing from these studies, the chapter explores how the relationships between artisans and material are developed in the act of making, and how craftsmanship is founded in the emergence of an intersubjective encounter. This agentic negotiation builds the epistemological foundation of craftwork and sets the stage for the development of crafts as material discourses.

The chapter is divided in six sections. The first section refers back to the scholarly gap in the conceptualization of skill, proposing that is possible to understand skill as the establishment of a perceptive-active field, a form of attunement between maker and material. In the second section, I develop the notion of craftsmanship as an agentic negotiation. In this conception, craftsmanship is not a quality, but a performance of the act of making that establishes a tensioned intersubjective relationship between maker, material and tools. The third section is dedicated to the explanation of how skill and craftsmanship give rise to a form of knowing that cannot be fully understood in terms of a classical epistemology, and proposes an alternative line of thought for considering the knowledge in crafts. Based on the philosophy of Gilbert Simondon and its development into anthropology by Tim Ingold, the concept of process-oriented way of knowing is developed. In the fourth section, I address the implications of such a theory in the formation of crafts, referring back to the formation of material productions and their development in relation to skill and craftsmanship. Showcasing the discursive dimension of craft and its institutional epistemes, the rise and fall of artisanal claims to knowledge are exposed in the fifth section. Finally, in the sixth and last section of the chapter, crafts are described as material discourses, a concept that seeks to combine a focus on the material grounds of productive endeavours with an attention to the epistemic and discursive operation of skilled practices.

58 Csikszentmihalyi, "Flow: The Psychology of Optimal Experience: Steps toward Enhancing the Quality of Life."

2.2 Skill as an attunement with material

Defining or conceptualizing craft is a difficult task that most authors shy away from[59]. Part of the problem stems from the variety in which the term can be used, which, to my perception, can be summarized in three general forms: there is “craft”, in a universal singular, without articles, often used to refer to a general field in a broader analysis – for example, when related to art, in the *Art and Crafts* movement, or industry, in Glen Adamson’s works[60]. Accordingly, it is usually typed under a capitalized form, as *Craft*. The second category can take form as *a* craft, with an article and lower-cased, or *crafts*, in the plural. It denotes different types of material production that fall within the general category of ‘Craft’, sometimes referred to as trades or handicrafts, and that would generally be parallels to what is now known as the professions. Finally, there is also the *craft of*, in the sense of the process within a particular profession or task, usually used in conjunction with a specific practice, as in the *craft of* writing, or the craft of research, music composition and so on.

The greatest danger in this variety of use is the conflation of the first and last categories, which ends up having troublesome consequences for the second. This confusion can be seen in David Pye’s definition of craft, that “it means simply workmanship using any kind of technique or apparatus, in which the quality of the result is not predetermined, but depends on the judgment, dexterity and care which the maker exercises as he works”[61]. Accordingly, it is also present in the thought of Richard Sennett, related to the “desire to do something well”[62]. The problem is that 'craft' becomes a vague word applicable to almost any circumstance involving human activity, without limits or boundaries, and can therefore be associated with artistic practice, industry, theoretical thought and so on. This openness is useful to challenge traditional classist frontiers and question the real social distinction

59 A similar sentiment is vocalised by Sir Christopher Frayling, in a keynote lecture to Heritage Craft Association in 2013, followed by Langlands, in the preface to his book *Craeft*, echoing David Pye statement that “craft is a word to start an argument with” See David Pye, “The Nature and Art of Workmanship” (Cambridge: Cambridge University Press, 1968) and Alexander Langlands, *Craeft: How Traditional Crafts Are about More than Just Making*, vol. 53 (Faber & Faber, 2017)..

60 Adamson, *The Invention of Craft*.

61 Pye, *The Nature and Art of Workmanship*. p. 2

62 Richard, *The Craftsman*. p. 9

between making practices, but it loses the particular object of analysis in return[63]. In Sennett's view craft can be anywhere. But then, what become of the practices denoted by craft? What become of the trades? While the importance of Pye and Sennett's contribution to craft studies cannot be dismissed[64], their definition is insufficient. The origin of this problem is that the conceptualization of Craft and its employment to characterize specific crafts follows a backwards logic – that is, instead of finding in the actual phenomenon of crafts that which correlates different practices and allow for their clustering, it takes its consequence as a starting point. A better perspective, perhaps, is to follow archaeologist Heide Nørgaard's argument that the base of craft "is the skill of the individual person"[65]. But, what is skill?

In daily affairs and professional environments, what is meant by "skill" is often blurry and obscure. When analysed from a scholarly perspective, one quickly notices how undertreated the notion of "skill" actually is. Classical epistemology has dwelt little on the concept, understanding that it only accounts to the *application* of knowledge, without being a proper instance of knowing. Knowledge and truth appear related, while "skill" simply denotes a subsidiary, more significant to labour than to philosophical works, in a schism whose origins scholars claim trace back to Plato and Aristoteles[66]. Studies on professionalism, where one could imagine the question would be treated in more depth given the ubiquitous focus on practice, often disappoint as well. Donald Schön argues that in the model of "Technical

63 A similar analytical problem in an exceedingly open and inclusive conceptualization is criticized by Michael Schwalbe, echoing Harry Braverman, regarding 'skill'. Arguing against the perception by Barbara Ehrenreich that no job is truly unskilled by claiming that such an analysis "masks tremendous variation" and "dulls the concept of skill, Schwalbe relates the degradation of the concept of skill with the murky understanding of 'craftsmanship'. See Michael Schwalbe, "In Search of Craft," *Social Psychology Quarterly* 73, no. 2 (2010): 107–11, https://doi.org/10.1177/0190272510369086.

64 David Pye's *The Nature and Art of Workmanship* and the ideas of workmanship of risk and of certainty therein, along with Sennett's *The Craftsman* are two of the most influential books on the notion of crafts and craftsmanship, and figure in most contemporary writings of craft theory. As an example of this influence, in the Trevor Marchand's edited book *Craftwork as Problem Solving*, four of the thirteen chapter's make use of David Pye's ideas – some explicitly constructing their analysis based on his concepts – while five refer to Sennett, and both authors figure in Marchand's introduction. See Trevor Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making*, ed. Trevor Marchand (Farnham: Ashgate Publishing Limited, 2016).

65 Heide W. Nørgaard, *Bronze Age Metalwork: Techniques and Traditions in the Nordic Bronze Age 1500-1100 BC*, *Bronze Age Metalwork: Techniques and Traditions in the Nordic Bronze Age 1500-1100 BC*, 2018, https://doi.org/10.2307/j.ctvndv72s.belt plates, pins and tutuli p. 4

66 Holst, "The Fall of the Tektōn and The Rise of the Architect: On The Greek Origins of Architectural Craftsmanship."

Rationality" – hegemonic in professionalism studies – skills are thought of as "an ambiguous, secondary kind of knowledge"[67], a perception that clearly mimics classical epistemologists and rationalism. Schön's departure from this perspective is particularly significant to design disciplines, and his studies bring to the table the question of skill and the problematic of its apprehension. Yet, while Schön effectively deconstructs the idea of the "residual character" of skill, he does not directly develop it as a concept, focusing instead on the "knowing in action" that takes place in skilled practice[68]. My goal is to address this gap.

Fortunately, Schön is not alone. Focusing on the concrete environment of production, scholars from anthropology, archaeology and cultural studies seek to understand skilled practice in less disciplinary, intellectually formal environments. The works of David Pye and Peter Dormer and, treading on the philosophical thought of Hannah Arendt, Richard Sennett's *The Craftsman* brought notable attention to skill and craftsmanship and renewed the interest in their potential[69]. Progressively, this growing field of research now known as *craft theory* has picked up on the task to theorize skill[70]. Amongst many scholars counted in its lines, perhaps the most prominent contemporary author that deals with the question is the British anthropologist Tim Ingold.

Ingold argues that making is not a process of translating a conceptual idea into matter, but rather the process where one "finds his way"[71] by following the material's properties. In opposition to Aristotelic hylomorphism, Ingold rejects a dualism between form and substance and suggests that artefacts come to be as they are woven in the flow of "forces" of *skilled practice*[72]. What this means is that craftspeople do not impose ideal forms into nature, but engage with nature in a form-generating process[73], or *morphogenesis*, in which the properties of materials, the affordances of tools and the perception and movements of the maker come together in a creative action. Form, he proposes, is generated through this encounter – it *grows* out of the process itself.

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67 Donald A Schön, *The Reflective Practitioner* (Basic Books, 2013), https://doi.org/10.4324/9781315237473.

68 Schön, *The Reflective Practitioner*.

69 Richard, *The Craftsman*.

70 Maikel H. G. Kuijpers, *An Archaeology of Skill: Metalworking Skill and Material Specialization in Early Bronze Age Central Europe* (New York: Routledge, 2018), https://doi.org/10.4324/9781315196022.

71 Tim Ingold, "The Textility of Making," *Cambridge Journal of Economics* 34, no. 1 (2009): 91–102, https://doi.org/10.1093/cje/bep042. p. 97

72 Ingold. p. 100

73 Ingold, *The Perception of the Environment*. p. 290

Ingold's view opens the path to theorize skill as something other than the mere application of knowledge or a capacity for technical reproduction. Ingold proposes a "generative relation between the person-organism and the environment"[74] that conditions the development of skill and, therefore, takes into account the experience of the contextual world as an active process that affects the maker just as it does matter[75]. As pointed out by Brazilian anthropologist Carlos Sautchuk, this conception of skill has a deep phenomenological influence. In the apprenticeship of skill, practitioners "watch and feel as they work", in a process of "rediscovery"[76] that brings to the fore the properties of materials as they appear "directly implicated in the form-generating process"[77]. In other words, rather than the capacity to manifest exterior codes and form into a particular medium, skill is acquired through "an attentive, perceptual involvement" with materials in a real, actual productive setting – within the processes of the craft[78].

Treading on the same path and drawing much from Ingold's work, Dutch archaeologist Maikel Kuijpers offers an important perspective on skill, connecting it to a form of "recognition of and response" to material.[79] Associating the resulting quality of the produced object with how skilful or unskilled makers are, he argues that skill allows different individuals to "respond differently towards the material"[80]. While this capacity of (differential) response might be interpreted as an application of external knowledge, Kuijpers instead follows Ingold, affirming that "it is important to explore the relationship between knowledge and the human senses"[81] and arguing that it is through perception enacted in practice that knowledge of material comes to the craftsperson. In other words, 'recognition' and 'response' are made possible by means of an "intimate relationship between the maker and material […] achieved

74 Translated from the original in Portuguese: "uma relação gerativa entre o organismo-pessoa e o ambiente" in Carlos Emanuel Sautchuk, *Aprendizagem Como Gênese: Prática, Skill e Individuação*, *Horizontes Antropológicos*, vol. 21, 2015, https://doi.org/10.1590/s0104-71832015000200006. p. 122

75 A more in-depth description of foundations that lead to this interpretation of skill can be found in Tim Ingold, "Three in One : On Dissolving the Distinctions Between Body , Mind and Culture,"(1999)., where the author addresses more directly the entanglements between the social, the biological and the individual dimensions of both perception and skill.

76 Tim Ingold, "On Weaving a Basket," in The Perception of the Environment: Essays on Livelihood, Dwelling and Skills, 2000, 339–61 p. 353

77 Tim Ingold, "On Weaving a Basket," in *The Perception of the Environment: Essays on Livelihood, Dwelling and Skills*, 2000, 339–61. p. 345

78 Ingold. p. 353

79 Kuijpers, *An Archaeology of Skill: Metalworking Skill and Material Specialization in Early Bronze Age Central Europe*. p. 41

80 Kuijpers. p. 3

81 Kuijpers. p. 49

through the hands, eyes, and tools"[82]. Importantly, this is a way of *understanding* that is indeed knowledge, but of a different kind –a "sensate understanding"[83], in Kuijpers's terms. As he phrases it, "craftspeople aim to express the *qualities* rather than *properties* of a material", meaning that instead of knowing materials by properties such as chemical percentages, deformability, tensile resistance and such, it is by what can be sensorially apprehended in practice that they do so[84]. While this knowledge "is not necessarily of the kind that can explain why something happens", therefore not strictly 'theoretical', it allows for a phenomenal relationship to be "clearly recognized, understood, and acted upon"[85]. Kuijpers is quick to notice that the process is particular and relational:

> In every encounter between material and craftsperson this dialogue is repeated; the idea shaping the material as the material tweaks the idea. *This interaction takes place at the level where craftspeople are able to perceive and understand their material through their senses and with their tools.* A craftsperson will listen and learn from material, how it behaves, and what it presents.[86]

To demonstrate his point, Kuijpers argues that unskilled makers "might not even recognize" the qualities of material, proceeding thus to respond differently to it than a skilled craftsperson would[87]. Besides presenting the different engagement with material that skill allows, this quote points to an important, perhaps more fundamental point about its nature – while skill is dependent on perception, in also implies a change in it. Perception does not stay the same whether skill is involved or not. In fact, it is precisely in this change that the possibility for a different 'response' or action is founded. What distinguishes the skilled and the unskilled makers is not only a different capacity to act, but a different capacity to *perceive* that affords action. But Kuijper's use of the word 'recognition' is important. For the change in perception is not simply physical, or biological, but epistemic – it is not the capacity to see the grain of wood by means of vision, but to see meaning *in* the grains of wood.

82 Kuijpers. p. 50

83 Kuijpers. p. 9

84 Kuijpers. p. 50, my highlights

85 Kuijpers. p. 49

86 Kuijpers. p. 48, my Hihlights

87 Kuijpers. p.64

What I argue is that it is precisely this epistemic shift in perception that defines skill. To be more precise, skill should be understood not solely as a capacity made possible via a change in perception, but as the establishment of this transformation. It is the change in perception and its association with practical meaning related to the processes of making that qualifies skill – after all, the capacity to perform a particular task is conditioned by the ability for the task to be posed. It is only the skilled who knows what to do and is able to perform it when faced with a problem[88]. In other words, skill is the establishment of perceptual fields that allows knowledge of a practical syntax to be developed. It is the ability to see, *with* the material, the virtuality of action – thus, its language is that of craft.

If skill can be understood as the establishment of perceptual fields, it is effected, as most authors of craft theory would agree, through experience; slowly constructed by the active engagement with materials, tools and techniques in the process of making. Progressively, makers develop the attunement with the perceptual information present in production, coupling it with their bodily and abstract knowledge. In other words, it is by experiencing that the craftsperson gets the 'feel' of things. Through this feeling understanding is constructed and theoretical knowledge can be associated with practice. This explains the incapacity of old artisans to explain things in scientific ways, because skill bypasses the need for explication, both in its acquirement and employment. In it, the hierarchy between research and practice is inverted, if not dissolved altogether. What could be the equivalent of research, in traditional crafts, does not stem from a teleological drive for discovery, by means of inquiry and testing, but is prompted in practice because of the intrinsically experimental nature of practical action.

88 Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making*.

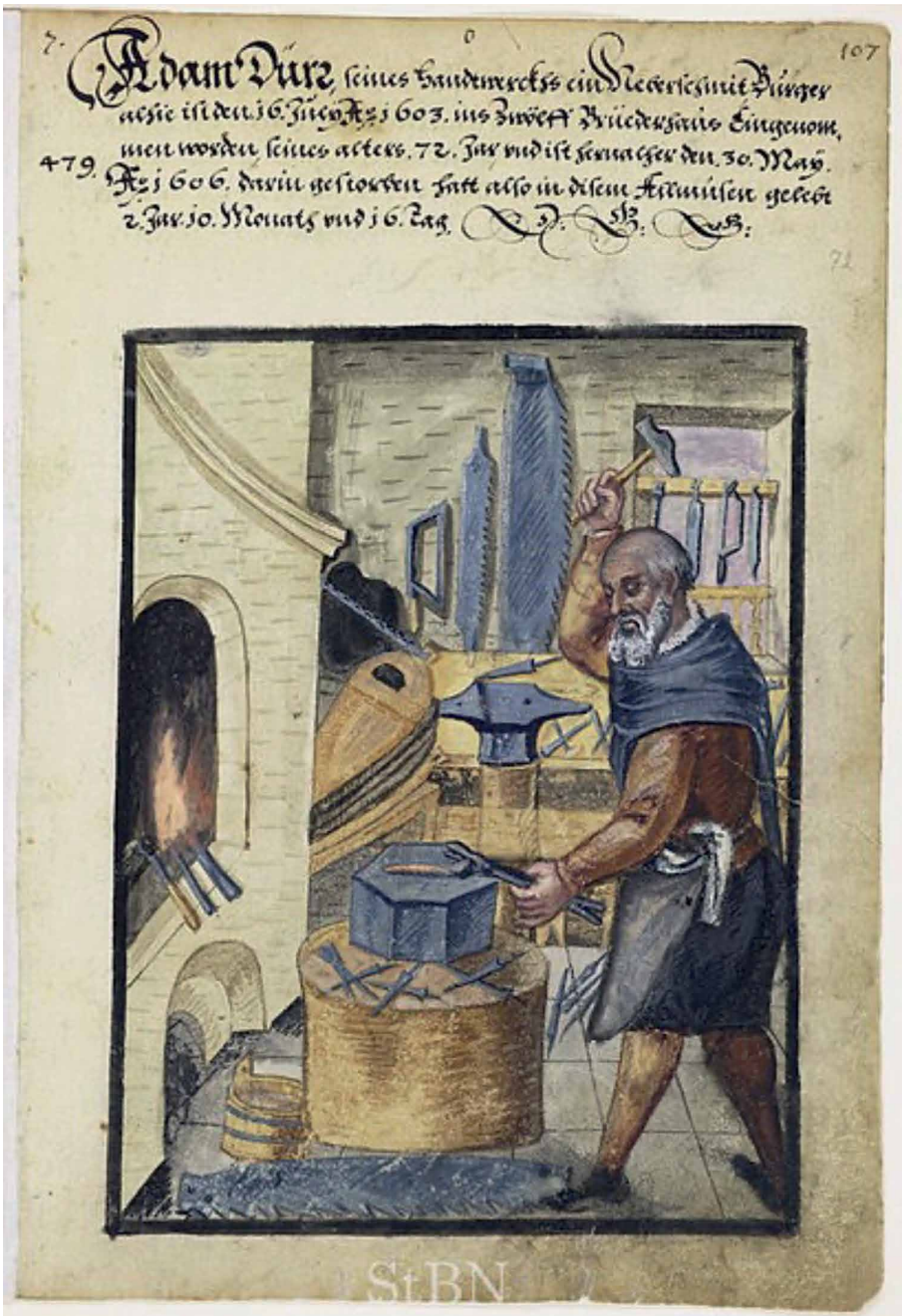

FIG. 2.1 Blacksmith at work in a medieval kodex plate. Source: Wikipedia Commons

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Take for example blacksmiths: they learn how to measure temperature by colour and then gauge the transformation it will inflict on matter, without the need for scientific explanation of the quantum mechanics and chemistry involved in these procedures. Blacksmiths 'use' these disciplines without theoretically 'knowing' them because their ways of knowing are that of the exploration of the world and its phenomena. The heating of steel produces blackbody radiation and makes the material pliable simultaneously, and different amounts of heat serve different functions in the craft (forging, hardening, tempering, forge-welding etc.). This variation in temperature is perceivable most directly by colour, in the absence of other (or better) ways of measurement. From 'cherry-red' to 'white', blacksmiths gauge the temperature of the steel with the precision required by their works, without the need of an objective codification – degrees alone, either Celsius or Kelvin, tell little about when to quench a blade if, in addition to the abstract knowledge of metallurgy, one lacks a thermometer. Across centuries of explorations, blacksmiths came to know the phenomena of quantum mechanics and chemistry *in action,* without knowing them in descriptive terms. They cannot explain or abstract it, but they certainly know about its existence in the general functioning of the world. They know it *because* they use it, insofar as it is a component of their craft, and they slowly developed the mode of perception that allow this engagement. As Marchand argues, "the process of learning through exploration, experimentation, and reflection brings about new knowledge or a new way of knowing (or getting to know) something"[89].

Long ago, practical metallurgists understood that a given piece of metal could be made to change its behaviour, from ductile and tough to rigid and brittle, by hammering it while cold. The opposite transmutation, from hard to ductile, could also be achieved by heating the piece of metal again and then allowing it to cool down slowly (that is, by annealing it). Yet, although blacksmiths knew empirically how to cause these metamorphoses, it was not until a few decades ago that scientists understood the actual microscopic mechanism. As it turns out, explaining the physical basis of ductility involved a radical conceptual change: scientists had to stop viewing metals in static terms, that is, as deriving their strength in a simple way from the chemical bonds between their composing atoms, and begin looking at them as dynamical systems.[90]

Michael Polanyi offers some insight in this matter, from his example of how people can recognize faces but fail to explain how precisely that is done, and how police methods were developed to allow the communication of this particular embodied

89 Marchand. p.13

90 Manuel DeLanda, "Material Complexity," *Digital Tectonics*, 2004. p. 17

knowledge[91]. Polanyi accepts that methods can be developed to access this knowledge, but these still do not explain it. What fills the gap in the transmission of knowledge is individual agency. In this case, that of the policemen. That is, one can communicate the resemblance of the face itself (how, more or less, it actually looks) to the police officers, but for them to be able to recognize that face in the real person, they will be activating their own facial recognition apparatus, not that of the interviewee. In crafts, the master shows the apprentice the starting and finishing points of a procedure, as well as the objective path between the two – but the semantics of the action are constructed mainly by the apprentice. As Ingold puts it, "progress from clumsiness to dexterity […] is brought about not by way of an internalization of rules and representations, but through the gradual attunement of movement and perception"[92].

In the terms of French philosopher Gilbert Simondon, a leading scholar in the study of technique, this sensate engagement affords information[93] – whose unit, a *bit*, in the words of Gregory Bateson, is a "difference which makes a difference"[94]; a difference that, in relation to the task at hand, is meaningful, that opens a horizon of possibility. As Simondon points out, information is not a discrete, absolute thing that stands in its own right, being this a problem in information theories based on *bits,* and thus of cybernetics. For the author, the problem is that of meaning, and this is the mode of perception referred here – it is the capacity to find a particular meaning in the changes of colour of heating steel related to the task at hand that defines a skill of the blacksmith. And what matters the most is that this meaning is not absolute, self-standing or autonomous in any way, but it is connected to a network of flows, forces, contingencies and tendencies.

In this framework, it is also possible to see how theoretical knowledge can act on skill – as it does, but it does not guarantee it or equate to it. To coalesce in skill, any information gathered through other means must establish a change in perceptual capacity. Acquiring or improving skills via theoretical, representational sources is a translation of properties into qualities, in a reverse process as the one suggested by Kuijpers as needed to (theoretically) understand skilled practice. Going back to the example of blacksmithing and quantum mechanics, many modern blacksmiths

91 Polanyi, *The Tacit Dimension*, 2009.

92 Ingold, *The Perception of the Environment.* p. 357

93 Gilbert Simondon, *On the Mode of Existence of Technical Objects* (Paris: Univocal Publishing, 2012).

94 Gregory Bateson, *Steps to an Ecology of Mind : Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology.* (London: Jason Aronson Inc., 1987). p. 276

incorporate the use of magnets to test the temperature of steel for hardening. As it happens, the hardening temperature of steel – more technically when the transformation of it molecular grain structure from ferrite to austenite is significant when hot steel is quenched– generally sits bellow its *Currie Temperature*, in which the material loses its magnetic properties. Blacksmiths, then, convert this piece of information coming from theoretical knowledge of metallurgy into a perceptive tool, understanding the properties to access the qualities of their material. They will test if the steel is magnetic and, if not, know that it is (probably) hot enough for hardening. Skills, as such, can be located in the boundaries between the concrete and abstract aspects of knowledge and, more importantly, establish their connection. They operate as the bridge between descriptive, operative, and projective knowledge; that is, between the information of a given state, the processes to transform it and its possible development into a new state.

If "all craft is approximation" as Pye suggests[95], meaning that the way of knowing of craftspeople is that of tendencies and finding a non-linear middle ground between idea and actual production, it is also an approximation in a metaphorical sense: a reduction of distance between the world of the maker and the material environment of production[96]. More than an established way of traversing this complexity and arriving in a location, skill represents the ability to perceive the horizon of possibilities in which paths can be constructed, how they can be navigated, and which negotiations they imply. Thus, increases in skill are not directly matters of efficiency, but take the shape as the expansion and diversification of this horizon. Skill provides the craftsperson with possibilities of action, pathways that allow one to tread through towards the intended goal. Accordingly, archaeologist Heide W. Nørgaard points that "[c]hoices taken within a working process can be viewed as a 'sorting out of possibilities"[97]. As with any journey, there is not a single possible trajectory, and their plurality emerges from the variation in their contexts. Making is just as so, and the landscapes of its processes are populated by materials, techniques and tools.

95 Pye, *The Nature and Art of Workmanship*. p. 30

96 Kuijpers, *An Archaeology of Skill: Metalworking Skill and Material Specialization in Early Bronze Age Central Europe*.

97 Nørgaard, *Bronze Age Metalwork: Techniques and Traditions in the Nordic Bronze Age 1500–1100 BC*.belt plates, pins and tutuli p. 248

2.3 The agentic negotiation of craftsmanship

Richard Sennett's *The Craftsman* is possibly the most influential work on crafts and craftsmanship of the last decades. Sennett's arguments, different from other studies on craftwork, are constructed with a focus on the people. They provided a fresh perspective by bringing the question of skill to the centre of the discussion. Consequently, Sennett defends that craftsmanship is present not only in the products of craft, but primarily in the way people approach their production, being a particular stance by which they perform their practice envisioning an outcome marked by excellence. In his terms, a desire to "do things well"[98].

However, the fundamental premise that craftsmanship is related to an innate desire is, philosophically, rather simplistic. The ontological nature of Sennett's claims denotes a short-sighted approach to the human condition, and ultimately reduces the question of craftsmanship to an unprovable and almost meritocratic individual entrepreneurship. By associating it with a sort of natural impulse, Sennett loses sight of the material and cultural implications of making things and the epistemological nature of craft. The result is that, despite the eloquence of its definition, his concept of craftsmanship is diminished in explanatory and critical potential.

Sennett's ontological interpretation of craftsmanship has done little to demystify this concept that is so important, and yet remains so mercurial in craft theory. Undoubtedly, craftsmanship is related to skill, but treating both terms as synonyms would a wasted opportunity. A direct equivalence to 'quality' falls equally short. If anything, craftsmanship is uniquely associated with the things of craft, and such a broad scope puts in question the necessity of a differentiated concept[99].

In paralel, the specificity of craftsmanship as a "quality of something skilfully made", noted by dictionary definitions[100], puts forward a provocative question. What is unique about the products of skill that warrants the need for a specific quality, or character, to explain it?

98 Richard, *The Craftsman*. p. 267

99 Adamson, *The Craft Reader*.

100 Craftsmanship. (n.d.) In Cambridge Dictionary. https://dictionary.cambridge.org/pt/dicionario/ingles/craftsmanship

To remedy this lack of proper definition and address the question above I believe a better path to conceptualizing craftmanship and understanding its relationship with knowledge and skill lies not in the inner desires of people, nor on the substance of crafted objects, but in skilled practice. More specifically, I believe craftsmanship is to be found in the relationship established between maker and the world *in the act of making*.

The complexity of craftwork requires the awareness of the workers in relation to a multitude of variants, to which they have to engage actively in the course of the production. As Marchand argues, craftwork is constantly marked by problem solving, in a structure encompassing many dimensions and contributions from material, social and cultural perspectives[101]. "In craft", he states, "problems emerge in tandem with identifying mistakes or registering deficiencies, and they arise while learning technique, and alongside experimentation, improvisation, and innovation"[102]. Similarly, Schön argues for the existence of a "reflection-in-action", claiming that "practitioners themselves often reveal a capacity for reflection on their intuitive knowing in the midst of action and sometimes use this capacity to cope with the unique, uncertain, and conflicted situations of practice"[103]. The autobiographical story of Benvenutto Cellini is a good example of how improvisation is an essential part of craftwork as well as a rational, intentional employment of skill. Showcasing instances where both invention and the knowledge behind it surface in face of struggle, it makes explicit the kind of awareness and versatility one must perform when actively working with a particular material, in all its stubbornness and particularities:

> I discovered that the cap of the furnace had blown up, and the bronze was bubbling over from its source beneath. So I had the mouths of my mould immediately opened, and at the same time drove in the two plugs which kept back the molten metal. But I noticed that it did not flow as rapidly as usual, the reason being probably that the fierce heat of the fire we kindled had consumed its base alloy. Accordingly I sent for all my pewter platters, porringers, and dishes, to the number of some two hundred pieces, and had a portion of them cast, one by one, into the channels, the rest into the furnace. This expedient succeeded, and every one could now perceive that my bronze was in most perfect liquefaction, and my mould was filling[104]

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101 Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making*.

102 Marchand. p. 15

103 Schön, *The Reflective Practitioner*.

104 Benvenuto Cellini, *Autobiography of Benvenuto Cellini*, ed. Charles W. Eliot (New York: Collier & Son Corporation, 1938). p. 381

> Now oak-wood of that kind heats more powerfully than any other sort of tree; and for this reason, where a slow fire is wanted, as in the case of gun-foundry, alder or pine is preferred.[105]

As Cellini's insightful (and sometimes comical) stories make clear, the tasks of crafts are highly related to the agency of the artisan, but not in a hylomorphic sense. In Adorno's term, they are rich in "rationality", because "the means have their own logic, a logic that points beyond them". [106] While some proponents of craft theory use this remark to defend an aesthetic quality as the goal of any craft[107], a *telos* that underscores material productions towards some supposedly higher end, a better interpretation should follow a Marxist approach, given its evident influence over Adorno's thoughts. For Adorno, the particular reality of craft cannot be understood only as "stereotypical formulas" or simply "practices (…) supposed to spare the energies" of the artist, because "the uniqueness of each *concrete* task excludes such a formalization"[108]. It is clear that instead of advocating for a virtual quality as the origin for craft's rationality, the author means the connection with an objective, concrete reality that has to be addressed in every instance of making. In other words, Adorno argues that crafts are not reduceable to a mere mechanical operationality that simply realizes conceptual ideas into material forms. That is so because the operations that constitute craft are constantly grounded in a concrete setting, and, as such, cannot afford the kind of simplification the concept implies.

In the words of the curator and historian Glen Adamson, "craft is intrinsically analogue (as opposed to digital). Its physicality is irreducible"[109], but that does not mean that the act of making is devoid of rationality, a simple activation of muscular memory. Even within a singular process, such as sawing a plank, repetition is a not a mere mechanical reproduction. Tim Ingold compares it to walking, as "just as no two steps are quite the same, so too, every stroke is a little different"[110]. While driving the handsaw, carpenters face slight changes in their perceptive-bodily engagement with the material, and "the force, amplitude, speed and torque varies, albeit almost imperceptibly, from stroke to stroke, as does the posture of the body and the muscular-skeletal configurations of tension and compression that keep it in

105 Cellini. p. 380

106 Theodor W Adorno, "Functionalism Today," in *Rethinking Architecture: A Reader in Cultural Theory* (Routledge, 2005), 31–41. p. 36

107 Adamson, *The Craft Reader*.

108 Adorno, "Functionalism Today." p. 36. My highlights

109 Adamson, *The Invention of Craft*. p. 165

110 Ingold, "The Textility of Making." p. 98

balance"[111]. This "rhythmic" quality, in which movements are "felt"[112], indicates that the knowledge of the artisan is in the hand (and the flesh) rather than coalescing in a set of rules and representations, in the sense that the body is the territory and the measure of the process. That is, a process in craft is understood, or 'read', by the sensual and sensorial feeling that it provokes. This feeling constructs the register, or the archive, of the embodied knowledge in crafts, the 'making' of the 'making', the 'process' of the 'process'. Crafts are in a permanent process of becoming concrete[113]. Linking the example of the carpenter sawing a piece of wood with Deleuze and Guattari's theories, Ingold develops a similar interpretation:

> The carpenter who has a feel for what he is doing is one who can bring the many concurrent variations with which he must engage more or less into phase with one another. This calls for continual correction, in response to an ongoing perceptual monitoring of the task as it unfolds[114]

As a reflection of this concreteness, of this situation in reality[115], materials and things have resistance - a sort of reaction that does not require intentionality. Jane Bennett calls this phenomenon as "vitality", or "the capacity of things – edibles, commodities, storms, metals – not only to impede or block the will and designs of humans but also to act as quasi agents or forces with trajectories, propensities, or tendencies of their own"[116]. In other words, the world has a *grain*, in its objective, material and social dimensions, and making implies a way of dealing with that grain. This can be seen as a form of agency[117], or as Collins's notion of "inscription", in the sense that it generates "affordances" in the way something is to be perceived, signified, read – i.e., the way in which it responds to action[118]. The corollary, as Ingold put it, is that

111 Ingold. p. 98

112 Ingold. p. 98

113 Crevels, "Aspectos Da Conceituação Do Trabalho Em Marx : A Alienação Como Abstração Concreta."

114 Ingold, "The Textility of Making." p. 99

115 Donna Haraway, *Antropologia Do Ciborgue*, *Belo Horizonte: Autêntica*, 2009.

116 Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (London: Duke University Press, 2010), https://doi.org/10.1017/S1537592710003476.

117 Alfred Gell, *Art and Agency: An Anthropological Theory* (Oxford: Clarendon Press, 1998), https://doi.org/10.1525/var.1998.14.2.101.

118 Harry Collins, *Tacit & Explicit Knowledge*, vol. 16 (London: The University of Chicago Press, 2010), https://doi.org/10.1188/12.CJON.341-342.

makers have to work in a world that does not stand still until the job is completed, and with materials that have properties of their own and are not necessarily predisposed to fall into the shapes required of them, let alone to stay in them indefinitely.[119]

A good example of how this problem-solving aspect of making relies on agency can be found in the relationship makers have with tools. In Kuijpers's analysis, tools mediate skilled practice by being simultaneously perceptive and transformative. As such, they can be understood as extensions of the body that allow one to perceive the material according to the conditions of its transformation. Tools provide a way of sensing that is directly coupled with the possibility of action: a chisel allows one to 'feel' the wood in its resistances (and affordances) to being carved; a hammer, to 'feel' the steel in the way it bends upon a blow; a scraper, to feel the clay as it cedes under pressure.

While it is common amongst modern theory to understand tools as extensions of the body[120], Sautchuk points out that this is not the only possible expression of their use. Depending on the action and meaning performed by the tools, they can be seen as completely external elements, to whose subjectivity the craftsperson must relate, or even *be part of*. Both expressions can be seen in the case of the divergent relation fishermen from Northern Brazil have with the fishing hook, according to the contingencies of the processes in which the hook is active, and the kind of engagement it makes happen[121]. For fishermen in the lakes, the hook is an extension of the arm, enlarging their bodily potentials. On the other hand, coastal fishermen address their body as parcel of a larger mechanism, or technical object[122]; on the fishing boat, artifacts and tools can work together as "partners" or "betray" the fishermen[123]. This differential relationship with tools, the author argues, implicates in a different perception of craftspeople by themselves – with different notions of personhood and agency. The hook, in these environments, acquires different *meanings*, without any change in its primary form or technological formation.

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119 Ingold, "The Textility of Making." p. 93

120 Merleau-Ponty, *Phenomenology of Perception*; Marcel Mauss, *A General Theory of Magic*, *A General Theory of Magic*, 2005, https://doi.org/10.4324/9780203996140; Michael Polanyi, "The Tacit Dimension" (University of Chicago Press, 1966).

121 Carlos Emanuel Sautchuk, "O Que a Rede Nos Ensina Sobre o Pescador?," *Revista Coletiva* 1 (2010): 1–4.

122 Simondon, *On the Mode of Existence of Technical Objects*.

123 Sautchuk, "O Que a Rede Nos Ensina Sobre o Pescador?"

FIG. 2.2 The Forge by Goya

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Moreover, the relationship with tools exposes the dynamism of a craftsperson's body and agency. Eduardo Viveiros de Castro's maxim that the body "constitutes a habitus"[124] in the accounts of perspectivist and animistic Amazonian indigenous peoples stands for a great example of how the very idea of the body is a relational construction. They present a world of agency in which entities are fluid, in which bodies are transformed according to the tools employed. The use of animal hides by shamans is perceived by them as a literal change in their bodily affections and capacities – they are perceived, in fact, as instruments, tools. In this framework, tools perform an activation of alien powers, of powers belonging to realms commonly outside what is often defined as human. Entering an activity with tools is an incorporation and activation of different capacities. It allows one to "function" as another[125], to momentarily *become another*.

The common ground between the analysis of Kuijpers, Sautchuk and Viveiros de Castro is the perception that the subject-object relationship between workers and tools or materials is not as solid as it is professed to be, nor does it take a single format. In all cases, however, tools make possible the establishment of a relationship between agencies. If this scheme seems needlessly to re-establish a duality between subject and object, it is because it is related to it – but such conclusion would be misleading, reducing the actual phenomenon taking place. What is happening in the moment of making is not *seen as,* or *describes* a duality between subject and object, it (potentially) *actualizes* it. In the process of making, agencies are established and a complex inter-subjective relationship is founded, or better yet, negotiated. More than a territory in which the categories of subject and object are given, making is the territory where they are developed. It is precisely because skill is perceptual that this is so.

To acquire skill, one must personally engage the work and the craft, testing the networks of resistance and affordance in relation to one's own capacities and limitations. In this relationship, Merleau-Ponty's idea of "mind" may prove useful. As Toadvine points out, Merleau-Ponty's notion of mind is organized "by the characteristic structures of the human world: tools, language, culture, and so on. These are not originally encountered as things or ideas, but rather as 'significative intentions' embodied within the world"[126]. What this interpretation allows is to understand that the experience of the world is contiguous to it, in the sense that

124 Eduardo Viveiros de Castro, "Cannibal Metaphysics: For a Post-Structural Anthropology," *Univocal*, 2014, 245. p. 72

125 Eduardo Viveiros de Castro, "Os Pronomes Cosmológicos e o Perspectivismo Ameríndio," *Mana* 2, no. 2 (1996): 115–44, https://doi.org/10.1590/s0104-93131996000200005. p. 133

126 Ted Toadvine, "Merleau-Ponty, Maurice Stanford Encyclopedia of Philosophy," *Choice Reviews Online* 41, no. 12 (2004), https://doi.org/10.5860. p. 6

the mind is constructed over and with the categories there found. Moreover, these categories are primarily understood not as objects, "things", but as potentials. The reflexive constitution of experience is weaved with intensities that possess directionality – flows of forces, not solid, fixed entities.

In the reality of the material production, these intentions, tendencies, resistances or affordances – here clustered under the umbrella of agency – are indeed *real*. They are real insofar craftspeople have to compete with contending forces, when engaging with the materials, tools and other entities of production. From the point of view of the maker, the act of making is a struggle with more or less inertial constellations that are coaxed into a purposeful disarray, and from there into a new state. As seen, materials do not stand still or fall neatly into a desired shape; tools and instruments have their own stubbornness and can perform in disagreement with one's intention, in more dramatic cases mauling their operators; and even the maker's body resists a mechanical regime of movement.

Accordingly, the relationship between 'maker' and 'made' is a topography marked by many degrees of such encounters. As Farleigh phrases it, "the craftsman is being guided by his medium as much as he is guiding it"[127], but the relationship is not always to the benefit of the maker's intention. Rather, what defines the success of the craft endeavour is precisely the question of whom (or what) claims the subjectivity over the material transformation taking place – in a similar manner as with Viveiros de Castro's theory regarding the cosmological predation amongst Amazonian indigenous people, this is an instance of dispute for the first-person pronoun, "I"[128]. In crafts, subjectivities are volatile, and the positions of subject and object can be flipped, to the detriment of the maker's will.

This agentic negotiation within the act of making is often perceived as such by craftspeople. Merleau-Ponty's 'intentions' can be seen in the drive to anthropomorphize non-human entities, in a similar manner as it is done, for example, by many animistic societies[129]. The fishermen studied by Sautchuk condemn the use of nets for fishing the *pirarucu* because they see it as an *inactive* tool[130]. In their view, the fish entangles itself in the net, thus fishing itself. This removes the harpooner's modes of action from the equation and, accordingly, sours the

127 John Farleigh, "THE CRAFTS — THEIR PAST, PRESENT AND FUTURE," *Journal of the Royal Society of Arts* 96, no. 4757 (1947): 28–37. p. 29

128 Castro, "Os Pronomes Cosmológicos e o Perspectivismo Ameríndio."

129 Descola, *Beyond Nature and Culture*.

130 Sautchuk, "O Arpão e o Anzol: Técnica e Pessoa No Estuário Do Amazonas."

relationship of 'trust' between fish and fishermen[131]. The net is a problem, in this situation, because it erases the specific relationship of agency deemed as acceptable for their culture, and replaces it with one understood as based on "cowardice"[132].

Similarly, Zé Diabo, a Brazilian blacksmith that produces images of the *Orixás,* presents a work philosophy that, for foreign eyes, can appear as chaotic[133]. As shown by Lucas Marques, within the cosmological framework of the *Candomblé* religion, their deities, the *Orixás*, have the capacity to incorporate in physical beings (people included) to act upon the world[134]. As such, the images of the *Orixás* are seen not as mere representations, but quite literally become the manifestation of these entities in the process of their fabrication. As the sculptures are made and progress towards their final shape, they start showing the agencies of *Orixás,* reflecting the will of the entities. Therefore, the craftsman has to rule his work in accordance to the *Orixás* disposition – by the resistances and stubbornness of the material, these entities steer the maker into producing a body that satisfy their desires[135].

This agentic negotiation can also explain, on the other hand, the bitterness with which some craftspeople and craft theorists engage with and judge machines. The machine does not perform the formation of the craft product in relation to the craftsperson directly, but mediates the process precisely in ways that can replace skilled practice. This is perceived as 'unskilled' because it is depersonalized, because the appearance of the skill in the form of machine is one that is outside the potentiality of the craftsperson. In other words, it presents a mode of action of another kind, to which the craftsperson cannot relate, being locked within the perceptive and active conditions of a human being. In Simondonian terms, the machine produces in another regime of individuation[136], and by being detached from the logic of embodied, humanized skill, it can be seen as problematic in the craft discourse. The tendency, as expected, is that relationships in which the agency of the craftsperson is diminished or alienated in anyway are considered 'un-craftlike' and, therefore, shunned upon. On the other hand, it is not uncommon that, as craftspeople become familiar with new technological developments and machines,

131 Sautchuk.

132 Sautchuk.

133 Lucas de Mendonça Marques, "Forjando Orixás: Técnicas e Objetos Na Ferramentaria de Santo Na Bahia," 2016.

134 Marques.

135 Marques; E E Evans-Pritchard, *Witchcraft, Oracles, and Magic among the Azande* (Oxford: Clarendon Press, 1976).

136 Simondon, *On the Mode of Existence of Technical Objects.*

their specific modes of action are incorporated in the craft processes and they cease to be perceived as problematic for some operations[137]. As seen in Alan Crawford's account of the Guild of Handicraft, led by the notorious Arts and Crafts enthusiast C. R. Ashbee, the employment of machines was carefully discriminated in the workshop. Being commonly used "in the preparation of materials and other routine processes", machines were removed from other, more skilled and unique activities, as Ashbee "was afraid that their wider use might pose a threat to creativity"[138].

Particularly, more than a definite, universal relation, what seems to be the common ground amongst different crafts is a degree of negotiation. Making is as much a merger between maker and material as their continuous tension, and every instance of making engenders a particular relationship of agency. Thus, there is not one mode of relationship between maker and what is made, or even between subjects, objects and processes, for that matter; but many[139]. Consequently, there is not one epistemology of making, but countless. The craftsmanship of the artisan involves the mediation between these dimensions – but that does not mean that craftsmanship is outside them, rather the opposite is true. It is precisely by enacting the dimensions of a socially and materially established production that craftsmanship comes to be. Craftmanship happens within the network of agents in a particular morphogenetic assemblage, through the employment of a perceptive and transformative dialectic in the very activity that gave birth to it. In simple terms, it is the enactment of skill – if skill is what affords action, craftsmanship is the realization of action *in a particular way*. The more skilled a craftsperson is, the easier she will engage with production and make the specific network of agency of her craft emerge, securing her position in it. In other words, as experience builds up, the flow of forces between agents coalesces into more a stable form. From the outside, this may look as an automation of the maker's body, a simple capacity of mechanized movement, but that is not the case. Instead, more nuanced explorations still occur, as the development of skill moves to more subtle, less tangible material qualities:

137 On this note, Campbel writes an insightful summary of the problematics of the machine (and industry) in relation to crafts: "it is the factory system, with its associated forms of discipline and control (such as the assembly line), that constitutes the real contrast with handicraft production. Hence, the contrast is not really between hand production and machine production, but rather between a production system in which the worker is in control of the machine and one in which the machine is in control of the worker. […] the human is in charge of the machine and not the machine of the human.Colin Campbell, "The Craft Consumer: Culture, Craft and Consumption in a Postmodern Society," *Journal of Consumer Culture* 5, no. 1 (2005): 23–42, https://doi.org/10.1177/1469540505049843.

138 Alan Crawford, "C. R. Ashbee and the Guild of Handicraft," in *Pioneers of Modern Craft*, ed. Margot Coatts (Manchester: Manchester University Press, 1997). p. 4

139 Evidently, as forms of production, these practices are not completely autonomous and unrelated. Symbolic, technical and material conditions operate across many crafts, imposing, if not equal, similar constraints and possibilities.

> Dexterity would be precisely the capacity to adjust to countless, sometimes tiny variations of a task that appears as but only seems to be always the same. Thus, Bernstein's famous phrase, according to which the insistency in a 'same' gesture results in fact in a repetition without repetition, since what is being exercised is the flexibility of the answer to these variations. [140]

Understanding that the production performed in crafts has to respond to a complex reality through the development of a mode of perception linked to the possibilities of practice, craftsmanship can be understood as the enactment of skill *in response* to the complexity in action. In this engagement, the virtuality of action provided by skill becomes the actual in a process of intersubjective encounter – craftsmanship is the actualization of this relationship. As such, craftsmanship is more of an emerging phenomenon than a thing in itself. Contrary to the idea of genius, talent or the like, this definition of craftsmanship is not an autonomous quality or capacity that exists in a latent state prior to its development. It is not located in the subject, as something waiting to be put to practice, nor in the product, as a quality inscribed in it, but it circles back to the active moment of practice, in the encounter of entities, both objective and epistemic, that constitute making, and is actualized there. Craftsmanship is only real in the moment of its operation, in the actual engagement between the maker and the process. Rather than *being*, craftsmanship is always *performed*.

140 From the original in Portuguese "a destreza seria justamente a capacidade de se ajustar às inúmeras, e às vezes ínfimas, variações de uma tarefa que parece, mas apenas parece, ser sempre a mesma. Daí a famosa frase de Bernstein, segundo a qual a insistência num "mesmo" gesto resulta na verdade numa "repetição sem repetição", uma vez que o que se exercita é a flexibilidade da resposta às variações." Carlos Emanuel Sautchuk, *Aprendizagem Como Gênese: Prática, Skill e Individuação*, *Horizontes Antropológicos*, vol. 21, 2015, https://doi.org/10.1590/s0104-71832015000200006. p. 123

2.4 Process-oriented ways of knowing

A way to summarize things is to say that craftsmanship is a perceptive-cognitive alignment with the making processes, in which the particularities of production are negotiated with the material world. Following Ingold's interpretation of creativity, this is a way of understanding craftsmanship *forwards*, in contrast to the general notion that goes *backwards*[141]: that is, creativity and craftsmanship do not pre-exist practice, as an ideal waiting to be materialized, but stem from it. Craftsmanship is a creative event taking place *in-between* subject and object, practitioner and material, connecting things in their dynamical flow and weaving the world of life – or, more precisely, a form-giving process that arises from the manipulation of things and materials following their specific embedded proprieties and qualities.

In any case, can this conceptual framework of skilled practice be described on an epistemological level? More specifically, what sort of episteme can frame the concepts of skill and craftsmanship in their relational character? According to Viveiros de Castro, Western modernity favours an "objectivist epistemology" where "to know is to objectify" and in which the "telos is provided by the category of the object". [142] *Telos* is the purpose, goal or, following an Aristotelian reading, "that for the sake of which something is done or occurs"[143]. Importantly, this is a way of knowing that disregards any sort of subjectivity in the definition of the categories of thought. Knowing, in this epistemology, is "to desubjectify", to separate that which is "intrinsic to the object and what instead belongs to the knowing subject, which has been inevitably and illegitimately projected onto the object."[144]. The corollary is that both subjects and objects, besides being hermetic in relation to each other, are conceived as "the results of a process of objectification"[145]. It is possible to perceive how *knowing* and *making* (or, roughly, theory and practice), in this scheme, are conceived as inverted operations that, nonetheless, share a common premise. On the one hand, making is understood as the projection of an idea, a form, into matter, the so-called hylomorphism[146]. On the other hand, to know is to distinguish what's projected and what is intrinsic. Both accept, however, the projection over the object

141 Ingold, "The Textility of Making."

142 Viveiros de Castro, "Cannibal Metaphysics: For a Post-Structural Anthropology." p. 60

143 Brennan, Tad. Telos, 2002, doi:10.4324/9780415249126-A134-1. Routledge Encyclopedia of Philosophy, Taylor and Francis, https://www.rep.routledge.com/articles/thematic/telos/v-1.

144 Viveiros de Castro, "Cannibal Metaphysics: For a Post-Structural Anthropology." p. 60

145 Viveiros de Castro, *Metafísicas Canibais*.

146 Ingold, "The Textility of Making."

as the condition of subjectivity. In both cases the subject recognizes itself objectively only if "it succeeds in seeing itself 'from the outside' as a thing"[147]. Within such a logic, the subject is defined in the lines of this operation, and it can be understood as an essential separation between the territories of thinking and making.

Gilles Deleuze refers this mode of thinking to the genesis of 'the hylomorphic model'.[148] If craftsmanship is a process of coupling the information afforded by skill as an attunement in practice, operating precisely through the establishment of subjectivities, it follows that it does not fit within objectivist epistemic grounds. Artisans, craftsmen, and minor scientists in general, Deleuze argues, always had a different conception of the relation between matter and form, at least implicitly: they did not impose but teased a form out of an active material, collaborating with it in the production of a final product rather than commanding it to obey and passively receive a previously defined form. This indicates that the rationalities embedded in crafts differ from hylomorphic ones. As Debortoli and Sautchuk point out, this is the "central controversy" of Ingold's thoughts on *technique,* construed as an "inseparable process of the subjects' particular experiences" in opposition to the modern notion of *technology* as affirming the "independency of the production of human subjectivity"[149].

Despite the impossibility of addressing the question from classical epistemology, it is clear that skill and craftsmanship are fundamental to craft, and thus should remain as core elements of its conceptualization. Following this premise, a fundamental connection between these concepts (which is also a common denominator amongst many authors dealing with the epistemology of practice) is the activity of making itself. From Schön to Ingold, the perceptive dimension of skilled practice is always coupled with action, with an active engagement with the material world. Or, as Trevor Marchand puts it,

> the process – the act of making – is what counts in this context. The sublime confluence of hand, mind, body, and eye working together to create an object that is beautiful, practical, functional, and challenging is, in effect, to solve a problem. Thinking and learning through making are at the core of the act of craft. [150]

147 Viveiros de Castro, "Cannibal Metaphysics: For a Post-Structural Anthropology." p. 60

148 Gilles Deleuze and Felix Guattari, *Mil Platôs: Capitalismo e Esquizofrenia*, vol. 1 (Rio de Janeiro: Editora 34, 2000), https://doi.org/10.1590/s0104-93131998000200008.

149 José Alfredo Oliveira Debortoli and Carlos Emanuel Sautchuk, "TÉCNICA, CORPO E ARTE: APROXIMAÇÕES ENTRE ANTROPOLOGIA E MOTRICIDADE," *Licere* 16, no. 2 (2013): 1–29. p. 7

150 Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making.* p. *XVII*

From the convergence and dependency of skill and craftmanship on the act of making, therefore, it may become possible to reflect upon their epistemological character. This would allow the description of the particular rationalities of different crafts, such as the exemplary “philosophy of joinery” referred to by Kropotkin[151], or the “nature of the Gothic” in Ruskin, figuring a particular *rationale* of stonemasons[152]. Additionally, it may provide the leap from the situated, bodily involvement of skill and craftsmanship to a broader arrangement that encompasses the different epistemologies of making and constructs a notion of craft in general terms – so as to establish it as a meaningful scholarly field – and, in this research, localise from where a perspective of crafts originates.

This line of thinking is present in the work of the archaeologist and anthropologist Leroi-Gourhan, who argues that a technical object, such as an instrument or artifact can only be fully understood when analysed within a process[153], or, as Sautchuk puts it, “in operation”[154]. This is easily perceivable when dealing with, for example, tools. Since, for Leroi-Gourhan a technical object’s existence is dependent on action, a tool thus "exists" in the gesture that gives it movement[155]. In simpler terms, it means that “to describe something as a tool is to place it in a relation with other things, in a field of activity in which it can exert some effect”[156]. As a “materialization of an interaction of matter with the means to transform it”, the tool is a direct consequence of a procedure. It is, physically and conceptually, a “witness” of a material transformation, or, in other words, of the *process*[157].

151 Petr Alekseevich Kropotkin, “Fields, Factories, and Workshops; or, Industry Combined with Agriculture and Brain Work with Manual Work.,” *Fields, Factories, and Workshops; or, Industry Combined with Agriculture and Brain Work with Manual Work.*, 2011, https://doi.org/10.5962/bhl.title.18827. p. 162

152 Irenee Sals, “The Nature of Gothic,” *AA Files*, 2011, 180–269, https://doi.org/10.1017/cbo9780511696138.009.

153 Leroi-Gourhan, *Gesture and Speech*, *Gesture* (London: The MIT Press, 1993).

154 Sautchuk, “O Que a Rede Nos Ensina Sobre o Pescador?” p. 2

155 Leroi-Gourhan, *Gesture and Speech*.

156 Translated from the original in portuguese “descrever uma coisa como ferramenta é coloca-la em re- lação com outras coisas num campo de atividade no qual ela pode exercer algum efeito”. in Sautchuk, *Aprendizagem Como Gênese: Prática, Skill e Individuação*, 2015. p. 129

157 Leroi-Gourhan, *Gesture and Speech*. p. 117

Threading on this path, in his *On the Mode of Existence of Technical Objects,* Simondon's preferred case study is the diode[158]. Accordingly, his description of the diode's mode of existence is not a description of the scientific principles operating in an ideal form. Neither are his reflections therein constrained solely to the scientific developments that allows its creation, but they encompass the technical developments in the diode's form and operation in relation to the reality it is employed in.

Moreover, as discussed above, tools have particular modes of action that, when engaged in a particular operation or productive setting, acquire specific meanings. This way of thinking technical objects is extrapolated by Ian Hodder, who writes that the way "humans identify, perceive and categorize things is linked to the uses they have of them"[159]. Using Chinese oracle bones, he exposes how they were understood when looked from the perspective of Shang dynasty's oracles, XIX century healers and modern archaeologists, and how "these different ways of knowing are not just abstract philosophical reflections – they involve the bones very differently in practical, social and material contexts"[160]. While Hodder's main concern is not on the way things are known, addressing the matter only insofar as "different ways that humans claim to 'know' about things and make them useful lead to different ways of being connected to other things"[161] –his demonstration that "things come about and come to be known because of a heterogeneous mix of humans and things"[162] is remarkably in line what has been discussed so far. Moreover, it directly links the development of "different epistemologies", or ways of knowing, to the "collections of things" and the relationships established by the entities in such networks[163].

158 Simondon, *On the Mode of Existence of Technical Objects.*

159 Ian Hodder, *Entangled: An Archaeology of The Relationships between Humans and Things* (Oxford: Wiley-Blackwell, 2012). p. 12

160 Hodder. p. 12

161 Hodder. p. 12

162 Hodder. p. 13

163 Hodder. p. 13

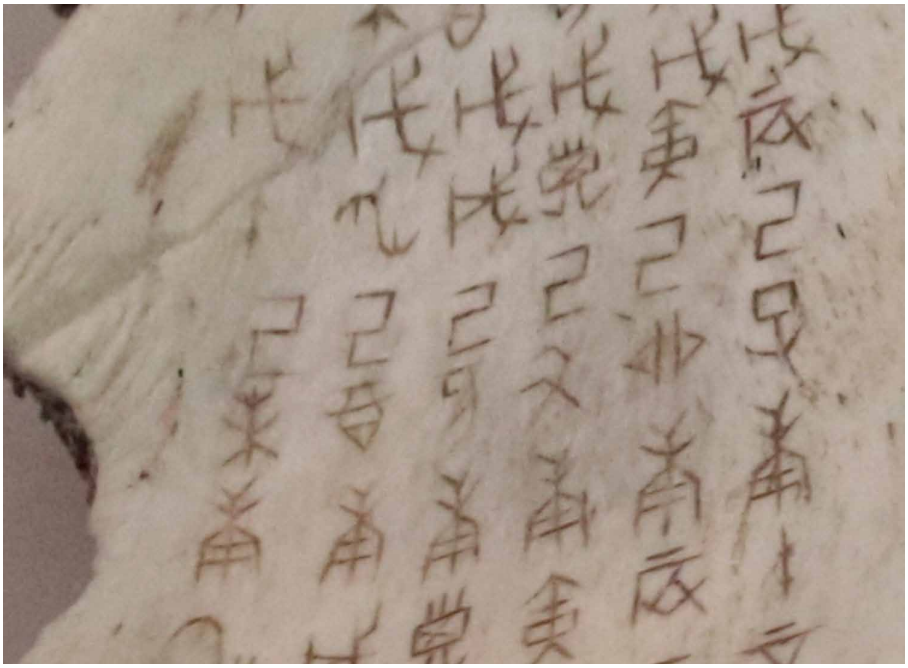

FIG. 2.3 Chinese oracle bone. Source: Wikipedia Commons

Evidently, the performance of craftsmanship responds not solely to the physical materiality (the properties and qualities of materials), but to many other contingencies that are active in the processes of making. In *The Textility of Making*[164], Ingold asserts that the material production of the craftsperson is akin to a weaving knot. This knot is composed by the lines representing the materials used and tools required, but also by the techniques and other social constructions associated with the craft. Also Marchand notes that craftspeople, in all the situations he studied, are "actively engaged with materials, other actors, and the surrounding environment in their individual pursuits to settle problems, enhance skills, broaden knowledge, and construct social identities and professional status".[165] Thus, in the perspective of the craftsperson, the material production is not defined by the categorical limit of things, but includes these social contextual relations. A material, for example, is not known by its form only, but by the way in which it is used, what is its purpose, how it can be worked on, manipulated, transformed and so on. Its qualities are defined by the sociocultural reality of its environment and by the

164 Ingold, "The Textility of Making."

165 Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making*. p. 12

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experience surrounding it. There is a level of "wayfaring", as Ingold would put it[166], meaning that form-making happens as the processes of material exploration unfold; but there is also level of cultural and historical hylomorphism given by a social landscape, that conditions what is judged as valuable or useful in a given context.

In crafts, therefore, things are encountered in their social existence, which is incorporated by craftspeople, as the experience of things appears as the amalgam of its different meanings: in its laboratorial form, as a test or experiment; in a daily, quotidian sense, as a happening or event; and as the accumulation of knowledge and skill. In other words, as: a) a process of discovering something; b) a participation in particular events or situations; and c) a familiarity constructed by proximity throughout an extended period, usually surrounding a particular subject. In the act of making, these different expressions of experience become entangled, in a continuous process of simultaneously being and becoming, integrating perception and action through the particular point of view of the craftsperson. As Pamela Smith argues, "for artisans, experience and the production of things were bound up with their own bodies"[167]. In this sense, one could argue that experience within the act of making *is* the particular point of view from which craftspeople find themselves in the material production and how they are anchored to it, being the only way they can relate to it. This bodly encounter with things in their relational, socially embedded character sets the foundations for a particular way of understanding the world, intertwining imagination, actions and memories - and inscribing in the body the constelations of a material social environment.

Such consequence is expected, given the very nature of experience within a phenomenological framework. Nonetheless, the importance of this phenomenon is perhaps underappreciated. Understanding the concept of craftsmanship as a dynamic and fluid negotiation between agency and contingency, individual and social, and perception and reality, this formulation suggests that the experience in the processes of making acts as a *boundary* of the craftsperson's ways of knowing, understanding a boundary not as a limit, but as the place where something begins[168]. Accordingly, this idea suggest that craftspeople share an epistemic rationality (or epistemology) based on experiences, which refer mainly to the processes of making – the *experience of craftsmanship*. In other words, based on the

166 Tim Ingold, *Being Alive: Essays on Movement, Knowledge and Description*, *Being Alive: Essays on Movement, Knowledge and Description*, 2011, https://doi.org/10.4324/9780203818336. p. 143

167 Pamela H Smith, *The Body of the Artisan* (London: University of Chicago Press, 2012).10, 15 and 25°C

168 From the Heiddegerian notion (drawn from Artistotle) of Graham Harman, *Tool-Being: Heidegger and the Metaphysics of Objects*, *Techné: Research in Philosophy and Technology*, vol. 7, 2004, https://doi.org/10.5840/techne20047325.

particular ways in which craftspeople relate to and perform their practice – that is, how they face problems, demands, the everyday life of production etc. Thus, there is a directionality in craft's ways of thinking that shapes how craftspeople perceive and understand materials, tools and skills, and also their reflections on the roles of their craft in society, its relationship with tradition, culture, economy and so on.

With this considerations, instead of understanding the act of making simply as a sort of passive background where skill and craftsmanship take place, and whose only contribution to their development would be to serve as a support or stage for their performance, the act of making can be seen as an active tributary that provides the terms with which they operate. In other words, just as perception does not remain the same whether skill is involved, so it happens to knowing when it is *in action.* Instead of an instance in which knowing assumes a particular character when set in practice, the reality is that it is the practice and the modes of action therein that create a particular way of knowing.

Given that craftsmanship is the establishment of subjectivity in an encounter of entities that, as Hodder defends, creates a particular epistemology, it is sensible to suggest that craftsmanship generates the epistemologies of crafts. In other words, if the question is framed in the terms of an experimental construction of an epistemology in which the way things are known derives from their situation in action, it is possible to understand that the processes performed by craftspeople govern the interactions of entities and, thus, their relational meaning.

Leroi-Gourhan argues that it is in these relations that technical objects are produced – or, better yet, "materialized", as he would phrase it[169]. In other words, technical modes of relation coalesce in technical objects that, in turn, carry them forward. This is particularly significant if one considers that tools are themselves products of a such a formation and, fortunately, are directly addressed by the author. Tools are historically formed, or individuated, to use a simondonian term[170], based on the *telos* of particular techniques. They are developed gradually in a dialectic dance between gestures, things and socioeconomic contingencies; where the hands of craftspeople, the stubbornness of the material and the ways of living come together in the formation of a tool. Where, for example, the interactions between rollers, rivets and plates, the mechanics of a tendons, muscles and bones and the particular demands of a people that appreciate moving about balanced atop a two-wheeled contraption fold upon themselves to coalesce in a *hand-held bicycle chain rivet extractor*.

169 Leroi-Gourhan, *Gesture and Speech.*

170 Simondon, *On the Mode of Existence of Technical Objects.*

Or where steel, hammers, fire, horses and cattle herding practices converge in a specifically shaped kind of anvil. In short words, tools register the gestures of a procedure of material transformation and, as such they are physical archives of particular modes of relation between entities. Thus, the entanglement with tools, in the agentic network of making, is an entanglement with a set of devices that carry within them the processes underlying their development. If the material tweaks the idea, more even so does the tool. To use a tool is to acquire a technical directionality that operates across material and an epistemic dimensions. An axe, for example, posits a virtuality of a leveraged movement empowering a sharp edge. When coupled with the fibrous nature of wood, it affords splitting. Tools carry a way of making crystalized in their formation, in the sense that a tool provide possibilities of material transformation within a certain tendency. It is possible to affirm, then, that the mode of existence of tools is *process oriented*.

Moreover, this phenomenon constructs on its specific terms both the maker what is made. When at work, craftspeople "*are thinking with tools",* as Marchand is keen on noticing[171]. The "epistemologies" that arise from the encounters with tools influence the relationship one has with what is being made and, in particular, steers the form in which the challenge of production is addressed. It shapes, in other words, the "problem-setting" of craftspeople[172]. Technique, as Lucas Marques defends, emerges then as "a mode of relation that provide the genesis of the both the artifacts and the humans themselves".[173] The corollary, unsurprisingly, is that craft *creates* the craftsperson as much as it creates the craft product.

A similar perspective leads Piotr Kropotkin, already in 1912, to advocate for overcoming the schism of science and "handicraft", especially in education. Amongst his arguments, there is a defence that discovery and invention on the XIX century were led chiefly not by scientists applying rules and laws but by people who "knew something which the savants do not know — they knew the use of their hands"[174]. Particularly in tune with Ingold's knots, Kropotkin argues that "their surroundings stimulated their inventive powers; they knew machines, their leading and their work; they had breathed the atmosphere of the workshop and the building-yard"[175].

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171 Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making.* p. 12

172 Schön, *The Reflective Practitioner*.

173 From the original in Portuguese "A técnica [...] é sobretudo um modo de relação que propicia a gênese tanto do artefato quanto do próprio humano." Marques, "Forjando Orixás: Técnicas e Objetos Na Ferramentaria de Santo Na Bahia." p. 79

174 Kropotkin, "Fields, Factories, Work. or, Ind. Comb. with Agric. Brain Work with Man. Work." p. 174

175 Kropotkin. p. 174

Moreover, since perception is pre-cognitive[176], the implication of an epistemology of making goes beyond simply possessing a specific kind of knowledge – in fact constructing a *rationality,* as stated by Adorno[177] or, as Foucault would put it, *a system of thought*[178]. Particularly, the *craftsperson's way of thinking* is structured by the processes of making, contrary to other forms of knowledge that are based on objectfication. This mode of knowing turns objects into processes: craftspeople can shift from knowing 'what' to a 'knowing how', following Gilbert Ryle's terminology[179] – they understand the things of their craft by the way in which they can be made, decoding it in making processes and proximal constituents – tools, techniques, materials etc. What this means is that the productive processes represent the territory of craft, even if its primary object is a material production. This distinction is fundamental, as in this framework, the product itself appears as relatively secondary, and its seen by the optic of production. The product is at the horizon, always, luring the craftsperson, but the paths that lead to it are those of practice, of *making*. In agreement with Schön's thoughts, craftspeople know *in action*.

The way of thinking of crafts translates things into events, encounters and operations. Clearly, as such, it is radically foreign to the epistemology described by Viveiros de Castro. In opposition to an objectivist epistemology that seeks to classify and order things based on their objective properties, craftspeople know materials not by their substance, as limited and identifiable objects determined by their physical characteristics and boundaries, but by how they can be worked, as the ensemble of their possibilities and limitations in relation to practice and its processes. This is what allows them to translate external elements into the language of the craft – thus allowing them to actively take part and navigate it. It is a way to perceive things and position themselves accordingly that follows a particular logic; a logic that in turn follows practice. The act of making, the process, is the *common locus* of the entities and the meanings in the realm of crafts, and their *order*:

> Order is, at one and the same time, that which is given in things as their inner law, the hidden network that determines the way they confront one another, and also that which has no existence except in the grid created by a glance, an examination, a language.[180]

176 Merleau-Ponty, *Phenomenology of Perception.*

177 Adorno, "Functionalism Today."

178 Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences.*, *Man*, vol. 6 (London: Routledge, 2005), https://doi.org/10.2307/2799252.

179 Ryle, *The Concept of Mind.*

180 Foucault, *The Order of Things: An Archaeology of the Human Sciences.* p. *XXI*

If Foucault's description of the system of thought operating in the base of similitudes, or "resemblance" – which, by the XVI century was linked to space and conformed a "convenience" that brings "things together and makes adjacent things similar"[181] – holds true, it is possible to understand that the linkage that binds things and make them related in crafts is not a space, but the event encompassed by craftsmanship. It operates, therefore, not in matters of similitude, or at least not a simple similitude of form, but in a resemblance of agency, which encompasses the affordances, resistances and tendencies of materials, tools and other entities to the transformations instigated by craftwork. Through this operation, an axe becomes similar to a chisel in relation to their *telos*, yet simultaneously distant given their mode of operation, the sort of cutting it allows, the movements and preparation required, the level of precision and so on. Following that logic, in the realm of woodwork, a plane is often closer in concept to the simple sandpaper than many other steel-bladed tools, such as handsaws[182]. The same could be said of materials as well, and how their relative adjacency in the acts of making sometimes clashes with other taxonomies. In summary, what is at play is what Foucault points out when saying that "there is no similitude and no distinction […] that is not the result of a precise operation and of the application of a preliminary criterion."[183]

In this framework, it is possible to understand Kuijpers's argument that "[…] craft is not a set of fine products, or even a set of skills; it's "a way of exploring and understanding the material world"[184]. Glenn Adamson, in his *Thinking Through Craft*, assumes a similar stance. He argues that craft should "be considered primarily as a way of thinking rather than as a way of making"[185]. But such definitions, as much as they go in the right direction, are too careless. To undo the hermetic division between thinking and making, a definition of craft cannot forgo of the processes of making, half-circling into a hylomorphic sieving of projected ideas out of things. *Things*, as exemplified with the exposition on tools, are as much results as active participants in the specific way of thinking in crafts. Moreover, as Roy Wagner reminds, "each

181 Foucault. p. 21

182 From the perspective of mechanical physics, however, an axe would be closer to a hammer, given the leveraged logic of its use, and the materials used in their handles and heads. Tools with remarkably similar engineered forms – such as a miter saw and a chopsaw, both basically consisting in a saw-spinning motor mounted on a hinged structure over a base where the piece is fastened – belong to distinct crafts, for their saws differ in material. Steel, teethed saws cuts in the realm of fibrous, soft materials like wood; while composite, fast spinning abrasive biscuits cuts homogeneous, hard pieces of metal.

183 Foucault, *The Order of Things: An Archaeology of the Human Sciences.* p. *XXI*

184 Oppenheimer, *"The Future Is Handmade."*

185 Glenn Adamson, *Thinking Through Craft* (New York: Berg, 2007), https://doi.org/10.5040/9781350036062. p. 4

style of creativity is also a style of understanding."[186] Thus, subverting Viveiros de Castro original quote on shamanism, perhaps a more precise statement is that *craft is a mode of acting that implies a mode of knowing*.[187] This mode of knowing is what I refer to as a *process-oriented ways of knowing*. Being process-oriented means essentially, in Ingold's words, "thinking through making"[188]. It is a way of thinking that inevitably flows back to the process and gets renovated at each iteration of the practice itself, without the need to "theorize" the practice afterwards, without the need to "take lessons" from practice, but automatically, being immersed in practice, incorporating it through skill and re-enacting it in craftsmanship.

2.5 The formation of Crafts

The proposition that there is a particular rationality proper to crafts, in the form of a *process-oriented way of knowing* that permeates their practice might seem like a bold one. Thus, a clarification is needed in relation to the terms and their relationship. The process-oriented way of knowing operating in crafts is not a universal, all-encompassing *episteme* whose origins lie in a special or transcendental character possessed by crafts, or is imbued in them through an external ideology or discourse. Rather it stems from the nature of skill as a perceptual shift, and it is primarily linked with the act of making and the embodied engagement with matter. It is a way of knowing, in short, that originates from the reality of material transformation and the conditions of its performance in skilled practice. Craft, as an instance of making, is thus not its origin, but a *locus* where it is developed and expressed; where it is *in operation* and, therefore, can more easily be seen. In other others, it is the formation of crafts as material engaged models of making that creates the conditions for process-oriented epistemologies to flourish. Considering this, it is appropriate to now follow a materialist approach and examine how the practices understood as crafts come to be.

186 Wagner, *The Invention of Culture*. p. 27

187 "Shamanism is a mode of action entailing a mode of knowledge, or, rather, a certain ideal of knowledge" in Viveiros de Castro, "Cannibal Metaphysics: For a Post-Structural Anthropology." p. 60

188 Ingold, *Making Anthropology, Archaeology, Art and Architecture*. p. *XI*

Regarding the formation of crafts and in tune with what has been discussed so far, Heide Nørgaard affirms that "the ability to create something is the main point"[189].. It is possible to see how this definition underpins Nørgaard's perception of the formation of different crafts and professions:

> Prospecting may be essential for the beginning of the metallurgical process; however, it cannot be regarded as a separate field of work, but should be seen in direct association with mining. The mining of the ores, as well as their beneficiation, requires a high level of knowledge. In particular, underground mining demands special knowledge of shaft lining, tool making, the exploration of prospective veins and the extraction and beneficiation of the ores […]. In comparison to the forming areas of metalwork, fundamentally different skills are needed here. A separation of these two fields into two 'professions' seems to make sense.[190]

Her conclusion that craft "is therefore qualitative work executed by the hand", however, perpetuates Sennett's problematic broadness, and the subtle link to a particular individual disposition or "motivation"[191]. Accordingly, this leads her to understand craftsmanship as a form of quality, specifically related to "extremely skilled work" since, in crafts, the "goal is quality work"[192]. Her perception echoes the dictionary definitions of craft and craftsmanship and, although slightly more developed than Sennett's focus on the product – referring to *work* instead of "*things*" – remains caught up in a duality between the individual and the social. Nonetheless, her reference to the "ability" and the exposition of the importance of technical differentiation point to a promising way forward. Nørgaard's definition refer to a historical instance of labour division following the adjacency of skills in a particular production that is behind the formation of crafts.

It could be argued that Nørgaard's reference to skill as the core differentiator between crafts is circumstantial, that is, that the network of skills differentiates between crafts according to the division of labour it requires in a particular social setting. Work, after all, is deeply social, and so is technique. Nørgaard accesses this social character from the perspective of Bourdieu's notion of *habitus*:

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189 Nørgaard, *Bronze Age Metalwork: Techniques and Traditions in the Nordic Bronze Age 1500–1100 BC*.

190 Nørgaard.belt plates, p. 7

191 Nørgaard; Richard, *The Craftsman*. p. 4

192 Nørgaard, *Bronze Age Metalwork: Techniques and Traditions in the Nordic Bronze Age 1500–1100 BC*, p. 4

> in a study concerning the 'body of knowledge', the 'motor know- how' of a craftsman must always also be considered a kind of knowledge transmission and thus the social structure in which the craftsman is embedded. Consequently, all these kinaesthetic skills […] are as much part of the habitus of a craftsman as his psychological skills and the sense of aesthetics shaped by the respective society.[193]

Thus, following her reasoning that the ability to create in central to craft, supported by Marchand statement that "technology is, and has always been, a part of craft"[194], the concept of technology can prove valuable to defining crafts within a social framework. The term "technology*"* derives from the junction of the Greek terms *technè* and *logos*. *Technè* originates from *Tiko*, meaning "axe"[195], and is the root of both "technique" and "art". For the ancient Greek there was no difference between the two, since they understood art as a practical knowledge, a *craft*[196]. *Ars*, the Roman word heir to *technè*'s meaning, was equivalent to what we define today as "technique" or even "science"[197]. Willian Morris, in his writings, borrows from these definitions to make a conjoined understanding between art and technique in his conceptualization of work as an artistic creation[198]. In accordance with Morris, Farleigh states that "[t]here is a thrill in making a fine thing and a thrill in possessing it."[199] Sérgio Ferro's concept of "free labour"[200] is similar and contributes to understanding the concept of "technique" not only from an instrumentalist point of view, but expanded as the "arts of making"[201].

Logos, on the other hand, accumulates many meanings throughout the history of philosophy, especially amongst the Greeks. In short, it initially refers to "word",

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193 Nørgaard. p. 249

194 Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making*.

195 Ingold, *Making Anthropology, Archaeology, Art and Architecture*. p. *XVII*

196 Juliana Cristina Salvadori, "Literatura e Crítica , Ars e Techné : A Poiesis Moderna Como Herança Romântica," n.d., 109–21. Raymond Williams, *Keywords: A Vocabulary of Culture and Society*, *Raymond Williams Now* (New York: Oxford University Press, 1985), https://doi.org/10.1057/9780230373464.

197 Williams, *Keywords: A Vocabulary of Culture and Society*.

198 Especially noticeable in his *News of Nowhere*, as exposed by Silke Kapp, Morris defines art simply as the expression on someone's pleasure in labour, and therefore dismisses the importance of inspiration and genius in artistic creation, focusing instead on craftsmanship and the problematics of a social structure that impedes the democratization of art practice outside the realm of commodity production. See Silke Kapp, "Construction Sites of Utopia," in *Industries of Architecture*, ed. Katie Lloyd Thomas, Tilo Amhoff, and Nick Beech (Abingdon: Routledge, 2016), 125–34.

199 Farleigh, "THE CRAFTS — THEIR PAST, PRESENT AND FUTURE." p. 37

200 Sergio Ferro, *Arquitetura e Trabalho Livre* (São Paulo: Cosac Naify, 2006).

201 Michel de Certeau, *A Invenção Do Cotidiano*, vol. 0 (Petropolis: Editora Vozes, 1998), https://doi.org/10.11606/issn.2236-4242.v0i8p31-45.

both spoken and written, and more precisely, "verb", and over time assumes the now customary dual meaning of "study" and "reason"[202]. Accordingly, the philosopher of technology Andrew Feenberg presents a definition of technology that focus on the latter interpretation of *Logos*, understood as 'rationality', instead of 'study' or 'knowledge'. This is also the view of Canadian scientist Ursula Franklin, to whom technology is a "a way of doing something" rather than a collection of gadgets or tools[203]. What it implies is a way of seeing technology not as a factual entity, but as an established relationship between things that follows a particular epistemic modality.

Drawing back to the "social structure in which the craftsman is embedded" presented by Nørgaard, this interpretation entails a social dependence to technology, a *situation* within a cultural environment that conditions its mode of operation[204]. Thus, understanding technology as the *rationality of the arts of making* implies a collective and contextual consciousness, encompassing the agencies and actions of individuals in their social relations, dealing with the necessities and the powers that are immanent to their contingent existence as productive beings[205]. Accordingly, as the object of technology, making is not only a material practice, but reflects many social and cultural conditions[206]. The very materiality (in its philosophical dimension) of making anchors its practice into a situated, entangled state – the Hegelian notion of the concrete, meaning the *unity of diversity*[207] or, in other terms, the spectrum of relationships that some object (or concept) embodies[208]. From this perspective, making can never be dissociated from this manifold social, material and economic relations that permeate it, both objectively and virtually[209].

Unlike craftsmanship, crafts cannot be regarded solely as personal performances. The deep material entanglement of skill provides crafts with a socioenvironmental character, grounding the qualities of the process-oriented ways of knowing in historical and geographical environments. The relationship artisans develop with

202 Williams, *Keywords: A Vocabulary of Culture and Society*; Andrew Feenberg, "Tecnologia, Modernidade e Democracia," 2015.

203 Ursula M Franklin, *The Real World of Technology* (Berkeley: Anansi, 2004).

204 Nørgaard, *Bronze Age Metalwork: Techniques and Traditions in the Nordic Bronze Age 1500–1100 BC*.

205 Ivan Illich, "Needs," *Critique*, no. 0 (1990).

206 Chris Gibson, "Material Inheritances: How Place, Materiality, and Labor Process Underpin the Path-Dependent Evolution of Contemporary Craft Production," *Economic Geography* 92, no. 1 (2016): 61–86, https://doi.org/10.1080/00130095.2015.1092211.

207 Arthur, *Dialectics of Labour: Marx and His Relation to Hegel*.

208 Feitosa, "O Flerte Do Filósofo (O Ensaio Quem Pensa Abstratamente? De Hegel)."

209 Pierre Lévy, "O Que É O Virtual?," *Tiosam.Org* 8 (1996): 160.

materials is steered by the technical and societal conditions in which they are developed, with which they interact dialectically. Accordingly, Alexander Langlands, in his 2017's *Craeft,* weaves a history of deep entanglement between traditional crafts and the British landscape[210]. Exploring rural practices such as thatching roofs, digging canals, or herding sheep and their associated techniques, the author demonstrates the extent and depth of people's knowledge in regard to the contextual environment and how it influenced both their techniques and ways of living. Langland's exposition of this situated nature of craft practices also clarifies the potential reach and influence that they exert on broader, societal issues. The material knowledge and the process-oriented rationality of crafts, despite operating often in the relatively reduced scale of the workshop, can be visible in the materialization of productions of larger scale.

A telling example can be found in the city-making practices of the Incan civilization. Located in high altitudes, often at the mountaintops of the Andes, Incan cities (more specifically Machu Picchu and similar settlements in the Cuzco region) challenged urban historians with their seemly illogical locations. Recently, however, the Brazilian geographer Rualdo Menegat formulated a credible theory explaining the reasons and methods behind the construction of these cities[211]. His thesis, in his words, "is that there is an intrinsic relationship between the landscape and the construction of cities, in a manner that turns them organic and maintains the least effort of civilization for their construction"[212]. Concretely, what the author suggests is that the location of Incan cities is primarily related to what the landscape afforded them. Menegat recognized that the cities of Machu Picchu and Ollanataytambo sit precisely where large geological fault lines cross[213]. While this location might seem disadvantageous at first, the author presents four conditions that point otherwise – two of which are highly illuminating for this discussion.

Firstly, the fractured nature of the landscape provided an abundance of construction material: Menegat was able to identify a matrix with eight orders of rupture (from the geological faults themselves to mineral fracture in handheld samples) ranging

210 Langlands, *Craeft: How Traditional Crafts Are about More than Just Making.*

211 Rualdo Menegat, "Cognição e Paisagem No Processo Civilizatório Andino: A Matriz Do Lugar Como Chave Para Decifrar Machu Picchu," *Revista Brasileira de Horticultura Ornamental* 16, no. 1 (2010): 41–45, https://doi.org/10.14295/rbho.v16i1.506.

212 From the original in Portugues "Nossa tese é de que há uma intrínseca relação entre a paisagem e a construção das cidades, de sorte a torná-las orgânicas e fazer prevalecer o princípio do menor esforço civilizatório para a sua construção," Menegat. p. 41

213 Rualdo Menegat, "How Incas Used Geological Faults to Build Their Settlements'. GSA Annual Meeting Annals. Boulder: GSA," in *GSA Annual Meeting Annals. Boulder: GSA*, 2019

in scale from hundreds of kilometres down to a couple of dozen centimetres[214]. This fractal breakage of the material provided the Incans with a site where "the surface is covered with fragments of many shapes and sizes"[215]. Builders had plenty of somewhat ready-made or easy to cut blocks to construct their structures. Moreover, and referring to Menegat's second point, the fractured material composing the mountaintops meant that the area was very pliable, easy to mould into the plateaus and surfaces that an urban environment needs. In practice, this meant that the Incans could perform both tasks together, shaping the sites for construction and obtaining the building materials in a single process – a hypothesis supported by the urban morphology of Machu Picchu, in which "the main sectors, buildings, and stairs were built following the three said fault directions"[216].

Working together, these two points afforded Incans with a preferred directionality for their building efforts, *a technique*. As the author writes, "[in] this technique, the residues from the lapidation [of plateaus] were transformed *mutatis mutandis* in construction material of walls, whose construction style match the fractal geometry of the blocks"[217]. The assemble logic of rock blocks preferred by Incans to build their architecture, while nightmarish when thought of in terms of the rationality of planning and designing, is logical with the very nature of the rocks. The tendency of these blocks to break along stress lines not only makes the work easier but also creates puzzle-like pieces that accurately trace each other's shape. Incan builders, instead of following a clear directive, followed the affordances of these rocks or, as Menegat puts it, seen through the agency of the mountain:

> the fractal world of faults, with blocks and geometric patterns of many scales, accepts that one works the shape of the blocks more with the sign and the percept than with a clear concept as that required by theories and sophisticated planning.[218]

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214 Menegat, "Cognição e Paisagem No Processo Civilizatório Andino: A Matriz Do Lugar Como Chave Para Decifrar Machu Picchu."

215 Menegat.

216 Rualdo Menegat, "How Incas Used Geological Faults to Build Their Settlements'. GSA Annual Meeting Annals. Boulder: GSA," in *GSA Annual Meeting Annals. Boulder: GSA*, 2019.

217 From the original in Portuguese "Nessa técnica, os resíduos da lapidação transformavam-se *mutatis mutantis* em material de construção de paredes e muros cujos estilos construtivos se ajustavam à geometria fractal dos blocos." in Menegat, "Cognição e Paisagem No Processo Civilizatório Andino: A Matriz Do Lugar Como Chave Para Decifrar Machu Picchu." p.43

218 From the original in Portguese "o mundo fractal das falhas, com blocos e padrões geométricos diversos e em várias escalas, aceita que se possa trabalhar mais com o signo e o percepto, ou seja, trabalhar a forma dos blocos, do que com um conceito transparente como aquele exigido em teorias e planejamentos sofisticados." Menegat. p. 43

These two points are centred around questions of building resources and technique, while the third and fourth conditions pointed out by the author concern other features of the fractured landscape that resonates with city making, specifically related to what Marion Segaud names as the *founding* ("*fonder")* aspect of human settlements[219]. Namely, these concern safety and access to water. From Menegat's two first points, nonetheless, it becomes clear from this story that the historical formation of a craft follows a pattern similar to that of the individual maker when acquiring skill, but on a social, collective level. In the Incan case, the deep engagement with the Andine landscape and the associated perceptive capacity in relation to the possibilities afforded by the material conditions of the geological faults established the processes and conditions of a technology.

Moreover, this assessment in terms of technology implies a correlation between its art and its rationality or, in other words, the connection between a productive and a reflexive character, between *labour* and *knowledge*. In this sense, it is possible to understand a craft as an established way of making in a particular historical setting; a specific and culturally determined skilled practice surrounding a production. In other words, crafts are socially accepted, constructed and recognized fields of practice, in which products of different kinds are made, or actions performed[220], according to a historical development of the processes, skills, techniques and materials dealing with their particular production.

However, crafts also incorporate knowledge that reflect their social and cultural environment, such as how are objects used, valued, traded; what do they mean, how they are perceived etc. The formation of a craft involves, on the one hand, the symbolic structures permeating the *habitus* and their association with socioeconomic and cultural backgrounds. On the other hand, it involves also the material conditions of production and their objective characteristics, culminating in limits such as the division of labour, as pointed by Nørgaard[221]. Thus, crafts form as collective endeavours and shared environments with cultural expression, in which the dynamics and hierarchies structuring material productions are resolved under the semantics of the material engagement of skilled practice.

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219 Marion Segaud, *Anthropologie de l'Espace: Habiter, Fonder, Distribuer, Transformer* (Paris: Armand Colin, 2010), https://doi.org/10.4324/9781315094960-12.

220 This research deals primarily with material crafts, with special attention to those in which creative and productive labours are deeply intertwined. However, crafts also encompass other practices, for example, the service and care sector. See Helen Holmes, "Transient Craft: Reclaiming the Contemporary Craft Worker," *Work, Employment and Society* 29, no. 3 (2015): 479–95, https://doi.org/10.1177/0950017014535834.

221 Nørgaard, *Bronze Age Metalwork: Techniques and Traditions in the Nordic Bronze Age 1500–1100 BC*.i

A craft operates a reproduction of culture that carries in itself the agency and subjectivity of the craftsperson and, therefore, acts in his inclusion in the social, to be recognized as part of it by himself and others. Craftsmanship thus represents a personal experience of cultural practices, in a fusion of the individual and the social through skill, and the formation of craft is operated through a transformation of skills that, nonetheless, falls inside the frame of a culturally accepted practice.

Especially significant on this collective level of craft formation is the relationship between different agents, professionals and stakeholders – in other words, the *ecologies* in which these communities of practice are situated. Instead of establishing a categorical limit to crafts based on an intrinsic quality held by them, a sort of transcendental end goal that, once achieved, merits a field of production with a legitimate 'craft' title, process-oriented ways of knowing traverse productions in their specific setting by a common origin – in the convergence of labour and knowledge that characterizes skilled practice. Making is the *genesis* of a process-oriented way of knowing, not the other way around. Thus, while this *episteme* does not create the crafts or trades in their individual and generic structures, it makes them discursively adjacent and provides them with a common directionality of thought and a shared semantic field. Acting as a vector of resemblance, on which a common ground can be established, a shared way of knowing makes possible the development of convergent notions of personhood linked to particular crafts, as exposed by Sautchuk and Marques, but also broader social identities and cultural entanglements amongst different crafts[222].

This commonality is exposed by Pamela Smith's study of XIV and XV century artisans of the Lowlands and Southern Germany, showcasing that many of the artisans did not perform one craft exclusively, but traversed many techniques and trades[223]. Many migrated from one practice to another, were trained in one area and wrote about others, or even became famous doing many different things. The Limburg brothers, for example, were famed illuminators, but originally trained in goldsmithing. Jan van Eyck, besides panel painting, "also illuminated book of hours, produced coats of arms and organized festival decorations, for the Burgundian nobility, and even gilded the statues on the Bruges town hall"[224]. As Smith points out, this versatile activity was "typical for the type of artisan in the Guild of St. Luke"[225].

222 Sautchuk, "O Arpão e o Anzol: Técnica e Pessoa No Estuário Do Amazonas"; Marques, "Forjando Orixás: Técnicas e Objetos Na Ferramentaria de Santo Na Bahia."

223 Smith, *The Body of the Artisan.*

224 Smith. p. 39

225 Smith. p. 39

These connections create the conditions for the establishment of institutions, such as the Guild of St. Luke. The Guild, as Smith highlights, was a shared a common social and political collective between craftspeople and artists in fifteen and sixteen centuries[226]. Specifically, the Guild of Saint Luke, alongside to panel painters, "included illuminators, leather gilders, jewellers, tapestry weavers, goldsmiths, sculptors, saddle makers, and other physicians and apothecaries."[227]

Taking in account Mary Douglas theory that thought and cognition are established in society by institutions, it is possible to relate the formation of craft institutions such as the Guilds to process-oriented epistemologies since, to become stable, institutions require parallel cognitive conventions.[228] This interpretation allows one to rephrase Marx's historical materialism and describe not a situation in which the modes of production define, by their very nature, the epistemological regime of a given society. Instead, modes of production are coupled to particular rationalities because their historically developed ways of making act as institutions, in Mary Douglas's sense. The establishment of individual crafts and the guilds, in this view, can be understood as institutions sharing (and shaping) the particular rationality and the political form of personhood of craftspeople. Moreover, the institutionalization of an *epistemic commonality* and the coalition of different trades opens up the possibility for the flourishment of a discourse, sometimes actively recognized, pursued and put forth by artisans.

226 Smith.

227 Smith.p. 39

228 Mary Douglas, *Exploraciones En Cosmología* (Madrid: Alianza Editorial, 1988).

2.6 The artisanal claim to knowledge

Considering that crafts are formed through the development of a material-social dialectic in which knowledge and labour are coupled in skilled practice, coalescing in technical and societal institutions, is it possible to find craft's discursive equivalents of Mary Douglas' "cognitive conventions" in history?

What is problematic in the effort to answer this question is precisely the tacit, embodied condition of the craft's ways of knowing which, by essence, means that such occurrences are bound to be curtained in their unspoken, non-explicit manifestation. Nonetheless, there are at least two historical developments whose conflictive nature allow for traces and evidences of the veiled operation of craft's episteme to surface. Namely, these mark precisely the moments of struggle, departure and rift that divide the realms of making between different actors, consequently establishing the image of what came to be known as "modern crafts"[229] and its main counterparts, *Art* and *Industry*.

The turn to written knowledge that reached the artisanal world in the XIV century can be seen as an indicator of this phenomenon. As Pamela Smith shows, artisans and craftspeople started to convey their knowledge through pen and paper, presenting a picture (and an epistemology) that, so far, had remained mostly hidden from scholar account. The "explosion of technical treatises", specifically including architectural treatises, indicates how artisans were "compelled to write down their modes of working"[230]. Conveyed in the texts of artisans and artists from the XIV century northern Europe (more precisely, Germany, Flanders and The Netherlands – although the phenomena can also be seen in Italy), this "artisanal epistemology" challenges a common dichotomy between art and crafts. Moreover, it portrays the attempts towards the establishment of a discourse, a 'school of thought' as it were, that would expand the material inheritances of craft into a more general epistemology:

> [In] the lively commercial centres of the free imperial cities, where craftspeople had a clear view of their economic and social powers, artisans began to express their belief that their experiential knowledge was as certain as deductive knowledge.[231]

229 Adamson, *The Invention of Craft*.

230 Smith, *The Body of the Artisan*. p. 31

231 Smith. p. 34

As the author points out, this shift towards the reliance of explicit knowledge is also related to the necessity of artisans to actively re-affirm their skill at the twilight of the guild system, in favour of new institutional formations. Such a change had severe implications in the division of the arts of making, a divide related to the socio-political changes occurring in Europe in its process from Pre-modern to Modern times. The rise of the *Bourgeoisie*, especially in urban areas with high merchant activities; and the establishment of state powers by families with no dynastic claims were both part of this context and both were highly, although distinctively, related to artisan production. The former, by the very economic links of production; the latter, by the use of Naturalism as a background philosophy for their "state theatre"[232]. As result, in the seventeenth century, a separation within the Guild's ranks already reflected the division between arts and craft further established later on:

> [As] painters came to recognize their own economic power and success, they declared themselves to be unique among the various trades of their guild. Panel painting became their way of demarcating themselves off from their fellow artisans. Through this sough-after medium of panel painting, Campin, van Eyck and Van Wan der Weyden claimed they were artisans of a higher order than their diverse fellows with whom they shared a culture and a guild… These artisans displayed a heightened self-consciousness of themselves as panel painters, emphasizing the medium in which they worked.[233]

In this scenario, patronage played a significant role in the invention of the "fine arts" and resignification of crafts that would later mark their separation in epistemic terms and social value. Some crafts, evidently, were deemd not noble (or aesthetic) enough to be praised in a courtly environment, and thus were deemed to remain as crafts, trades or practices not even perceived as autonomous occupations. Examples of these are plentiful in Langlands's *Craeft*[234]: his focus on agricultural crafts showcase many crafts that wouldn't attract patronage and were mostly performed by the rural population as a common part of their livelihood, such as sheep husbandry, roof thatching or ditch building.

The phenomenon is complex, and accessing the division of arts and crafts in its full discursive history is not the focus of this study. Unintuitively, however, this very rift allows one to trace the epistemology put forth in these craft environments into the realms of what would later be recognized as a fine art. In other words, to recognize how the artists of these times were attuned to and reproduced a discourse they shared

232 Smith.

233 Smith. p. 39

234 Langlands, *Craeft: How Traditional Crafts Are about More than Just Making*.

with artisans and craftspeople. It can be perceived in the question of authorship, which is deeply entangled with scholastic matters in these times. It is a form of authorship that takes shape not simply as a cult of the self, as it is commonly perceived today, but as a claim to recognition of the process of making and its performance by the individual. Maker marks assert the authorship in panel paintings of the era – Schongauer, as Smith notes, signed his engravings with "a monogram of his initials, in the form of a goldsmith's mark."[235] – as well as depictions showing the artists hidden in their portraits. This sort of self-affirmation in the product sometimes even defied scholastic conventions, with examples of artist signing paintings depicting the face of Christ (which was supposedly an archetypical image realized through the artist by God himself, and thus generally considered and treated as made *not* by human hands). In other words, it represents a shift from treating the image as *granted* to mankind by divine will and *channelled* through the artisan's labour, to that of the authority of the artisan to properly depict God's creation – equating the representation of nature with its objective counterpart. Not a simple imitation of the things observed themselves, but the "painter imitating the act of Creation in his work"[236].

In such instances, it is possible to see the convergences in the discourses of arts and crafts, and understand that both artists and urban artisans of this period were claiming the validity of practice and observation, and by consequence, experience, as epistemic tools. The parallel to empiricism is not too far-fetched – in the written works of these artisans, emphasis is often given to the conditions in which the act took place and the very presence of the author, with accurate indications of the place, tools and techniques employed. The same phenomenon also appears in the panel painting:

> The right panel from Robert Campin's *The Anunciation Triptych (Mérode Altarpiece)* (ca 1425) expresses this new artisanal self-consciousness and some of its claims. Joseph the carpenter is shown at work, surrounded by his tools, in a workshop that looks out onto a lively Flemish commercial scene. As in Campin's other paintings, the elements of carpentry and joinery are rendered with exquisite attention to detail. For example, in Campin's *Worship of the Shepherds,* the lath emerging out of the disintegrating wall shows attention to the actual method of construction and the supports of the structure are depicted as if salvaged from a previous use. Such particular and specific details enhance the realism of this religious scene, but they also indicate a view of the profound significance of craft and handwork… artisanship is here portrayed as part of the redemption of nature.[237]

235 Smith, *The Body of the Artisan.* p.31

236 Smith. p. 41

237 Smith. p. 55

Standing together with the self-referencing marks and the reference to the context of production is the depiction of the very act of painting, showcasing a reflexive stance that weaves together the questions of personal and craft identities, materially and discursively, with the process itself. Underlying the practice, according to Smith, is the rise of a self-consciousness of the artist *as a maker* and the identification of the value (economic, symbolic and epistemic) of being so. As she notes, "van Eyck's claim to the capacity for authentic representation came out of his highly developed sense of himself *as an artisan*"[238]. Thus, it is possible to interpret this newly founded awareness as the formation of a particular *class consciousness*, despite not being a fully-fledged, generic and ideologically certain identity like the *proletariat*. In any case, Smith's work demonstrates that the "artisan epistemology" played a major role in the formation of artists' identity and that their work was directly linked to its practice and epistemic claim.

The establishment of an artisan identity had material *and* stylistic dimensions: on one hand, the technical repertoire of crafts steered artistic practice, with the example of Schongauer, whose "background as a goldsmith probably turned his focus naturally to engraving, for the technique of engraving had emerged out of the practice of goldsmiths"[239]. On the other hand, stylistic preference was aligned with a particular agenda, and artists "used naturalism to assert their self-consciousness and skill"[240]. More importantly, however, is that these were linked to a discursive, epistemological formation whose grounds greatly resonate with the concept of skill, as developed above:

> They not only asserted their own powers of observation and claimed knowledge and authority based on those powers, but they also made claims about the power of sensory apprehension more generally: the objects of nature perceived by the senses and human engagement with those objects – artisanship – could lead to profound knowledge and redemption. [241]

The idea of a conjunction between the practice of making and understanding nature remained alive in the artistic production of the seventeenth century, as shown by Glen Adamson[242]. Accordingly, a corresponding meaning was incorporated in the works of these artisans, and they were thought to display "not just the mysterious

238 Smith. p. 44. My highlights

239 Smith. p. 39

240 Smith. p. 37

241 Smith. p. 55

242 Adamson, *The Invention of Craft*.

workings of nature, but also the equally wondrous workings of the maker's hands"[243]. Objects produced in this framework expressed the convergence in epistemic and artistic values, being understood as not "merely decorative", as they later would, but "as concrete manifestations of knowledge" [244].

The progressive divide between the two fields represented to the artistic practice, nonetheless, a movement towards more a representative, object centred epistemology, as well as the disconnection with other trades and crafts. Enjoying the privileged position in courtly environments, artists would still be much involved in the development of furniture, interiors and other commissions outside the realm of fine-art, but mainly from a managerial position. The results of these enterprises – ranging from disproportionate to outright dysfunctional – show signs of how sometimes their mode of action had already become distinct in relation to craftspeople. According to Adamson, it was not that "artists sneered at the prospect of designing decorative art, but rather that they were often not up to the task. They were often inexperienced at the job and had a difficult time managing the artisans hired to execute their ideas"[245]. In simple terms, although the idea of a convergence between mind and hand was still very much alive, in the reality of production artists and craftspeople frequently did not share a common practical stance and the same knowledge.

Particularly significant in this passage is the change in the relationship between thinking and making, translated in a division of labour. Accordingly, if the separation of so-called fine arts and craft can be traced back to the period of the guild system, albeit in an initial or latent state, it assumes a fully developed condition only in the eighteen century which, not coincidentally, marks yet another division: the rise of industry[246].

The main goal Adamson's book *The Invention of Craft* is to argue that, unlike most descriptions and the popular interpretation, crafts are not the reminiscent of an archaic past, but a legitimate modern creation. Craft as it is understood today, he argues, is a discursive phenomenon formulated in the advent of modernity as the opposite of industry and, therefore, the seemly dichotomic relationship between the two is largely an illusion. Adamson shows that, in the developments of industry throughout the eighteen and nineteen centuries, a mix of mysticism, socio-economic power struggles and positivist discourse concurred to the association of craft

243 Adamson. p. 61

244 Adamson. p. 61

245 Adamson. p. 12

246 Adamson.

practices to a nostalgic idea of the past. At the same time, however, craft skills were essential to the inventiveness and the concrete realization of the technical innovations behind the advent of modernity[247]. The knowledge of craftspeople was fundamental to the production of machines, the development of the productive chains, the establishment of an industrial aesthetics and the overall social feeling of technological optimism[248]. The idea of craft forged in this environment, on the other end, served as argument against which industry was defended and presented as an ontological development of humanity. By its association with mystery, deceit, dogma and doxa, craft became representative of a human condition to be surpassed.

The process can be identified in the Victorian era, for example, when craft knowledge went through a severe process of technical explanation. Adamson shows how the production of Diderot's Encyclopaedia and the profusion of *Grand Expositions* participated in this movement, in a dual agenda of presenting to the bourgeois population the mysteries and curiosities of craft practices and simultaneously reconciling them with a clockwork vision of reality[249]. Moreover, Adamson's exposition shows that the movement that divides the discourse between industry and craft is also associated with a parallel artistic polarization:

> In the *Encyclopedie*, then, we see modern craft setting off on a bifurcated path toward abstraction and theatricality. This double trajectory would lead ultimately to its disappearance into engineering on one hand, and the non-productive but captivating demonstrations of the art gallery and the fairground on the other. These two tendencies have in common a newly *explicit* positioning of craft. [250]

The underlying assumption was that, under their embodied, skilled appearance, crafts could be explained and operationalized in purely technical ways – and that their quality and effectiveness could be reproduced as such by industry. The remaining artisan skills and techniques that could not be explained in scientific terms (what now would be recognized as tacit knowledge) were either deemed archaic and arcane, or romanticized as artistic[251].

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247 Adamson.

248 The work of Pamela O'Long also showcases how crafts were a necessary foundation of industry and participated in the general construction of modern society, see Pamela O. Long, *Artisan / Practitioners and the Rise of the New Sciences , 1400 – 1600* (Corvallis: Oregon State University Press, 2011).

249 Adamson, *The Invention of Craft*.

250 Adamson. p. 8

251 Adamson.

This simultaneous framing in the dichotomy of "mystery and the explanation" that hovers crafts in the Victorian era can thus be thought as a "double bind"[252]. The dual Victorian processes of mystification and explanation are not in opposition, but constitute the process of *re-veiling* craft knowledge with a new surface: as a contradictory process of *revelation*, etymologically stemming from *re* ("again") and *velo* ("to cover"), that is, as a process or *covering again.* Wearing a costume or a mask, one must remember, encompasses two movements: obscuring the original and offering a surrogate, it simultaneously hides *and* shows. This is the dual nature of the process of hiding: the mystery hides what's underneath, and the explanation supplants it with a new 'reality'. The double bind occurs because, whichever the destiny of a particular craft technique, be it explained or mythicized, the way it is perceived is removed from the realm of a skilled practice operating according to its particular conditions – its nature and logic are placed elsewhere, and craft becomes only its medium.

While in institutionalized environments or productions such as the encyclopaedias or the Grand Expositions the artisan epistemology faced this discursive setback, in the reality of workshops, factories and in the overall groundwork of the industrial revolution, such a division was not as clearly established. Craft, on the contrary, was central to the development of the technical repertoire and infrastructure that allowed a coupling of scientific reasoning and material production[253]. A remarkable example where this contradiction is concentred in singular practitioners is demonstrated by Edmund de Wal, recounting the mix of despise and reverence with which quakers and alchemists were met during the eighteenth and nineteenth-centuries[254]. Particularly interesting is the case leading to the reinvention of pottery in eighteenth-century Dresden, where young alchemist Johan Friedrich Böttger worked while incarcerated by King Augustus the Strong, facing charges of charlatanism, and ended up uncovering the processes to make hard-paste porcelain[255]. Rather than an instance of extraordinary individual genius, his story is one that showcases how, in this period, a convergence between alchemical and scientific stances was integral to the effort of technological development. As Adamson points out, this sort of approach was not an uncommon instance of production, but rather a general occurrence:

252 Deleuze and Guattari, *Mil Platôs: Capitalismo e Esquizofrenia.*

253 O. Long, *Artisan / Practitioners and the Rise of the New Sciences , 1400 – 1600.*

254 Edmund de Wal, *The White Road* (London: Vintage, 2015)

255 Edmund de Wal, *The White Road*

> In the alchemical laboratories of the seventeenth and eighteenth centuries, the fabrication of equipment – glass vessels, ceramic crucibles, metal instruments, and brick furnaces – was necessary to the conduct of precise instruments. […] there was an undifferentiated field of making, in which what we latterly choose to call science was inseparable from the artisanal trades. [256]

This mix leads Adamson to claim that, rather than being replaced by industry in account of the development of scientific approaches, "early modern artisanal workshops were hotbeds of technical research, artisanal skill was the empirical basis for science itself" and that there was "no firm distinction between artisanal and learned forms of knowledge" but "an active interchange" between alchemic research and early forms of modern science[257]. A similar argument is employed by Kropotkin, referring to a later period and exposing that inventions commonly associated with science – such as "the steam-engine, […] the railway-engine, the steamboat, the telephone, the phonograph, the weaving-machine, the lace-machine, the lighthouse, the macadamised road, photography" and "thousands, of less, important little things" – were devised not by "professional men of science", but by makers who "hardly had received any education at school"[258]. Their background was instead in the workshop, as jewellers, instrument makers, millwrights, masons and such - in short, artisanal backgrounds that, nonetheless, did not engendered a discursive resistance. Quite on the contrary, while "much of the innovation had been done by empirical trial and error", very often the manufacturers behind these developments "were in possession of practical knowledge, but wanted to present it as technical knowledge" [259]. Similarly, writing in 1947, Farleigh claims that "Industry has drawn from the craftsmen many of its best designers and will continue to do so"[260].

As Manuel DeLanda points out, this moment of an undifferentiated rationality in the development of industry is yet a corollary of a slow and broader process whose origins were linked to an epistemic departure from the material engagement represented by skilled practice. "[In] seventeenth-century England", he argues, "much more prestige was attached to scientific fields that were not concerned with the mundane mechanical arenas where materials displayed their full complex behaviour"[261]. One of the discursive results of this departure is the breakage of the

256 Adamson, *The Invention of Craft*. p. 61

257 Adamson. p. 61

258 Kropotkin, "Fields, Factories, Work. or, Ind. Comb. with Agric. Brain Work with Man. Work." p. 173

259 Adamson, *The Invention of Craft*. p. 75

260 Farleigh, "THE CRAFTS — THEIR PAST, PRESENT AND FUTURE." p. 35

261 DeLanda, "Material Complexity." p. 16

correlation between the notion of materiality and the processes of its transformation, in favour of scientific *explanation*, as Adamson shows: "Materiality and explanatory language map onto one another completely, without residuum or remainder, or any evident dependency on the hands of an artisan."[262] In simpler terms, it was a shift in what 'understanding a material' meant that, in opposition to the "artisanal epistemology" of artists and artisans of earlier eras, was independent from the processes of making:

> The wondrous action of new substances, however, operated on a molecular level, out of sight. How did improvers in these areas of manufacture describe their work? Their responses might be seen as occupying a middle ground between long-established and newly emerging ways of thinking about materiality. To some extent, improvers presented their amazing products in alchemical terms. They ascribed them quasi-magical, animate powers, reserving for them the mystery that had once attended all transmutable materials. At the same time, they subjected them to the usual welter of explication we have seen in the case of ceramics; and went further still, beginning to articulate what we might call scientific formalism, which treated materiality as purely a matter of calculation and ideation. Insofar as cast iron, papier-mâché, and rubber could be made to assume any form, they provided a seemingly unmediated route from intention to object. Explanation could therefore focus on the underlying science of the materials, which made the leap possible; and design, which directed the aesthetics of the result. The practical basis of manufacture, by which individual objects were actually fabricated, was taken for granted.[263]

While in the reality of early industry much was developed under the ways of knowing of craft, the discursive shift of the industrial revolution represented a problematic change on the condition of existence of crafts. In other words, if in the grounds of the workshops and the factories in the eighteenth and nineteenth centuries alchemical, process-oriented ways of knowing were paramount to the development of the industrial complex we benefit from today, the discursive shift establishing science as its only legitimate epistemology paved the way for a rift in the connection between knowledge and labour that characterizes crafts:

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262 Adamson, *The Invention of Craft*. p. 86

263 Adamson. p. 75

> It is true that skilled hands were sometimes brought under control during the period of industrialization through brutal, direct means […]. As recent historians of the industrial revolution emphasize, however, the move to large-scale factories was slow in coming and limited to only a few places and trades. Much more wide-reaching and significant was a softer form of centralization in which *skilled hands were brought under control through discursive and pictorial, rather than physical, means.*[264]

Therefore, what Adamson argues is that craft, as seen in contemporary times, became a reality in the event of modernization, as an opposition to *industry* – and this happened in both practical and discursive levels. Thus, the way one understands and conceptualizes craft (and the way crafts practices are reproduced) in modern society was constructed on the same conceptual background as its discursive counterpart. Evidently, crafts existed before the industrialization, but what Adamson shows is that the perception imbued in crafts during the Victorian era shaped its actual manifestation, creating both the general view towards crafts nowadays – seeing them as romantic or archaic practices – and the material manifestation of craft practices. Craft became, by history and by symbolisation, the opposite way of making of industry. Craft predates industry, but it is also much changed by the hegemonic advent of industry. If craft was very much alive in the early nineteenth century England, it remained since as the *other* of industry, and now encompasses only the practices that least are transformed by its objectivist epistemology, and operate mostly (although not completely) in accordance to opposite epistemologies: epistemologies based on process-oriented ways of knowing, stemming from practices that resist objectification.

It seems clear that, in many ways, the episteme of crafts figures in history in ways remarkably similar to a discourse, if we understand the latter from a Foucauldian perspective[265]. On one hand, these expositions tell a story of the tumultuous life of craft's institutions and ways of thinking, and how they relate to contending and adjacent forces. Their discourses intermingle with other identities, and the cultural and productive territories under its epistemic sovereignty shift. When institutions like the Guild give way to other powers, their discourse is forced to emerge, to become vocal, explicit and maybe political, safeguarding the epistemic claim of its class. Productions formerly under its institutions and participating in the dissemination of its discourses, like panel painting, turn autonomous, and their ways of knowing may depart from its process-oriented basis. These two historical developments describe a discursive rise and fall of an artisanal claim to knowledge: first, in complex relations

264 Adamson. p. 7. My highlights.

265 Foucault, *The Archaeology of Knowledge*.

of affirmation between artistic and artisanal; later, by an opposition with industry that, nonetheless, attests to craft's significance. In these instances, the usual boundaries of crafts and the specificities of their existence and discourse seems to balance in a knife's edge, for these are indeed moments of agitation, when the productive structures and epistemic conditions of crafts are tensioned out of phase.

2.7 Craft as a material discourse

Returning to the matter of definitions, it is possible to understand that *craft* is akin to a discourse in the sense that it describes the range of possibility within a specific production. The devices of craft, however, are tools and techniques, functional normatives (based on use), symbolic referentials, historic and economic prerogatives etc. Taking this in account, and to analyse crafts in its overwhelming manifestations and complexities (and without trying to define them *a posteriori,* inevitably reducing their reach), I propose to employ the methodological reasoning of Foucault's treaty on discourse, found in *The Archaeology of Knowledge*, on the study of *material discourses*[266]. This conceptualization enables an analysis that simultaneously situates craft in: a) its particular realities (woodworking, masonry, hairdressing etc); b) in its conceptual origin and generality as a broader field of production (the general notion of "craft", thus in tension with the material discourses of "industry" or "arts", for example); and c) as an employable concept to address a field's practice (the craft of writing, the craft of architecture etc) – all related to an epistemic dimension. Thus, a material discourse describes a production in its complexity and historicity, gauging and describing its apparitions and its hold on society in the light of these conflictive, contradictory manifestations.

266 To note, "material discourse" is *not* entirely a Foucauldian concept and perhaps would, contradictory, be expressed in his texts as a "non-discursive" practice. However, Foucault's description of discourses and their interplay with epistemes, society and non-discursive practices offers a remarking fresh approach of studying social phenomena in their interdependence and complexity while, on the other hand, dismissing the need for a complete new theorization of social relations. He is, indeed, rather emphatic that his archaeological method does not eliminate or make other forms of analysis invalid, but co-exist with then, in the measure that it deals with different aspects of analysis. See Foucault.

Most importantly, this approach acknowledges the relationship between material practices and knowledge – it recognizes the nature of crafts as epistemological practices, making possible to recognize how material productions are associated with and can be analysed from an epistemological perspective. In short, the concept of material discourse describes the conditions of existence for a given production, that both defines its boundaries and the relations between its objects, techniques, aesthetics, economic and symbolic evaluation etc. It makes it possible to analyse crafts taking into account their variety of manifestations and performances on both theoretical and practical dimensions.

The definition of "material discourse" thus deals not only with what is said, but what is made[267]. If the concept of "discourse" in Foucault describes the "conditions of possibility" of what is said, a "material discourse" defines not only why and how things are made in a given historical and social context, but also what is possible to be made, and that includes to a great degree the given material conditions, be them economical, technological and even aesthetic[268]. Moreover, it defines (or rules) how these different aspects interact in the making of something, and how can they be understood, described and conceptualized.

In other words, a material discourse establishes the relationship between these discursive conditions with a material foundation of how things are made. It describes the range of possibilities for a given production, that define the boundaries, the periphery and the connection between objects, techniques, aesthetics, economic and symbolic evaluation etc.

Was this entails is that each material discourse has its own conceptual framework and mode of production that work by the rules of its existence. In other words, a material discourse is never purely intellectual, or discursive in the strict sense of the world, rather the opposite, it cannot be completely disassociated from its temporal-spatial apparition and its material environment. Similarly, it cannot be disentangled with its cultural, social and historical dimension. As modality of manifestation, a material discourse is, evidently, an historical phenomenon. In the case of craft, skill, craftsmanship, quality, manual labour and others are its language, its semantic and syntax, even if they are not the entirety of its existence.

Understanding craft as a "material discourse", craft has an area, a surface that it encompasses, "a theme" so to speak. This theme qualifies and differentiates

267 Foucault.

268 Foucault, *The Order of Things: An Archaeology of the Human Sciences.*

craft from the other modes of material production, such as industry[269]. In terms of knowledge, the quality of craft that it is founded in the processes, in practical dimensions, because it can only be learned (and thus communicated) in the stances of skilled practice. Thinking in craft follows the formula, and therefore can only take the form of thinking through making - *thought is process-oriented in craft*. As a material discourse, therefore, craft is associated with a system of thought[270]. As Foucault presents in the preface of *The Order of Things*, with Borges's passage regarding the Chinese encyclopaedia's taxonomy of animals (organized in categories like "tame", " stray dogs", " fabulous", "drawn with a very fine camelhair brush", animals "that from a long way off look like flies" and so on) a different system of thought implicates in a different *semantic field*, a *tabula* that "enables thought to operate upon the entities of our world, to put them in order" [271]. This also happens with the epistemologies of making. However, the process-oriented ways of knowing do not operate *upon* the entities of world, but *with* them. Non-scientific but still empirical, the correlation between knowledge and labour means that the ways of knowing of craft are *alchemical*, built on transformations and procedural encounters, not of classifications and hard definitions. As seen, skill and craftsmanship do not operate in the same manner as scientific thought, and much less of language, as described by Foucault[272]. Contrary to the "non-place" of language, as Foucault phrases it[273], the epistemologies of craft are ever localized, if not in a fixed *place*, in the event of craftsmanship, in the act of making.

269 There are other forms of material discourse, and I exposed two already, namely "arts" and "industry". Evidently, different material discourses produce their epistemes and employ them in very specific ways, defining, the specific ways of knowing in different fields of practice. However, explaining their material and discursive formation is beyond my scope in this thesis.

270 Foucault, *The Order of Things: An Archaeology of the Human Sciences.* p. *XIX*

271 Foucault.

272 Foucault.

273 Foucault. p. *XVII*

2.8 Conclusion

Tracing the intricate interplay between skill, craftsmanship and knowledge, in this chapter I explored the multifaceted nature of craft and developed a theory of knowledge in material productions. Grounded on the insights from the fields of anthropology, philosophy and the so-called craft theory, the epistemologies of making emerge as the specific rationality of craft material practice - not merely as means of production, but as pathways to exploring and comprehending the material world.

At the heart of this exploration lies the recognition of skill not as a simple mechanical ability, but as a form of a personal, materially induced perceptive-cognitive shift. Through the engagement with the material world within the making process itself, craftspeople embed themselves in a transformative process of creation that establishes new fields of perception, developed in reflection of material qualities and properties. Thus, craftspeople attune to materials, becoming aware of the possibilities of action and the flows of forces intrinsic the productive environment.

Skill thus represents the foundational mean with which craftsmanship is performed. Understanding craftsmanship as the dynamic interplay between maker and material, it can be understood as an event where artisans navigate the nuances of production in tandem with the material world. It is a relation between the maker and the materials, developed as an agentic negotiation wherein their relative subjective positions are established.

Transitioning from individual perspectives to broader phenomena, I described how the intersubjective encounters of craftsmanship shapes craftspeople's modes of understanding reality and identity. Drawing from theoretical insights from philosophy and anthropology, I described the epistemological dimensions of crafts in the form of a process-oriented way of knowing. Transcending classical epistemology, this alternative approach offers a fresh perspective on the fluid and dynamic nature of knowing in action, underscoring the profound implications of skill and craftsmanship in shaping the formation and development of material productions.

Finally, from an exploration of the formation of crafts and their claims to knowledge, I framed crafts a materials discourses — dynamic discursive territories where the interplay of skill craftsmanship and social institutions converge to shape the way people make things and express material knowledge. Through this lens, crafts and their institutions can be analysed in the historical complexity, avoiding the biases and short-sightedness of hylomorphic approaches. Moreover, this conceptualization serves as a methodological background for the comparison of different fields and models of production, through which architecture and crafts can be positioned in relation to each other – being, thus, of particular importance to this research.

TOC

3 Epistemic horizons

Knowledge as ranges of possibility

3.1 Introduction

An important hypothesis of this research is that understanding the epistemologies of making can be beneficial to architectural thought, design and production, as well as clarifying its tacit dimension. To access this hypothesis, the underlying question of how knowledge can be recognized and valued becomes highly significant. This is especially true in regards to tacit ways of knowing, in which justification, a fundamental requirement for the appraisal of knowledge as such in classical epistemology, is not straight forward.

Therefore, in this chapter the question of how to appraise knowledge is used to confront some misconceptions of knowledge, science and information; and to provide a methodological approach that allows different forms of knowledge (especially tacit) to be accessed in tandem with the concept of skill (thus in agreement to my epistemologies of making). Consequently, this chapter points to a possible form of appraising knowledge that doesn't rely in the concept of truth and for which justification is found in generative potential – what knowledge makes possible – allowing a non-technocentric approach to knowledge.

The chapter is divided in four sections. In the first part I address general discussions of classic epistemology and information theory when confronted to the question of the appraisal of knowledge, and its importance for the question of tacit knowing. The relation between knowledge, cognition and imagination is explored in the second part: understanding that their boundaries are not clear distinctions, I argue that the terms are dependent and can only be addressed in conjunction. In the third section I push forward

the relationship between knowledge and imagination, proposing a conceptualization of knowledge as the establishment of *horizons of possibility*, and arguing that knowledge can be appraised by what it makes possible, being therefore contingent to imagination. Finally, in the fourth and last section I reflect on the consequences of my conceptualization for the question of tacit knowledge and skill, highlighting the difference between my approach and the main authors dealing with tacit knowledge.

3.2 The question of knowledge appraisal

Hungarian chemist and philosopher Michael Polanyi is considered a pioneer in describing the existence of tacit knowledge, as a way of knowing that is not or cannot be made explicit. It is the knowledge reflected, in his words, in the fact that "we know more than we can tell"[274]. Expanding on Gilbert Ryle's distinction between "knowing what" and "knowing how"[275], Polanyi set out to describe tacit knowledge and address its presence in sciences, arguing that discoveries, research and innovation are not as objective they were presented, but depend on cultural and social contexts of the researcher. For Polanyi, every knowledge has a tacit origin, meaning that the inexplicable way people appropriate it in personal and particular ways provides the basis (and biases) on which explicit knowledge becomes a reality.

Perhaps the most common example of Michael Polanyi's concept of tacit knowledge is the activity of riding a bicycle. Started off by himself, the example is very effective is transmitting the general quality of being non-explicit, but does not easily relate to other ways of knowing that the author intends to prove as having a tacit foundation, such as theoretical knowledge[276]. To remedy this distance, much ink has been spent on the notions embodied, practical or somatic knowledge, in attempts to develop a bridge between the two[277]. Nonetheless, I believe yet another line of investigation might prove useful. Notably, while the status of the ability to ride a bicycle as knowledge is conflictive – there is little disagreement that it requires skill.

274 Polanyi, *The Tacit Dimension*, 2009. p. 4

275 Ryle, *The Concept of Mind*.

276 Polanyi, *The Tacit Dimension*, 2009.

277 Marie Louise and Stig Sørensen, *Embodied Knowledge. Perspectives on Belief and Technology*, *Embodied Knowledge*, 2012, https://doi.org/10.2307/j.ctvh1dx2t.3; Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making*; Collins, *Tacit & Explicit Knowledge*.

In face of what has been exposed so far, it seems evident why Polanyi's own example for tacit knowledge is so recognizable as a skill. But how can my concept of skill be used to clarify a question of knowledge? More specifically, how does the concept of skill as the establishment of a perceptive-cognitive field and, consequently, the epistemologies of making in general, relate to the broader field of epistemology?

Dating back to Plato, in classical epistemology, knowledge is regarded as "justified true belief"[278]. It means that, for a person to know a proposition, the proposition itself must be true, the person must believe in its validity and the belief of the person must be justified[279]. The idea is deeply associated with the pursuit of truth but it also proposes that, in spite of (and in order to be considered as) being truth, knowledge also needs to be justified as such. The implication is that knowledge is inherently linked with a methodological dimension – that is, knowledge needs to be accessible, in one way or another. Disregarding, for the moment, the never-ending philosophical problems of truth, the justification side of knowledge may be a good starting point for analysis.

The necessity for justification in knowledge is associated with the historical development of classical epistemology, sitting in the foundation of modern science. Rooted in European positivism and deeply involved with the Enlightenment, science implies a concept of knowledge as a "secured, methodically acquired and communicable insight"[280]. This correlation between knowledge and science is commonplace in modern thought but, despite their intimate relationship, a confusion between the two terms can be misleading. According to Tim Ingold, the idea that science is the ultimate triumph of mankind, in opposition to *doxa*, religion or other cosmological views is pervasive of contemporary western society and marks the very notion of modernity[281]. Similarly, Adorno and Horkheimer define the mystification of reason or rationality as a new form of superstition that characterizes modern thought. The authors argue that the celebration of reason by scholars of the nineteenth century, paradoxically, gave rise to an ideology in which science was not

278 Daniele Fanelli, *A Theory and Methodology to Quantify Knowledge*, *Royal Society Open Science*, vol. 6, 2019, https://doi.org/10.1098/rsos.181055; Aileen Oeberst, Joachim Kimmerle, and Ulrike Cress, "What Is Knowledge? Who Creates It? Who Possesses It? The Need for Novelraph, Ralph Wedgwood, "Plato's Theory of Knowledge," *Plato's Theory of Knowledge*, no. 2003 (2013): 1–203, https://doi.org/10.4324/9780203085905. Answers to Old Questions," *Mass Collaboration and Education*, 2016, 105–24, https://doi.org/10.1007/978-3-319-13536-6_6.

279 Oeberst, Kimmerle, and Cress, "What Is Knowledge? Who Creates It? Who Possesses It? The Need for Novel Answers to Old Questions."

280 Frank Adloff, Katharina Gerund, and David Kaldewey, *Revealing Tacit Knowledge: Embodiment and Explication*, *Revealing Tacit Knowledge*, 2015, https://doi.org/10.14361/transcript.9783839425169. p. 22

281 Ingold, *Making Anthropology, Archaeology, Art and Architecture.*

seen as a pursuit and abidance to the justification of knowledge, but served as a justification by itself[282]. Their thought, as phrased by Habermas and Levin, is that the "process of gaining mastery over the mythical powers" represented by modernity, "invariably brings about the return to the myth"[283].

This phenomenon of uncritical acceptance of technoscience sets forth a general understanding that knowledge has an intrinsic "epistemic character"; that is, that knowledge can only be achieved through scientific means, and that only science has the legitimate claim over knowledge[284]. This assumption is controversial, if not entirely problematic,. Many authors have pointed how knowledge and its legitimization are entangled within relations of power, and how the symmetry between science and knowledge can reproduce structures of misogyny[285], colonialism[286], heteronormativity[287] and others. Voiced by Donna Haraway, one of their arguments is that the practice of science is a situated endeavour and, as such, its outcomes are often permeated with biases that reproduce oppressive discourses under the guise of a neutral *rationale.* A good example of how this phenomenon can take place is presented by Andrew Feenberg. In the paper *The Ten Paradoxes of Technology,* Feenberg describes situations where the employment of technology, whose status as knowledge is usually unquestioned given its scientific nature, fails empirically precisely because of its orthodoxy in scientific premises[288]. Moreover, besides the problematic of the operation of knowledge and its entanglement with power, the question presents a fundamental paradox in the definition of knowledge itself. The belief that science is the only legitimate claimant to knowledge, based on science being the sole means of justifying true belief, would require treating science as the means to its own legitimation.

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282 Horkheimer and Adorno, *Dialéctica de La Ilustración*.

283 Jurgen Habermas and Thomas Y. Levin, "The Entwinement of Myth and Enlightenment: Re-Reading Dialectic of Enlightenment," *New German Critique*, no. 26 (1982): 13, https://doi.org/10.2307/488023. p. 15

284 Adloff, Gerund, and Kaldewey, *Revealing Tacit Knowledge: Embodiment and Explication*. p. 22

285 Donna J. Haraway, *Simians, Cyborgs, and Women: The Reinvention of Nature*., *Contemporary Sociology*, vol. 21, 1992, https://doi.org/10.2307/2076334. Claudia von Braunmuhl, *Mainstreaming Gender: Entre El Discurso Crítico y El Discurso Burocrático Del Poder*, *Género, Feminismo y Masculinidad En América Latina*, 2001; Virginia Vargas Valente, "Feminismos En América Latina.," *Raíces Comunes e Historias Compartidas*, 2019, 57–68, https://doi.org/10.2307/j.ctvn5tzmv.7.

286 Boaventura de Sousa Santos, *Epistemologies of the South*, *Epistemologies of the South*, 2015, https://doi.org/10.4324/9781315634876. Ananya Roy, "Who's Afraid of Postcolonial Theory?," *International Journal of Urban and Regional Research* 40 (December 1, 2015): n/a-n/a, https://doi.org/10.1111/1468-2427.12274.

287 Michel Foucault, *História Da Sexualidade 2: O Uso Dos Prazeres* (Rio de Janeiro: Graal, 1984).

288 Andrew Feenberg, "Ten Paradoxes of Technology," *Techne: Research in Philosophy and Technology* 14, no. 1 PLISS (2010): 3–15, https://doi.org/10.5840/techne20101412.

The confusion between science and knowledge, nonetheless, has old roots. A view of science as equal to knowledge has, generally, a contradictory consistency with the etymological meaning of the term itself. In his *Keywords,* Raymond Williams reminds that, across the centuries, the meaning of science varies greatly from its contemporary use: from the Latin *Scientia* that literally meant "knowledge", the term evolved into a more specific meaning in the fourteenth- and fifteenth-centuries[289]; and it stopped being representative of every knowledge, designating a particular "branch or body of learning"[290]. The generality of its use narrowed, often appearing as a synonym for "art" until the seventeenth-century[291]. From this period on, 'science' began referring to skills more related to theoretical knowledge, and designating the methods and observations that provided "demonstrative proof in an argument"[292]. The further development in this direction, Williams suggests, is deeply related to the distinction between "experience and experiment" that takes place in the eighteenth-century:

> Experience could be specialized in two directions: towards practical or customary knowledge, and towards inner (SUBJECTIVE (q.v.)) knowledge as distinct from external (objective) knowledge. Each of these senses was already present in experience, but the distinction of experiment – an arranged methodical observation of an event – allowed new specializing emphasis in experience also. Changes in ideas of NATURE (q.v.) encouraged the further specialization of ideas of method and demonstration towards the 'external world', and the conditions for the emergence of science as the theoretical and methodical study of nature were then complete. Theory and method applied to other kinds of experience (one area was metaphysical and religious; another was social and political; another was feeling and the inner life, now acquiring its new specialized association with ART (q.v.)) could then be marked off as not science but something else.[293]

According to Williams, the distinction between "experience" and "experiment" operated a specialization in the understanding of science that excluded "many other areas of knowledge and learning"[294], consolidated in the nineteenth-century's use of 'science'. Understood then as "the successful methods of the natural

289 Williams, *Keywords: A Vocabulary of Culture and Society*. p. 277

290 Kubler also reminds that the disconnection between art and science is contemporary to that of arts and crafts, claiming that "our inherited habit of separating art from science goes back to the ancient division between liberal and mechanical arts" . See George Kubler, "The Shape of Time: Remarks on the History of Things" (London: Yale University Press, 1970), https://doi.org/10.2307/774651.

291 Williams, *Keywords: A Vocabulary of Culture and Society*. p. 278

292 Williams.

293 Williams. p. 279

294 Williams. p. 279

sciences"[295], science began confusing itself, once more, with multiple bodies of knowledge. Conversely, it unfolded in a general movement "where a particular and highly successful model of neutral methodical observer and external object of study became generalized, not only as science, but as *fact* and *truth* and *reason*"[296].

Science, then, became both the justification and truth that supports knowledge and, as such, the entirety of its objective dimension. Once again, science and knowledge were conflated. But this time, rather than represented by it, knowledge was limited by this particular interpretation of science, and other forms of knowing were disqualified, as shown in the previous chapter in relation to artisanal epistemologies.

While this confusion between the science and knowledge seems to survive still[297], science is better described, and in general accepted in the scientific community itself, as a method or approach, a way in which to proceed in order to produce and develop knowledge in ways that it can be evaluated and legitimized (also in its legal meanings)[298]. This last part is particularly important due to its connection to authority. Western, modern society is largely guided by scientifically recognized knowledge, despite of its many inconsistencies and idiosyncrasies, and it is a significant way of assigning responsibility between society's members[299]. In general, science is accepted as an efficient way to structure the search for knowledge, providing attitudes, common practices and formalities that facilitate its production, evaluation and distribution. This description is concordant with the definition of "science" on the Cambridge Dictionary:

295 Williams. p. 278

296 Williams, p. 279. Original highlights.

297 As present in recent studies on knowledge and epistemology, like Fanelli, and particularly in those focused on the question of tacit knowledge, such as Collins. See Fanelli, *A Theory and Methodology to Quantify Knowledge*; Collins, *Tacit & Explicit Knowledge*.'

298 This view can be seen in the many attempts on defining science for general readers in large scientific institutions' websites. For a brief display: science is defined as "observing the world by watching, listening, observing and recording" in the Nasa page "Science for Kids", at https://spaceplace.nasa.gov/science/en/; as "the pursuit and application of knowledge and understanding the natural and social world following a systematic methodology based on evidence", by the Science Council of the United Kingdom, at https://sciencecouncil.org/about-science/our-definition-of-science/; and as "both the body of knowledge (the things we have already discovered), and the process of acquiring new knowledge (through observation and experimentation – testing and hypothesizing)" by the Australian Academy of Science, at https://www.science.org.au/curious/people-medicine/what-science.

299 Illich, "Needs."

(knowledge from) the careful study of the structure and behaviour of the physical world, especially by watching, measuring, and doing experiments, and the development of theories to describe the results of these activities.[300]

Knowledge, on the other hand, appears as the "understanding of or information about a subject that you get by experience or study, either known by one person or by people generally", and "the state of knowing about or being familiar with something"[301]. On the one hand, the former description seems to be closely related to the definition of science, implying that knowledge can be obtained by the same *means* present in science, namely "experience" (that can be read as both in the *quotidian* and *laboratorial* meanings – more precisely divided into "experience" and "experiment", as shown above) and, especially, "study". One the other hand, it refers to "information" that, in its dictionary description, appears as "facts about a situation, person, event, etc"[302], implying a concreteness, and providing science (and knowledge) with a direct linkage to this concrete dimension. In this line, the latter dictionary description of "knowledge", albeit not explaining much in terms of the processes or the quality of knowledge, highlights its relationship with something that is external, to which the knower is related. This perspective offers an important facet of knowledge, indicating *a directionality* in knowledge. Knowing is *knowing something*.

Justification, from this perspective, can be seen as the correlation between the something that is known and its existence, measured by its observability in the concrete reality. This directionality can provide a better distinction between knowledge and science, and some principles for their assessment. A better argument for science as a model that correctly addresses knowledge is that science is a validation model to access how reliable knowledge (or a way of acquiring knowledge) is, in terms of its observation in reality. In other words, a process of evaluating the justification of knowledge based on the reliability of its referent in the objective world. Science, thus, can be understood as a method of addressing the directionality of knowledge. As such, a fundamental aspect of science is its grounding on the concrete reality, on what can be perceived (and tested) in the physical world. A scientific method, thus, is a way of designing the pursuit of knowledge such that it can be validated in accordance to this premise, that is, its observability. In other words, a form of modelling research so that it can be validated by scientific tools such as experimentation.

300 Science. (n.d.) In Cambridge Dictionary. https://dictionary.cambridge.org/pt/dicionario/ingles/science

301 Knowledge. (n.d.) In Cambridge Dictionary. https://dictionary.cambridge.org/pt/dicionario/ingles/knowledge

302 Information. (n.d.) In Cambridge Dictionary. https://dictionary.cambridge.org/pt/dicionario/ingles/information

It is undoubtable, then, that knowledge is not exclusively on the *inside*, in the realm of the mind, but is also related to the objective reality. After all, a premise of knowledge is that it *remains* true, or justified, when it is passed on. People learn and teach it, and, despite perhaps not in identical ways, replicate the knowledge and its outputs from their forebearers.

> Knowledge, according to the consensus within the human sciences, counts as a key concept of human praxis. What one does seems to be based on knowledge, and whoever can do something has knowledge at his or her disposal which is not accessible to someone who cannot do something (i.e., whose action does not succeed) – at least not right at the moment of acting/failing.[303]

The link between knowledge and the objective reality seems to be based on information, which leads to the question of the validity of information for the appraisal of knowledge. In this line, an approach is given by the sociologist of science Harry Collins, from his ethnographical work in science laboratories. Trying to clarify the distinction between tacit and explicit knowledge, Collins devises an overarching conceptual metaphor of knowledge as "strings of information"[304]. These "strings" can be understood as sequences of organized information that allows it to be understood and, therefore, applied. The way in which this information is organized is what defines knowledge and gives it its character: if it is explicable, in terms of being decodified into language, it is explicit; if not, it is tacit. Regardless, Collins' notion is that both forms of knowledge involve the transfer of "the ability to accomplish new tasks"[305]. This perspective implies that knowledge could be interpreted as the utilitarian semiotic content of information; the part of it that humans can understand and apply.

While Collins deters himself from the appraisal of knowledge, limiting his analysis to the identification of knowledge's potential for explication, Daniele Fanelli tries to address the question from a similar interpretation of knowledge, but with a radically different approach. Echoing the argumentation of Collins, in which justification follows the premise that knowledge is the compression of information by the creation of "patterns", Fanelli proposes the development of a mathematical formula to appraise knowledge[306]. His equations seek to quantify knowledge considering the level of change performed in information and the overall use of this information to qualify a particular explanation or theory.

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303 Adloff, Gerund, and Kaldewey, *Revealing Tacit Knowledge: Embodiment and Explication.* p. 22

304 Collins, *Tacit & Explicit Knowledge.* p. 9

305 Collins. p. 9

306 Fanelli, *A Theory and Methodology to Quantify Knowledge.*

Fanelli's attempt is a significant one, although it presents problems of its own. His description of the value of theoretical knowledge concludes with this statement: "the value of a theory is inversely related to its complexity and directly related to the frequency of its use"[307]. It is a questionable claim, if not entirely problematic. Just like every other piece of knowledge, to be considered scientific (which, for him, equates to be considered true or, at least, justified), regardless of how sound Fanelli's equations might look, they have to account for what is observable in reality. In this realm, his conclusion fails. The mistake can be seen using the example of gravity: Newtonian theory of gravity is notoriously simpler than Einstein's[308]. Yet, Einstein's theory explains far more phenomena than Newton's, such as the orbit of Mercury, black holes, gravitational lensing, gravitational waves and so forth – none of which explainable, and some not even conceivable, by Newton's Laws. In fact, the orbit of Mercury was a problem within Newtonian theory of gravity that contributed to the need of a new theory, eventually leading to Einstein's General Relativity. Newton's theory, however, successfully explains most of the phenomena involving gravity at lower scales, and it could be argued that, outside the realm of astrophysics, it is probably used much more frequently than Einstein's.

Moreover, this formulation disregards the difference in subjects addressed by theories that, nonetheless, are valued in relation to one another. Fanelli is aware of the question, and he tries to provide an answer: "Given two theorems addressing different questions, in the more general case, the difference in knowledge yield will depend on the lengths of the respective proofs as well as the number of computations that each theorem allows to be spared."[309] However, it seems as a weak argument that the length of the formula can be directly compared with the amount of explanation it gives. These are not easily quantifiable variables on their own – often short explanations are dependent of more lengthy knowledge, such as codes or mathematical principles, and gauging the amount of explanation some knowledge provides is, at least, a difficult endeavour. Seemly, Fanelli's premise creates situations in which the evaluation of knowledge becomes purely speculative, which, conversely, undermines the enterprise of fitting the question in a mathematical equation.

307 Fanelli. p. 17

308 The former limited to posit an attractive force between two bodies with mass and the latter explaining the curvature of spacetime by massive objects that bends the trajectories of things, including massless particles such as photons.

309 Fanelli, *A Theory and Methodology to Quantify Knowledge*.' p. 17

Besides, another problem arises if one deals with knowledge that cannot be fully (or practically) translated in "computations", such as the description of tacit knowledge[310] by Collins, as knowledge that is not made explicit because the length of the explanation would be just too long[311]. This form of knowledge, in Fanelli's view, would be the least valuable of all, regardless of its contribution to society or its power to explain the concrete reality, simply by its length. Once again, Fanelli's assumption seems to lead to a conclusion that goes against what can be perceived in reality. This time, specifically on the domains of private enterprises: studies on management are increasingly seeking to understand the contribution of tacit knowledge in terms of productivity[312]. During times in which employees would spend their work life in one company, the tacit was a given, and new workers would slowly catch up to it while building experience. However, in environments where employment is increasingly fluid and volatile, the tacit dimension of knowledge becomes an important asset, and companies seek to design innovative organization models that facilitate its dispersion and transfer between employees[313]. Richard Sennett studied, for example, how companies like Toyota explore the potential of tacit craft knowledge to their advantage, incorporating many practices in their work environment that foster its development amongst teams[314]. Similarly, engineers working on the development of artificial intelligence also started focusing their studies on the tacit. While computers have long surpassed human capabilities in mechanical processing power, operating calculations in timeframes orders of magnitude faster than any person, with surgical precision, tasks that require more complex and analytical judgement proved challenging to compute. Computers continuously fall short at tasks that seem banal to most people, such as recognizing a rock or understanding humour. It becomes clear that, through programming the explicit alone, A.I cannot simulate the same kind of reason humans employ[315].

310 Polanyi, *The Tacit Dimension*, 2009.

311 Collins, *Tacit & Explicit Knowledge*.

312 Etienne Wenger, Richard Mcdermott, and William M Snyder, *Cultivating Communities of Practice* (Boston: Harvard Business School Press, 2002). Harry Collins and Robert Evans, *Rethinking Expertise*, vol. 7 (Chicago: The University of Chicago Press, 2007).

313 Holmes, "Transient Craft: Reclaiming the Contemporary Craft Worker."

314 Richard, *The Craftsman*. Additionally, Mihalyi Csikszentmihalyi, in his lifelong studies on happiness, associates the non-explicit side of practice with self-fulfilment and satisfaction, higher productivity and the development of expertise. See Csikszentmihalyi, "Flow: The Psychology of Optimal Experience: Steps toward Enhancing the Quality of Life."

315 Matteo Pasquinelli, "Machines That Morph Logic: Neural Netwroks and the Distorted Automoation of Intelligence as Statistical Inference," *Site 1: Logic Gate, the Politic of the Artifactual Mind*, 2017.

There are some important contributions offered by the works of Collins and Fanelli, but they lack stronger theoretical consideration, especially on the philosophical and human proprieties of knowledge. Relying heavily in information theory, these authors make the threshold between knowledge and information much too blurred. Information by itself is not knowledge, as "the mere provision of information holds no guarantee of knowledge, let alone of understanding", reminds Tim Ingold.[316] Information compression is not knowledge either because it doesn't entail comprehension. The pattern alone cannot contain knowledge. Knowledge indeed needs to take shape, and just like meaning is transmitted through signs, knowledge can only travel by some *medium*. This medium, however, cannot be considered knowledge but just the form, a recipient that carries information. Knowledge remains ungraspable, at least by itself – it has no substance, it can only exist as an abstract notion. Its external existence is dependent of readers, otherwise the information loses its meaning and the knowledge 'contained' in something (a statement or an equation) is not reconstructed[317]. In Simondon's lexicon, the question is phrased in terms of *signals* and *codes*, as explained by Andrea Bardin:

> Of course, the signal is this energy modulated in order to be converted into something else, such as the possible beginning of a procedure (if received by a machine) or a meaning (if received by a human being) (…) But the signal is not to be considered information, unless it encounters and modifies a system (or a subsystem) with a proper code.[318]

In this sense, there is no reason to consider that any medium properly contains knowledge, only encoded information. A computer, a book or other medium that stores information is not capable of doing anything with it unless it has a set of tools to make sense out of it. This leap is important: in order to calculate, a computer follows a program that tells it how to organize the information, how to relate different packets of information with each other, and to drive on that to perform an operation. This is a machine operation, and whether it is knowledge is questionable, yet it is remarkably similar to Collins' "ability to accomplish new tasks"[319]. Regardless, it shows that knowledge implies a rationalizing operation on information in a particular way, in other words, intelligence - and intelligence requires the capacity

316 Ingold, *Making Anthropology, Archaeology, Art and Architecture*. p. 1

317 This interpretation of information is shared by French philosopher Gilbert Simondon who, going a step further, claims that even information is primarily located on reciprocal influence between sender and receiver than in the sign, criticizing what he conceives as a confusion between "signal" and "information" in cybernetics. See Gilbert Simondon, "Imagination et Invention," *L'invention Dans Les Techniques, Cours et Conférences*, 1976. and Andrea Bardin, *Epistemology and Political Philosophy in Gilbert Simondon* (London: Springer, 2015), https://doi.org/10.1007/978-94-017-9831-0_1.

318 Bardin, *Epistemology and Political Philosophy in Gilbert Simondon*. p. 27

319 Collins, *Tacit & Explicit Knowledge*.

of association and the capacity to extrapolate, to *predict*, which, in Fanelli's terms, is an ability to compare a given set of information with prior acquired information and come up with a probability of results[320].

3.3 The poetic imperative of knowing

Fanelli's reading of prediction is still limited, however – it doesn't explain how information is compared to prior knowledge and previously processed information, neither the magnitude of this operation. Nonetheless, it is possible to design some conditions that need to be satisfied for the formation of knowledge, regarding the general acquisition and rationalization of information. It is not contentious to argue that the conditions described in these operations are met in the process of comprehension, or learning, at least by humans – with the care to clarify that they do not exhaust or describe the actual operation of human learning processes. Rather, they are here presented as proxies: these conditions can be used to describe a very crude minimal standard process of comprehension to address the acquisition of knowledge. They are:

A) Firstly, the simplest form of meaningful information acquisition one can imagine is the process of a simple *correspondence* between the new data and a previously existent categorical framework or, to use Collins' terms, "patterns"[321]. When the case is a simple comparison, which seems to be Fanelli's general understanding of how knowledge comes to be, the patterns are previously established, and only then are they projected on the new context. The processing of information, in such case, can indeed be thought as an equation itself – it takes previously formed patterns and examines the new information through it, fitting the recognizable features of the new context into the slots of the variables already given. The result is two-fold: on the one hand, there is the association of new information to previously existing patterns; on the other, there is a by-product of information that is not computed in any set and thus not processed within this operation. In other words, in this first model, any data that extrapolates categorization is ignored – the process through which information is analysed will be addressed only insofar as problems are solvable by the first set of patterns.

320 Fanelli, *A Theory and Methodology to Quantify Knowledge*.'

321 Collins, *Tacit & Explicit Knowledge*.

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B) A second scenario takes place whenever the new set of information also changes the patterns itself, meaning that the new set of information not only is compared with the priorly possessed system of patterns, but adds on to it, enlarging or reconfiguring the database of information, in a process of *adaptation*.. It can work either *in addition* to the mode of correspondence, or by its *review*, in face of conflicting or residual information. One process describing a simple addition would be that in which, after information is processed in accordance to a simple association, the remaining and problematic information, or what is left that does not fit the categories, is processed to the creation of new patterns not previously accounted by the existing ones. The result is simple: the creation of new patterns that add on to the total account. Alternatively, information can be processed reviewing patterns used beforehand, in order to make it useful to address the missing analysis. In other words, a process of categorical shift. Because it provides a way in which already patterned information might be organized in a different way, in ways that the pattern database possessed by the knower are not just *added* on, but also changed, this process *reviews* and changes to the previous set of patterns. The simplest form of review is the enlargement of previously stablished patterns – the inclusion of different parameters in a category that do not affect the other parameters, for example[322]. Other, more complex forms of change are also possible within this model – for example, the adaptation and enlargement of parameters themselves.

C) Finally, a meaningful attempt of addressing how information can be rationalized into knowledge must take in account the *poetic*, that is, the possibility of extrapolation that is so common in human cognition. It can be thought as a process similar to the previous one, but it implies a situation in which the new information operates on the patterns a *fundamental shift*. In this case, the new information is accessed and the patterns are actualized *beyond* the necessary to explain the new data, generating new possibilities of association and affecting their very underlying logics. In comparison with the previous operation, the new information is not used to only review the patterns previously formed, acting where the patterns were incomplete, but can reconstruct (partially or fully) the logic of their establishment, changing the very rationality behind the patterning process. In other words, it changes the parameters, the rules of classification and categorization behind the acquisition and organization of information.

322 The confusion between patterns, categories sets and parameters is understandable, and will not be completely addressed here, since the objective is not to delve too deep in abstract distinctions within information acquisition or cognition in general. It should suffice, for the moment, to establish that patterns, categories and sets are used interchangeably, while parameter refer to the underlying rules that connect a new datum with a particular pattern. Parameters, therefore, are precedent to the patterns, and rule the categorization of new information, while patterns allow its further management.

In this regard, it appears that the *adaptation* process is a better description of ordinary learning reality and that, together with *correspondence*, it creates a spectrum of ways engaging with the world and processing information. On one end, there is a more direct and utilitarian process, requiring little adaptation from the established patterns (or categories) in which people analyse the world, which may be called *analytical*, describing a way to navigate the word according to previously possessed knowledge but with little change of the rationality behind it. An example of this is the process of learning of a new word in a familiar language. While it might seem a simple case of adjusting the word to previously existing categories, such as "noun", "verb" or "adjective", the addition of a new word also implies a new way of representing a given situation, and it carries etymological and ordinary connections that associate its signifier with different categories, objects or actions. Similarly, in crafts, the acquisition of a new tool of a different logic but same functionality as the old one (an electric saw as opposed to a hand saw, for example) imposes on the artisan a process of learning of the same kind. The artisan needs to learn the new properties, qualities and workings of the tool, but these refer to processual categories she is already familiar with. Thus, the categories grow, and incorporate the new way of performing a particular task by the addition of the new tool.

On the other hand, there is another mode of comprehension that effects a deeper change, modifying the analytical tools in more significant ways. In this operation, one incorporates new information and develops new insights from them, allowing the assessment of previously acquired information through newly structured patterns that may improve or change its explanation. It might be called a *developmental* process, because it entails an increase not only in the data level, but also on the basis of pattern structure or, in other words, in the methods of navigating the world. In this side of the spectrum, it is possible to identify bigger changes in the methodological level. An example, in this case, would be the learning of a new language, with is grammatical and semantical particularities that allow for a radical new way of representing the desired situation and the construction of meaning. In relation to crafts, an example can be found when the artisan changes the scope of production, as in the carpenter that, by need or desire, decides to explore the craft of *lutherie* (making musical instruments). In this situation, the shift in the categories the artisan is familiar with is so profound that the analytical structures will need to be reassessed – the understanding the material, tools and techniques, the organization of processes or, in summary, the production as a whole – for her to complete the tasks. In this situation, some categories will be enlarged and adapted, while completely new ones will need to be constructed. Thus, the *developmental* model it is a model that access the enlargement and dynamic adaptation of categories, but its potential to radically change the modes of comprehension and the analytical tools are limited.

A middle term between these two modes of apprehension probably describes the most common experience of learning and processing new information. In it, new categories are created insofar as old ones can't afford proper understanding, encompassing the new and problematic information that doesn't fit the patterns already at hand.

The *poetic* model, however, seems to be more reflexive. In fact, it may explain the process of how new patterns are created: through the breakage of previous associations and hierarchies, allowing the development of multiplicity[323], followed by the re-crystallization of a rational structure. This model represents an operation where the possibility of association between data is multiplied, in an exponential growth of possibilities that starts to resemble imagination. It can be thought of as the capacity to *play* with information and categories, suspending patterns and, in opposition to Fanelli's claims, de-compressing information. As imagination, it creates the growth in *knowledge potential* by crossing and merging patterns, tensioning different rationalities – followed by its rematching with reality, its reduction and reposition inside the concrete: a 'grooming' back to the directionality of knowledge. In other words, the first moment of imagination is that of the lift in the limitations, a suspension of previously acquired patterns as way to reduce the rigidity of the phenomena of the world. It raises the complexity of possible relations, and allows the thinker to scope different associations, perhaps absurd in their initial impulse, but allowing multiplicity. Then comes the process of 'grooming', and it narrows down the chaotic associations into the plausible – the *possible*.

This process, perhaps not coincidentally, is possibly that of dreams. Current theories of the *functionality* of dreams propose that, during sleep, free from the dangerous reality of the physical world, the brain processes the information acquired when awake, not by fitting it neatly on where it is better accounted for, but purposefully trying to fit it on different patterns[324]. By creating different situations, it *scopes what could be possible*, without the constraints of what *is actually* possible. By launching outside the reasonable, dreams test the limits of the possible, and help in the preparations for survival in the real. Dreams, in this vision, are irrational by design – but, counterintuitively, represent a process of rationalization.

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323 Gilles Deleuze and Felix Guattari, *Mil Platôs. Capitalismo e Esquizofreni - Vol 3*, *Journal of Chemical Information and Modeling*, vol. 53, 2013, https://doi.org/10.1017/CBO9781107415324.004.

324 Olsen, M. R., Schredl, M., & Carlsson, I. (2020). Conscious use of dreams in waking life (nontherapy setting) for decision-making, problem-solving, attitude formation, and behavioral change. *Dreaming, 30*(3), 257–266. https://doi.org/10.1037/drm0000138

Therefore, the workings of the poetic model may describe the basis of the construction of knowledge, and perhaps even intelligence, but particularly how new information is related to old, and how it proceeds to form knowledge. Knowledge formation requires *abduction*, the ability to proliferate and, more than predict, *foresee* – the former being a closed ability to postulate the *now in advance of then* – a statistical operation that acts funnelling towards one future scenario. The latter being open, the ability of projecting sight *forward*, *from* now to then, as a flamenco dancer's fan, expanding the horizons of the possible. In other words, the imaginative side of knowledge acquisition is not simply a rationalization of information towards a probable answer, but also the expansion towards possible configurations, creating a *horizon of possibility*.

These models can be interpreted as modes of comprehension, ways of learning. Knowledge is the result – a particular way in which information is organized (through patterns and associations) that makes it possible to navigate the world by predicting or foreseeing situations. These models fit the concept of "dialectics", in its Hegelian interpretation – not meaning, necessarily, a negative connotation, but the interplay of two elements that, by their relationship, account for more than the sum of its parts. In other words, a process in which the link between the related terms, by itself, also transforms them in a progressive way[325]. It is indeed through Hegelian dialectics that Karl Marx constructs his theory of human development, that also addresses the notion of knowledge in a dialectical process between human and nature[326]. Moreover, it also seems to be compatible with the description of the process of learning by French philosopher Merleau-Ponty, arguing that organisms are not passive in the apprehension of reality, but the resulting behaviour of learning is a "form". Forms, in his interpretation, are "total processes whose properties are not the sum of those which the isolated parts would possess" that exist "wherever the properties of a system are modified by every change brought about in a single one of its parts and, on the contrary, are conserved when they all change while maintaining the same relationship among themselves" [327]. As Toadvine points out, for Merleau-Ponty, learning cannot be explained simply in terms of trial-and-error corrections to previously obtained patterns, but instead involves an individual engagement that relates to and deals perceptual pre-reflexive stimuli[328]. What it means is that, while

325 Arthur, *Dialectics of Labour: Marx and His Relation to Hegel*. Marco Egídio Schäfer, "Hegel e a Economia Política," n.d., 253–62.

326 István Meszáros, *A Teoria Da Alienação Em Marx* (São Paulo: Boitempo, 2006). Karl Marx and Frederick Engels, *Marx and Engels Collected Works. Volume 3, Karl Marx, March 1843-August 1844*., vol. 3, 2010.

327 Writing in 1942 in the text *La structure du comportement* (Paris: Presses Universitaires de France), quoted in Toadvine, "Merleau-Ponty, Maurice Stanford Encyclopedia of Philosophy."

328 Toadvine.

perception is referent to the objective world, the resulting process of learning cannot exclude the experience of the learner. It can be concluded from this that there is not only one way of knowing, but several, differing in their levels of structural impact at the moment of apprehension, or, in other words, from different ways of *learning*.

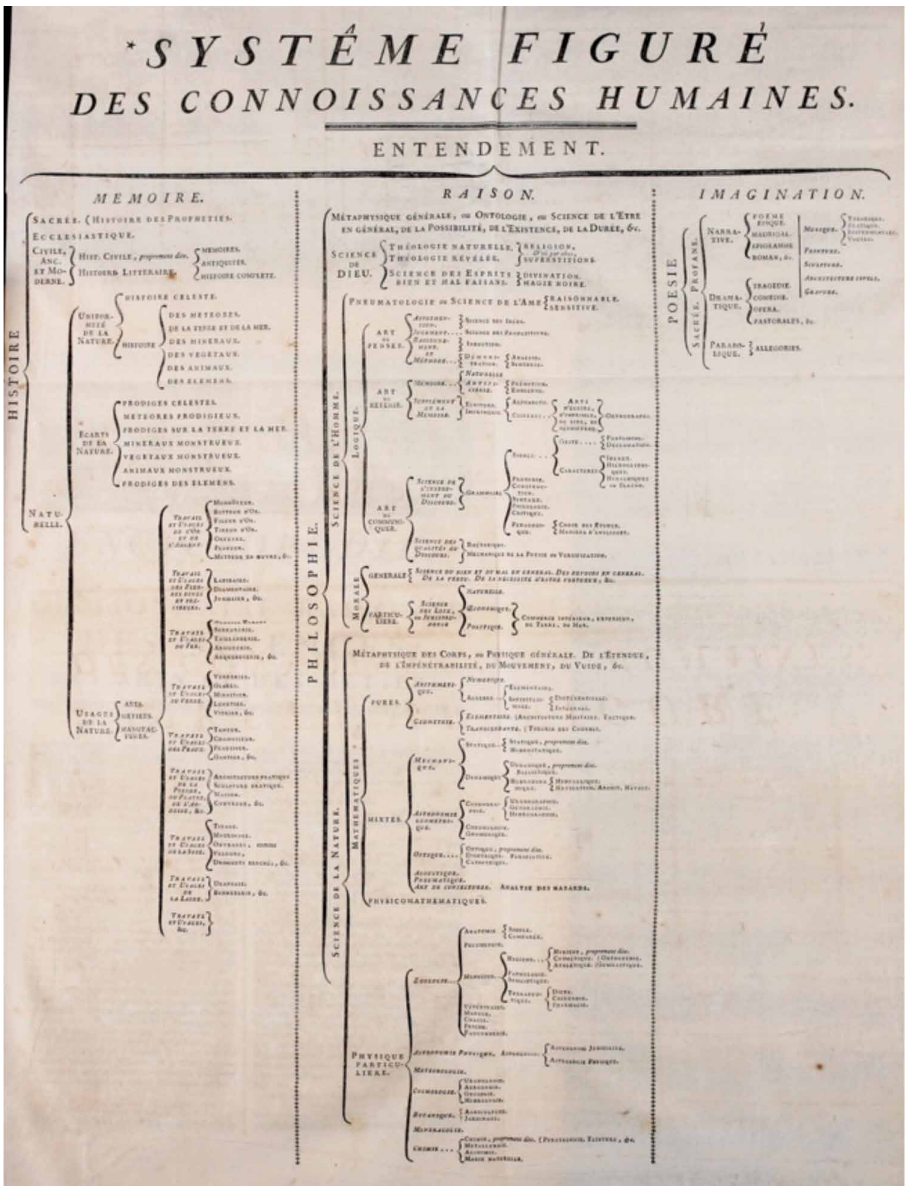

FIG. 3.1 The separation of knowledge, or 'understanding' ["entendement"] in Diderot's Encyclopaedia.

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3.4 Ranges of possibility

Taking into account the points analysed so far, the overall picture of appraising knowledge seems more promising, although still a challenge. Knowledge and learning are somewhat clarified in terms of their conditions and operation, but remain difficult to measure in their own. Therefore, another approach might be useful: popular in more practical scenarios, the measurement of knowledge by its outputs provides some insights. Try to appraise knowledge in businesses, Paul Eisenberg suggests using metrics such as the number of patents, process improvements, new models of products, services and the like[329]. His approach echoes a standard method in managerial environments – focusing on pragmatic outputs. It is a view that, although admittedly indirect, avoids the confusion between science, knowledge and information – commonly present in studies that try to provide general but direct approaches, such as Fanelli's. By accounting only the tangible outputs of productions that very specifically require knowledge and all that it encompasses, second order tributaries of difficult measurement, like information, can be subtracted from the assessment. This results in a more precise picture of how, for example, this information is being *used*, which in turn can give an outline of the knowledge involved.

The operation can be thought of as an *input-output* measurement. As such, the method is limited in differentiating the many aspects of production that may affect the outcome. The experience, productivity, collaboration, resources and the like compose a network that makes it hard for knowledge to be accessed as the object in these cases. In other words, the method seems somewhat limited in its usefulness for grasping knowledge in it qualities, form and potential. The contents of knowledge and how they work remain mysterious. As such, this method is seemly in contradiction to my process-oriented ways of knowing. However, it presents a concrete (or at least pragmatic) way of appraising knowledge with a clear advantage: Eisenberg's method looks at knowledge from its social position, rather than aiming for a generic, overarching concept that is then applied to social realities. By doing so, it is inherently less prone to scientific biases because it does not rely on preformulated notions of what knowledge is or is not, like Fanelli's does. Neither it evaluates forms of knowledge by their scientific adaptability or, in other words, how easily they fit into scientific principles of falsifiability, description and so on. Instead, this method evaluates knowledge by its influence on real, complex environments or, in other words in its applicability and usefulness of knowledge in relation to real life situations and its potential to affect them.

329 Paul Eisenberg, "The Balanced Scorecard and Beyond – Applying Theories of Performance Measurement, Employment and Rewards in Management Accounting Education," no. September (2016).

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Still, the focus on tangible products makes the method more prone to other biases, conversely. Products, patents and other forms of concrete outputs in situated productions are affected by other social and economic relations that define their value and usefulness, thus influencing their demands and the efforts that go into making them. For example, a company might decide to focus on the production of fewer new models that present higher potential for profit, interrupting other projects before their full development – what would then be counted as a smaller amount of knowledge. Since other aspects of production also affect the outcome, it becomes difficult to address knowledge outside very specific studies and try to provide an overview of its general potential. In other words, the method is not good to evaluate general forms of knowledge (be it tacit, practical, intuitive, etc) across different scenarios and develop consistent theories that explain them.

Nonetheless, taking the advantage of the managerial method, this type of approach provides a model for the appraisal of knowledge in the framework of my proposed theory of the epistemologies of making. My proposition is that, in the circumstances explored in this research, knowledge can be recognized, qualified and valued by what it makes possible. This operation requires understanding knowledge by the principle that characterizes the mind for Merleau-Ponty's, that is, as "a second-order or recursive structure" that is "oriented toward the virtual rather than simply toward the real."[330] In other words, my proposition is that it is possible to appraise (and understand) knowledge by the potential it can operate: knowledge's associated *range of possibility*.

In this interpretation, knowledge can be understood as the rationalized information that is required for something to made, even if it is not realized[331]. It is information combined and organized through the reflexive movement of imagination in response to the perceived environment. Knowledge, in this sense, can be understood as the foundation upon which ranges of possibility are built, even if they are not made concrete (or, in other words, if that knowledge is not used). In short, knowledge is something that allows other things to exist – it is rationalized information that makes something possible, and it is precisely by measuring what it makes possible that knowledge can, thus, be appraised.

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330 Toadvine, "Merleau-Ponty, Maurice Stanford Encyclopedia of Philosophy"; Merleau-Ponty, *Phenomenology of Perception.* p. 6

331 To make something possible means that the conditions of its existence, of its creation, invention or discovery are all accounted for, and that, should the effort be employed, nothing else would be required besides the process of actualizing it. In short, it means that the information required to formulate a concept, an object or other forms of endeavour is already possessed and processed and at hand. It does not, on the other hand, means that this particular thing exists already – only that its existence is non-dependent on prior discoveries, explanations, compressions or, in short, rationalization of more information.

This explanation of knowledge makes it remarkably similar to language, or skill, as discussed in the previous chapter. Similarly, in this analogy, a knowledge unit would be a representative term, like the word – a sign, to use a more academic term. A sign that, unlike the word, doesn't need to be materialized. Knowledge can exist without being objectified, which does not mean that it is entirely internal, or abstract. It is present in the way we understand the world: the shapes we identify as objects, the movements we make to perform an action, the association between phenomena and the sensations we feel; all these are informative of our world and constituent of its virtuality, *what it might be*, but seldom are they materialized into words or other forms of representation. When not externalized in objects, or *reified*, knowledge is *tacit*.

Although it may appear so, this is not a purely idealistic approach, because it proposes that knowledge is always a referent and always context dependent. Knowledge here is not a substance, but a relation of significance that proposes a realisable possibility, as an organization between perceptible signs that opens a path for further connection. In other words, knowledge is a relationship between things that constitutes meaning within a particular setting and allows for further relationships to develop. To use an example: words can carry information so long as they work with something possible to be identifiable, as long as they make the correspondence to something concrete, *as long as they have meaning*. This concrete can be an ideal fact, like a mathematical truth, or a physical, concrete object, like a chair.[332] Additionally, as Tim Ingold describes, in his *Perception of the Environment*, learning comprises the establishment and the development of the subject in relation to the object, in this case the knower and the known, respectively[333]. In this way, the process of learning something implies a re-construction, a *re-invention* of knowledge. The person who learns must deal with the material conditions of the objective world. As seen in the previous chapter, these include, for example, the direction of the fibres of wood or the tools available for the task; the social and cultural conditions of the environment, like the particular function an object has to have or the economic value of different tasks, products and services; and oneself, since the individual must incorporate the movements of body and mind that allow one to grasp the information and process it in meaningful ways. In other words, whether learning means understanding and training which muscles to engage in other to replicate a specific movement, or engraving the meanings of words or

332 Since knowledge is dependent on the concrete and the concrete is dependent on perception, it could be logical to claim that knowledge is based in perception. However, as previously discussed, there is an imaginative side to the organization of information and, as shown by Ingold, it cannot be completely explained by the perception alone, although it plays a large role in it. See Ingold.

333 Ingold, *The Perception of the Environment*.

logics of theories in memory – it is a process in which knowledge is made again inside an individual that, conversely, has to change to do so. Only then is knowledge established, as it is only when it is successfully reconstructed that it can be employed, founding the ranges of possibility that qualify it as such.

This proposition is in accordance to the aforementioned understanding of knowledge as related to a praxis or an application, present in Collins; in line with Bateson's information imperative of making a "difference"[334]; and in agreement also with Fanelli's possibility of associating the value of knowledge to its outcome, but without its reduction to a compression of information. Appraising knowledge by what it makes possible also corrects the shortcomings of the 'managerial' approach of Eisenberg, while maintaining some of its qualities. It rules out the managerial choices and conditions that channel analysis into a particular direction, giving a broader view of knowledge's potential without limitation to a particular environment. My approach maintains the social directionality, but described in broader terms, incorporating the possibilities of imagination[335]. This way, practicalities that limit knowledge's possibilities are removed from the evaluation – for example, the access to resources and amount of effort required for a particular production. In summary, it deals with the immediate consequence of knowledge and if it is justifiable, but also with its potential as a new realm of possibility.[336]

The focus on the relationship between knowledge and the potential it brings forth also helps one to avoid a problem of justification pointed by Oeberst *et al*[337].

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334 Bateson, *Steps to an Ecology of Mind : Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology*.

335 If asked not about what was produced with a new piece of knowledge, for example but what may be produced with a particular epistemic assemblage, scientists and professionals of the area can employ their knowledge and understanding of broader social environments to imagine possibilities, including situations outside the immediate constraints and motivations of their employers and institutions.

336 In this way, my approach may prove useful to address the possible uses for knowledge and how it might shape the development of society. By doing so, it may allow to better position a particular knowledge in relation to moral standards or political evaluation. Morally condemnable or not, the development of the Atomic Bomb on Project Manhattan, from development in the understanding of nuclear physics, in particular the equivalency of matter and energy, showcase how this question is at play in political scenarios. The potential of using nuclear physics in the development of weaponry was clearly recognized by both scientists and politicians alike, and the knowledge in question was valued accordingly. Project Manhattan costed approximately two billion dollars at the time (equivalent to twenty three billion dollars in 2019) and, although the sum cannot directly translate the value of the knowledge per se, it gives an overall image of its significance. See Alex Wellerstein, "The price of the Manhattan Project," Restricted Data: The Nuclear Secrecy Blog, May 17, 2013, accessed December 7, 2020

337 Oeberst, Kimmerle, and Cress, "What Is Knowledge? Who Creates It? Who Possesses It? The Need for Novel Answers to Old Questions."

The authors argue that knowledge is conceived as something that is localized on individuals, and justification must be met on these levels. The individualist nature of this concept of knowledge, especially in regards to its justification, creates problems:

> Some difficulties that arise from these conceptualizations with focus on the individual are of crucial importance when considering mass collaboration and education. First, advancement in knowledge is difficult to explain in terms of a conception that localizes knowledge solely within individuals (see Popper, 1968). Second, knowledge that results from collaborative work distributed among several people would be difficult to understand, as the requirement for individual justification might not be met for each person involved. This becomes most evident in the realm of science, where collaboration is widespread. When a research project is based on the expertise of very different contributors, the knowledge resulting from the project can hardly be attributed to only one person.[338]

By locating the justification of knowledge outside an individualist realm, in the context of its social application, knowledge doesn't need to be incorporated in one individual to be operative, thus existent. In my framework of knowledge appraisal, as long as it potentializes a particular phenomenon, knowledge can be considered to be real – although not necessarily explicit or especially valuable. Networks of agents, possessing different sets of information or partial knowledge can therefore be seen, when in cooperation, as the holders of a larger body of knowledge. If the organization of these agents allow for a new potential, be it a new concept, a new product or a new way of doing something, it can be considered, in fact, that it constitutes new knowledge.[339] Since every operation contains in itself information, every organization can be considered as an arrangement of information. What follows is that every productive arrangement, by itself, can be considered a form of knowledge, even if it is not explicit or localized entirely in any of its individuals. This collective form of knowing, as seen in the previous chapter with the case of the Incan cities, is fundamental in the constitution of a craft. Following this approach, knowledge can be recognized in practices that are not institutionalized under a profession or discipline, and are even carried forth without a direct relationship between its agents.

Such is that case, for example, of the influence of anthropic action in the formation of the Amazon Forest. Contrary to the myth of a virgin natural landscape, there are two lines of evidence that propose that the current state of the forest is highly influenced by human activity. The first relates to the unexpected homogeneity of

338 Oeberst, Kimmerle, and Cress.

339 This an important point for architectural production, as will be discussed in the following chapters. It also implies that reorganizing networks may be a powerful way of producing knowledge.

the Amazon's biodiversity[340]. The samples from surveys performed in vastly distant regions were found to resemble greatly, despite great differences in topography and elevation[341]. This homogeneity is unexpected, unmatched in other, similar biomes. Also, researchers discovered that a high number of the plants found across the Amazonian territory are from species useful to indigenous societies in the region. This discovery fostered a theory explaining that the Amazonian homogeneity stems from a practice of "cultural selection of useful species"[342] that generated "induced and localized ecologies, islands of resources in which the biological diversity is managed".[343] The second line of evidence refers to what became known as the *Terra Preta*, or "Black soils" – a fertile and nutrient-rich type of soil found across much of the rainforest's area, easily recognizable for its dark coloration. The high levels of organic carbon, nitrogen, phosphorus, calcium, besides a high presence of charcoal, ash, bone, fired clay and other human made artifacts in its composition suggest that the soil was altered by the deposition of waste by indigenous populations, over many generations, in small mounds surrounding their dwellings[344].

340 The forest spans an area of approximately 5.5 million km^2 (decreasing about 10.000 km^2 annually due to predatory farming and logging practices). Its borders, as expected, are not easily defined, but in a general overview, it ranges from the Andes mountain range in the continent's West to some 500 km east of the Amazon River mouth, in North-eastern Brazil, and from Central Bolivia, in the south, to Venezuela in the north. It houses an estimated number of 40.000 different species of plants - although studies disagree greatly, ranging from 12.000 to 80.000 - which represents around 11% of the world's total. See MMA. (2019) Bioma Amazônia. Ministério do Meio Ambiente. BFG (The Brazil Flora Group). (2021) Flora do Brasil. 1-28 pp. Jardim Botânico do Rio de Janeiro, Rio de Janeiro. Klaus Morales dos Santos, "Amazon Rainforest: Biodiversity and Biopiracy.," *Student BMJ.* (London : British Medical Association, 2003), https://doi.org/info:doi/. Maarten J.M. Christenhusz and James W. Byng, "The Number of Known Plants Species in the World and Its Annual Increase," *Phytotaxa* 261, no. 3 (2016): 201–17, https://doi.org/10.11646/phytotaxa.261.3.1.

341 Marcos Pereira Magalhães et al., "The Lower Holocene and Amazonian Anthropogenesis during the Long Indigenous History of the Eastern Amazon (Carajás, Pará, Brazil)," *Boletim Do Museu Paraense Emilio Goeldi:Ciencias Humanas* 14, no. 2 (2019): 291–325, https://doi.org/10.1590/1981.81222019000200004

342 Being many of the Amazonian indigenous societies semi-nomadic, they would carry seeds along their journeys, re-establishing the crops in new locations. Through their wanderings, these peoples scattered farms across the Amazonian landscape, eventually seeding many pockets of the region with the species associated with their culture and daily life. Magalhães et al.

343 From the original in Portuguese "gerando ecologias induzidas e localizadas, 'ilhas de recursos' cuja diversidade biológica é manejada e modelada em benefício das gerações presentes e futuras" in Patrick Pardini, "Natureza e Cultura Na Paisagem Amazônica: Uma Experiência Fotográfica Com Ressonâncias Na Cosmologia Ameríndia e Na Ecologia Histórica," *Boletim Do Museu Paraense Emílio Goeldi* 7, no. 2 (2012). p. 10

344 There are some opposing theories on the origins of the Black soils, presenting its possible formation without human participation, but the question is still open to debate and no conclusive evidence has yet surfaced. Still, the possibility of its anthropic genesis, together with the evidence from the biodiversity studies, (Morgan J Schmidt, "A Formacao Da Terra Preta: Análise de Sedimentos e Solos No Contexto Arqueológico," in *Amazônia Antropogênica*, ed. Marcos Pereira Magalhães (Belém: Museu Paraense Emilio Goeldi, 2016).

Together, these evidences construe an image of an environment whose formation is a history of iterative processes, slowly coalescing into "a historically built and dominated by human activity landscape".[345] In this scenario, it is not be too far-fetched to claim that the indigenous peoples and their practices are constituent of a non-localized body of knowledge whose outcome is the production of the Amazon rainforest as it is appears today: a semi-stable product of a multitude of affordances, agencies and practices "modelled for the benefit of present and future generations"[346].

The *justification*, in such case, refers to the social use of knowledge and its political implications, by assessment of its effected and possible employment and, more importantly, the concrete conditions of its usage. This implies science as a method of evaluation – not as a measure of the validity of knowledge, but of its generality, its scope and reproducibility under variating circumstances. To use an example, it could involve accepting this indigenous form of production as knowledge, although not necessarily as science – and that, in effect, it shouldn't refrain from the scientific exploration of such sociotechnical forms of living, rather the opposite. Recognizing them as knowledge of some sorts would imply, nonetheless, considering whether they allow for outputs that are significantly in phase with concrete reality, and thus the focus would drive into its limits and applications, just as well as its explanations; exploring what different ways of living make possible *and* what makes them possible – as in, for example, its potential theoretical enrichments (just as used in many instances of this research). In other words, justification, in this proposition, is not so different than what is accepted *as justification* in other epistemological studies. But it has an easier opening to less direct and straight-forward examinations – it is less specialized. By incorporating in the examination the expanded fields of possibility of a given knowledge, one avoids dealing it in terms of mere efficiency or intentionality.

This can be better noticed, perhaps, using another example, present in Collins[347]: the baker and the bread making machine. Collins argues that the knowledge in the bread baking machine is equivalent to that of the baker, because it bears the same result. Namely, bread. Moreover, the bread making machine has a higher success rate than the baker, and so could be argued that it employs knowledge in a better way. His argument, however, is not on the validity of knowledge of one or the other but that, in fact, the knowledge of the baker is encapsulated in the machine and, thus, that

345 Schmidt. p. 176

346 Pardini, "Natureza e Cultura Na Paisagem Amazônica: Uma Experiência Fotográfica Com Ressonâncias Na Cosmologia Ameríndia e Na Ecologia Histórica." p. 10

347 Collins, *Tacit & Explicit Knowledge*.

baker and bread machine have the same knowledge. The statement is true, but only to a certain extent. What Collins fails to account is that the knowledge of the baker that allows him to make the same bread as the machine is, in the reality of their environment, much broader than his mechanical competitor.

In theory, there could be machines that encompass all the possible breads that the baker can make, but still they would fail to compare to him because their knowledge is static. Each and every machine would be limited to its own production, to what figures in its technical *repertoire,* and so, the knowledge they possess as a collective will be always limited to that potential, equals to the sum of their individual products – their range of possibility. The baker, other the other hand, without the necessity of new information, can cross-reference his knowledge, fold it own its own, and get a different result – for example, experimenting with *croissant* dough in the shape of a *baguette*. This is what Merleau-Ponty describes as a process of *coherent deformation*, a tentative disruption of available significations, distorted to reveal new potential[348]. The operation requires imagination, and an argument could be made that this exemplifies the need to the consider the *poetic* mode of apprehension as a parcel of knowing. It is possible see that the knowledge possessed by the baker, precisely because of its breath and adjacencies, allows him to develop new knowledge, and thus the range of his possibility is greater than that of the combined machines.

Another important contribution of this way of appraising knowledge is that, by focusing on what knowledge makes possible, it does not fixate the idea of *truth*. Truth is important, in this notion, only in relation to the proposed potential of knowledge; on how well, in reality, does knowledge affords possibilities. But this is not an aspect of knowledge that has to be defined at first hand. Consequentially, the approach does not impose on knowledge that it has to be *scientific* – that is, that knowledge has to be based in some truth determined by scientific standards. As far as science is concerned, it appears as a method, rather than a premise. To use Feyerabend words, this mode of appraisal does not propose "only one correct point of view".[349]

A good example can be found in anthropological studies on indigenous practices, following Berger and Luckmann's claims that the production of technology and myth are two aspects of social life acting on the maintenance of a symbolic universe, or *reality*, constantly reproduced through its own performance[350]. In resonance with

348 Merleau-Ponty, *Phenomenology of Perception.*

349 Paul Feyerabend, "Outline of a Pluralistic Theory of Knowledge and Action," 1999. p. 275

350 Berger and Luckmann, *A Construção Social Da Realidade: Tratado de Sociologia Do Conhecimento.*

such notion, Izaque João's ethnography of the indigenous people in Central Brazil known as *Kaiowá* challenges clear distinctions between technology and cosmology, economy and symbolism, in the establishment of an epistemic horizon[351].

Being the first plant ever cultivated by *Jakaira,* one of the *Kaiowá* deities, the *saboró* (white corn) is considered sacred, and it embodies the meaning of their entire agricultural production, bridging together cosmological and practical domains. Accordingly, the farming of the *saboró* requires a ritual, the *Jerosy Puku*[352]. Collectively, the *Kaiowá* communicate with the spirits by singing a long succession of verses, each referring to a particular stage in the culture of the *saboró*. This performance ensures that the *saboró* and other crops yield satisfactory harvests, but also contributes to the good faring of other aspects of daily and spiritual life.

There is a particular importance of a *savoir-faire* in the *jerosy puku* that comes to the fore in João's words. The ritual has specific rules of performance, based on the *Kaiowá* mythos, but also reflecting a constantly reaffirmed way of living. It requires, for example, the preparation of a particular beverage, called *xíxa*[353]. Whenever ingested by *Kaiowá* shamans, the *xíxa* strengthens their sung words, consequently empowering the song as a whole. Extracted from the *saboró* corn, the fermentation of this beverage implies previous successful harvests and the maintenance of a cyclical phenomenon. Via the ritual, a particular knowledge regarding the corn – how and when it should be planted, cared for, and harvested – coalesce into the way of living of the *Kaiowá* and have direct implications in their habits and farming practices, but also in a cosmological dimension. By performing the *jerosy puku* in tandem with the *saboró*'s life cycle, the *Kaiowá* re-actualize their relationship with the plant, reaffirming the entanglement between their beliefs, the environment they live in, and their technology. In this way, the ritual, the cultivation and their amalgam configure an epistemological system, constantly recreating itself and the conditions of its existence. The ritual *affords* the harvest; the harvest *allows* the preparation of the beverage; the beverage *empowers* the ritual.

The question of interest here, therefore, is not about knowledge's legitimate condition (or not) as truth, but about its *practical virtuality*, about how it relates to concrete efforts and practices and informs them. Whether one 'knows better' is another question: a question about what *better* means. Here the situation of knowledge must again be taken in consideration, along with its political implications.

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351 Izaque João, "Jerosy Puku," *Piseagrama*, 2013.

352 Izaque João, "Jakaira Reko Nheypiru Marangaty Mborahei: Origem e Fundamentos Do Canto Ritual Jerosy Puku Entre Os Kaiowá de Panambi, Panambizinho e Sucuri'y, Mato Grosso Do Sul" (Universidade Federal da Grande Dourados, 2011).

353 João.

Even if one agrees that the modern, scientific form of knowledge, in specific cases, may be 'better' than 'others', it is so only within a particular social environment, and that does not necessarily hold true for others[354]. In the case of the *Kaiowa*, the ritualistic practices, together with their contextual knowledge, maintains a way of living. The *Jerosy Puku,* considering its position inside their cultural inheritance and its compatibility with it, is indeed knowledge[355]. Thus, by gauging knowledge by what it makes possible, my approach of knowledge appraisal opens the possibility to addressing intercultural disparities without a preconceived notion of what is essentially true, focusing instead on what is favourable in any particular context.

3.5 Skill and tacit knowledge

The model of knowledge appraisal based on the ranges of possibilities, together with its analytical corollaries, is particularly significant for this research – namely, to investigate the relationship between skill and tacit knowledge and in architectural production. While understanding its full implications requires further investigation beyond the scope of this thesis, it is possible to sketch some primary possibilities. As a first consequence, this model allows the analysis of how the different appearances of the concept of tacit knowledge in the relevant scholarship can be interpreted through my conceptualization of skill. In other words, to characterize how craft ways of knowing relate to the way tacit knowledge is conceptualized by other authors.

354 Feenberg, "Ten Paradoxes of Technology."

355 Compatibility that, one should notice, is not as restrictive as Feyerabend suggests in his rather outdated statements about "closed societies", in which the "myth" supposedly controls every aspect of life and leaves "not a single avenue left open to those who might want to think along different lines". His is a poor reflection of the reality of many indigenous societies in which, contrary to his claims, mythical "doctrine" has in fact a much looser grip on individual's ways of thinking. Many mythological accounts are fragmentary, unconclusive and do not strive for an overarching (or even unique) explanation of reality, but focus on certain aspects of existence and everyday life,. Was this unique and unescapable way of thinking the case, one could expect no internal conflict or disputes to arise other than conscious rebellions against the prevailing epistemology – which, of course, is as nonsensical as untrue. If anything, the affinity of thought in "closed societies" seems much more relative to the relative small size of communities and the constant contact and collaboration between its members, enjoying a low division of labour and closer kinship relations. In any case, it is far from an environment in which "the restriction of the individual is complete". See Pierre Clastres, *A Sociedade Contra o Estado* (São Paulo: Cosac Naify, 2013), https://doi.org/10.20396/remate.v11i1.8635958.

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In this sense, the thought of Michael Polanyi, considered as an initiator to the topic of Tacit Knowledge is, evidently, worth analysing. The same should apply for the works of both his main reference in the development of the concept, Gilbert Ryle, and of the possibly most prominent scholar that continued to develop upon his ideas, Harry Collins.

In a first correspondence, in his disturbing examples involving electric shocks, Polanyi refers to the two *terms* of tacit knowing, namely the syllables associated with the electric shocks, and the electric shocks themselves. He claims that tacit knowing is formed when "the subject has learned the connection between the two", which seems like an evident statement in regards to knowledge – in the ranges of possibilities model, it would mean the perception of a teleological virtuality, in which the subject predicts an outcome. The question, however, is why it remains tacit, which, for Polanyi, is due to a specific awareness that, focalized in the second term, loses sight of the first. It is, admittedly, a confusing argument, but one that Polanyi uses to claim that there is a directionality of knowledge, present in the very processes of learning, that requires a personal engagement for its application.

To understand his suggestion, first it is necessary to see that Polanyi is speaking from the perspective of realism, as "[t]hought can live only on grounds which we adopt in the service of a reality to which we submit."[356] Perhaps due to his background as chemist, Polanyi's philosophy is ingrained in empiricism, and his ideas on thought and knowledge are accordingly grounded on the acceptance of this framework – "rooted in the universe", as he vocalizes[357]. Thus, the *becoming aware* central to Polanyi's ideas is form attunement that, even at unconscious levels, affords tacit knowing, by establishing connections between entities, or "objects", in the real world. In his words, "tacit knowing is the way which we are aware of neural processes in terms of perceived objects"[358]. In light of my previous arguments, this is clearly a parallel with the establishment of skill, even if perception, for Polanyi, forms "the bridge between the higher creative powers and the bodily processes", which is a misconception, according to my interpretation[359]. Perception does not only form the bridge or connect these instances, but represents the very basis on which they can acquire meaning. Especially in relation to the "higher creative powers", perception is what allows its development, as a the medium and territory of skill. Assuming this position, his arguments on the focal and subsidiary awareness can be interpreted from a new light:

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356 Polanyi, *The Tacit Dimension*, 2009. p. 9

357 Polanyi. p. *XIV*

358 Polanyi. p. 4

359 Polanyi. p. 7

[the structure of tacit knowledge] shows that all thought contains components of which we are subsidiarily aware in the focal content of our thinking, and that all thought dwells in its subsidiaries, as if they were parts of our body. Hence, thinking is not only necessarily intentional, as Brentano has taught: it is also necessarily fraught with the roots that it embodies. It has a from-to structure"[360]

What Polanyi names as subsidiary awareness can be interpreted, alternatively, in a similar fashion of Ingold's dealing with saw strokes or steps on a walk[361]. The proximal entities are the steps, for they can be seen as a parcel of an operation that reiteratively points towards a broader unity that gives it is meaning, according to Polanyi. This leads him to postulate that it is precisely this direction that makes the awareness of the single step be bypassed by consciousness, becoming subsidiary thought – while the focal thought is pointed to where the person is going, the distal element. Polanyi relates this "from-to" character of knowing to skill, arguing that "in the performance of a skill, we are aware of its several muscles moves in terms to which our attention is directed"[362].

In face of these points, my argument is that what Polanyi recognizes is the process-oriented character of craftsmanship. It is the meaning-finding process that is directly connected to a possibility of action that characterizes skilled practice, seen in the networks of agency inside a process of material engagement. In other words, Polanyi is looking at the performance of craftsmanship and more specifically, the body's movements inside it. He is looking at the body operating contiguously to the other agencies within the enactment of skill; trying to grasp how they acquire meaning in this organism-environment continuum. Thus, Polanyi recognizes that "subsidiaries are used as we use our body" and "all novel thought is seen to be an existential commitment".[363] In other words, Polanyi perceives that thought is always related to an engagement with the objective world, always situated in the coarse surface of experience. Thus, it is possible to perceive that Polanyi's thoughts are highly in tune with my propositions and that, although some aspects of both theories diverge, the overall functioning and definition of tacit knowing from Polanyi's insights can be described in terms of skill.

360 Polanyi. p. *XVIII*

361 Ingold, *Making Anthropology, Archaeology, Art and Architecture.*

362 Polanyi, *The Tacit Dimension*, 2009. p. 11

363 Polanyi. p. *XIX*

In relation to this scholarly history of the concept of tacit knowledge, the framework of skill presented here resonates best with the works of Gilbert Ryle, whose postulations do not revolve around explicit and tacit forms of knowledge, but about knowing *how* and knowing *that*[364]. Ryle's work is a critique on the idea that there is an external intellectual background to knowing, a "ghost in the machine" that exercises knowledge through the application of rules and theory prior to practice.[365] Knowing *how*, therefore, is not merely an expression of knowing *that*, as a command from mind to body, but an instance of understanding. Knowing how is a form of intelligence, a "disposition" to think and learn and be "on guard" to possible problems *in action*[366]. The parallel to skill, as presented here, is evident, and although Ryle does not relate it directly to perception, he expands the concept of mind in terms that resonate greatly with it. He states that a skilled practitioner, such as a chess-player, and a skilled observer share a same "path", as they both can identify and "be on the alert to detect"[367] the same mistakes, opportunities and so on. These operations are not located solely on the mind understood as a purely theoretical place, "for the mind is not even a metaphorical 'place'. On the contrary, the chessboard, the platform, the scholar's desk, the judge's bench, the lorry-driver's seat, the studio and the football field are among its places"[368]. The mind, for Ryle, is not set in opposition with the body, the tools and the world, but floods into and emerges from them, in a very similar fashion as professed later by other scholars: "The mind itself, if such a vision is correct, is best understood as the activity of an essentially situated brain: a brain at home in its proper bodily, cultural and environmental niche."[369] Knowing, in Ryle's conception, is linked to practice much in the same ways that skill is connected to craftsmanship, in mine.

In regards to Harry Collins, a parallel reading between our theories is not so simple, and requires a more careful approach. Harry Collins famously divided tacit knowledge in three main categories, "relational", "somatic" and "collective"[370]. Least 'tacit' in Collin's taxonomy, relational tacit knowledge refers to information held by knowers that, by habit or intention, is not made explicit simply by not being formulated or undisclosed. Its status as tacit, therefore, is not fundamentally related

364 Ryle, *The Concept of Mind*.

365 Ryle. p. 27

366 Ryle. p. 47

367 Ryle. p. 55

368 Ryle. p. 51

369 Andy Clark, "Where Brain, Body and World Collide" in Carl Knappet and Lambros Malafouris, *Material Agency: Towards a Non-Anthropocentric Approach*, ed. Carl Knappet and Lambros Malafouris, vol. 53 (New York: Springer, 2019). p. 1

370 Collins, *Tacit & Explicit Knowledge*.

to any attribute of the knowledge itself, but rather by the circumstances it is found in. It may take form as small details that seem unimportant or too troublesome to explicate in a particular process, or as a 'trade secret' consciously kept unspoken. Whichever the case, under the framework of skill, relational knowledge can be understood as facets of knowledge whose perceptive affordance – i.e., how easily they can be perceived – is weak, from an external or internal position, but whose information is located in the objective world. An external position would account for knowledge that is regarded as obvious, but, in fact, requires some prior level of skill or engagement with practice to come to awareness – a part of the complex constellation of variables that shows itself in practice, and are apprehended easily once one is immersed in it. Even if this form of knowledge is technically accessible from outside of practice, from theoretical means for example, its importance is most visible from within. Trade secrets, on the other hand, are subtle even in practice, and imply an unorthodox path within the horizons of possibility established by experience, being therefore direct tributaries of skill. In either case, the communication void is a result of the complex perceptive nature of skill and its grounding on practice, with its unstraightforward relation to linguistic explanation, even if, in the case of relational tacit knowledge, the information it contains is passible of codification.

Somatic tacit knowledge stands more generally for embodied knowledge, such as in the case of bicycle riding, and therefore its relationship with skill is not very problematic. In the conception of skill presented here, the body can be understood as a multiple, superimposed entity. The body is both a perceptive and active tool; it can extend into other tools or be integrated within larger technical assemblages. It is the point of encounter between material context and the situated position of the maker, as well as between objective and epistemic dimensions. In short, the body is fully immersed in, contributes to its formation, and expresses skilled practice. Thus, Collin's 'somatic knowledge', in the framework of skill, would refer to the body's capacity to attune with outside information. However, contrary to Collin's claim, my view is that this knowledge is not fully passible of explication. As exposed before, the knowledge of the body is of perceptive nature, and must be constructed, *re-invented* at the personal, situated level. It is not simply a question of the complexity of its formulation, but of the incontrovertible gap between individual experiences of our physical, embodied existences. The problem is that Collins's reasoning is too direct, mechanical, coming from information theories, using 'bits' and 'strings' of information that are, inevitably, linear in concept and result in the reification of relationships. His reasoning, as stated by himself, is that of "Social Cartesianism" and, as such, it is bound to repeat a fixation on the "interaction between physical objects, sometimes referred to as strings and sometimes as

entities."[371] Contradictorily, this leads Collins to disregard a fundamental character of tacit knowledge, specifically that which gets out of phase in the attempts to make knowledge explicit: "in spite of the fact that translation can rarely be done without loss or transformation, this is not what is emphasized here"[372]. Instead, his reflexion "emphasizes that which is not lost in translation" [373] – a grave mistake. The loss of translation tells precisely something about the tacit character of knowledge. Additionally, since it is in practice that the encounter of distinct facets of knowing come together in a meaningful expression, what is lost in translation is precisely the arena of craftsmanship, where skill is developed,. This is what leads Collins's failure to properly address, in the bicycle example, that what is at play is not only the movements required to steer the bicycle or keep it from falling. It is that these actions, the feel for the bicycle and its particular way of moving through space are developed within a perceptive-bodily development. The formation of the bicycle rider is a person's self-invention in the encounter of wheels, eyes, roads, muscles, chains, wind and so on. As such, this knowledge is personal, and can never be transferred.

The last, and in Collin's view, the most tacit kind of knowledge is collective knowledge, being the only completely inexplicable. In his writings, it takes shape as a form of culturally dependent kind of knowledge, representing the ability to navigate and negotiate "social convention" and "personal interaction"[374]. The collective knowledge of negotiating traffic in bicycle riding, for example, "involves knowing how to make eye contact with drivers at busy junctions in just the way necessary to assure a safe passage"[375]. Thus, it would seem that such knowledge is not explainable under my concept of skill. However, the social world has a material expression – its primary actors are embodied beings, whether we assume the standpoint of analytical or accept non-anthropocentric philosophies. Collective tacit knowledge has a layer of linguistic, representative, communicative relationships that in themselves can appear abstract, but there is no reason to perceive these relationships as something disconnected to the objective world. On the contrary, as in his bicycle example, the application of this communicative layer is eminently objective, allowing the cyclist to negotiate traffic. Similarly to the other cases, Collins's 'collective knowledge', can thus still be framed as a process of, in a particular situation, perceiving meaning in relation to action. Moreover, my perspective, with the focus on skill, avoids creating a duality between body and

371 Collins. p. 15

372 Collins. p. 10

373 Collins. p. 10

374 Collins. p. 121

375 Collins. p. 121

society. In this direction, it is possible to understand that social skills represent the form of attunement with social norms, conventions and habits, understanding that society is bodily, and that the body, conversely, is a social habit[376]. In other words, against Collins:

> [The] nature of the body does, to a good extent, provide the conceptual structure of our lives, but that conceptual structure is located at the collective level, not the individual. One of the main projects of this book is to demote the body and promote society in the understanding of the nature of knowledge.[377]

Collins's arguments in relation to the body ultimately fails because he refuses to think beyond a linear hierarchy in the 'conceptual structure' of individuals and society. His argument may look similar to my proposed anchor in the real, but that is not so. The "real" I refer about is not a stable thing and does not imply an objectivity *a priori*. Instead, this 'real' is constituted by experience, and the dynamism of processual encounters. Instead of operating in a duality between individual and social, skills are wedged across them, creating adjacencies and discursive cohesion. Thus, instead of thinking of 'string of information' shared amongst a collective via some obscure process of knowledge transfer, collective skill can be thought of as an *approximate response*, a similarity in the particular interpretation by individuals to the social "rules of action" that Collins talks about[378]. This means that the contents of tacit knowledge are both individually and socially situated: what one knows is similar, but not exactly what the other knows. Nevertheless, since they refer to the same practice, discipline or circumstance – as in traffic example – there is a common ground constantly negotiated between the members of such collective. This iterative negotiation actualizes the similarity between individual approaches, and cohesion emerges. This is why there is always a certain 'blurriness' in the collective tacit knowledge, as can be seen in Collins's remark:

> Attempts to render meaning clear, on the other hand, involve repeating the message using many varied strings in an attempt to make interpretations cohere; sending the same string over and over again will add nothing to meaning transfer, however useful it was in the case of information transfer[379]

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376 Viveiros de Castro, "Cannibal Metaphysics: For a Post-Structural Anthropology."

377 Collins, *Tacit & Explicit Knowledge*. p. 8

378 Collins. p. 2

379 Collins. p. 26

This blurred aspect is a reflex of the degrees of freedom and agency of the individuals that is essential to invention and the development of knowledge, but does not disqualify the collective side of this form of knowledge. Rather, this peculiar character indicates that collective knowledge operates as 'tendencies'. The implication is that, to properly analyse a particular epistemic subject as a collective knowledge, one should study it much more from the perspective of this tendential character than by trying to grasp an 'essence' or 'truth'. In fact, from the perspective of my method of knowledge appraisal, the way these tendencies 'resonate' with different realities mark the validity of theory. For this tendential character, the blurriness of collective knowledge, is a reflection of the differences inherent to society, a measure of social convergence and conflict. Thus, just like an electron cannot be pinpointed without the loss of information regarding is momentum, neither can this form knowledge be fully explained without losing its situatedness. Ultimately, this is the reason Collins regards collective knowledge as the only fully tacit of his three kinds of tacit knowledge. Somewhat frustratingly, however, he steers away from accepting this complexity – here, the label of tacit is an avoidance, explaining away the plurality of collective knowledge.

Ultimately, it is possible to frame Polanyi, Ryle and Collins's works under my conceptual developments and the effort is useful as a form of bridging distinct scholarships and theoretical standpoints, besides clearly locating my contribution in relation to the main authors of the topic. But this endeavour does not fully make justice to the possibilities of understanding (tacit) knowledge via the framework of skill. Fortunately, the model of knowledge appraisal previously developed allows a further development in the understanding of skill in relation to epistemology more generally.

In opposition to the interpretation of classical epistemology, the application of knowledge, in my framework, is not a subsidiary, but a fundamental instance of knowing, related to the very possibilities of an epistemic horizon. In a broader sense, it could be argued that skill is related to the productive power associated to ranges of possibilities that describe knowledge, not simply a capacity affording its employment. However, while it would still be possible to simply interpret skill as the application of knowledge, it might prove more useful to start the analysis considering skill as a phenomenon of equal footing as knowledge, stemming from the relationships exposed in the previous chapter. There are some parallels between knowledge and skill that allow this interpretation. Firstly, skill and knowledge share a similar directionality, referring respectively to their performance or observability in the concrete reality. Moreover, the link with and the necessity of imagination is present in both notions. Referring back the discussion of technology as the rationality of the arts of making, this interpretation once again resonates with

Nørgaard's thoughts. According to her, the link between knowledge and technology is clearly associated to a virtuality and, furthermore, conditional to its establishment, as technologies are "born from the knowledge of what is possible" and are thus "man-made processes that offer a way for further development"[380]. One could argue that such is the case for a process-oriented regime of knowledge. Accordingly, as Trevor Marchand defends:

> Perceiving, doing and feeling are part and parcel of the same cognitive matrix for problem solving that also includes producing inner or interactive dialogue and narrative around findings, procedures, experimentation, and results; numerical forms of interpreting, predicting, and calculating; and imagining[381]

Notably, this passage contains not only perception and action operating in the same instance as experimentation and calculation, but also imagination, which seems to be the tonic as in, for example, also alchemical explorations. Pamela Smith's description of alchemical epistemology shows that alchemist operate primarily in an imaginative register, "working on what might be rather than exploiting what already exists", as reminded by Adamson[382]. An alchemical way of thinking, therefore, is focused on the exploration of virtuality and, as shown previously, the directionality of process-oriented ways of knowing is related to projected intentions, to outcomes. In that sense, they can be understood as *teleonomic*. Thus, a process-oriented way of knowing is bound to operate in terms of possibility and virtuality, and represents a *poetic* regime of knowledge. Here, it is worth reminding that craft, which operates in the basis of skilled practice, get its name from *Craeft*[383], or, as Adamson points out, "from the German word *Kraft*, meaning power or potency, and its archaic bond with sorcery is preserved in terms such as 'witchcraft'."[384] The capacity of imagination and its proliferation are indeed paramount for the development of both skill and knowledge. This quality, and its association with a form of understanding, is captured clearly by Roy Wagner:

> Thus, our understanding needs the external, the objective, whether this be technique itself, as in "non-objective" art, or palpable research subjects. *By forcing his imagination, through analogy, to follow the detailed conformations of some external and unpredictable subject, the scientist's or artist's invention gains a*

380 Nørgaard, *Bronze Age Metalwork: Techniques and Traditions in the Nordic Bronze Age 1500–1100 BC*. p. 3

381 Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making*. p. 12

382 Adamson, *The Invention of Craft*. p. 105

383 Langlands, *Craeft: How Traditional Crafts Are about More than Just Making*.

384 Adamson, *The Invention of Craft*. p. 99

sureness it would not otherwise command. Invention is "controlled" by the image of reality and the creator's lack of awareness that he is creating. His imagination, and often his whole management of himself, is compelled to come to grips with a new situation; it is frustrated, as in culture shock, in its initial intention, and so brought to invent a solution.[385]

Notably, the "sureness" Wagner refers to is akin to a form of justification, and it refers back to the necessity of a subsequent process of reality-check, or grooming, also part of the aforementioned poetic model. Particularly, it describes a similarity in the practice of scientists and artists alike – not as knowledge, but as *invention*. Wagner's ulterior goal is to argue that this sort of process allows the fieldworker to invent culture, in the sense of understanding it and producing knowledge. Nonetheless, following the arguments of Ingold, it is possible to translate the matter to making, in a form of dynamic relationship in which invention is the source of knowledge.

Pursuing this thread, one could go as far as Ingold and, claiming that knowledge is *not* information, since "every human is a centre of perception and agency in a field of practice", argue that knowledge in reality consists primarily in collections of skills[386]. Nonetheless, simply equating knowledge and skill may not be the best course of action. Skills cannot be reduced to a question of pure information, for they imply a change in *perception*. It is this change, this shift, that affords for an association of material qualities to meaning. The information rationalized as such is located in the boundaries between the concrete and abstract dimensions and, more importantly, establish a connection between material qualities and a productive range of possibilities. It encompasses and organizes, as noted before, the information of a given state, of the operations that can transform it and its possible new states. Thus, *as* the establishment of a perceptual shift through material engagement, skill is a *form of rationalizing information that produces knowledge*.

More specifically, skill is an operation that constitutes knowledge of a specific kind. Skill is a sensate form of understanding and, as such, so is the knowledge it produces. It produces the knowledge of material qualities and of how materials and tools present themselves in forms of perception coupled with possibilities of action, thus it encompasses also a form of material virtuality: what materials might be, how they can be transformed and what sort of processes are encompassed in such operation – as well as the limitations, difficulties and the inertial stubbornness

385 Wagner, *The Invention of Culture*. p. 18. My highlights.

386 Ingold, *Making Anthropology, Archaeology, Art and Architecture*.

of things that are involved in this process. Being learned within and through the act of making, the knowledge produced by skill is the knowledge regarding the agencies that might manifest in production, their encounters and their forms of relationship. Importantly, the knowledge of skill is obtained and actualized in craftsmanship, and so it can never be stored externally, only performed over and over again, enhancing the tendencies for its reinvention, in a similar manner that walking repeatedly maintains a pathway. Just as what is seen in a well-crafted object is not craftsmanship, but its traces, marks, testimonies of its performance, so it happens with skill knowledge. The supposed knowledge embedded into artifacts is but a sign, teeming with information readily available for another person to pick up and reconstrue the path to the maker's employed knowledge – but the way in which this information is apprehended and knowledge is invented happens in terms of one's own perspective. That is, this knowledge is not transferred between agents, but reinvented according to one's particular skillset and how adjacent it is to the skillset of the original maker, and, importantly, by one's capacity to extrapolate. The poetic character of knowledge allows for this gap between the invariably different experiences and skills of people to be overcome, even if not fully or in the exact same terms.

The knowledge produced by skilled practice is, thus, a form of tacit knowledge. Because it has to be re-invented individually, it cannot be fully transmitted. It needs to be adapted to the knower's body, to the workings of the subject and the object established in the performance of craftsmanship; it depends on the very singular existence of the one who employs it and, therefore, is never completely the same for different makers and cannot be properly transmitted. Transmission, in this case, is an attunement between inherently different ways of seeing the world that cannot ever be fully reconciled. Particularly, because they are sensual. One cannot ever know really if one experiences colours, for example, the same way others do. Therefore, communication has to work on basis agreeable signs, on decided equivalences that come from a shared environment – ideas brought from the outside, by association – and that correspond the inner experience to those signs. In other words, since skill knowledge necessarily stems from an inner motion, as the sum of perception and the thing, the signifier becomes problematic – it cannot properly function as signifier and object at the same time, because the very act of making it the object of examination undermines its existence as an agreeable signifier. For example, when communicating how wood reacts when worked upon, the body and tactile ability is involved – they are the gauges through which craftspeople experience the resistance of the wood – but they have no clear signifiers because their experience is immediate. Thus, craftspeople refer to other activities, to metaphor, in search of other signifiers, or show, so that the interlocutors can make an analogy, and try to replicate it - so that they can *feel* (or experience) it by themselves.

While material properties can be expressed in transferable formulas, equations or descriptions, material qualities are felt, they are sensorial. The translation between the two will invariably remove part of sensorial quality, and that explains the frequent use of metaphors in craft apprenticeship. As metalworkers most probably know, listening to the sounds of welding provides trained ears a lot of information about the quality of the weld. This ability of understanding the sound of a weld is shared amongst metalworkers, but in welding classes, internet forums and video tutorials, these sounds are often compared to ordinary acoustic experiences – being frying bacon and ripping paper particularly common[387]. This is a way to counteract the loss in perceptive potential, by relating the action of welding with other phenomena with similar sonic output. While 'tacit' in Michael Polanyi's interpretation, this knowledge is discussed and flows within the community of practice through these metaphoric means, serving as a device of communication between practitioners. As Frampton puts it, a metaphor, "rather than being solely a linguistic or rhetorical trope, constitutes a human process by which we understand and structure one domain of experience in terms of another of a different kind."[388] This displacement, however, is not complete and cannot fully transmit, to the linguistic version, the entirety of its original potential. Ultimately, the sound of the weld points to the existence of knowledge that is not linguistic in nature, but refers to the practice itself. Communication in crafts is performed by approximation, not exact association.

> The full explication of any skilled trade makes it clear just how much there is to be comprehended, […] in the very act of revealing craft knowledge, these texts [how-to manuals] made it seem like a vast terrain that could be traversed only with great difficulty. The tacit nature of craft results in one of the curious inversions that marks its invention: it was precisely the wide publication of technical secrets that yielded the insight that artisanal skill is fundamentally incommensurable with discourse. Like a conjurer's trick, even when seen up close, craft process doesn't reveal itself entirely, nor can it be easily repeated. So one counterintuitive message of the nineteenth-century technical manuals, for all their expansive detail, is that to really teach a given process requires repeated demonstration, and then (crucially) hand-over the tools. The only way to really learn a craft is to do it yourself, over and over; not only reading about it, but even seeing it enacted at close range, is a mere spectator sport."[389]

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387 This information is part of an investigation I developed under the scope of the training program of the TACK Communities of Tacit Knowledge ITN program, and was presented during the 2nd Intermediate Meeting in Oslo, in 2020. Its contents can be found at the Network's digital archive at https://tacit-knowledge-architecture.com/

388 Frampton, *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture*. p. 11

389 Adamson, *The Invention of Craft*. p. 59

Being modes of perception, skills are built on personal experience and are simultaneously shared amongst a community of practice and particular to each individual[390]. On the one hand, thinking in craft remains mostly in the tacit realm, given its historical (and discursive) developments: easier to adapt into the schemes of the division of labour, the explicit(able) contents of knowing through making were captured by industry in the development of modernity. Explicit knowledge is abstractable, and thus dividable. Conversely, craft is thus related to the maintenance of knowledge through non-codified methods. It relies on memory (both mental and bodily) and its register methods are thus focused on people. People are the "archive" of crafts, especially historically: embodying skill is a way to store knowledge, and apprenticeship is a way in of passing it forward. Even if these two – skill and apprenticeship – do not perform a transfer of knowledge per se, they foster the re-creation, the *re-invention* of knowledge in the individual forms of subjectivity (body-mind-culture) of new craftspeople which, in turn, reproduce its episteme. This process creates another tradition, as Ingold shows: a way to absorbing knowledge, a way of "learning" that better reflects the particular, embodied and re-invented, process-oriented ways of knowing. On the other hand, the relationship established between maker and world is one that is developed under the terms of their encounter in practice. It is relative to an objective, external reality that could potentially be codified and represented, but it is accessible only from a situated and embodied position. The specific character of a person's body, her ways of thinking and cognitive capacities, and the conditions of her particular situation in action – say, for example, her mood – will define her relationship with the material world, influencing her craftsmanship. These individual particularities steer the development of skill which, in turn, coalesce into knowledge. And that is precisely the reason skill and craftsmanship are, ultimately, tacit. Consequently, rather than considering skill as a form or type of tacit knowing, it should be done otherwise, and understood that tacit knowledge is a consequence of skilled practice.

390 Ingold, "Three in One : On Dissolving the Distinctions Between Body , Mind and Culture."

3.6 Conclusion

More than explaining the particular rationality of crafts, understanding skill as the base for a way of knowing in material productions poses a question particularly significant for an underlying goal of this research, that of understanding tacit knowledge. In this chapter I addressed how this can be performed in light of the epistemologies of making. Questioning science-centred conceptualizations of knowledge in classical epistemology and information theory, I clarified the relationship between knowledge and the material world, highlighting knowledge's need for directionality in the appraisal of knowledge. I exposed the dependent relationship between knowledge and imagination, necessary for the apprehension of information necessary in learning processes. Based on this imperative, I proposed a way of appraising knowledge based not in a conceptualization as justified true belief, but in the identification of its ranges of possibilities, the *epistemic horizons* that constitute knowing. Finally, I challenge the privilege of knowledge over skill, inverting their relationship, and positing that skill is a form of rationalizing information that produces knowledge, rather than being its subsidiary or mere application. Thus, given the perceptual, embodied nature of skill, its transmission is rendered impossible outside the actual engagement with production, which explains tacit knowledge.

The interpretation that tacit knowledge is produced through skill refers back to the original distinctions made by Gilbert Ryle of "knowing that" and "knowing how" that influenced Michael Polanyi in his definition of tacit knowledge. As such, both of these author's insights and conceptual frameworks can be explained in terms of the epistemologies of making and, in turn, play a role in the analysis of craft knowledge in architectural production. In contrast, the arguments in this chapter are at odds with the works of Harry Collins. They serve, therefore, as an alternative to his analysis, and can be used to confront his ideas or interpretation of particular cases. Besides relating to the scholarship of tacit knowledge, the focus on the generative potential of knowledge makes possible a form of knowledge appraisal that dismisses the need for a mental disposition, a 'belief', and its connection to an unattainable 'truth' to be recognized. Instead, it latches knowledge in practice, in the crossover between real and virtual. More precisely, it allows the investigation of knowledge their encounter between theory and practice: how acting – or performing, practising, making – *is* knowing.

In relation to the particular context of this research, the model of appraisal developed in this chapter allows a direct way to recognize, in architecture, the networks of knowledge outside its disciplinary boundaries and, more importantly, evaluate them on equal footing. Significantly, understanding the *ranges of possibilities* at play in architectural production can bring to the surface the forms of knowledge that are not explicit or accounted for in more common perspectives. Thus, the developments of this chapter make it possible to situate the craft dimension of architecture and, consequently, study the field under the tenets of the epistemologies of making. In other words, it allows the recognition of the knowledge performed in material production of architecture, produced through the skilled practice of architects, but also of builders and construction workers. In turn, this mode of analysis serves to evaluate the reach and capacity of my theory of knowledge in material productions to analyse architecture. In other words, it establishes the possibility for an analytical bridge between the knowledge of craft and of architecture, allowing the investigation of the fields' epistemic regimes in tandem and in comparison to each other.

TOC

4 Between draughtsmanship and craftsmanship

Possibilities of a craft-like design from the work of Korteknie Stuhlmacher Architekten

4.1 Introduction

If craftmanship is always performed, it involves a particular teleonomic formation that includes a specific set of skills based on a perceptual construction, whose directionality is related to the values and intentions of the maker and the problems addressed in their daily work. In other words, carftsmanship is built upon on the terms of intentionality. In the light of these considerations, can my theory of knowledge in the making be useful to address the work of architects? What could be considered the craft of the architect?

My goal in this chapter is to access how the epistemologies of making can describe architectural design. To answer this, my proposal is to explore the environment of making of architects – what could be said to be the stereotypical architectural practice, the work of a *firm*. In other words, I assume an indirect approach: instead of performing an analysis based on the tools of the architect inside a broader agentic network (for now), I rather focus on *what is made possible* by the knowledge present in an architectural office and how it can be understood if gazed upon from

the perspective of craft knowledge. Thus, before questioning directly the material of architecture, I question what is the *material of design*: what are the specific agencies that architects negotiate within architectural design? What are the questions posed and the challenges faced by architects? What sort of *grain* populates their works? In simpler terms, in this chapter I present an investigation of what concerns architects; not in grandiose endeavours and incendiary manifestos, but on the reality of daily work, in the kickbacks of their tools and stressful engagements of problem-solving.

Taking in consideration that the marks of craftmanship can be recognized by a shared community of skill, an initial notion of an architectural design craft emerges in accounts of the works of the *Korteknie Stuhlmacher Architecten* (KSA) through the voices of their clients, critics and juries. Portraying the office's philosophy and the architects deep engagement with the building, I use their descriptions of KSA's practice to portray the rich networks of agency and collaboration in the production of their architecture. Following these threads, the chapter outlines some conceptual lines, in an attempt to appraise how architectural design can be analysed from the perspective of craft. I propose that the architectural practice practised in the work of KSA can be understood with the employment of three concepts: "consistency", "coherence" and "resonance". The concept of *consistency* addresses the multifaceted nature of craft as emergent from the connections between the craftsperson and materials, tools, techniques and skills. Particularly, it explores how these connections are developed in processes of mutual and intersubjective development through experience, repetition and reinvention. *Coherence* describes how crafts are conditioned by and responsive to material and economic environments, and how this reflects in the work of the craftsperson. Thus, coherence characterizes an ability to navigate the contingencies of the social context and balance different aspects of production accordingly. Driving from the concept of affection in Spinoza, *resonance* represents how crafts are structured in the encounter between a productive syntax and a phenomenological semantic, where the experience of users is the central provider of meaning and the focal point for craft production. From these concepts, the chapter explores how craftsmanship can be understood in architectural practices and how it may foster new ways of thinking about both design and construction.

The chapter possesses three subchapters. These subchapters develop respectively the notions of coherence, consistency and resonance. Throughout theses subchapters, four of KSA's school projects are uses as exemplars of how the epistemologies of making can be applied in an analysis of architectural design. This cases bring to surface the potentialities of these concepts and their theoretical basis when applied to design and offer ways to further explore the idea of craftsmanship in architectural theory and critique.

4.2 Consistency: the distribution of skill and quality in buildings

In an interview with Elsbeth Ronner, the architects of KSA explain how they seek to use knowledge obtained in previous projects for the development of new ones.[391] Mechthild talks about how solutions evolve and are repeated in many projects, and how such attention and care construct what she names as "rigour".[392] This may sound obvious to many practitioners, but in truth, it is often at odds with what is expected and praised in architectural discourse, where the primacy of originality, authorship and expression seems ubiquitous.

In KSA's work, however, this iterative construction of knowledge can be seen throughout their designs, and has been often perceived by critics as a fundamental quality of their work. Some examples of this strategy are, to name a few: the use of integrated furniture, which allows them to incorporate technical installations in cabinets; their preference for natural and durable materials, creating a recognizable palette in their designs – most perceptible by the use of tiles in the facades and wood in interiors; and a deep care with tridimensionality, with generous use of ceiling lights, mezzanines and different heights and angles. Refered to as "ostensibly consistent" by Ronner, such repetition of approaches and solutions seen in different of KSA's designs, besides constructing a reoccurring quality in their buildings, also contributes to their complexity.[393] Sofie de Caigny, writing about their work, reflects that in this design strategy "everything is important and everything deserves equal attention".[394] This sort of all-encompassing drive can be seen in their design of the *Campus Cadix,* in the Flemish city of Antwerp.

391 Elsbeth Ronner, *Decorum and Irregularity*. Elsbeth Ronner's essay on the work of Korteknie Stuhlmacher Architecten, based on an interview with Mechthild Stuhlmacher and Rien Korteknie; written in 2015, updated and translated in 2017. Available at http://ksa.nl accessed in 16/04/2021.

392 Elsbeth Ronner, *Decorum and Irregularity*.

393 Elsbeth Ronner, *Decorum and Irregularity*

394 Sofie de Caigny, *Monuments and Their Many Voices*, Flanders Architectural Review, 14, 2020

FIG. 4.1 Aerial view of the Campus Cadix. Source: KSA

The project of the *Campus Cadix* is a school complex[395]. It encompasses the installation of facilities for technical apprenticeship in a new building, counting with workshops that work together with a specific pedagogical approach; the renovation of the old school building for more conventional classes; and repurposing of a warehouse as the new sport centre of the school.

The new building of the Campus Cadix is a long and vertically oriented building, spanning the entirety of the block facing the street. The façade colours are mainly grey and yellow, in a scheme that follows nearby buildings, dating from the XVII and XVIII centuries. Mechthild once told me that these yellow glazed tiles are particularly common in Flanders, and thus they are included in many projects they design in the region. Big, pixelated letters mark the building's name in its first floor, echoing the old practice of writing the function of buildings in their very matter, usual in the Low Lands.

395 As a curiosity, the plot where now the *Campus Cadix* buildings sit was once the northern bastions of Antwerp's ancient walls, complete with a moat, that stood until the late XIX century, when the canal was reclaimed to land and the walls undone. This information comes from the archaeological study of the site, performed in 2009 for the renovation project.

FIG. 4.2 Elevation of the new building of the Campus Cadix. Source: KSA

Wrought within a contemporary aesthetical framework but resonating with the contextual and traditional architecture, this solution of creating tiled facades that incorporates writing already presents a first example of KSA's reiterative practice. The feature is explored also in the projects of the *Jeugvoorziening Everaertstraat* and the *Stedelijke Lyceum Lakbors* schools (explored bellow) and in the extensive development of *Citygate*, designed in partnership with many Dutch and Flemish architectural offices, making KSA's contribution evident for those familiar with their practice. It also appears in the project of the *A.J. Schreuderschool voor Bijzonder Onderwijs* under a ludic, special format that includes contributions from the student's designs.

FIG. 4.3 Tilework in the schools of KSA. Source: KSA

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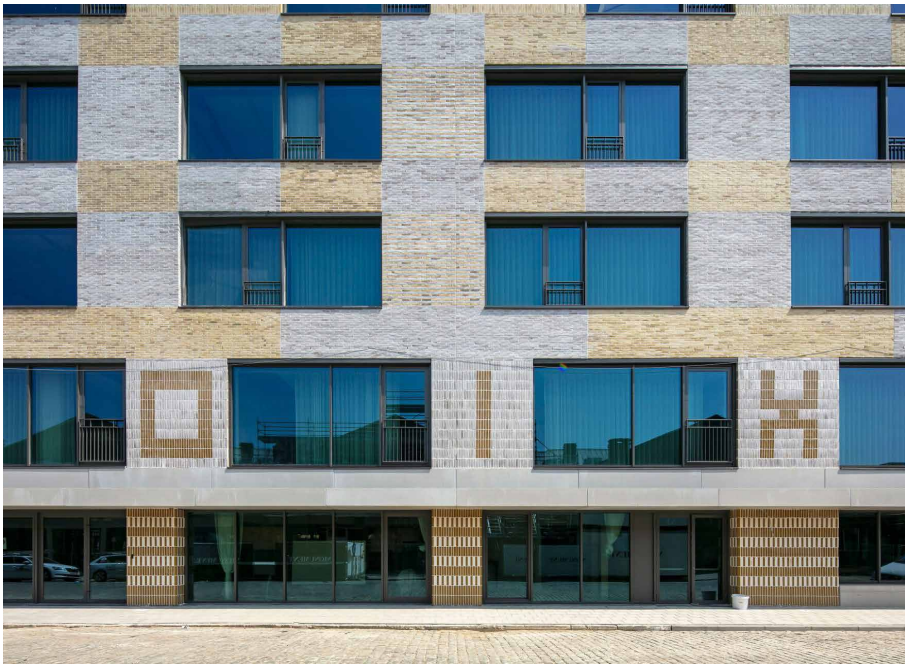

FIG. 4.4 Front façade of Campus Cadix's new building. Source: KSA

The plinth is not flush with the façade, but stands inwards, receiving students under the cover of higher floors. From there upwards, the floorplans of the new building progress from a bulky rectangular shape to an "E" format in its lowers levels, and back to a slender simple rectangular format, escalating the three volumes facing the interior of the block. In the roofs created by this "staircase" shaped volume, the architects placed terraces, landscaped into lush green areas that house the pitched covers of the skylights for the floors below – showcasing Mechthild's '*hobby*' in landscape architecture[396]. These terraces are visible from the inside through many perspectives, depending on which level the observer stands: in some places they can be seen from below, highlighted against the mostly grey Flemish sky; or from above, showcasing the Escher-like differences in level; mostly, they face the observer from the side or straight forward, invading with their organic chaos the otherwise structured and rational lines of the building's interior.

396 From the interview with the project manager leading the development of the Campus Cadix project.

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FIG. 4.5 Section of the Campus Cadix's new building. Source: KSA

In the entrance and in the staircases, bright yellow tiles follow the facade theme, mimicking the contrast of the outside. The vertical circulation, apart from the more monumental staircase at the lobby and the free-flowing scheme of the last two floors, is located at the ends and at the middle of the building, coinciding with its three volumetric protrusions. As in the facade, pixelated numbers are tiled in white against yellow and inform the level. The floor is also tiled yellow in the mezzanines between the flights of the stairs, which are textured in the same concrete grey as the walls surrounding them. Screwed to the wall's surface, oak handrails are the only wooden element in the composition. In between the two flights, a screen of vertically placed steel profiles painted in dark grey divides the area, but allows visual contact. The frames are screwed to the concrete steps following a diagonal line that sits opposite to the inner handrails, built on circular steel profiles welded to the metallic screen.

As one leaves the transit areas and progresses to places of permanence, the clean, artificial yellow is partly replaced by the soft and matte texture of wood, present in the hallway's sturdy doors and window frames. The panels of recycled oak are made with narrow and long blocks glued together, resembling the tiled walls. The detailing is simple, and the orthogonal composition they create is completed with tiles placed vertically in tones of grey and white, grey peg-boards, and low bespoke coat hangers against a dark background, positioned below a small wooden shelf. The exposed concrete of the columns, flush with the surface of the tiles, completes the assemblage, framing it at both sides and dividing it at the middle. The logic is repeated along the corridor, creating a rhythm that softens the length of its long, straight surface and providing a furniture character to an otherwise simple element of partition.

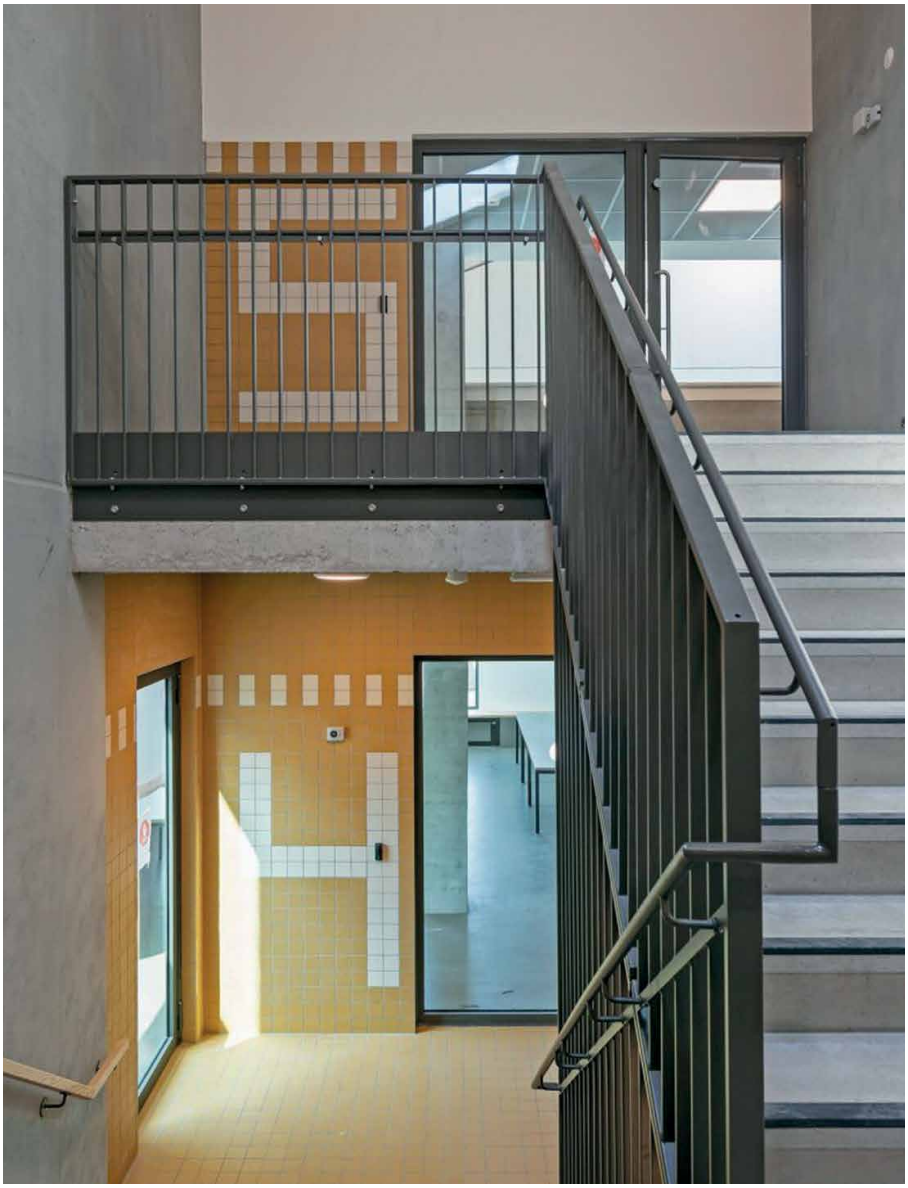

FIG. 4.6 Stairwell at the new building of the Campus Cadix. Source: KSA

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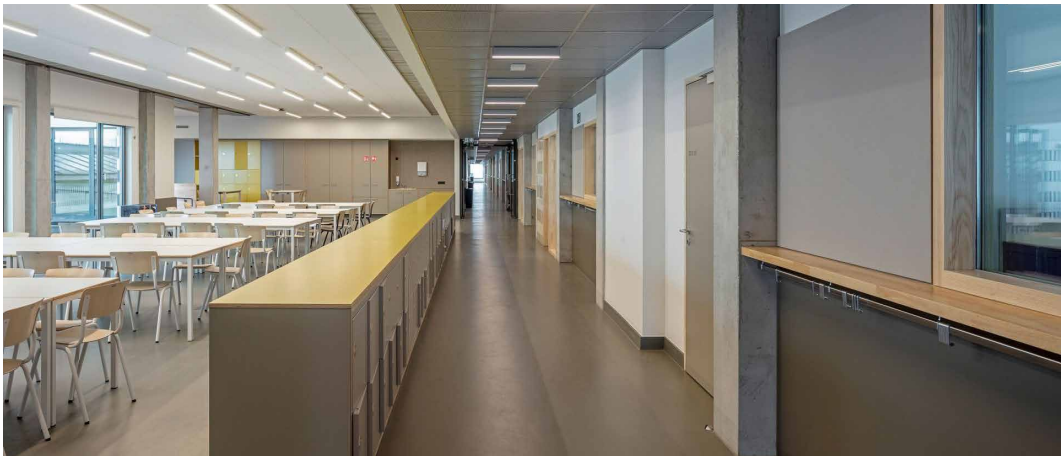

FIG. 4.7 Corridor of the Campus Cadix's new building. Source: KSA

These coat hangers, trivial as they may seem, are another repeated feature in KSA's design. They showcase not only their strategy of using imbedded furniture as a haptic devise (discussed ahead in 'resonance'), but also the amount of care that goes in the production of details. The coat hangers were specifically addressed by the architect in charge of the Cadix project, during one of our talks. As they tell me, coat hangers in general are often forgotten in the design of large buildings – which, in the case of cold countries like Belgium, can become a nuisance. Schools need a large number of coat hangers that compete with other storage requirements. They are also somewhat tricky to design, for they need to accommodate varying sizes of coats, and be resistant enough to endure a possibly rough handling by hurried teenagers, surviving still the humidity of their rain garments. Moreover, coat hangers have to be accessible enough to foster students to actually use them, ideally in an agile way so as not to stall their flow. KSA's architects became aware of these troubles and others by designing other schools in the low countries, as well as other public buildings.[397] Slowly, they constructed the knowledge that went into the design of the particular version found in the Campus Cadix, spread along the corridors in open but recessed volumes, lined in Formica. This version, their employee admits, is still not perfect, for the decision of placing the coat hangers at waist level – concurrently tested in yet another project – proved not as easy to use as imagined.

397 KSA's experience on designing schools started back in 2006, with their project for the *Basisschool de Toermalijn,* in Rotterdam. Before the Campus Cadix commission, KSA designed other two schools: the *A.J Schreuderschool* (2008) and the *Freinet Basischoolen in Lile en Herentals (2009)*. The long-term work of Campus Cadix (in the design phase from 2009 to 2017), nonetheless, meant that during its development, KSA was simultaneously designing five other schools.

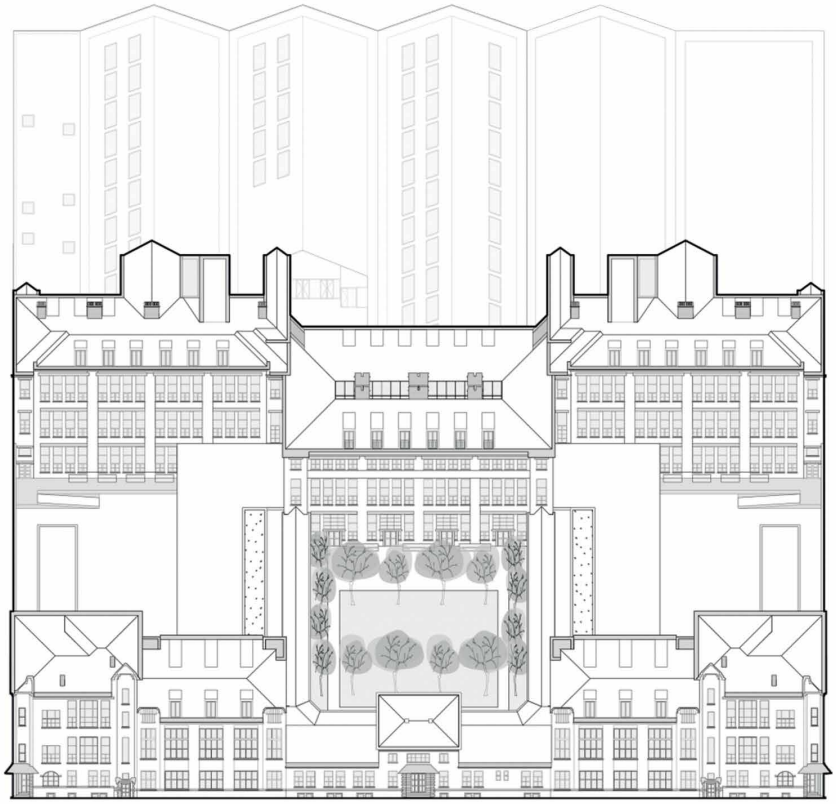

FIG. 4.8 Axonometric view of the old building of the Campus Cadix. Source: KSA

In addition to the newly constructed building, the school's old facilities were renovated, and the level of attention given to their restauration is worth of notice. It shows in the treatment of the glass used in the windows, restored to its original state by the office – using not clear but subtly translucent glass – which, according to the project leader, are still manufactured today in Belgium solely to be used in historical renovations. Also, after an archaeological investigation, the window frames were discovered to be originally painted blue, and the colour is being reinstalled (after many tests on how the colour sits in the to-be-restored wooden frames). A similar treatment was dispensed for the dark red tiles that originally covered the corridors. A thorough effort was employed to recover the maximum number of original tiles during the demolition processes, and also to match the new tiling in colour. The internal walls are covered in these new tiles to about knee high, lower than initially planned due to budgetary considerations. The effect, nonetheless, might be even better than the original design, as the lower line created by the tiles accentuate the generous ceiling height.

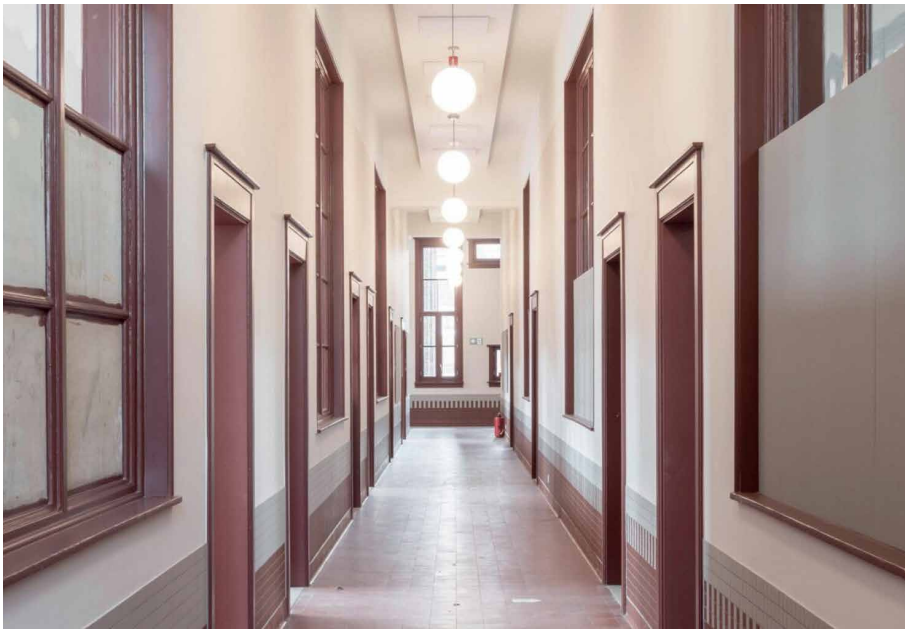

FIG. 4.9 Corridor of the Campus Cadix's old building. Source: KSA

The old school counted with three courtyards that are greatly explored in the new project. In contrast with the labour-intensive but discrete work of renovation in the built volumes, in these three areas the intervention by KSA is evident. In the two lateral courtyards, additional structures were built to house two refectories. The solution resonates with the office's approach for the *Basisschool Edison* project, as the refectories articulate between interior and exterior spaces. The way the pavilions are built also draws from yet another project: sitting on elongated concrete pillars, beams of laminated wood sustain the elevated roof, while framing high openings for the entrance of light – a strategy used in their *Van Estereen* pavilion. Finally, the attic of the old is of particular importance, echoing the success of design choices for the *Predikheren Mechelen* last floors. Similarly to the monastery, the attic of Campus Cadix counts with mezzanines, positioned at the centre of the space and surrounded by open areas. The central volume, below the open mezzanines, accommodates storage, technical and other functional rooms, besides housing the staircases. Above, light floods in by skylights – turning the atmosphere somewhat scholastic. The colour code, with the addition of dull red laminated doors to the cabinets and shelves, converses with the rest of the school.

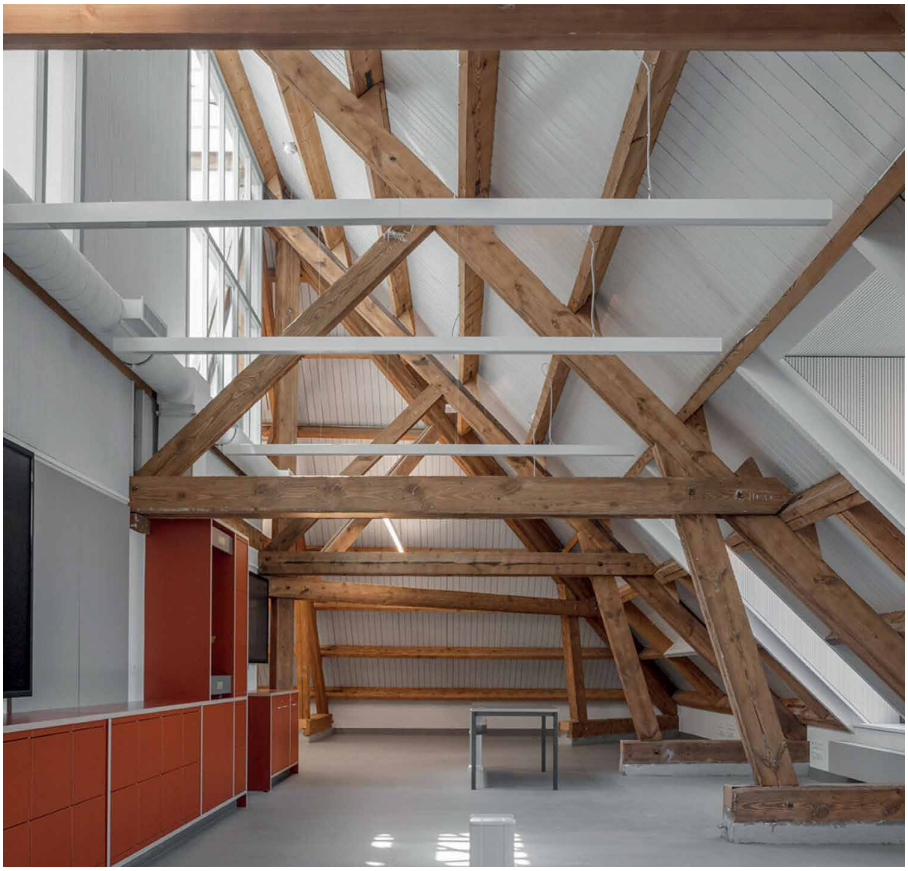

FIG. 4.10 Attic trusses at the old building of the Campus Cadix. Source: KSA

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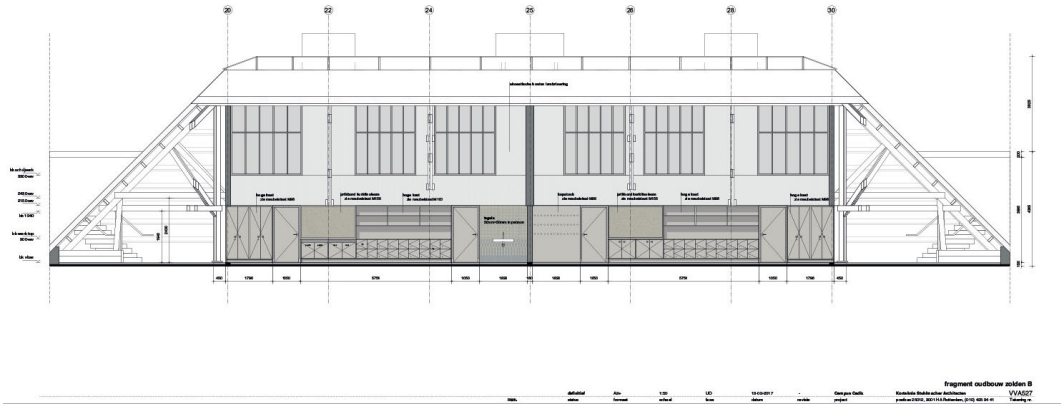

FIG. 4.11 Section of the old building's attic at Campus Cadix. Source: KSA

FIG. 4.12 Attics at the Predikehren Mechelen, the Campus Cadix new building and the Catherijneconvent Utrecht Museum Source: KSA

The reiterative strategy also establishes KSA's material palette, which is sometimes pointed out as being similar in different projects – as can be seen from the images the office produces in their *beeldenboeken,* the brochures of specifications. From talks with Mechthild, Rien and other of KSA's architects, it becomes clear that there is a deep history of use in many of these materials that warrants their position in the palette. One example, also seen in the new building of the Campus Cadix, specifically in the ceilings of the last floor, is the uso of the compound panels from *Lignatur*, a Swiss company that produces a particular wooden modular structure for roofs and floors. Their elements are made of wooden panels connected through beams,

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with voids in between that can be filled with acoustic or thermal insulating material, for example. Is a very versatile element, given the variety of products with which it can be filled; it is durable and it possesses the natural wooden finish preferred by the architects of KSA; and it is very easy to assemble. Because of this plurality of qualities – aesthetic, technical and constructive – the system is much used in their projects and, after working with the elements repetitively, the architects of KSA are very aware of its properties: they know very well when, where and how to apply it. Rather than publicizing a constructive system, the point is that, inside the practice of KSA, even the material choices are treated as solutions that are progressively developed through repetition to achieve the quality that is later perceived by others. This practice is what affords their designs with an 'aura' of finely-honed, bespoke solutions. By employing them over and over again, the office accumulates knowledge on these seemly small details of construction, spatial organization, or furniture design.

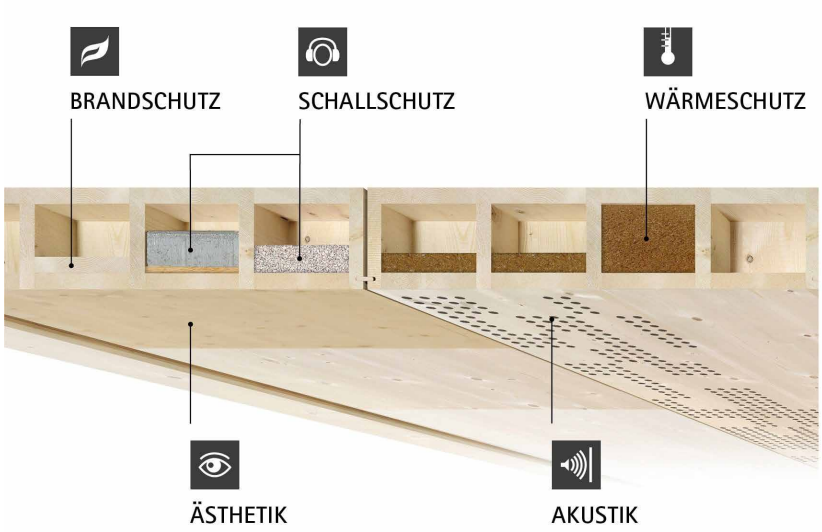

FIG. 4.13 Lignatur. Source: KSA

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FIG. 4.14 Use of Lignatur in KSA's designs. Source: KSA

It is also following this strategy that KSA takes advantage of the complex nature of buildings to design good quality interiors, especially in renovations. With clever movements, such as designing useful integrated pieces of furniture out the ventilation and heating appliances, or using the premises of insulation or acoustics to apply texture-rich panelling in the building's walls and ceilings, granting spaces with a haptic quality. These movements require, evidently, and in-depth knowledge of building regulations – but also an associated shift in the way of knowing materials and spatial configurations, perceiving opportunities in traditional or alternative design solutions. It implies, for example, getting to know wooden panels by the perspective of acoustic performance, especially in comparison to other panelling systems or sound dampening materials – conversely, it opens up the possibility of discovering in these a haptic quality that is appraised in the backdrop of wooden surfaces. In other words, this kind of design strategy involves the establishment of a semantic encounters between different fields of material properties and qualities which, in turn, open up possibilities for informed judgement and the rise of new configurations. It is, thus, a sort of perceptive shift or, to be more precise, a change in awareness that, yet again, it constantly reiterated and coalesces in a pragmatic solutions. In other words, skill.

FIG. 4.15 Panel at the old building's corridor. Source: KSA

KSA's reiterative strategy refers not only to specific technical or material solutions, but also to explorations of intrinsically spatial quality – the sort of question that would be considered as 'properly' architectural in an orthodox (and, admitedly, outdated) interpretation, in opposition to construction. A good example can be found in KSA's use of the orthogonal lines as general composition guides seen in the Campus Cadix project. These lines fill the environment and organize the spaces. They regulate the zones, establishing boundaries and allocating colours and texture. Mainly embedded in the materials and elements, like furniture, these lines are constrained by them. In other words, they are generally not real in themselves, but are created from the divisions and encounters between different surfaces, in the borders of the designed furniture and in the differences in colour along the walls. They emerge from these joints across space and, as they appear, they become the visual horizons that anchor the elements together, connecting everything under a unique formal rule. The horizontal lines, more explicit, are more fundamental, basic or structural (in spatial terms). They give the main separations of spaces and define the tactile hierarchies within rooms. In KSA's proper lexicon, they are the *rules*, the

guidelines that conform space and the approach to space[398]. They define the ethics of the interiors. The vertical joints are, in general, additional, aesthetic - but not as an excessive or gratuitous element: ludic may be a better word. They add texture and differentiate the composition made by the horizontal lines, and, in the analogy with KSA's rules and play, they represent the latter. Inside the more rational, pragmatic spine, these are additions the architects allow themselves, but that operate within a well-defined leeway.

FIG. 4.16 KSA's use of horizontal, vertical and diagonal lines. Source: KSA

Following this self-subversion logical scheme, the orthogonal preference, albeit definitely hegemonic to their projects, is not a dictatorial approach. Deviations of this pragmatist rhythm can be found here and there: plain-in-sight off-angle and asymmetrical movements are presented so directly that they almost go unnoticed - on the slopes of the ceiling, in the stairway's diagonals or in the glitchy facade. They are never overused, and their quasi-scarcity, together with the sincere and *au passant* way in which they are shown, provides them with an intriguing tone. Whenever present, it feels not coincidental. As such, they appear so remarkably evident that one might be embarrassed to question their reason to be. The truth is that they are mostly used whenever such a solution can draw its form from another link, another engagement with a problem. Siding the staircase's escalated ascent with diagonally shaped panels avoids a complicated production and assembly, besides creating an easy and reliable railing, to which the handrails are attached. Moreover, since the staircase can be crossed underneath, repeating the escalated pattern on its underside could create corners against which a running teenager's

398 This notion was developed in Mechthild Stuhlmacher's private lecture to the TACK – Communities of Practice Knowledge network during its first Foundational Meeting, in March 2020, Rotterdam. Mechthild addressed similar questions in one of the TACK Talks lectures, available on the TACK website, https://tacit-knowledge-architecture.com/events/tack-talks/.

forehead might find its path. Similarly, the slanted ceilings evidently follow the roof structures, but also help to settle organic divisions of spaces that, in floorplan, are often boundless – coupled with skylights, they create somewhat individual regions, points of interest that remain open for sight and access but that possess an encompassing, embracing quality often exclusive to walled rooms.

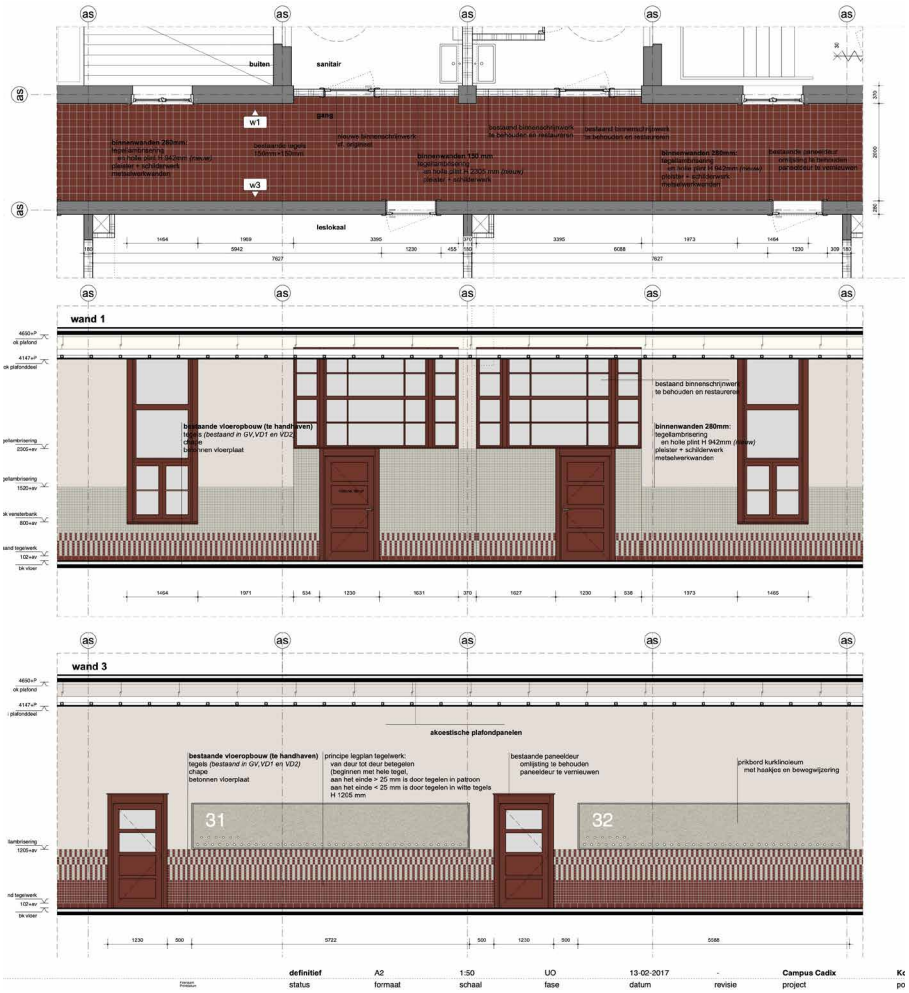

FIG. 4.17 interior elevations of the old building from the Campus Cadix. Source: KSA

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This hierarchy of lines is thus not purely aesthetic. As with the staircase, the orthogonal structure imposed by KSA into Campus Cadix posses many link with spatial and material concerns. The lines that establish the position and shape of lockers and coat-hangers also create connections and divisions between spaces, forming windows that open the view from the classrooms to the workshops and collective areas. Others define counters that delimitate the open study spaces against the corridor, breaking its monotony without sacrificing fire-safety requirements. Particularly, the lines define a zone in which all cabinets, closets and other furnishings are made with easy to clean, durable materials, and shaped in versatile forms that, if need be, can be appropriated for other uses, or easily replaced.

As the list of reiterated solutions grows long, it becomes clear that a naive notion of innovation has no place in the practice led by Mechthild and Rien. KSA's solutions are not attempts to always think differently by its own sake, or to have new and original responses to always new and original questions. Rather, I would argue that it is by facing old, traditional questions and following well-developed ways of thinking against new, situated and dynamic backgrounds that their innovation is built up. And that is the reason why, when analysing their setting in singular projects, these solutions are adequate. They function and fit the design. They feel tailored and innovative in their effectiveness, and are often regarded as such by juries and scholars.

There is not much praise for improvisation in KSA's works. On the contrary, theirs is an architecture of awareness, of intention, of conscious choice and deliberation – even when *at play*. The spatial ordination with lines explored in Campus Cadix is intentional and, as a result, the design is sober, but playful. This sobriety is an important tributary of the overall consistent aura of KSA's work in other projects as well. It is a statement of the design choices and, more importantly, of the knowledge contained in them. What is particularly significant, therefore, is how these elements bring together many aspects of the craft of architecture and the different sets of knowledge involved. Seen thorough the lenses of my theory of craftsmanship, it is possible to understand the origins of this multiple knowledge by situating the design of the Campus Cadix alongside other works of the office, and perceive the practical strategy that rules such decisions. In other words, by recognizing KSA's craft as a history of self-formation and self-development, it is possible to describe this quality under the notion of *consistency*.

Richard Sennett argues that the mastering of skills requires tireless repetition and dedication[399]. In time-scapes spanning many years, an apprentice learns the craft in piecemeal steps, slowly building up familiarity with the techniques, tools and materials of the trade. Each step is a collection of repeated actions and, as practice shapes movements, the apprentice becomes increasingly capable of replicating the desired results. As Nørgaard points out, one "characteristic of the craft is the slow and continuous learning of the individual elements until they become a habit"[400]. This formula is repeated in every stage of craft formation, as the apprentices move from learning one process to the other, embodying the techniques that compose their craft. The techniques that are mediated by craftspeople during their training are also part of the technological tradition of a specific society. Tacit knowledge is more than just the adoption of these technologies: it is the internalisation of this knowledge and the feeling for the situation – the conversion of a learned and imitated knowledge in craft which is, through repetition, deeply ingrained in the body.

Similarly, in the production of artifacts, repetition is a measure of skill and a requirement for the craftsperson's job. All pieces of a porcelain tea set or of a dining set of chairs have to be similar enough to fool the eye and body of its users and, as Glenn Adamson points out, symmetry requires the ability to produce identical (although mirrored) halves[401]. In contrast to the interpretation of romantic writers associated with the Art and Crafts Movement, such as A.W. Pugin and John Ruskin, imperfections of the handmade are not always praised in crafts. Several techniques are specifically intended to erase the marks of labour and hide the traces of the production processes, a precursor of industrial secrecy. Sanding is the most evident example, but the practice can also be seen in the historical construction of wooden cabinets. The dovetail joints, so admired and sought after in contemporary woodwork, would be covered with veneer and visible only from the insides of the drawers. This is the case, for example, of Japanese furniture from the XVIII century[402]. It is unclear when the trend shifted, and Eduard Barnstey is considered one of the first furniture makers to adopt the idea of displaying the joints, following a philosophy of construction honesty that owned much to the Arts and Crafts ideals[403]. Paradoxically, for a great time the erasure of one's own marks on a crafted

399 Richard, *The Craftsman*.

400 Nørgaard, *Bronze Age Metalwork: Techniques and Traditions in the Nordic Bronze Age 1500–1100 BC*.belt plates, pins and tutuli

401 Adamson, *The Invention of Craft*.

402 Porfírio Valadares, "Da Construção à Montagem" (Universidade Federal de Minas Gerais, 2012).

403 Annette Carruthers, "Edward Barnsley," in *Pioneers of Modern Craft*, ed. Margot Coatts (Manchester: Manchester University Press, 1997).

object attested instead for the skills of the maker. To remain visible in the products of their labour (and to market their work), craftspeople relied on trader's marks and, since those could also be falsified, on the *consistency* of their work, often hidden in details. In a game between makers and connoisseurs, small hints of authorship could be found in subtle traces that, purposefully or not, told the tales of the way things were made.

Consequently, a consistency in the rhythm, meaning the repetition in the ways of learning in the progression within the trade, follows a consistency in production the apprentice is able to perform. In other words, the regularity in the training process, based on practice and reiterated in every process comprising the craft, is conditioned by the regularity apprentices are able to produce with their effort. Flipping this thought over – it is possible to understand that, as a form of regularity, consistency is paramount for the development of skills and, as the mode of learning in crafts, it describes a quality in the performance of craftsmanship. As such, consistency plays a role of both measure and method of craft apprenticeship – it is the way through which skills are developed and a quality used to appraise them. Following the thoughts of David Pye, consistency determines the ability of craftspeople to perform between the "workmanship of risk" and of "precision"[404].

Consistency, thus, can be considered as a measure of how the distribution of knowledge is organized across a particular production or endeavour, that is, how the different aspects of production are reconciled and coached to work together in a meaningful whole. If described under a Hegelian terminology, it is consistency that is behind the coagulation that creates an "unity" in the "diversity"[405]. Since a craft is a multitude of entities and agencies coming together, affecting and effecting on each other, consistency is an aspect of craftsmanship that negotiates and weaves these affections together through the establishment of known paths. It is a holistic approach - thus, alchemic, relating to the power of transformation in all of nature, instead of a focused, regulated and abstracted nature – thus it is about processes in their complexity. Consistency is the balance of complexity:

> Complexity entails a wide array of innovative notions that would take social investigation a long way from conventional linear analyses of structure or action/agency. Complexity also explores how components of a system can, through dynamic interaction, 'spontaneously' develop collective properties or patterns, such as colour, that are not implicit in the same way within its components.

404 Pye, *The Nature and Art of Workmanship.*

405 Crevels, "Aspectos Da Conceituação Do Trabalho Em Marx : A Alienação Como Abstração Concreta."

> The interest is in emergent properties, regularities of behaviour that transcend the ingredients that make them up. Complexity argues against reductionism, against reducing the whole to the parts.[406]

Accordingly, consistency dictates, for example, the way detailing is regarded amongst craft discourses. In a brief summary, a well detailed project, in crafts, is one in which the whole sum of details is well worked on. Since craftsmanship itself is an event that cannot be perceived directly from the produced object but depends on the recognition of marks and traces of skill, details are a *proxy* of quality. This can be seen, for example, in Oliver Watson's account of Bernard Leach's production, showing that while his designs were already praised during his early career, the pots he made suffered long from technical deficiency, due to Leach's training and approach being performed, in his own words, "primarily as an artist and secondarily as a craftsman"[407]. Particularly, these took form as an inability to replicate, in detail, the pots, cups and dishes for a standardized production. If Leach's works lacked consistency between expression and execution, in "fine craftsmanship", on the other hand, the "concern is, as it has been for all time, with the perfect balance between design and material", as pointed out by Farleigh[408]. A similar critique falls over the production of Eduard Barnstey, from the words of Annette Carruthers[409]. Barnstey's choice of substandard materials and other production shortcuts when facing economic struggles meant that his furniture was "not always as well made as it could be"[410]. Eduard was well aware of the significance of these detailing blunders, being described as "mortified" when a client noticed the use of plywood in a drawer, and pushed towards a more consistent practice in his later works, trying to avoid, for example, "the contradictions of producing by hand something that looks as if made with machine tools and processes"[411]. Curiously, the financial strains he faced, which stemmed mostly from his inexperience in estimating production costs (which could also be regarded as a consistency failure), only relaxed when his approach shifted and, instead of cutting production corners, Barnsley took upon the highly skilled

406 John Law and John Urry, "Enacting the Social," *Economy and Society* 33, no. 3 (2004): 390–410, https://doi.org/10.1080/0308514042000225716. p. 401

407 Oliver Watson, "Bernard Leach: Rewriting a Life," in *Pioneers of Modern Craft*, ed. Margot Coatts (Manchester: Manchester University Press, 1997). p. 26

408 Farleigh, "THE CRAFTS — THEIR PAST, PRESENT AND FUTURE." p. 35

409 Carruthers, "Edward Barnsley." in *Pioneers of Modern Craft*, ed. Margot Coatts (Manchester: Manchester University Press, 1997). p. 12

410 Carruthers. p. 14

411 Carruthers. p. 15

Bert Upton as his foreman. Together, they managed to experiment at the borders of handmade and machine production and develop solutions and details that better responded to the requirements of the time with, for example, the use of veneered flat boards more suited to the changes in temperature and humidity caused by central heating.

In summary, the balance of the amount of work spent in different aspects of the project is one of the most important measures of how well-detailed a project is, rather than the specificity in the details themselves. Thus, (good) craftsmanship is more easily found in well-rounded productions than in object with particular overly determined details. This does not mean that thinking an individual detail in depth is counter-productive or prejudicial to craftsmanship, but rather that, in the perspective of craft, a success in one part does not pardon the failure in another. Quality is more about the absence of defects than the evident demonstration of prowess - more about having no weaknesses than having a particular strength. This comes partially from a focus on utility. The quality of handmade guitars depends on its shape and materials, but also on the correct measurements and on the proper assembly and finish of all pieces. Mess up the alignment between neck and body and the strings will be out of place. Tilt one single fret and the guitar turns unplayable. Make the sound board too thick and it won't vibrate; too thin and it breaks. The perfect guitar, as my luthier brother says, is on the brink of disaster. In this sense, the way of the craftsperson differs from that of the specialist. Consistency in crafts represents not only the regularity in the replication of a single aspect of production, but also the maintenance of a standard of quality throughout the entirety of the process. It is the quality that stems from complexity, as perceived by Law and Urry, rising from the dispersed (and consistent) attention to many aspects that contribute to the production as a whole[412].

Detailing is also an important feature in the appraisal of quality in architecture. Particularly significant in this way of thinking are the works of Edward Ford. In agreement with Farleigh, who claims that "[great] design grows out of a mastery handling of material, which means a full awareness of the true forms that can be drawn out of a material, and a great skill in making"[413], Ford defends that understanding details are fundamental to understanding architectural production:

412 Law and Urry, "Enacting the Social."

413 Farleigh, "THE CRAFTS — THEIR PAST, PRESENT AND FUTURE." p. 31

> Details are the basis for, not an accessory to, understanding a building. This is not to say that the detail contains within it the idea of the totality of the building; this book is, in fact, an argument to the contrary, only that an understanding of the building cannot be separated from an understanding of the detail, and that the role of the detail is not simply to create pleasant allusions or comfortable associations. Significant details are about a good deal more than construction, but they begin with construction.[414]

The parallel in architecture needs to be threaded carefully however, for it is sadly often fetishized, as in the worship of Carlo Scarpa's details as stand-alone masterpieces[415]. In crafts, the attention to details is highly referent to the overall quality of the project, rather than about particular details autonomously. A careless obsession with details, without regards to their consistency, can lead to an opposite appraisal. The most eloquent example may perhaps be found in Rem Koolhas's *maison à Bordeaux*. One of his first projects to gain international attention, the house is described as "a masterful innovation of space"[416] and "a universe at once simple and complex"[417]. In stark contrast, as featured in the "Koolhaas Houselife" documentary, by Ila Bêka and Louise Lemoîne, portraying the work-life of a housekeeper, the project appears as a collection of minor failures. It is an exemplary case of the commonplace idea amongst architectural discourse that 'all good architecture leaks'. This controversial notion, attributed in its different formulations to the Oslo School of Architecture (AHO) and more prominently to Frank Lloyd Wright, aims to detach the appraisal between design and execution. Thus, it allows immense praise for a house that, quite literally, leaks – but that also has problems of circulation, ergonomics, has an endless need for renovations and repairs, besides being enormously difficult to clean. In short, the praise awarded to the house's design clashes with the actual quality of the building in relation to its functionality *as a building*. In the documentary, the mismatch in what are considered and recognized as values between design and construction is made evident, as viewers accompany the maid's struggles and the life of a building in constant intensive care. It showcases that, in this disregard of consistency, the craftsmanship of architecture is often valued not in relation to the accumulation of knowledge and skill that are so fundamental for its formation, but from an abstract focus of design innovation.

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414 E. Ford, *The Architectural Detail* (New York: Princeton Architectural Press, 2011). p. *XV*

415 Michael Cadwell, *Strange Details* (Cambridge, MA: MIT Press, 2007), https://doi.org/10.1055/s-2008-1040325.

416 https://www.archdaily.com/104724/ad-classics-maison-bordeaux-oma

417 https://en.wikiarquitectura.com/building/house-in-bordeaux/

Hence, the idea of consistency explains KSA's practice of repeating solutions, materials and strategies in their designs. These are highly layered projects, that involve flexibility, atmospheric qualities, pragmatic decisions, well-detailed specifications, careful considerations about light and energetic efficiency and so forth. Their buildings don't orbit a central idea. They are not manifestos; they are poetic, in the sense that they allow for multiple interpretations, focusing on each of these different aspects. But, more importantly, they are as such crafted – in other words, they present the multiplicity of knowledge that crafted artifacts do – and not only as common architecture generally has by being a constellation of crafts, but in the very design and architectural project. That is, KSA's work is complex, and this is an epistemic quality of their practice: the ability to navigate, organize and harmonize all these aspects. Notably, their projects take long time to be developed and constructed, as can be seen in the processes of these schools – Campus Cadix was 13 years in the making. And it is also translated in their organization within the office. Every project has a manager that becomes, in reality, the craftsperson of a particular building – exploring all the aspects of the architectural practice in its development, without a single focus or a great division of labour.

It is in this way of readdressing questions that their work folds into itself. The repetition of solutions promotes their re-invention, establishing, iteration after iteration, the finely honed, well-detailed elements that will contribute to the overall crafted aura of each project. Made by repetition, they are nonetheless dynamic. In this process, design questions and ideas are experimented with, analysed and improved. As every iteration is situated in a new project, with its own contingencies, it represents a new test of its previous versions, adding to the office's knowledge on its possibilities and limits. Each generation of dormers, coat hangers, counters or blackboard walls teaches the architects of KSA some small lessons of the life of buildings. Slowly, their experience with many challenges, at the level of details, constructs an overarching knowledge that allows the development of a design that brings them together. It is a form of understanding design as a process of redevelopment of the set of knowledge one possesses to challenge the endeavour of building. In comparison with the solutions of Rem Koolhaas's *maison à Bordeaux*, KSA's solutions wouldn't afford such a comical portrayal, and they present an alternative to a cheap notion of innovation that depends not on slippery ideals such as inspiration or the stroke of genius, but rather on pragmatic programs of incremental improvement, both of solutions and the knowledge behind them.

The result is a consistency spanning many scales and aspects of architecture: the lines of the Campus Cadix weave its overall aesthetics, but also its use and the technical decisions involved in its development. However, just as the lines themselves, this is a strategy that has no body of its own. The logic of lines exposed

here was not the driving force in their design process - as far as I understand, it is not even vocalized as a significant part of it. It emerges as a corollary from this accumulation of knowledge over time. Accordingly, it is not treated as an explicit guideline telling employees how to think the spaces, but it emerges from this entanglement of different approaches. This "order", if it can be called as such, is emergent – and similar in kind to the *sophiē* of the Greek artisan:

> the tektōn, who is said to possess sophiē, is able to create wonders out of matter by rendering visible an invisible and immaterial order. In fact, shipbuilding was considered to be magical in that it brought to light something hidden. A shipbuilder would be praised as being in possession of sophiē, insofar as he shows some extraordinary, detailed knowledge of what a ship and its navigator need to adapt to under changing circumstances; he consequently builds the ship according to these navigational needs and takes into account the interplay of materials, construction principles and the forces of the universe. Such a ship would be beautiful in the sense of being harmonious and fitting into the world order. [418]

In the work of KSA and in architecture in general, consistency takes shape as the multifaceted character of design practice. As Ruth Morrow would perhaps phrase, many crafts, or "material practices" sit in a "sisterly manner next to architecture"[419]. The term "sister practice", coined by the author to address her experiences with textile and concrete and its relation to architecture, is used to denote an "intellectual and material proximity", and is infused with ethical and feminist theory. In any case, it is an example of how skill creates adjacencies, which, in turn, allow for associations and extrapolations between different practices to occur – *changes of domain*, as Sennett terms it[420]. As described previously, this is indeed a pathway to knowledge, in the sense that it can enlarge the ranges of possibilities of a particular practice, but it also represents an opportunity of methodological assessment. In this sense, architectural thinking *in action* can be understood through the ways of knowing of craft, despite the contradictions in some areas of their discourse. If a sort of craft-like consistency is sought after in an architectural design, perhaps it is important, for example, assuming into the design process the character of craft productions. An example, indeed, is given by Ruth Morrow, from her explorations with textile:

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418 Holst, "The Fall of the Tektōn and The Rise of the Architect: On The Greek Origins of Architectural Craftsmanship." p. 4

419 Ruth Morrow, "Sister Practices: Non-Normative Exoeriences of Time and Technology," in *A Gendered Profession* (London: RIBA Publishing, 2016). p. 100

420 Richard, *The Craftsman.*

we also know the importance of 'taking time'. This sense of taking time is surely central to any material practice in search of quality outcomes. The cyclical and incremental processes of trialling, developing, and gaining expertise an investment of time […]. In such contexts time becomes the underwriter of quality, (and indeed in some instances has proved to be the guardian of our intellectual property). But taking time is an unusual and counterintuitive strategy in the 'bring-to-the-market-as-fast-as-you-can' business culture.[421]

In a similar manner, the adjacencies of techniques and the bounding together the different skills within a particular production are paramount to craft, as it defines both the territory of its existence and the structure of apprenticeship. A "qualified craftsman", Nørgaard reminds, "is able to perform all steps of the necessary sequence" of a particular production, and is from this premise that apprentices progress in their learning[422].

Accordingly, the way in which consistency is learned at KSA is less heroic and institutionalized than it may seem, confirming what Mechthild has already told me in our Q&A session during her TACK Talk lecture[423]. It is the result of their particular way of working. Mechthild frequently wanders about the office, making stops at people's desks, where she spends many long minutes talking, exploring ideas in detailed discussions. These are no monologues, but truly in-depth exchanges whose topic varies from the position of a coat-hanger to expectations of how a space might be appropriated, or what subjective reactions it might get from people. Many references surface, as testimonials to her scholarly knowledge, but more significant to this discussion are the allusions to previous projects. It is like this, during these interchanges, that she brings in the solutions developed previously and energise them anew, at any corner of the office, in the coarseness of conviviality. Precisely because of the triviality in which it occurs, this is a phenomenon that is easy to miss – and very hard to perceive if not through ethnographic means, and even as such, as they sit in small notes on my field diary, whose power only on reflection becomes clear. It is, nonetheless, very familiar for architectural students, since it operates generally in the standard format of design studios. Mechthild is, after all, also experienced in teaching. Besides running KSA alongside Rien, her curriculum includes teaching activities in Delft and Berlin. This phenomenon makes it possible to address perhaps a less visible part of the architect's tools – which is not related to the material or their more evident affordances – but to the time necessary for a skilled perception

421 Morrow, "Sister Practices: Non-Normative Exoeriences of Time and Technology." p. 98

422 Nørgaard, *Bronze Age Metalwork: Techniques and Traditions in the Nordic Bronze Age 1500-1100 BC*.belt plates, pins and tutuli p.8

423 Available on the TACK website, https://tacit-knowledge-architecture.com/events/tack-talks/.

of the task at hand to be developed. In this sense, and drawing from the notions of collective developments of knowledge presented earlier, it is possible to understand the very organizational and operative structure of the architectural office as a tool equally significant as sketching and modeling. Since, as Sautchuk points out, a mode of learning must be analysed and understood "by the type of social relations in which it is implicated"[424], aspects like the spatial environment and the modes of interaction within an architectural office can be seen as important tributaries in the transmission of the particular architectural approach and its specific "problem-setting", as Schön names it[425]. In the case of KSA, this problem-setting involves the sort of holistic consideration that binds together many different challenges of architectural design, but also affords a specific architectural tacit knowledge.

4.3 Coherence: architecture as a contingent practice

Critics and scholars who look at KSA's work recognize, with some surprise, a sense of humility, of an architecture that follows the budget, that doesn't try to overshadow its premises and let things happens - not shying away from challenges but engaging with them. This seemly banal character of their work underlies a work stance that, nonetheless, is worth of attention. Elsbeth Ronner describes it as "*welvoeglijkheid*", a word in Dutch meaning a mix of appropriateness, decency and suitability[426]. In short, it denotes a quality involving their work as being deeply conscious and responsive to contingencies – for example, budgetary ones – where they not only do they address these difficulties, but manage to create very insightful solutions based on these challenges. KSA's preoccupation with the possible, the feasible, translates into a work stance that acts within the contingencies and difficulties, and opts to engage them as a way to improve the quality of the finished problem. It is possible to identify this strategy, for example, on how KSA engages directly with the limitations of the plot, specifically in the design of two schools, both located in Flanders.

424 From the original in Portuguese "a aprendizagem deve ser consi- derada pelo tipo de relações sociais em que está implicada" in Sautchuk, *Aprendizagem Como Gênese: Prática, Skill e Individuação*, 2015. p. 119

425 Schön, *The Reflective Practitioner*.

426 Elsbeth Ronner, *Decorum and Irregularity*.

FIG. 4.18 The plot of the Lakbors school. Source: KSA

The *Stedelijk Lyceum Lakbors* is a school situated in a very irregular plot that sits in a 45 degrees angle from the street, with only a single, narrow connection to the street – made even narrower by the existence of the two historical buildings. The plot occupies mainly in the inside of the block and has a vaguely triangular form. For the sake of clarity, the overall shape can be compared with that of an arrowhead, being the shaft the connection to the street. The plot's total area is generous in size but, looking from the entrance, it would be easy to radically misinterpret the scale of the project. The architects of KSA decided to transfer this challenging shape to the overall typology of the building, creating the marked diagonal elements in the roof, and at the same time generating a complex spatiality on the interiors of the buildings, playing with light, verticality and tridimensionality. The Lakbors school is made of what initially appears as different volumes connected by some passageways but, on a closer look, one realizes that it is a single main building comprised of a series of interconnected volumes, including the two older, existing constructions.

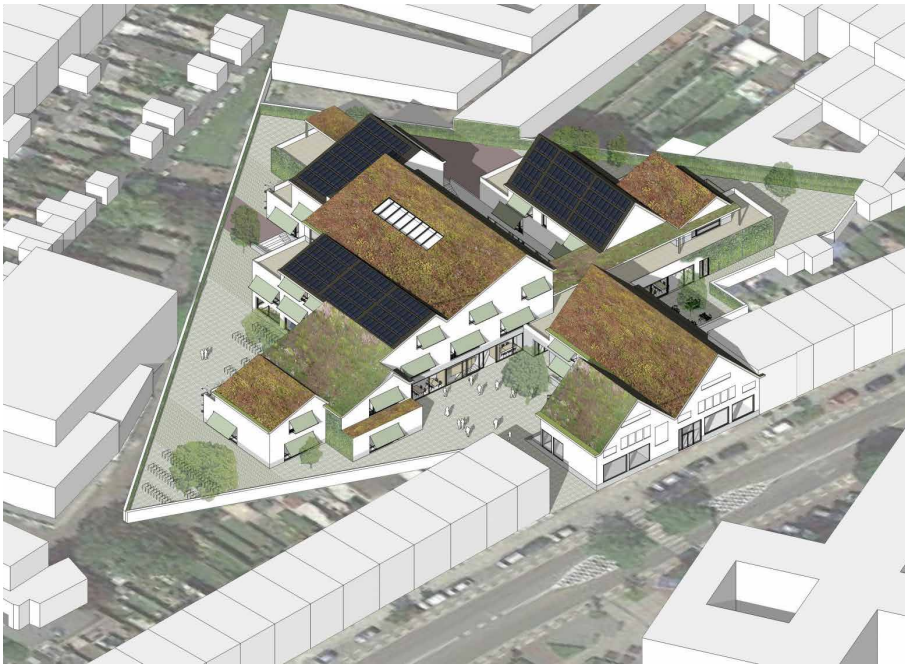

FIG. 4.19 Aerial view of the Lakbors school. Source: KSA

The two historical buildings, varying in height and overall size, flank the entrance to the complex, being the only parts of the project to face the street directly. Their overall design was kept, but these buildings gained new roofs and large windows in the plinth, providing a much more open relationship with the street. From the passage of the entrance, students and teachers find a larger square enclosed by the main building which, at first, can appear as small. The placement of the new building is a directly opposite approach to the previous situation of the existing to-be-demolished buildings, that were positioned alongside the limits of the plot, leaving the middle as an ample green and open space. The school is located roughly in the middle of the plot, and thus the building hides from the newcomers most of its volume and internal green spaces. Instead of following the plot's orientation, the new construction reflects the general orthogonality of the historical buildings by the entrance, a strategy that creates irregularly shaped green spaces around the main building.

FIG. 4.20 Courtyard render of the Lakbors school. Source: KSA

What might be considered as a bold move indeed makes sense when one considers the domesticity that is so common in KSA's project descriptions, and how the scale of the previous open space, coupled with the imposing monumentality of the existing building's back façade, creates a space that is not on the 'human scale'. By fragmenting, breaking the ample space into many surrounding areas, the sight is enclosed and these fragments become less monumental. Additionally, the new building volume increases progressively in height, not presenting tall walls enclosing these spaces that, by being smaller, don't offer the perspective needed to capture the entirety of the height (and overall size) of the new building. Instead, it is more easily for it to be apprehended or understood as a series of distinct (although stylistically connected) buildings, not entirely unlike rowhouses. This strategy gives the project a neighbourhood atmosphere, distributing the program and softening the scale of the building. Each part of the school, or "house" as the architects refer to, is assigned with a different program, in a way to accentuate the autonomous character of each section. This also allows a narrative composition. Appearing as many, the building becomes many, as its different volumes, while remaining connected physically and aesthetically, also possessing a unitary character. The whole project resembles an enclosed village and, indeed, the architects state that the school is designed as a "miniature city" – having thus a sort of medieval feel. Working somewhat like a castle, where the unity of the building is given as a surrounding unity, perceived from the courtyard or square within – the Lakbors building presents itself as many, from the inside, from the perspectives and views of its enclosed open spaces.

FIG. 4.21 Courtyard render of the Lakbors school. Source: KSA

To maintain the scale needed for a domestic, neighbourhood-like character, large requirements of the program were moved to the basement. They are located in the heart (or main section, or “house”) of the building. In order to light these areas, a low-level patio is located in the middle of the building, cutting deep through its main volume like a narrow alley. It ends in a large stair connecting it to the ground level on one side. On the other sides, it is surrounded by windows, illuminating the classrooms on both sides. The patio has no cover, and it is flanked by the terraced areas on the floors above, as if facing their balconies towards the alley. This composition imbues the patio with a casual centrality, and it serves as a visual point of connection between different levels –enhancing the social character of a school. It is a place of encounter between students, understood as young people that need space to exercise their public life – beyond being simply the subjects of knowledge transfer.

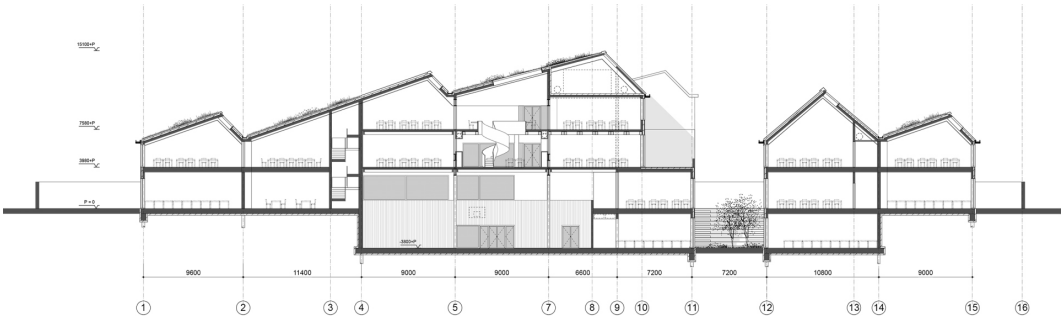

FIG. 4.22 Section of the Lakbors school. Source: KSA

Similarly to the Lakbors school, the plot of the *Jeugdvoorziening Everaerstraat Antwerpen* occupies mostly the middle of a residential block of rowhouses. The school has a double agenda: while during the day it is "owned" by students and teachers, during the night some of its spaces are opened to youth associations of the neighbourhood. Thus, the school operates with three different entrances, and has many semi-private spaces through which the spaces are articulated. Taking advantage of such contingencies, KSA's design weaves a complex play between public and private narratives, situated in a somewhat fragmented building whose boundaries of inside and out are difficult to gauge. To deal with the enclosed condition of the plot, the architects designed many quasi-open spaces as sort of greenhouses – "verandas", as they call them – that at the same time bring light to the interior spaces and also create small breathers that remedy the encapsulated nature of the school.

FIG. 4.23 Courtyard render of the Everaertstraat school. Source: KSA

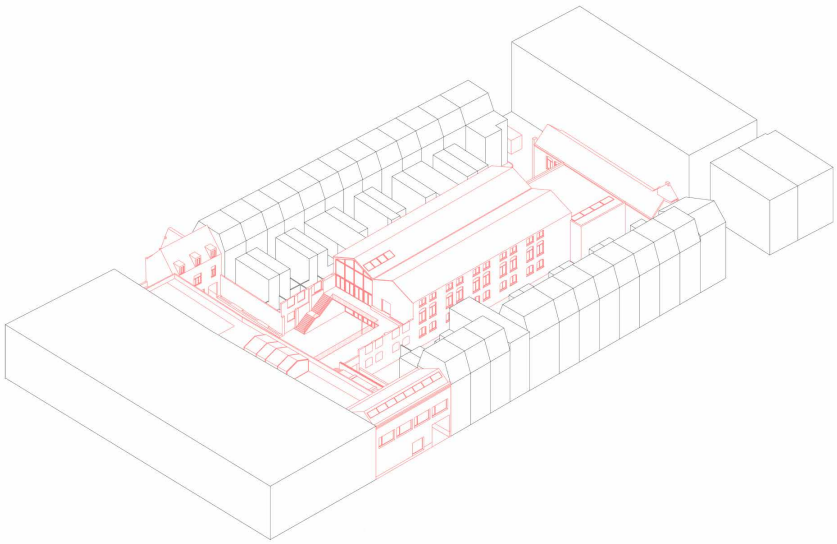

FIG. 4.24 Axonometric view of the Everaertstraat school. Source: KSA

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Moreover, to separate the use of children from that of student associations, the main entrance is scaled down, resembling a humbled version of the brutalist artifice: a sequence that takes the entrants through an intimate, enclosed space, contrasting with the openness of the streets, just to be soon flung into another opening. In the place of an awe-inspiring monument, however, students enter into the so-called *groete speelplein* (or "big play-square", literally), a large courtyard splatted with gardens that provides access to the building and views of the interior façades. It is, at the same time, a bold and an unassuming move. It allows a clear view on the facades and create an identity for a building that, for its large size, has almost no appearance on the street. At the same time, by following the brutalist formula (consciously or not), it enables to distance the atmosphere of the place from the public and collective character of the street. In order not to completely dissociate the building from the outside, however, openings in the opposite gates provide the project with a trajectory traversing it, cutting the block in two, at least visually. They connect the courtyard with the neighbourhood and create almost a surrogate for the street atmosphere inside the school. It is a sheltered and controlled environment that provides safety to the smaller children while, on the same time, offering them an aspect of the collective life shared with the city inhabitants. Conversely, the windows pointing to the courtyards are used to present a green area to the city, softening the dense composition of facades in the streets. It makes one wonder if it is not a way to, slowly and securely, teach the children about contemporary urban life, offering the degrees and contrast between public and private spaces. In any case, at their core, these are all very simple solutions that answer to very pragmatic questions, in a remarkably sensible and adequate way.

FIG. 4.25 Interior areas of the Everaertstraat school. Source: KSA

FIG. 4.26 Floorplan of the Everaertstraat school. Source: KSA

KSA's strategy of compliance, or appropriateness, is not limited to the relationship between the built volumes and the plot. It can be also seen in their use of natural materials. Despite of it being a general strategy of KSA, their choice of materials is always balancing the "materiality" with technical qualities. Thus, in the *Everaertstraat* project, not only natural materials were used, but other, industrial materials were employed in accordance to their properties in both the new building and on the readaptation of the old factory structures. This search for the best material for the task at hand is, a stated above, very common to the idea of craftwork, and it affects the use of natural materials in the practice of the KSA, reflecting also their positions on sustainability: wood, for example, is used not where it is possible to be used, but where it can be better used. Besides, and evidently, this approach to materials also permits the office to save on resources and operate well within their common budgetary restrictions.

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FIG. 4.27 Material specifications of the Everaertstraat school. Source: KSA

This attention and respect to the contingencies of each project is reflected also their representative choices. It is possible to notice the office's predilection for unusual and non-realistic architectural representations. Using stylized figures to populate school renderings or just showing nonchalant uncoloured perspectives, the architects make clear their intention not to pursue a hyper-realistic approach. This is how the *Everaerstraat* school project is represented, with ludic collages of hand drawn children, trees and plants instead of pictures. The images of the entrances, with the occasional appearance of cartoonish children, transmit domesticity and security, while still showcasing clear stylistic intentions in the treatment of the facades. The materials are not realistically represented, but still very identifiable. Shadows, however, are presented. Users will recognize a bit of the Sketchup Software aesthetics behind it, although with changes. The colours are softened to pastel tones and there are no stark lines. It points, simultaneously, to the primary tool used for the 3D representation, but also indicates that there was some posterior treatment of the images, in another software (which adds some mystery), adding layers to the image. Additionally, the images are extremely simple. They are not overcrowded, but instead show only some children, almost no furniture, and the vegetation. These are added not to capture the attention, they do not hide the building itself, but at the same time serve as a mechanism for understanding scale and to approximate the daily use. The sky is also another important feature, precisely because it presents no particular quality. It is not a lavish, impressionist sky (which would, indeed, make sense geographically, if one is fond of these artistic types of references), but a greyish pastel blue, tending to green, that seems to offer no abundance of light. Indeed, as the school is located in Antwerp, this would be closer to the usual sky people experience there, and while not bathing the building in light, it clearly shows that, despite the not-so-ideal weather, the school is well lit and harmonic with diffuse illumination.

FIG. 4.28 Exterior rendering of the Everaertstraat school. Source: KSA

KSA's representational strategy follows a particular philosophy behind their work: one that does not intend to deliver the design as if it were finished, completed, but rather treats it as a process, a possibility, that, if given proper care and effort, can come to reality, but still remains open to influence, contribution and discussion. Ultimately it is a more accessible way to represent architecture. It does not impose on the viewers the idea of reality (or a *simulacrum*, given the absence of the original), but leaves spaces to be filled by their imagination, in a sort of *creative trigger* that may encourage people into getting in the architect's shoes — that is, looking to spaces through a questioning position. This procedure levels the field between architects and clients (or destined users) and allows a design practice that is more focused on collaboration than persuasion.

FIG. 4.29 Exterior rendering of the Everaertstraat school. Source: KSA

In summary, there is a perceived quality in the work of KSA that is related to a special attention to the spatial qualities possible for architecture in tandem with a responsibility towards its material nature and social contingencies. I argue that this pressure represents precisely the pull of reality that helps grounding the overall endeavour of building spaces and make their practice similar to craftwork. As Marchand argues, after all, "identifying, and overcoming mistakes, problems, and challenges are activities deeply informed by the cultural contexts in which craftspeople operate, and by the social networks in which they act"[427].

For some, this might seem at odds with an analysis from the perspective of crafts, since craftsmanship is often equated to the utmost elevation in skill and quality. This is frequently translated in rather megalomaniac terms, such as using the *best* materials, the *best* techniques, the *best* processes, the *best* tools. In short, the best production. But, even if and where such impulses for excellency are true (following Sennet's interpretation of craftsmanship), they are tamed by the material conditions of the artisans and the social context to which they are linked: what materials are available, tools, processes, the capital needed to get them, but also the aesthetics praised by the social context that allow artisans to sell their products, the average price of the competing products, how much people are willing or able to afford etc. The differences in excellency and their associated contingencies, in any case, do not historically define craft in an exclusionary way. Excellency is not a measure to gatekeeping:

> According to our readings of Homer, there are certainly tektones who possess the highest form of technē, but others do not, and they are tektones nonetheless.[428]

427 Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making*. p. 12

428 Holst, "The Fall of the Tektōn and The Rise of the Architect: On The Greek Origins of Architectural Craftsmanship." p. 3

Working with the contingencies, and not just avoiding them, however, is a big part of being a craftsperson. Dealing with these, or balancing them out, is an attitude that connects the work with the socioeconomic conditions of the context, and working with constraints poses a tension between the search for quality and the adequacy with the material conditions available. Contrary to the common ideal of perfection, the actuality of craftwork is more often about doing the adequate than doing the best, and it implies a specific capacity of the artisan to properly read the surrounding's economic disposition. The craftsperson, thus, must be skilled in appraising the environment and the impact of their work in it. It is a form of self-assessment as much as it is a way of navigating the social conditions of the context.

Michael Owen Jones shows how deeply quality in craftwork is entangled with pragmatic aspects of production[429]. His demonstration that chairmakers will opt for less aesthetically pleasing and even technically inferior objects due to matters of time, budget, client preference and others show that the question is relative to the process rather than the object, which is in tune with my process-oriented interpretation: in the chairmaker's work, such considerations are translated and articulated by the lexicon of practice, of procedures and processes - it is mostly in the process that they engage with the object and negotiate its quality. As Cyril Stanley Smith remarks, 'The craftsman can compensate for differences in the qualities of his material, for he can adjust the precise strength and pattern of application of his tools to the material's local vagaries"[430].These negotiations are essential in crafts, as they develop in accordance with the contingencies and affordances given by society or, in other words, "the happening of the social world – its ongoingness, relationality, contingency and sensuousness"[431]. Navigating these conditions – material, social and cultural – in the performance of production is, as seen previously, a fundamental aspect of what craftwork is, and a particular negotiation within the performance of craftmanship.

Therefore, every craft practice and production need to be understood within the scope of the social-economic context. In other words, understanding that what we call craft denotes a model of production that, despite of all the focus on the excellency and expertise in craft discourse, is very much grounded in pragmatical questions. Despite quality being a very important drive in crafts, in general and historically, craftspeople have to balance it against the economic reality that sustains their production. The same holds true to architecture. Craft starts on the level of the

429 Michael Owen Jones, "Violations of Standards of Excellence and Preference in Utilitarian Art," 1987.

430 Apud DeLanda, "Material Complexity." p. 21

431 Nina Wakeford, *Inventive Methods: The Happening of the Social*, *Inventive Methods: The Happening of the Social*, 2012, https://doi.org/10.4324/9780203854921. p. 2

material, that has its own properties and affordances that need to be dealt within a particular production, which by itself is not always straightforward. Similarly, the endeavour of making a good building is not a question of design alone. Good materials are expensive, detailed work takes time and, at the end of the day, society cannot just afford every production to be the very best it can be. There is a tension between this strive for quality and what could be call the 'grain of economics' that architects have to deal with, which is often disregarded in the appraisal of buildings. As a way of making buildings and spaces, architecture, just like craft, have to address the contingencies of the economic environment and adjust the production accordingly. The navigation between these different points is fundamental to understand what good architecture is in terms of material production.

KSA's work can be explained as a practice that is aware of this necessity and actively pursues to keep it central to their process of decision making. Their strategy to "design from inside-out", for example, is an approach that is much more practical than only a metaphor defining the hierarchical and temporal organization of the design process. It involves the establishment of parameters and the definition of priorities, for example, in the allocation of resources for materials in relation to their position in the building. Interior materiality is prioritized for the sake of atmosphere and sensorial quality (which will be addressed below), while the façade's materiality becomes secondary. It is an approach that is diametrically opposed to renowned works of architects whose appeal is centralized in the experience of buildings as objects perceived primarily from outside. KSA's projects often present humble facades, in an architecture, described by Elsbeth Ronner, that "does not seek to brag or shout. It does not draw attention to an external discourse, but to the private experience of the building"[432].

KSA's decisions often step away from the notion of the old architecture genius, or the more contemporary "star-architect". In this sense, their work can be position at the other end of the critique made by theorists Steven Harris and Deborah Berke, in *Architecture of the Everyday*, denouncing a form of cult of the authorship that populates the production of architectural objects and representations, where a "heroic formal dexterity" is the focus, pursued obsessively[433]. In *The Shape of Time*, George Kubler points to this sort of misguided understanding of the genius, stating that "we still today unthinkingly identify 'genius' as a congenital disposition and as an inborn difference of kind among men" rather than a situated coming together of different factors that constitute, instead of a eugenic messianic figure, an "efficient

432 Elsbeth Ronner, *Decorum and Irregularity*.

433 Apud Janina Gosseye, Naomi Stead, and Deborah vand der Plaat, *Speaking of Buildings*, ed. Janina Gosseye, Naomi Stead, and Deborah vand der Plaat (New York: Princeton Architectural Press, 2019). p. 10

entity" in face of the particular challenges and dispositions of a time[434]. A genius, for him, is "a phenomenon of learning rather than of genetics", and, in relation to the apparition of such figures in history, "[t]imes and opportunities differ more than the degree of talent"[435]. In such a framework, it becomes meaningless to debate symbolically rich productions based on the matter of individual talent, or genius, but how the contingencies of a particular place and time are addressed and give shape to innovative solutions. As Marchand points out, "[p]roblems, like their solutions, are tied to concrete settings".[436] Architecture, accordingly, "is defined by its very contingency, by its very uncertainty in the face of these outside forces"[437].

This dichotomy between what seems an architecture of genius and an architecture of contingency can, nonetheless, be understood under the framework of crafts. For craftsmanship is frequently under a paradox, as the more successful artisans can break out of its social and material contingencies, to some extent. By gaining social status, some artisans rise above the normal constrains of their craft, and start defining tendencies, techniques and aesthetics by themselves, achieving relative creative and productive freedom. What constitutes the paradox is that this rise is inevitably accompanied by the distancing with the very contingencies that conditioned the particular skills of the craft. Dealing with problems and the constraints is part of crafts, and rising above it takes the artisan to a new paradigm, more akin to the dimension of the artist. That is not to say that art is without limitations, but they are of another kind. Crafts find their value in a more common market than arts, although still possessing significant symbolic values and participating within a complex structure of a "cultural middle-ground production", in which "on one side, there is a body of personally acquired practical 'know how' [and, on] the other side, one finds those artists and designers whose innovative activity tends to establish the current fashion or style"[438]. However, for most craftspeople, it is not a question of producing a statement that later is evaluated by galleries and critics, but incorporating it in the very development of the project. Thus, the analysis should not focus only on productions of the highest quality: the pinnacle of craft, idiosyncratically, is not very representative of craft. The same is also valid for architecture, as remembered by Boucsein:

434 Kubler, "The Shape of Time: Remarks on the History of Things."

435 Kubler. p. 8

436 Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making*. p. 14

437 Benedikt Boucsein, "What the Files Reveal: Making Everyday Architecture Talk," *Dimensions. Journal of Architectural Knowledge*, 2021. p. 167

438 Campbell, "The Craft Consumer: Culture, Craft and Consumption in a Postmodern Society." p. 36

> ‘high’ architecture is usually not as strongly influenced by external conditions as everyday architecture: Due to specific client-architect relationships, less restrictive budgets, or resources of the architects, external modal conditions can be transformed in the design process in a subtle, complex, and more elaborate way. Everyday architecture, in contrast, does not work against the strong modal conditions it is subjected to. It does not have the means, resources, and mandate to do so. Rather, it works with the conditions in an affirmative manner, translating them directly into architecture. [439]

As such, “everyday architecture” can be seen as perhaps more akin to craft than “high architecture”, in regards to how it responds to particular social and economic contingencies. An opposite example can be seen in the words of Peter Zumthor, acclaimed to be the architect of craft, in his interview for OASE, where he explicitly shows his influence over the clients, forcing them to choose a different plot[440]. Instead of embracing the difficulties and non-ideal situation of the land already possessed by his clients and accepting the challenge of a difficult negotiation it would imply, Zumthor instead opts to use his influence and change the setting altogether. *Crafty*, perhaps, but not exactly craft-like, if one follows the reasoning of Trevor Marchand that problems “may therefore be construed as challenges that call for response – challenges of the kind commonly encountered in craftwork.”[441] Indeed, this sort of authoritarian autonomy can be interpreted as the search for independence from material and cultural constraints, as in the paradox of upper echelon crafts. The flipside, however, is the loss of a connection with precisely the creative powers connected to this grounded, socially contaminated practice. In another paradoxical instance, Campbel shows how this sort of ‘subversion’ of craft tradition creates the virtuality for changes in style and the flourishment of new material cultures:

> Members of youth subcultures, for example (as the reference to baseball caps suggests), have been inclined to act as subversive consumers in this way for some time. The so-called teddy boys of the 1950s, for example, actually asked tailors to make up suits to their own Edwardian designs, ignoring the professional advice that the tailors themselves offered concerning what was considered aesthetically acceptable in men’s wear.[442]

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439 Boucsein, “What the Files Reveal: Making Everyday Architecture Talk.” p. 168

440 Klaske Havik and Gus Tielens, “Concentrated Confidence A Visit to Peter Zumthor/ Geconcentreerd Vertrouwen Een Bezoek Aan Peter Zumthor,” *Oase Journal* 91, no. Building atmosphere (2013): 59–82.

441 Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making.* p. 14

442 Campbell, “The Craft Consumer: Culture, Craft and Consumption in a Postmodern Society.” p. 30

It is important to notice, however, that in Campbel's example the break with tradition concerns specifically the break with a profession's established aesthetics, not the material conditions in which the suit was made. The stylistic innovation, in this situation, came from the clients, not the craftspeople that, nonetheless, produced it. As seen, in an immediate contrast with Zumthor's approach, the architects of KSA refuse to impose their ideas on the clients, but strive for fruitful relationships based on attention and care. Perhaps this care, or this rigour, to use Mechthild's term, is what imbues their projects with such perceived quality of appropriateness, as seen by Ronner.

Wilfried Wang tackles a similar discussion in recent paper, addressing the increasing irrelevance of context in the generation of architectural form. In a modern phenomenon that seems to contradict Jeremy Till's statement that "architecture is […] shaped more by external conditions than by the internal processes of the architect"[443], Wand describes a process in which "formal manifestations increasingly become products of their own logic and of an external intellect that takes possession of them"[444]. The process is linked with the abstraction impulse of early twenty century art *avant-gardes* and its discursive movement in favour of expressive freedom. Also, it refers to the underlying positivist episteme of industrialization, in which, from "sensory perception to movement skills, from techniques and technologies to products, from physical to non-physical systems and structures, humans have achieved autonomy from other species, from themselves and from nature"[445]. In contrast, the author points out to the importance of a cultural setting and a symbolic background to define, for example, the premises for the design differences between an urn and a pot: without the social dimension, both urn and pot are reduced to mere cylindrical recipients.

443 Jeremy Till, *Architecture Depends* (London: The MIT Press, 2009).

444 Wilfried Wang, "On the Increasing Irrelevance of Context in the Generation of Form Or: Why There Is No Difference Between an Urn and a Pot," *OASE* 76 (2008). p. 94

445 Wang. p. 93

4.4 Resonance: artifacts of use, affect and culture

There is a slight coarseness in K.S.A buildings, reminiscent of the notions of eastern crafts, as described by Junichiro Tanizaki in his book *In Praise of Shadows*[446]. To my eyes, as architect and craftsman, it appears to come mainly from materials: contrasting to the smoothness of their building's general pragmatic and rational shape, their materials have rich texture. But this coarseness is also emphasized by how the elements are arranged in the buildings, in layers of texture coupled with layers of colour, according to the different uses of the spaces. Whichever the case, this particular quality is ever present in the discourse surrounding KSA's practice. It is conceptualized in many ways. Frequently, it is referred to as "atmosphere", a term that tries to make evident the feeling of a space or room. Less often, it is appointed as "phenomenological" giving emphasis to the adequacy the approach has with phenomenology in philosophy. Finally, it is also referred to as related to "perception", linking it to subjective and emotional tones[447]. Importantly, all these forms of explaining their philosophy, besides evidently sharing a destination, a driving force that points them towards what could be considered their essence, also share a fundamental condition, or constriction, to which the notion is bound: the design of spaces is the design of the convergence between people, matter and time.

The way time is dealt by KSA can be understood as a response to Kubler's "succession of events" or Bergson's notion of "duration"[448]. The daily users have primacy in the designs of KSA. This hierarchy shifts the importance of design back to the interior, where function once again is treated. In this line, there is a hint of minimalism in KSA's approach to interiors, with the purpose of making spaces that can accommodate the mess of the everyday use without amplifying it. This can be seen, for example, in their *De Basisschool Edison* project, a design for a school in Antwerp.

446 Junichiro Tanizaki. *In praise of shadows* (Leete's Island Books, 1977).

447 Sofie de Caigny, "Mouments and their many voices", Flanders Architectural Review, 14; Mathias Muller, in his report for the Jury award for the project De Kamers

448 Kubler, "The Shape of Time: Remarks on the History of Things." Henri Bergson, *Creative Evolution* (New York: Random House Inc, 1944).

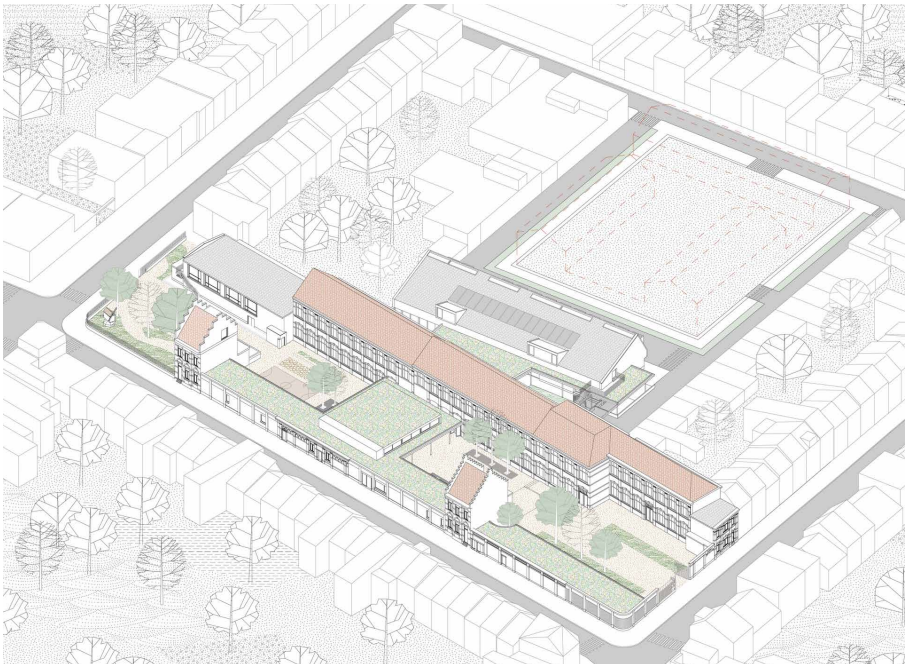

FIG. 4.30 Aerial view of the Basisschool Edison. Source: KSA

In short, *De Basisschool Edison* (referred to as *de Molen* in the office by the time of the research) is a project of renovation of the previous school building and the construction of a new one, articulated with the new addition of two *refters* – or refectories – that become the spatial coordinators of the entire complex. The complex contains a main building: a rectangular, long and narrow two-story high block of "grandiose design"[449], situated at the back of an equally long and narrow terrain and facing the street with a richly ornamented brick facade, in dark brown, and red painted wooden window frames; and a new building for the primary school, sitting in an added piece of land of irregular shape, where a parking lot used to be. The latter is slightly crooked, in relation to the lines of the existing building, and the design follows this diagonal alignment, sitting at the back of its plot. In fact, de Molen school can be understood a connection between two schools, and the refectories actualize this duality in the project. The refectories are located in new constructions, connecting the existing building and the new ones, thus establishing a unity in the entire school.

449 Available at the KSA's website, https://ksa.nl/, accessed 17/04/2024

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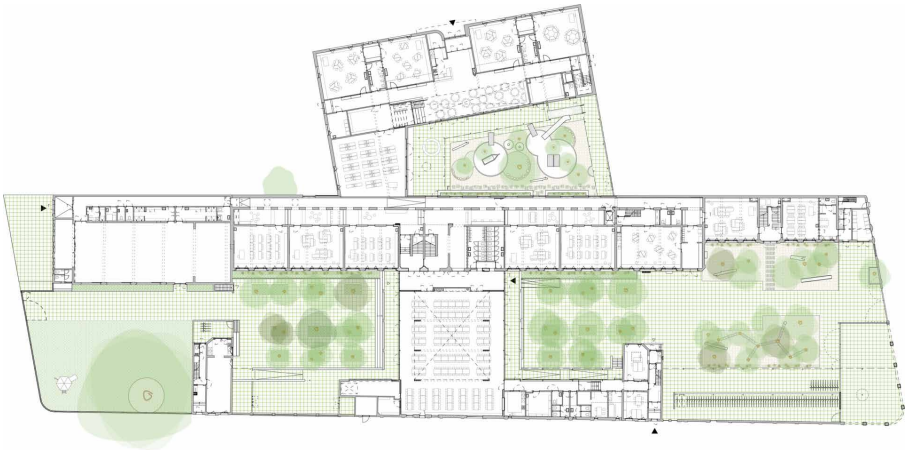

FIG. 4.31 Floorplan of the Basisschool Edison. Source: KSA

One of these refectories is more open and connected to the outdoor areas. It is designed with a focus on the older students. The other is more intimate and protected, intended particularly for younger students. The first *refter* also separates two outdoor areas, creating simultaneously a sort of an entry square, through which the students access the complex, and a more private courtyard that doubles as a gym area. It generates an interesting spatiality, where students are at the same time witnessing the movement of the school, integrated in its liveliness, while still in touch with public space. It also connects the main building with the new administrative area. The second *refter*, intended for smaller children, has a different atmosphere. While still organizing the circulation, it acts more as a filter, or a cushion. It has an irregular shape, as it incorporates the different grids of the old and new buildings. On the northern side, it follows the existing school building; on the south, it follows the new building's structural grid.

FIG. 4.32 Courtyard rendering of the Basisschool Edison. Source: KSA

Another spatial solution resonates with the idea of creating intermediary zones: the new corridor included in the main building. From the interview with the project manager, it was possible to trace its becoming. Initially, the old corridor was maintained, while the added space on the back of the building housed small tooms with tables and seating. Further on the design phase, these spaces were inverted, the small, open rooms were positioned against the classrooms and the corridor was now placed in the added volume. This inversion gives an additional quality to the rooms, that now serve as antechambers, intermediary spaces between the corridor and the classrooms. The allow light and visibility to run through, but conceal and create distance between the more permanent quality of the classrooms and the dynamic corridor. This simple solution re-engages the theories of Herman Hertzberger, in what he would call semi-private and semi-public spaces that buffer and articulate the different uses between rooms.

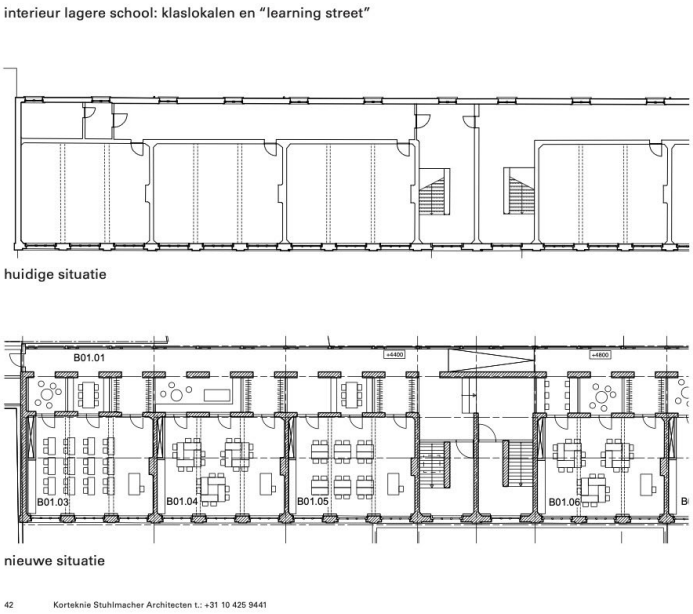

FIG. 4.33 Floorplan of the corridor solution of the Basisschool Edison. Source: KSA

As interesting as the spatial ordination of the design of school is, it is KSA’s material treatment of its interior that can most illuminate how their designs respond to experience. An example of this treatment is the way in which they design storage furniture, incorporating it as part of the building itself. By making the storage spaces and furniture in the same logic as the architecture supporting it, they frame the eventual additions, creating place for the play of the quotidian, incorporating the spontaneous in the designed.

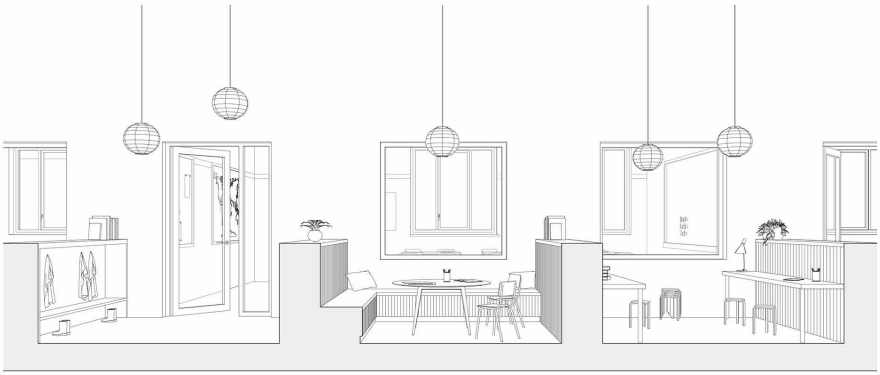

FIG. 4.34 Section of the corridor solution of the Basisschool Edison. Source: KSA

By merging furniture and building, wall and wardrobe, drawers and coat hangers, KSA's design reduces the layers within the architecture of *de Molen* and constructs a canvas on which appropriation can take place without contrasting to the background. The result is a parallel to their approach towards landscape, frequently addressed in their writings – a dialog between the building and a "life-scape" of its use-forms. It is a way of treating fixed furniture in a similar fashion as windows, framing and harmonizing that what is beyond the control of architects, and approximating the space and the objects that inhabit it. This strategy softens the classrooms, making them appear less chaotic. Even if chaos is present (especially with younger students), the background accommodates it in an orderly way.

FIG. 4.35 Interior perspective of the Basisschool Edison. Source: KSA

Once again, it is a reiteration of KSA's rule-and-play dialectic that, in this case, responds to the critique woven by Adolf Loos in *The Poor Little Rich Man*[450]. Instead of addressing the need for storage through the design of furniture and architecture as a closed system, a case where things need to fit neatly, ultimately freezing the life of user and building in the moment of its conception, KSA's approach is open. It houses objects, garments and the various items used or produced in class not by being a photonegative of their form, shaped specifically for one purpose – but rather accepting its limits and working with versatile designs that can maintain functionality without the need to predict their contents. This approach, resonant with the use of buildings, is also way of merging the timeframes of design and building, acknowledging "the spatial knowledge embedded in interventions in buildings made post-completion by inhabitants and users" that are "often regarded as beyond the bounds of the discipline"[451]. In a particular way, the solution incorporates the functionality and the life of the building in the design without prescribing it, but by saving the space in which these become part of the building and are presented to users. It *makes room* for them.

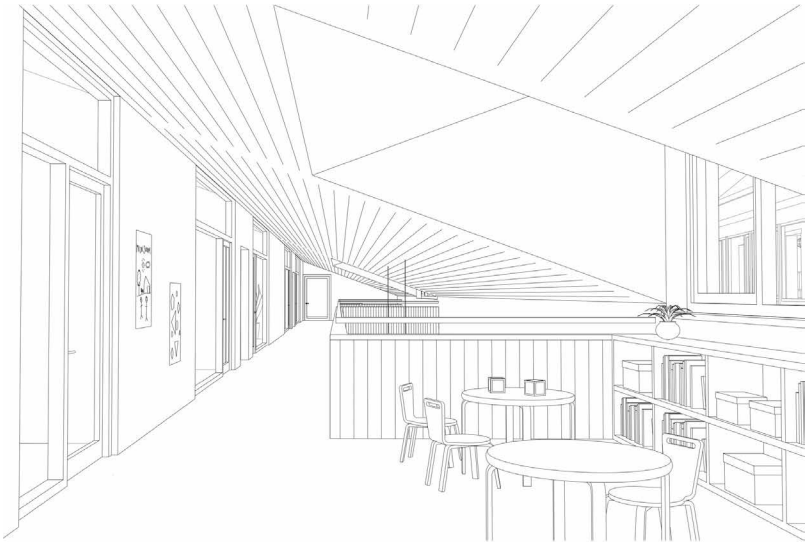

FIG. 4.36 Interior perspective of the Basisschool Edison. Source: KSA

450 Adolf Loos, "Poor Little Rich Man_Adolf Loos.Pdf," *Neues Wiener Tagblatt*, 1900.

451 Gosseye, Stead, and vand der Plaat, *Speak. Build.* p.11

Another consequence from this reduction of layers is that the building itself becomes more haptically approachable, more present and active in the interior, seizing to be only the background but becoming effectively at hand for its inhabitants. Closer to the use, to the bodies and to the senses, the building too becomes furniture-like. By sharing the same aesthetics and enchantment, it absorbs the greater 'permission' to be touched that furniture has. The walls stop being limits only and becomes more accessible. Even if mostly on the realm of perception, by sharing this haptic character with furniture the building acquires a bit of their potential, contributing to the sense of domesticity so often associated with their work[452].

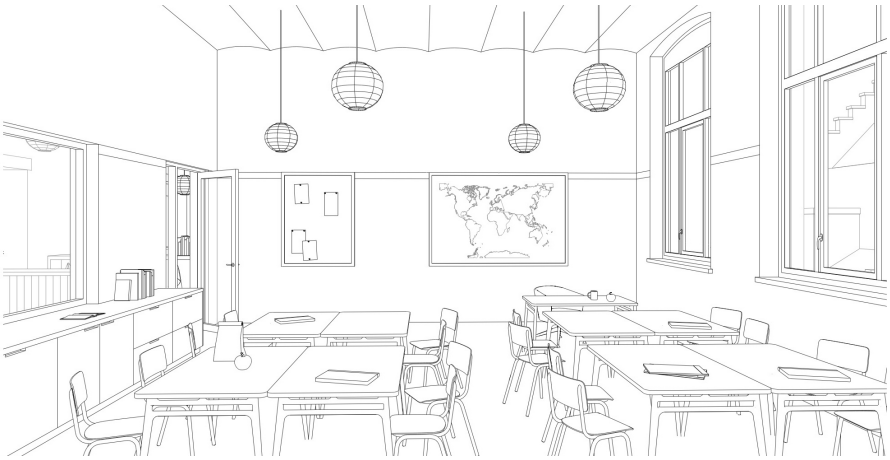

FIG. 4.37 Classroom at Basisschool Edison. Source: VAi.

In tune with these haptic capacities, the architects of KSA primarily use wood in places within the reach of the hand, especially when designing classrooms. This is a keen recognition of a material quality, as exposed by Kuijpers, but related to common use: of how good and inviting it feels to the touch, and how this sensorial quality is related to a tradition in crafts and architecture. With KSA's design of furniture that works together with these wall panels, the building and the furniture merge a little bit, and it becomes hard to pin-point where one starts and the other ends, in a sort of hybrid between two. Their buildings feel domestic, accessible, at hand, just like furniture. And it does so exploring the qualities of materials and the pragmatic requirements for furniture, like places to storage things, to hang coats, or surfaces to work or sit on. KSA's use of wood brings to mind haptic memories, it

452 Elsbeth Ronner, *Decorum and Irregularity*.

invokes images of wooden furniture, and evokes traditions of wooden architecture, filled of beams, trusses and joints that permeates the imagination of times gone past, especially in Europe. These images refer to and reproduce a diffuse idea of craft, be it from its dimension of quality or from its archaic tones. Wood is known and employed based on a material quality that is emminently tactile or, in other words, as a 'warm' material that invites the touch. There are other reasons for this, as it is also technically appropriate for contact. Handrails and ladders benefit from wood's capacity to absorb moisture to prevent slippage, for example, and that property explains its frequent use in handrails and on firefighters ladders[453].

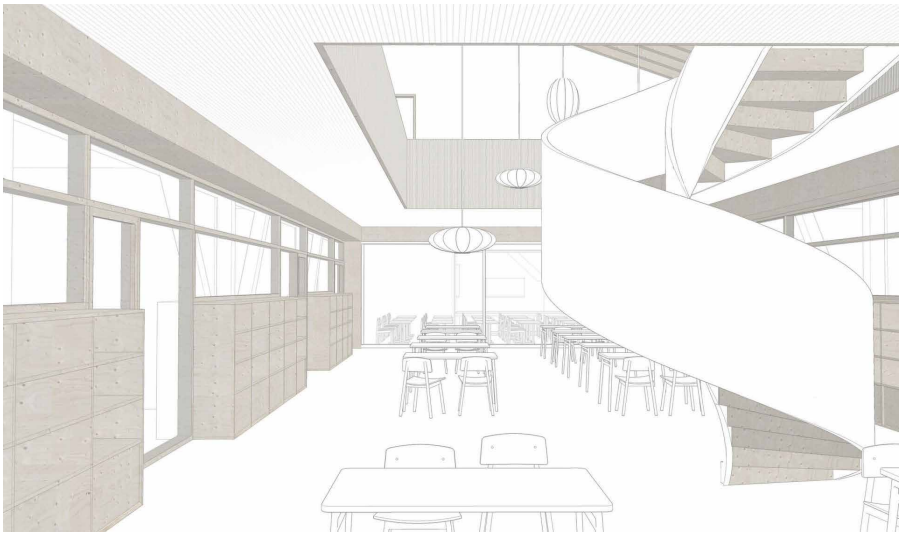

FIG. 4.38 Interior perspective of the Lakbors school. Source: KSA

Accordingly, in the *Bassischool Edison* and in other projects, one finds that the lower zones of the building's interior use the most wood, showing that the quality of material explored in this case is a sensorial one, particularly haptic. Wood is treated here mainly from a tactile perspective which, accordingly, finds a strong resonance with the crafts of furniture making. As noted by Porfírio Valadares, a crucial difference between the crafts of carpentry and cabinet or furniture making is the treatment of wood to the touch[454]. Furniture making with wood makes use

453 Valadares, "Da Construção à Montagem."

454 Valadares.

of several techniques to enhance the contact between skin and wood. In the west, sanding the surfaces up to fine grits is preferred; Japanese woodworking, on the other hand, is known for the employment of razor-sharp planes to produce a smooth effect, a featured noticed and acclaimed by Australian architect Richard Leplastrier. Running his hands through a handrail in a Japanese temple, he can recognize in its smoothness the wood plane used in its making[455]. The resonance between building and using is evident in his description, and viewers are presented with a notion of materiality that relies not on design in a *representational* sense, but within a process-oriented way of knowing; in which design is more of a volition, a directionality than a code or prescription. His notion of design, if the term needs to be maintained, has blurred boundaries, assuming its extrinsic, external *telos* in the amalgamation of making and using, in the experience in consumption *and* production. In other words, aiming at the "syntax of gestures and instruments simultaneously fixed in their types of relation, and flexible in their conduction"[456] that defines a technique. It is a practice that focuses on the relationships involved, be them haptic such as the feeling of smoothness, slowly constructed by the running of the skin against the wooden surface, or the very action of the wood plane that affords such sensual experience. Sensual and productive, phenomenal and processual, his remarks directly connect craft objects and crafted products, presenting a way of understanding materials in a continuum from process to use. Applied to materials, as DeLanda suggests, it is a way of referring "not to tendencies but to capacities, the capacity of a material to affect and be affected"[457] instead of an operation based on abstraction. Conversely, it creates a phenomenal connection with the world in its virtuality, in contrary process as the one described by Ben Trubody:

> due to the productive success of this worldview, we take abstract equations, objective measurements and the like, to be the origin of technological and epistemological advancement. Due to the success of this present-at-hand account of seeing everything explainable in terms of beings it is not difficult to take this mode of understanding as being primary, or how we "really" are in the world.[458]

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455 From the Documentary, "Architect Richard Leplastrier – Framing the View", available at https://www.avrotros.nl/archive/architect-richard-leplastrier-framing-the-view-17-10-2020~nxiur39u/, accessed 17/04/2024

456 Marques, "Forjando Orixás: Técnicas e Objetos Na Ferramentaria de Santo Na Bahia." p. 31

457 DeLanda, "Material Complexity." p. 19

458 Ben Trubody, "When Tacit Is Not Tacit Enough: A Heideggerian Critique of Collins' 'Tacit' Knowledge," *Meta* 5, no. 2 (2013): 315–35. p. 331

By referring to sensorial experience, the architecture of KSA seeks this connection, or *resonance*. Yet this craft-like tactic is pursued in many fronts: taking advantage of the tactile properties of materials, creating horizontal lines that distinguish the reachable and the unreachable, the attention to light and colour, marking windows with sturdy and reliable frames and so on. Specially, their intent is for the building to appear as handmade by being, in reality, proportionate to the human body and its senses. But that is done not in terms of direct transposition, as in historical examples – their buildings are not modelled like the human body, but responding to it. It is a way of referring yet again to the famous human scale, but applied to spatiality rather than visual proportion alone.

Following the thought of Alfred Gell, this is a question of the legibility of things, about how well things inform the craftsmanship of their production that takes place, as Adamson claims, in "an asymmetry between maker and viewer, articulated by practical knowledge"[459]. That is, a question on how well can the skill of maker be translated in forms that are apprehensible and understood by others, and incorporated in the object. The argument is that industrial, mass-produced goods are produced with much greater distance to this human bodily capacity, and thus with the general and quotidian experience of being alive – and thus the "practical knowledge" of their making is obscure. One does not need to be a professional craftsperson to understand skill. In fact, it is paramount to and abundant in daily life. As embodied beings, humans are mundanely performing skills of many kinds – be it in cooking, working, playing or moving about, in the common examples of walking, driving or riding a bicycle. The common denominator is the body (or more precisely in our existence as situated, contingent entities that can engage in the entanglements of material transformation), and thus as a model of production much closer to the operations in the body's realm, or scale, crafts much easily afford such recognition. For Gell, this is what creates the "enchantment" of crafted objects.

The so-called 'natural' materials can thus be understood in a similar tone, if perceived not as more or less artificial, but as closer or further from the realm of skill. In short, as crafted objects or artifacts in themselves. This is key to the enchantment of materials like wood – having 'natural' texture and colour and the marks of human skill acting together. This coarseness allows the senses to stick in the surfaces, and constitutes a strategy which KSA explores. The relationship with the sensorial brings craftsmanship to mind because it is a way to ground things in the lived experience, which evokes action, daily presence and care. Moreover, crafted artifacts are also directly responsive to the body, as can be noted from the curves

459 Gell, "Vogel's Net: Traps as Artworks and Artworks as Traps." p. 25

of knife handles, in the smoothness of wooden tabletops, or simply in the basic form of chairs, mimicking the body's anatomy. Besides ergonomics, they also respond to particular ways of doing things. Japanese sushi knifes are bevelled in one side only to make more precise perpendicular cuts; Western knives are double bevelled, less precise but more versatile. Japanese soup bowls, meant to be held up close to the face, are made of lacquered wood that transmits heat poorly; westerners leave the plate at the table, and their cutlery is precise in its function, preventing spillage – and they also have napkins. The objects that compose daily life, even if now mostly mass-produced, follow a design history that anchors them in crafts and present this attention to the body's proportions, mechanics and sensorial capabilities. As Marchand argues, craft "gives us identity through the things we make and the objects with which we surround ourselves"[460]. In other words, they inscribe the body in the invention of culture:

> We preserve a vast panoply of ideas, facts, relics, secrets, techniques, applications, formulas, and documents as our "culture," the sum of our ways of doing things, and the sum of "knowledge" as we know it. This "culture" exists in a broad and a narrow, an "unmarked" and a "marked" sense. […] The productiveness or creativity of our culture is defined by the application, manipulation, re-enactment, or extension of these techniques and discoveries. Work of any kind, whether innovative or simply what we call "productive," achieves its meaning in relation to this cultural sum, which forms its meaningful context.[461]

Gell's overall discussion on the distinction of art and artifacts also adds to the centuries-old problematics of aesthetics and functionality in architecture, challenging notions of what is represented in architectural spaces, the relevance of the intentions of its agents and how they are imprinted in the built environment (or not). By focusing on the qualities that emerge from the mid-way between maker and user, for Gell symbolism is never pure or transcendental but neither is the physicality supreme. His differential philosophy, in fact, may be useful to disturb the old dichotomy between "form" and "function" in architecture, proposing an attention to their middle-ground in the personal experience of space and buildings. While it may seem closer to functionalism, it goes beyond a pragmatic or economic response to the program. It's not strictly technical, but reflects a methodology that also encompasses the sensorial qualities of things, being their form an important side of it. On the other hand, it is not restricted to the shape of things, but refers to it in its use: how shapes interact with the actual bodies and minds of users. By

460 Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making.* p. *XVII*

461 Wagner, *The Invention of Culture.* p. 25

focusing on how things are perceived and lived, they cannot be fully dislocated from phenomenological features such as the measures of the body, symbolism and time. Time is important because it tensions the approach back to functionalism, in relation to a taxonomy of use or, in other words, a priority that is given for those who spend more time in the building, using it and benefitting from its design and spatiality.

> Time, like mind, is not knowable as such. We know time only indirectly by what happens in it: by observing change and permanence; by marking the succession of events among stable settings; and by noting the contrast of varying rates of change.[462]

Similarly, designing spaces directly is impossible. Space emerges from the relationship between boundaries and connections, uses and functions, voids and fillings, materials and bodies. Following Ingold's and the post-structuralist theories[463], it is also useless to try to determine 'space' as a universal or objective 'thing' in which every existence is equally related to, but one must do the opposite, not only viewing culture as always 'situated' in space, or *topos*[464], but the other way around, 'space' as always a cultural-situated reality. In other words, space is relational - it has no meaning on its own, but only insofar as it becomes an environment that houses events. Echoing Pallasma, if the city is the theatre of public spaces[465], architecture is always designing stages for life to unfold.

In that sense, perhaps the most telling description is Mechthild's defence that the craft of the architect is a "negative practice", meaning that their design is primarily concerned with the in-betweenness of many things. This is precisely what Alfred Gell means with his analysis of indigenous artifacts, such as hunting traps, when he states that they work as "photonegatives" of their maker's cultures[466]. Gell shows that artifacts, by their own material form and function, serve as ways in which the world of its maker can be read, being "models" ingrained with the relationships encompassed in its production *and* its use. It this sense, artifacts are both inserted in particular slices of reality, as useful objects, but simultaneously carry in themselves the very cultural, material and social relationships in which they arise. The author argues that hunting traps in fact embody the hunter's mode of action and replace

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462 Kubler, "The Shape of Time: Remarks on the History of Things." p. 13

463 Tim Ingold, "Against Space: Place, Movement, Knowledge," in *Boundless Worlds: An Anthropological Approach to Movement*, ed. Peter Wynn Kirby, 2008.

464 Frampton, *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture*.

465 Avermaete, Havik, and Teerds, *Architectural Positions: Architecture, Modernity and the Public Sphere*.

466 Gell, "Vogel's Net: Traps as Artworks and Artworks as Traps."

his presence and practice, both spatially and temporally – effectively hunting in his behalf. By encompassing and merging the roles and bodies of hunter and prey, the act of hunting and of being preyed upon, and the temporal (and spatial) dimensions that *verbalize* the hunt, the Zande net-trap is a materialization of a relationship that takes into account the particular modes of being of its participants. What is particularly significant to the matter at hand is that this characteristic approximation between different entities is effected by the production of artifacts, that embeds them with properties and qualities from foreign bodies and habits. Sautchuk demonstrates an eloquent example of how this encounter is ingrained, for example, in a harpoon:

> The harpoon is part of [the fisherman's] gesture as an amphibious weapon that allows the fisherman to reach the bottom of the lake without swimming down with his own anatomical body. As well as the capacity to assume an aerial and aquatic trajectory, its ergonomic design reflects attributes of the harpooner (a handle fitted to his size, habit, skills and strength) and of the pirarucu. The metal point of the harpoon is modelled locally according to its contact with the fish deep in the water, penetrating its scales and attaching to its flesh. The genesis of this weapon results from a double compatibility with the regimes of individuation of harpooner and pirarucu. The line (arpoeira) initially establishes an internal correlation of the harpoon, fixing it's head (pirarucu-like) to the handle (harpooner-like)[467]

Particularly significant in this passage is the point of view of the "fish-like" and "fisherman-like" properties that inform the harpoon's shape and operation. It shows that artefacts, be them tools or otherwise, to operate in the networks of agency and entities where they acquire their meaning and functionality, are formed by an ontological deviation. That is, they become slightly other, *akin* to the entities that they seek to connect or affect. In an inverse process of the shaman that appear as another to gain it's capacities, artefacts perform this operation by assuming, as Gell notices, this complementary, photonegative similarity. Taking such a process in account, it is possible to understand that crafted objects are connections that establish a potential for interaction by merging together different regimes of existence. The hammer head is "nail-like" and the handle is "hand-like". A chair's back is human-like, the chairs feet are floor-like, and so on. This, of course, can be brought to architecture, and the immediate consequence is that a building, before anything else, has to be *'body-like'* in its affective potential. It becomes, as such, also a potential recipient of meaning, by sharing the material and spatial regime of human bodies. As Frampton puts it, it becomes *vivid*:

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467 Carlos Emanuel Sautchuk, "The Pirarucu Net: Artefact, Animism and the Technical Object," *Journal of Material Culture* 24, no. 2 (2019): 176–93, https://doi.org/10.1177/1359183518804268. p. 10

> Since man has an asymmetrical physical structure with a top and a bottom, a left and a right, and a front and a back, the articulated world, in turn, naturally becomes a heterogeneous space. The world that appears to man's senses and the state of man's body become in this way interdependent. The world articulated by the body is a vivid, lived-in space. […] At the same time, the body is articulated by the world.[468]

In this manner, architectural designs can be understood traps, but traps to the senses and memories of the users, and buildings as photonegatives of the users' bodies and cultures. Being relational, space becomes a form of affection, as defined by Spinoza: an ensemble of relationships that surround a particular object or subject that, by establishing the connections between it and its contextual framework, defines its very being[469]. The notion of resonance, thus, is an ontological one, and it poses that, for understanding the being of things, one needs to understand how it affects and is affected in a reciprocal relationship with its environment in all their complexity, involving physical, biological and cultural dimensions. The objective of KSA's designs is to engage with this potential, aiming at a relationship between architecture and its users based on understanding their mutual affects. Additionally, "affection", in its more prosaic meaning, points to a care with the poetic dimension of life. The work of KSA, seeking to permeate personal dimensions of architecture, fosters the development of emotional ties with the buildings. It promotes the users to protagonists in the theatre of dwelling, in entanglements of symbolism, memory, function, matter and form.

Therefore, the sensorial focus of KSA has yet another consequence, besides the centrality of space in their design strategies: the centrality of reality or, better yet, experience. Since KSA focuses on experience, design is, for them, indeed a method, a path or a tool, not unlike the harpoon. They are constantly directed towards the complex reality of the built environment that is the goal, the end-point of design, even when it is still only a possibility. In this sense, their approach has yet another parallel with crafts. Trevor Marchand argues that

> the act of imagining in craftwork is not restricted to conceptualising intended objects or planned activities in the 'mind's eye' (i.e., visualising), but instead extends to imagining possibilities with all the perceptual senses that can be

468 Frampton, *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture*. p. 11

469 Gökhan Kodalak, "Affective Aesthetics beneath Art and Architecture: Deleuze, Francis Bacon and Vogelkop Bowerbirds," *Deleuze and Guattari Studies* 12, no. 3 (2018): 402–27, https://doi.org/10.3366/dlgs.2018.0318.

summoned in imagination, and as appropriate to the properties and qualities of the thing being designed and made. A craftsperson, for example, may imagine within the domain of motor cognition, or at a haptic level: imagining how an object will relate to the body; how it will feel or be held, carried, used, or interacted with; and how the thing might possibly be moved through, sat upon, or worn. Each of the above ways of knowing supplies stimulus and context to the others, constituting an abundant, overlapping exchange of information in the search for problems and their solutions[470]

Such conceptualizations operate resonating with the kind of "tacit norms" with which, as Schön puts it, "all of us make the judgments, the qualitative appreciations of situations, on which our practical competence depends"[471]. But because the norms themselves are essentially social and, therefore, rather blurry, they are not limits, but tendencies. Tendencies of what shape is a beautiful one, or what is considered as an adequate or meaningful form in a particular society – or, for instance, how the materiality of wood is perceived and how it affects a building's atmosphere. If these norms don't have precise limits and a clear axis, they nonetheless qualify in greater or lesser degrees how adequate, desirable and perhaps innovative material productions are. People know, from a collective of memories, more or less how these tendencies are positioned in society, but they also only have fragmented, partial knowledge, and judge things based on it. What is considered beautiful, just, good etc. is a complex relation between this perceived and created tradition in constant shift, and so people may disagree in their judgement, while not being able to pin-point exactly where and why a particular object differs or meets the tendency itself. Professionals train and sharpen their perception of beauty, in that sense, by being constantly invested in its discovery, absorbing accepted examples on arts, design, architecture, craft etc. that fit and clarify their perceived tendencies. The entanglement of this aggregate of subjective perceptions and an epistemological effort to translate them in ideas, codes, solutions can be described in a broader sense by what, for Alberto Pérez-Gómez, is the space of creation and "also the underlying substance of human crafts"[472] – *Chora*, as explained by Bardt:

470 Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making*. p. 12

471 Schön, *The Reflective Practitioner*.

472 Pérez-Gómez, 2015, p. 164

> Described as a mix of the sensible and noumenal, of the physical and eidetic, of the subjective and the objective, Chora is a transmitter and receiver […] It is at once spatial and material, a womb and matrix of the possible, a turbulent and liminal zone yet to be defined […] It receives the world of ideas (which cannot be perceived by the senses) and acts as the receptacle for the physically sensible, admixing the two in the process of making meaningful form.[473]

For the discussion at hand, nonetheless, it suffices to state that *resonance* describes the ability of material productions to answer to this complex demand of a materially and bodily produced culture in the very experience of people. In other words, it refers to the fact that craft practices and objects represent the encounter between the quotidian, the historical and the technical – and thus reflect particular social and cultural contexts related to experience, to the actual presence and engagement with material reality. Therefore, an important point of resonance, in distinction with a purely phenomenological approach, is the link it possesses not only with a perceptive, sensorial experience of buildings, but with a culturally constructed way of living and making, developed together as technical objects.

In simpler terms, buildings have habits and bodies marked on them, shaping them, but, conversely, also shape habits and bodies. As such, they are representative of culture and can be seen as archives. Particularly, buildings refer specifically to a lived experience. Speaking of resonance in architecture thus implies this concern with complexity and how buildings relate to our existence as situated, embodied beings, with bodies, senses, habits and limitations, and trying to figure out how do these give rise to a particular identifiable form (in its broader sense, not only of shape, but as unity). In the work of KSA, this form can be found in the notion of spatiality and its links to sensorial experience or, borrowing the term from Ben Trubody, a resonance with the world, understood not as "a thing, a place, or location but what structures our experiences"[474]. This may be the utmost secret to KSA's craftsmanship: they are not enchanted by design, but humbled by building.

473 Bardt. p. 2

474 Trubody, "When Tacit Is Not Tacit Enough: A Heideggerian Critique of Collins' 'Tacit' Knowledge." p. 319

4.5 Conclusion

In regards to the overall goal of my research – looking for architecture by the perspective of crafts – the study presented in this chapter begins to delineate the possibilities of using crafts as an analytical lenses to look at architecture. Exploring the work of the *Korteknie Stuhlmacher Architecten* office, the development of the kaleidoscopic concepts of consistency, coherence and resonance allowed for an assessment of architectural designs and objects from the point of view of their response to complexity, their abidance to material and economic contingencies, and their adequation to the bodily and culturally situated condition of experience. These refer specifically to qualities, and thus permit a heuristic approach to the appraisal of architecture that is positioned and justified in a broader, interdisciplinary theoretical framework, but focuses heavily on an empirical basis. In other words, the study exposed in this chapter shows that my theory can be used to perform an architectural analysis framed around craft, yielding practical outputs distinguished from other methods and scholarly approaches.

Not pretending to exhaust its possibilities, there are at least three differences such an approach generates in architectural analysis (and, consequently, to design). Firstly, it proposes an analysis that is not focused in singular buildings or collection of buildings understood simply as a general *oeuvre* of architectural offices, but one preoccupied in seeing this *oeuvre* as a development in itself, bringing the research that goes behind it and the discoveries that slowly build up the office's expertise to focus. It highlights the accumulation of knowledge and the development of skills in a particular practice or environment rather than in one specific production. In this sense, my approach opposes the analysis of buildings as standalone entities, but fosters the consideration of their development and the many smaller challenges within this process, including the inner workings of design practices and the many skills that architects must employ to navigate them. In other words, it is a way of understanding architectural offices as places of knowledge development that, as such, should be analysed in relation to the epistemic values they produce and re-produce.

Secondly, this approach fosters critics, scholars and other theoreticians to address buildings (and architectural practice in general) as products of economic activity, understanding the socio-economic character of construction and how architectural knowledge is employed to address the contingencies of reality. It signifies a shift in perception that connects the field of architecture with other realms of investigation. This approach addresses architecture from the perspective of an economic

and politically charged context, instead of pushing for an unsustainable (and unscientific) notion of disciplinary autonomy that finds no adherence with how the built environment is actually produced. Thus, it is an approach that can be used to confront architectural discourses with the grain of reality, understanding that the profession of the architect is neither disconnected nor the sole stakeholder in the production of space, and that its object of study (and practice) is a contingent and conflictive field where interests, powers and material constrains converge.

Thirdly, and finally, it encourages architects – scholars and designers alike – to seek and understand the "centres of gravity" of architectural designs as the features that serve as point of connection between the multiple dimensions of architecture (including social, spatial, material and symbolic). It fosters an appraisal of architecture that reaches beyond merely the intentions of architects and the concepts, meanings or statements they claim to imbue in their projects, questioning how well these different sides of architecture converge, and how well do they potentialize the multiplicity of the built environment and its response to life. Moreover, this approach energizes the other aspect of affection, in its more prosaic meaning: it reminds that besides dealing with complex and complicated matters, designers and scholars are dealing with passions – both their own and of others – and seeking to create a pleasurable built environment. On that note, resonating with the theories of W. Morris that art is the mark of pleasure in work – and in agreement with Roy Wagner's proposition of ethnography as a study of an specific encounter that can reveal many things about both ends[475] – it is possible to envision the invention of the built environment as an encounter of affects, in all their complexity.

In conclusion, drawing from the findings of this chapter, the appraisal of architecture from the perspective of craft puts forth a notion of architectural design craftsmanship that can be understood as an attunement with space. These three lines of thought, *consistency, coherence* and *resonance*, are channels through which craftsmanship can pursued by architects. More specifically, within the framework of craft theory, they work indeed as tools – meaning that they allow a specific horizon of possibilities to become visible and to be acted upon. Consistency, coherence and resonance, therefore, relate to a particular relationship between *telos* and *technique*. In this chapter, rather than focusing on the latter, these notions helped clarify the former in an architectural practice – technique now follows.

475 Wagner, *The Invention of Culture*.

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5 A joint of many worlds

Entangled knowing in Bataille en Ibens' 78+ construction system

An earlier version of this chapter was presented at the *IX Annual conference of the Construction History Society* and published inEric Crevels, "A Joint of Many Worlds : Entangled Stories in Battaile En Ibens ' s 78 + Construction System in Timber," in *Timber and Construction. Proceedings of the Ninth Conference of the Construction History Society*, ed. James W P Campbel et al. (Cambridge: The Construction History Society, 2022), 551–61.

5.1 Introduction

Returning to the question of how a theory of skill, craftsmanship and tacit knowledge can address architecture, the matter of technique still requires elucidation. In that regard, in addition to the assessment of the particular *problem-setting* of the architect, the framework of skill allows yet another line of investigation: it allows an assessment of architectural knowledge in alignemt with the so-called *production studies*[476]. In other words, it opens the possibility of examining how much from the knowledge embedded into the design of artifacts overlaps with that of its production, addressing not only the craft of the architect, but that of architecture – and what is at play in this complex relationship.

476 The term "Production Studies" is being proposed as a new field of investigation in architecture by a group of scholars composing the TF/TK team lead by the Universidade de São Paulo (USP) and the Newcastle University whose objective, among others, is to "advance critical understanding of relations between design and construction, and identify alternatives in which formal and informal building processes can become catalysts for social change". More information can be found in their website: https://www.tf-tk.com/resources/about-project. Last accessed on August 30, 2023.

Driving on such questions, this chapter explores the distinct networks of technical and embodied knowledge present in the development of the 78+ construction system in timber, designed in the 1970-80s by Flemish design office Battaile en Ibens. It develops the history of the *knooppunt,* a joint of a particular material and technical complexity that structures the system's wooden beams and cross-shaped columns. Design and technical decisions are traced in parallel to economic and marketing strategies, weaving together social and material phenomena that shaped the system's history. From the initial designs and prototyping, through publicity decisions and appearances in international expositions, until its idealization in the office's approach, the history of the *knooppunt* exemplifies the interplay between different stakeholders and knowledge orbiting the technological development of construction systems. From this historical account, I argue for the understanding of architecture and construction as complex constellations of different crafts and skills, including but not limited to architectural design and engineering, and explore the particular technique embedded in the architect's toolset.

The chapter is divided in three sections: section one introduces the 78+ system case study based on the *knooppunt,* and presents the microhistories of its design and construction, exposing the material inheritances and the different sets of knowledge present in its development. Section two addresses the question of the representation of the 78+ system that fosters the *knooppunt* as its symbol, while obscuring the contribution of the *chaîne opperatoire*. Reaching out of the case study, the section draws insights from critical theory and studies on creative industries to understand the phenomena. The third and last section reflects on the epistemic implication of the case in face of an epistemology of making. Addressing the question of what kind of skill architectural production presents and what are the field's perceptive affordances, the subchapter explores the epistemic nature of architectural practice, its potentials and the biases involving its construction.

5.2 A microhistory of design development

Amongst the dozens of models in the archive of the *Vlaams Architectuurinstituut* (VAi) in Antwerp, one finds what is expected in an architectural collection: private houses, public buildings, new urban developments and masterplans are assembled in light balsa wood or cast in white plaster. Sitting on a high shelf, however, a large wooden model contrasts with the landscape, see FIG. 5.1.[477] Four sets of mitred butt-joints surround a cross-shaped axle – their edges sitting in the recesses and their ends extruding outwards in a larger, doubled-lined shape. The inner corners are filled with triangular blocks, which gives the assemble a robust, solid appearance. The central axle protrudes outwards on one side, and the ends of large steel rods are visible on the faces of the corner pieces, fastened with washers and nuts. It is clear that the model represents no building.

The piece is a true-scale model of the *Knooppunt* ("joint" or "node", in Dutch), a joint that connects the beams and columns of the 78+ construction system developed by Claire Bataille and Paul Ibens's design office (B&I), working with International Design Constructions (IDC). Named after the year of its instalment, the 78+ is designed as a modular system, intended to be an "original, flexible, and above all economical prefabricated system"[478]. The cross-shaped axle on the model, sitting horizontally at the VAi's shelf, represents the column of the system, while the eight long profiles, conjoined in four mitred butt-joints, are the beams. The entire piece is traversed diagonally by two large perpendicular threaded rods, running slightly off centre, so as not to collide in the middle. The rods act as tethers and, with the help of the corner blocks, lock everything in place.

477 Wooden model of Bataille en Ibens' 78+ construction system joint "knooppunt", BE/653717/0101-BI/0299, Archief van Claire Bataille en Paul Ibens Desgin, Vlaams Architectuutinstituut archief, Antwerp, Flanders, Belgium.

478 Documents from Bataille en Ibens' 78+ construction system, BE/653717/0101-BI/0299, box 47- 49, Archief van Claire Bataille en Paul Ibens Desgin, Vlaams Architectuutinstituut archief, Antwerp, Flanders, Belgium.

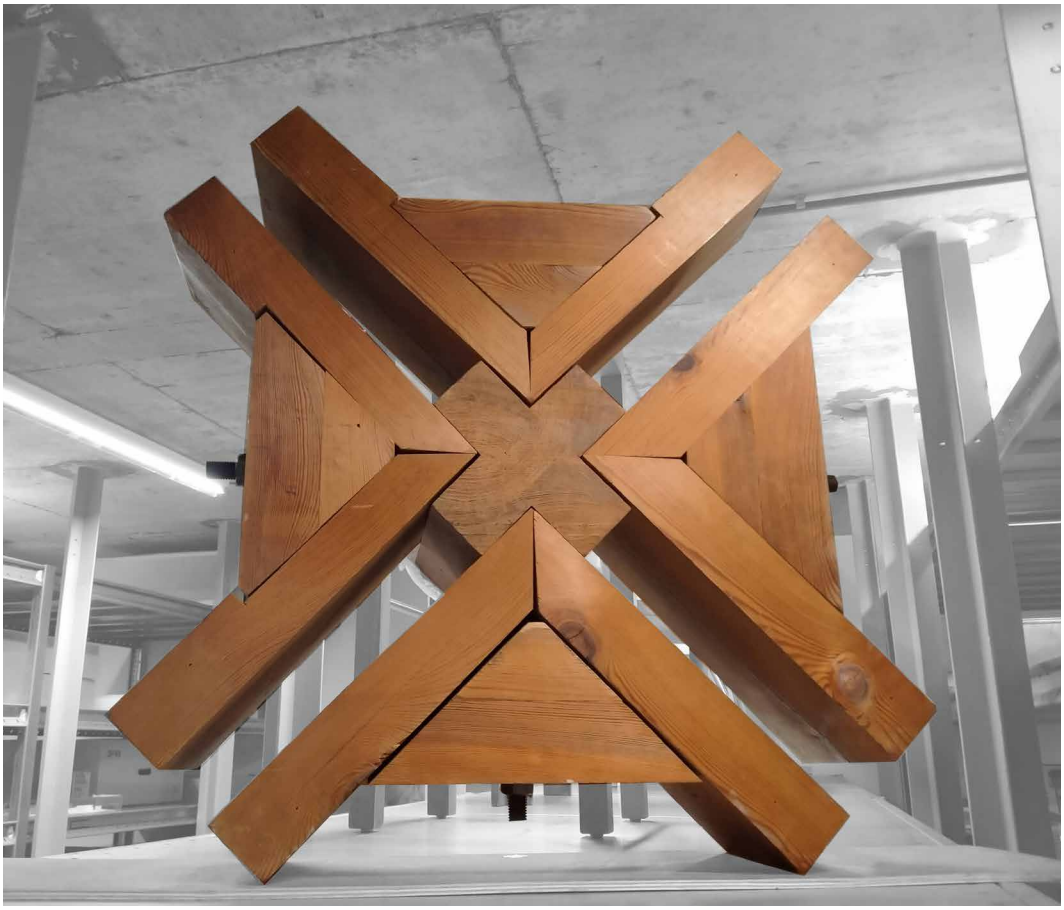

FIG. 5.1 Wooden model of the 78+ knooppunt. circa 1980. Source: VAi

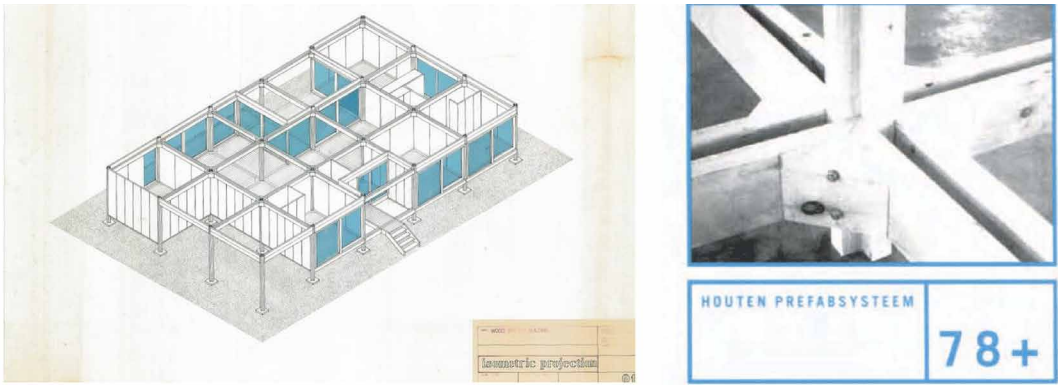

FIG. 5.2 Advertising material of the 78+ Construction System in timber. Source: VAi

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The *knooppunt* appears almost fully developed in the VAi's archives, already presenting its main components and general form in the earliest documents. Given the complexity of the assembly, however, it is likely to be the result of an exploration with many earlier versions, through careful consideration and iterative processes, as common in design[479]. Unfortunately, there are no sketches showing this initial progress but, despite the lack of recorded changes, traces of the design's development can still be recovered from the archived documents. Specifically, by comparing the existing technical drawings, photographic material and the model, some partial conclusions about the *knooppunt*'s design and the knowledge behind its production can be drawn.

The first of such transformations can be seen directly from the drawings. In an undated plan depicting a corner where the *knooppunt* was to be employed, there is an element of difficult explanation. Precisely in the middle of the beams' mitred butt joint stands a traced rectangle, with its longer side perpendicularly traversed by the lines representing the threaded rod. It is drawn in doubled dashed lines, which indicates that the detail is beyond the observers view (inside the piece, in this particular case) and that there is both a void and another object filling it. It is unclear which object that is. Unlike what is expected in such cases, there is no written indication of what it represents.

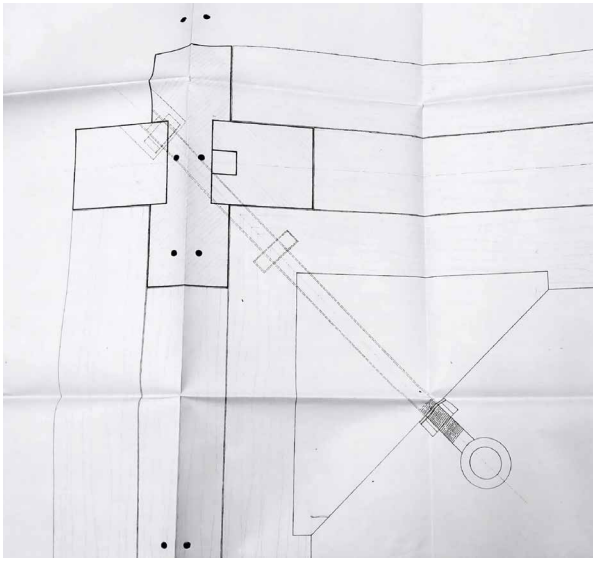

FIG. 5.3 detail showing the fastening rod with spacers and ring. Source: VAi

479 Donald A Schön, *The Reflective Practitioner* (Basic Books, 2013), https://doi.org/10.1017/CBO9781107415324.004.

The represented object could be a dowel (or loose tenon), since mitred butt joints commonly make use of these, or some kind of nut, spacer, or anchor through which the rod would run through. Yet, from a carpentry point of view none makes much sense, since they add unnecessary or unpractical complications with little to no benefits. Both solutions would require carving a complex, oblique shape in each of the beams, without much leeway in terms of alignment. Perhaps due to this unworkable nature, its last appearance is in a drawing from June 5th 1978, where the element was scratched over – reflecting a drawing mistake made by the architects or a correction pointed by another professional. In any case, the element was then abandoned. There is no evidence that it is present in the model: from the gaps in the joints, it is (barely) possible to see the rod and, interestingly enough, several nails – but nothing else.

The usage of the threaded rod contains other small developments. On the same undated drawing, it is possible to recognize that here the threaded rod ends in a ring, a feature that is repeated in a cross-section of the design for Mr. Leysen, dated of November 1977 (the earliest drawing in the 78+ folder)[480]. There is no reference of the ring's possible functionality, but it stands to reason that it was associated with a tethering function – perhaps linked to a necessity for wind bracing, since it is indeed remarkable that the 78+ system had no dedicated solution for that. Without referring to the particular design of the threaded rod traversing the joint, Baitalle and Ibens dealings with the question can be seen only in indirectly, through the documents of the structural analysis outsourced to an engineering office, made in September 1980. In it, engineers argue that the wind bracing was resolved with the use of wooden panels as the walls enclosing the system. The conclusion is puzzling, given that many similar projects do not abstain from additional bracing structures such as steel cables, not relying on panels – wooden or otherwise[481].

480 Documents from Bataille en Ibens' 78+ construction system, BE/653717/0101-BI/0299, box 47- 49, Archief van Claire Bataille en Paul Ibens Desgin, Vlaams Architectuutinstituut archief, Antwerp, Flanders, Belgium.

481 Given the similarities in the design and material use, the houses designed by Brazillian architect Marcos Acayaba are a good comparison to the 78+ system. As expected, they do make use of tethered steel cables for wind bracing. This critique is emphasized by scholars in a presentation I did on the history of the *knooppunt* at the IX annual conference of the Construction History Society, at the Queens College of Cambridge University, in early 2022. The argument proposed to Battaile and Ibens by the engineering office, which I reproduced to my interlocutors, was received with a great measure of scepticism.

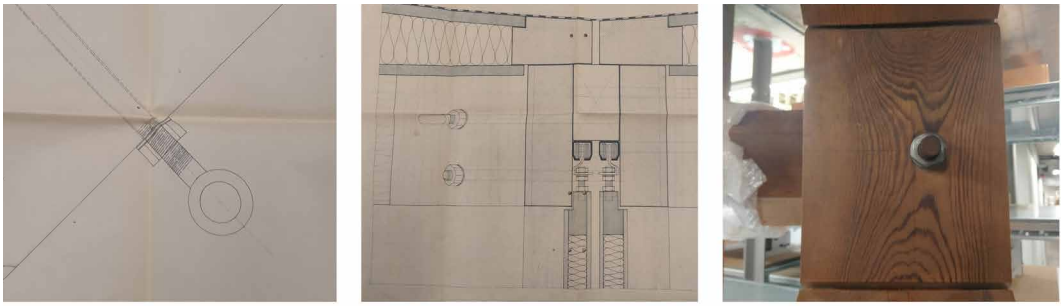

FIG. 5.4 Variation in the solutions for the corner block. Source: VAi

Another possibility, however, is that the whole conception was designed as a fastening device. Through the ring one could pass a lever, and easily apply tension on the rod. In any case, in a reproduction of the section, from June 1978, the ring is already abandoned in favour of a simple nut[482]. While perhaps more sophisticated in terms of technical functionality, the ring-ended rod would probably add unnecessary costs to the project. In contrast, threaded rods are common and cheap, and nuts are not so difficult to tighten with the help of an also common and cheap wrench. Given that the system was intended to be easily assembled, "simple enough for economic builders [and] general contractors", being a "'do-it yourself' advocate", such interpretation is not too far-fetched[483]. Other documents from the archive might attest to this economic preoccupation, too. In the aforementioned structural analysis, calculations were made with two different diameters for the steel rods, respectively of 3/4 and 1 inch. The study goes as far as proposing the usage of each dimension for the roof and floor joints, respectively. While this might seem like a casual proposition for engineering reports, it contrasts with how other components were addressed, being the only solution with two options. Additionally, the *knooppunt* model itself possesses only one rod for each diagonal, in contrast to the two per diagonal shown in almost every other technical drawing. At expense of the fidelity of representation, this reduction may have lowered the costs in the model's production.

482 Documents from Bataille en Ibens' 78+ construction system, BE/653717/0101-BI/0299, box 47- 49, Archief van Claire Bataille en Paul Ibens Desgin, Vlaams Architectuutinstituut archief, Antwerp, Flanders, Belgium.

483 Archief van Claire Bataille en Paul Ibens Desgin, Vlaams Architectuutinstituut archief.

More illustrative of the process of technical and epistemic exchange in the *knooppunt* is the constitution of the column. Specifically, a small development detail on the columns indicates a potential transfer of discipline-related knowledge generating the incremental improvement of the system's design. Since earlier designs, the *78+* system was mainly drawn as being constructed with solid pieces of timber. In these versions, the cross-shaped column of the *knooppunt* is constituted by the use of three pieces, a long one spanning the entire length of the column, in one direction, and two perpendicular pieces sitting in slots carved to its sides. This is the solution later used on the model siting at the VAi and the one present at the system's patent files, and little seems to have changed regarding its particular design. Some drawings show that the disposition of the pieces took into account the direction of the fibres of the wood – represented via the rotation in the hatch pattern – and the only particular change is the early presence of a represented square inside one of the perpendicular pieces, whose function is never indicated and that is absent from later drawings. It is, however, when the system incorporates the use of laminated timber that it is possible to trace some change in the solutions that steer the design of the column towards a more technically efficient format. The first time Bataille en Ibens represented the 78+ system using laminated wood is a detail in the documents procured for the structural calculations mentioned above, dating from the 9th of September of 1980. Counterintuitively, in this drawing, the wooden layers that constitute the three pieces of the beam are positioned perpendicularly to the direction of the pieces, in such a way that the outer layers sit completely free from the other pieces, as if added up to square column, see FIG. 5.5. Structurally, this makes little sense – being precisely the connection between the laminated layers a weak point susceptible to shearing. In drawings made shortly after, on the 19th of the same month, and on October 6th, it is possible to see the develop to a more rational configuration, in which the wooden layers are positioned in parallel to direction of the pieces. Considering that by November 1980, in description of the 78+ in the *De Wereld van het Design* exhibition memo, the system's material is directly described as 'laminated wood' (in the French "*bois lamele"*), and that the architects specifically address the system's structural capacity (up to three floors), it is not farfetched to interpret that this rapid change in the joint's design owns its development not to the architects, but to the engineers that noticed the irrational design, and that their findings made way into the exhibition material.

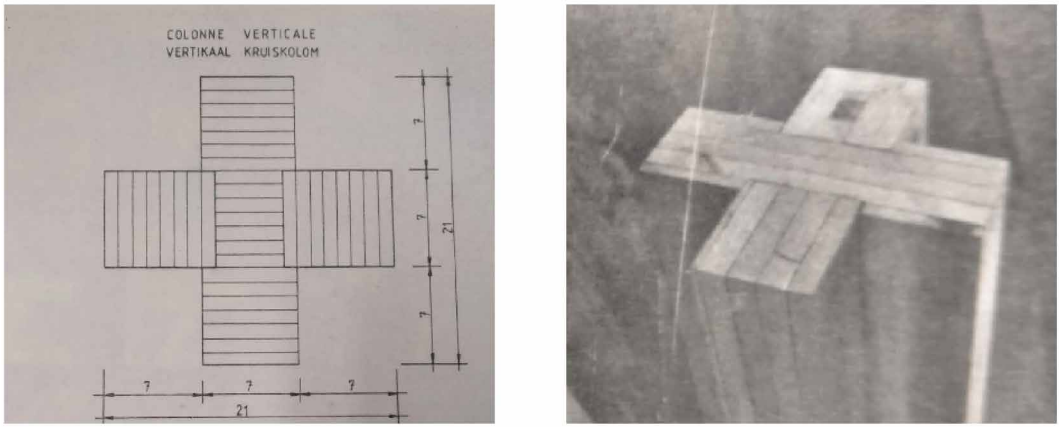

FIG. 5.5 Detail and photograph of the lamina orientation in the 78+ column. Source: VAi

Taking in account how the model relates to these initial development tales, the intention behind the model's construction seems to be experimental, meant to test the joint assembly rather than being used for exposition. Additionally, the model was shown only once in later media articles, in October 1980, and it was not included in the IDC's catalogue – as seen in FIG. 5.2 – nor presented in the *De Wereld van het Design* exhibition in the same year[484]. This absence is rather significant, given that the *knooppunt* is almost always featured, be it in exploded views or through the prototype building's pictures, and it appears to have become the main publicity element of the 78+.

Moreovre, as a crafted artefact, the model is rather unimpressive. Its pieces are loosely bound, the mitred joints are not flush and do not match exactly the angle of the cross-shaped column. The pieces are not *square*, as a carpenter would say. Several gaps can be seen, in sizes not expectable from its age. From a craft point of view, it was not particularly well made. This low-quality matches what is expected of a test model: built without the utmost care for precise fitting, but maintaining key aspects of its composition.

The existence of two different configurations of the corner blocks in the model attests best to this interpretation. In one solution, the corner blocks possess a square angled chamfer and sit in a recess carved in the beam, matching its geometry. This configuration would prevent the piece from moving backwards, which

484 Archief van Claire Bataille en Paul Ibens Desgin, Vlaams Architectuutinstituut archief.

is a common feature in many carpentry and woodworking joints. Yet, its application in the *knooppunt* is misplaced. The bolt which crosses and tethers the pieces acts by pulling the corner block towards the joint, not away from it. Accordingly, the alternative configuration is far simpler, with the corner block sitting flush on the surface of the beams, without any recesses or other complications.

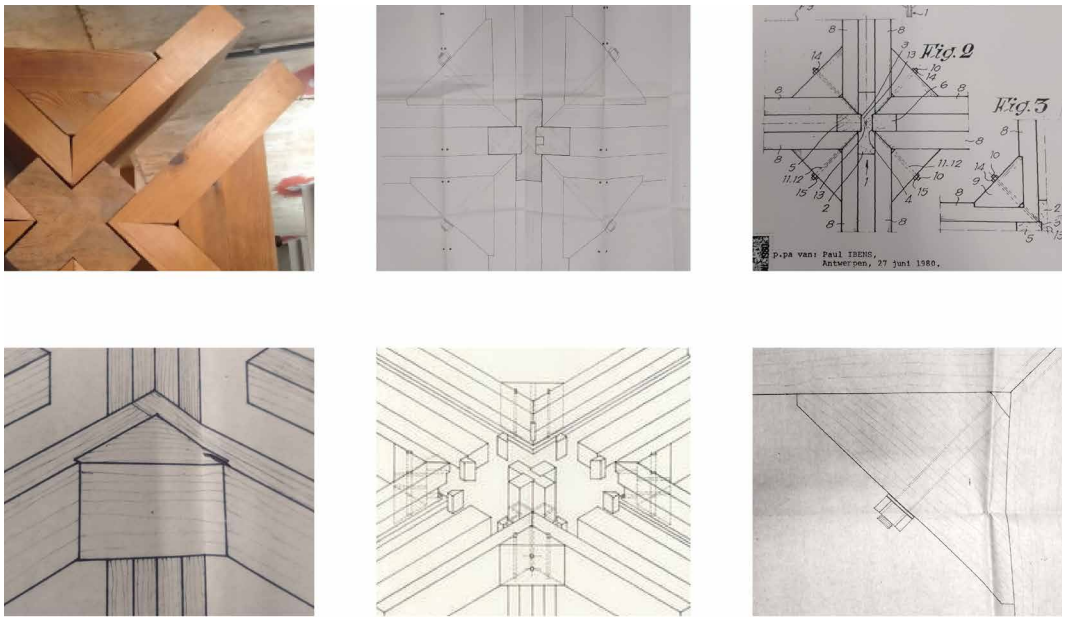

FIG. 5.6 Variation in the solutions for the corner block. Source: VAi

The use of both versions in the model suggests that the matter was not resolved at the point of its development, as seen in Fig. 5.6 (top left). Indeed, this detail can offer some clues on where temporally it sits in the whole story. The patent files of the 78+, submitted in June 1980, also show the two solutions (top right)[485]. Whereas one illustration in the file shows the flush version, another depicts the carved one, accompanied by a description that translates to "Figure 3 shows a solution in which the blocks 9 are incorporated into the beams 8", presenting an "execution variant"[486]. Moreover, in an exploded view with the carved solution, dated June 1978, it is possible to see a small ink marking made over the original drawing (botton left),

485 Archief van Claire Bataille en Paul Ibens Desgin, Vlaams Architectuutinstituut archief.

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hinting at the possible use of a flush configuration[487]. In the later (September 1980) and much more complex exploded view (botton centre), the flush version is the only one employed, notably with the addition of two pegs between the corner blocks and the beams, this time acting in accordance with the forces at play. From these documents, it is possible that the alternative, flush method, was suggested in 1978, but only tested at around the same time as the patenting process, *via* the wooden model – most probably, in preparation for the construction of the prototype pavilion around 1980 (discussed below).

While not useful in the 78+ specific case, the proposal of the carved solution requires some knowledge of carpentry techniques and it suggests that the craft's *savoir-faire* had already made its way into the project, particularly given the existence of the blue-ink correction in one of the drawings. Accordingly, some details testify to the constructive efficiency already contained in the model, and demonstrate the amount of technical knowledge embodied its production. For example, the corner blocks locking the joint are not exactly triangular, but trapezoidal – they have a chamfered middle edge, which is an important detail. Were it otherwise, the pointy edge would force the beams apart when tensioned. Without it, the tension applied in the rods pushes the beams against the inner faces of the cross-shaped column, effectively locking them in place.

Minute as they may seem, such tales of technical development present traces of practical knowledge regarding the properties of wood and the techniques of its employment, when confronted with the specific requirements and contingencies involving the development of a new way of building. This story sketches a picture of iterative development, indicating little nudges from craft knowledge that usher the design towards a more applicable and practical form. It is a story of epistemic interference between different fields, since B&I, together with IDC, were treading a path that connected industry, craft and architecture, balancing the many aspects surrounding its development. The *knooppunt* model is part of the process. As an experimental tool, it connects the conceptual and constructive sides of architectural productions by materializing ideas in the complex contingencies of physical reality. This phenomenon is akin to what is described by Gibson as *Material Inheritance*, a concept that refers to the traces of craft knowledge and rationality that make their way into and influence the ways of making and thinking of a particular industry, without being formally recognized or easily brought to surface[488].

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487 Archief van Claire Bataille en Paul Ibens Desgin, Vlaams Architectuutinstituut archief.

488 Gibsom, "Material Inheritances: How Place, Materiality, and Labor Process Underpin the Path-Dependent Evolution of Contemporary Craft Production," *Economic Geography* 92, no. 1 (2016): 61–86, https://doi.org/10.1080/00130095.2015.1092211.

However, an examination of the 78+ construction system through the *knooppunt* model, while significant in terms of understanding the tectonic values of the system's design, fails to put in evidence the complete picture behind the system's material inheritance. The representational character of technical drawings, sketches, and models present in architectural archives can often be misleading to understand the practical, *hands-on* dimension that governs craft knowledge and skill. Additionally, despite the material and technical entanglements exposed so far, the logic behind the design of the 78+ and the particular form of the *knooppunt* remain rather unclear.

FIG. 5.7 Photograph of the knooppunt assembly. Source: VAi

One such instance is the use of glue in the joint. Through the photographs, it is possible to note the presence of glue between the beams and the corner blocks, see Fig.5.7. It is a feature that might go unnoticed for untrained eyes, but that is intriguing after perceived. Given the existence of the corner block and the massive tethers and securing the assembly to the columns, it is at least an overshoot. Applied in the encounter between the beams and the corner blocks in the vertical plane, normal to the shearing forces, it's contribution to the structural stability of the whole is negligible, especially in the scale of a building. In fact, the difference in the application of glue is considered as one of the main distinctive features between the

crafts of woodwork and carpentry, as noted by Brazillian architect and woodworker Porfírio Valadares[489]. Already in woodworking, glue is of limited structural capacity, being often used in tandem with joints that direct the stress towards the wood. In these situations, the use of glue is structurally complementary, more focused on eliminating small movements that would loosen the joints overtime. In carpentry, however, this is precisely the opposite of what is desired, as keeping the structure (and especially the joints) a bit flexible is a desirable thing. Flexible buildings support better the stresses proper to its scale, accommodating the deformations from complex forces such as wind, likely changes of load positioning (from changing the furniture layout, for example), and possible movements of the foundations, among others.

Besides, nowhere in the drawings and technical documents the glue is ever mentioned or represented in anyway. In itself, this fact is not particularly surprising, details particular to construction are frequently overlooked or intentionally left out of drawings. Since drawings, flat and scaled down, have no capacity to depict the entire material reality of constructive details, compromises are made in benefit of clarity. Thus, relying on the experience and knowledge of builders and contractors is a standard practice in architectural draughtsmanship. Its absence on the wooden model, however, raises questions. The model is on a true scale and, given its material correspondence with the joint, one would expect a similar treatment.

In architecture, mysteries in design are often related to a logic that is specific to the construction site. This case is no difference, but logical reasoning alone does not suffice. On the assembly of the *knooppunt* the application of glue still seems unpractical. Applying it on the positioning of the beams would add an extra operation to be executed on site. This step, seemingly simple, would require the presence of a glue bucket or tube, a brush or other tool to smear it, and possibly a damp cloth to clean the excesses. All preferably within the reach of the builder's hand. While working in the floor beams, the inconvenience might not appear too big or unconventional when compared to other building site operations– but at ceiling level, with builders working on stairs or scaffolds, it begs for some justification.

489 Valadares, "Da Construção à Montagem."

In order to fully understand the knowledge at play in the development of the *78+* system, it is necessary to investigate its *chaîne opératoire*[490]. The concept of *chaîne opératoire* is particularly significant for studies of technology because it tells a story detached from its products and particular characteristics – technical or aesthetic – and focuses instead on the conditions and processes within the production of artefacts. In other words, it is a form of combined analysis that addresses both material and social aspects of "technological activity", according to Heide Nørgaard.[491] In the case of the 78+ and the *knooppunt*, these operations have even greater importance. The design of modular systems follows a discourse that advocates for rationality in construction, thriving on industrial maxims of efficiency, mass production and affordability[492]. In the system's description provided by the architects for the *De Wereld van het Design* exhibition, there was a great emphasis on making the system appear adequate for numerous applications (from residences to industrial villages) and different sites (including "third-world villages")[493]. This flexibility would require, evidently, a similarly versatile mode of construction. One could argue that this flexibility was precisely the *knooppunt* model's *raison d'être*, but that is not the entire story.

There is, in the 78+, a particular arrangement that works in favour of the importance of understanding the *chaîne opératoire*, and a single written source provides some explanation on the matter of the glue. In a text provided by the architects to the *Wereld van het Design* exhibition, it is stated that the 78+ is "based on cross sectioned vertical columns that are joined by *horizontal square frames* that form the floor and roof supports."[494] This description is accompanied by a step-by-step

490 Heide W Nørgaard, "Technological Choices," in *Bronze Age Metalwork: Techniques and Traditions in the Nordic Bronze Age*, 2013, https://doi.org/10.4324/9781315887630.Heide W Nørgaard, "Technological Choices," in *Bronze Age Metalwork: Techniques and Traditions in the Nordic Bronze Age*, 2013, https://doi.org/10.4324/9781315887630. Knappet and Malafouris, *Material Agency: Towards a Non-Anthropocentric Approach*.Carl Knappet and Lambros Malafouris, *Material Agency: Towards a Non-Anthropocentric Approach*, *Journal of Chemical Information and Modeling*, vol. 53 (New York: Springer, 2019). Lambros Malafouris, *How Things Shape the Mind: A Theory of Material Engagement*, *American Anthropologist*, vol. 117, 2015, https://doi.org/10.1111/aman.12210.Lambros Malafouris, *How Things Shape the Mind: A Theory of Material Engagement*, *American Anthropologist*, vol. 117, 2015, https://doi.org/10.1111/aman.12210.

491 Nørgaard, *Bronze Age Metalwork: Techniques and Traditions in the Nordic Bronze Age 1500-1100 BC*.belt plates, pins and tutuli p. 247

492 Koen Van Synghel et al, *Claire Bataille, Paul Ibens : Projets et objets 1968-2002* (Brussels, Ludion Distributie, 2003).

493 Archief van Claire Bataille en Paul Ibens Desgin, Vlaams Architectuutinstituut archief.

494 Archief van Claire Bataille en Paul Ibens Desgin, Vlaams Architectuutinstituut archief. My highlights.

execution procedure instructing that “the horizontal frames are installed” after the columns, and directing builders to see “the *model joint*”[495]. In stark contrast to the technical drawings, the instructions do not mention the *knooppunt*, but refer to the columns and these ‘horizontal frames’, never mentioned elsewhere. Notably, in a photographic series depicting the system’s assembly, where a model of the 78+ is constructed in steps, the square modules are missing[496], as seen in FIG. 5.8.

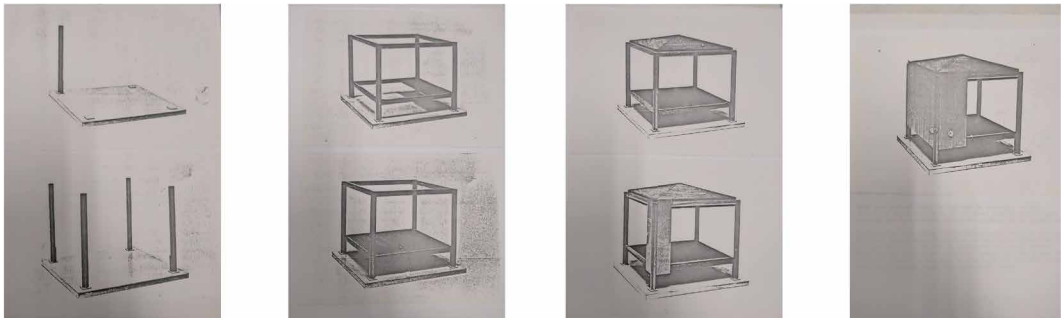

FIG. 5.8 Montage model depicting the 78+ assembly. Source: VAi

Fortunately, some clues of this arrangement come from the photographs depicting its use. The archives of the VAi include a photographic collection showing the assembly of a prototype building using the 78+ system, built for J. Ibens, Paul’s brother[497], see FIG. 5.9. The prototype consists of a pavilion of approximately 70 m^2, whose designs are dated from November 1979. The plan was developed over a four-square grid formed by nine of the 78+ cross-shaped columns. An isometric perspective of the design can be found in the patent documents, but the pictures (themselves undated) appear in other printed materials only in May 1981, meaning that its construction probably occurred around the same time as the patenting process – from the vegetation and clothing seen in the pictures, sometime in the warmer months of 1980.

495 Archief van Claire Bataille en Paul Ibens Desgin, Vlaams Architectuutinstituut archief.

496 Archief van Claire Bataille en Paul Ibens Desgin, Vlaams Architectuutinstituut archief.

497 Koen Van Synghel et al, Claire Bataille, Paul Ibens : Projets et objets 1968-2002

FIG. 5.9 Pictures of the prototype's building process. Source: VAi

As can be seen from these photographs, the beams are previously joined together along with the corner blocks in a square-shaped module. The module is then raised and fastened to the previously positioned columns. From the perspective of the construction site, the employment of the square modules with the *knooppunt* locking mechanism has significant advantages. Being the corner piece glued to the beams in a frame, the ensemble is easy to position and secure in place. Rather than dealing at once with several pieces that must converge in a single point, with their leveraged ends hanging on the back, the builders would deal with only one piece. Additionally, the cross-shape section of each column houses the square modules, keeping them in place and guiding them along the vertical axis.

This small, almost unseen detail of the system's assembly affords an important consideration regarding the relationship between the *knooppunt,* the square module, and the 78+ system. Instead of understanding the *knooppunt* as the main element supporting the system, both structurally and in terms of design logic, perhaps the definition of the square module has a similar (or even greater) importance. Indeed, the 78+ system only works as it does because of the square module *and* the joint, and they can be seen as complementary halves to each other[498]. This interpretation gives meaning to the use of glue, for the adhesive would be applied beforehand, in the construction of the square frames, prior to their fastening with the tethered rods. The glue, in this case, serves a function in assembly, and its presence in the final *knooppunt* is a trace of the construction logic into the final form of system. It is possible to envision a scenario, thus in which both the *knooppunt* and the square module were developed simultaneously, each element participating in the other's formation, as symbiotic counterparts that work together constructing the design, both in terms of the production process and of the final product.

498 Gell, "Vogel's Net: Traps as Artworks and Artworks as Traps."Alfred Gell, "Vogel's Net: Traps as Artworks and Artworks as Traps.," *Journal of Material Culture* 1, no. 1 (1996): 15–38.

5.3 Phase Shifts – the other sides of technical developments

The mutual interference between the *knooppunt* and the modular square frames imbues the 78+ systems with a superimposed, *dialogic* modularity that merges the rationalities of the design office and the construction site. In other words, it represents a combination of designerly and process-oriented ways of thinking, and different communities of practice – namely, design, engineering and carpentry[499].

Unfortunately, as can be attested from the archival collection on the 78+ system and the literature around it, this dialogic modularity remains unspoken of. While the *knooppunt* is represented not only in the model, but in several other media and in different formats (particularly with exploded isometrics), the assembly logic of the square frames is never portrayed visually in any technical drawing, in the IDC's 78+ catalogue, or the media articles. Taking into consideration its constructive rationality and possible importance for the very constitution of the *knooppunt*, the lack of representation of the square module in most of the 78+ documents is intriguing, as it goes against the office's advocacy for the system's simplicity and relationship with Do-It-Yourself (DIY) practices[500].

The shift makes sense from a marketing perspective, however; a realm in which the 78+ system was particularly successful – especially within architectural discourse. The system was featured in several exhibitions organized by the *Design Centre*: the *De Wereld van het Design* exhibition, in late 1980, after which the 78+ was awarded the *Sigle d'Or* prize; the *Design and Export* exhibition in the spring of the following year; and the *Belgica Hoy*, in November 1982, in Barcelona. The system was also featured in the *Biënnale Interieur* in Kortrijk, in 1982, with the construction of a red, barn-like two-stories pavilion, see FIG. 5.10. Following the exhibitions and prize, it appeared in several press articles[501], including the cover of *Neuf* magazine[502].

499 Wenger, Mcdermott, and Snyder, *Cultivating Communities of Practice*.Etienne Wenger, Richard Mcdermott, and William M Snyder, *Cultivating Communities of Practice* (Boston: Harvard Business School Press, 2002).

500 Koen Van Synghel et al, Claire Bataille, Paul Ibens : Projets et objets 1968-2002

501 Archief van Claire Bataille en Paul Ibens Desgin, Vlaams Architectuutinstituut archief.

502 Vol. 6, n 95, 1981 – from Bataille en Ibens' 78+ construction system, BE/653717/0101-BI/0299, box 47- 49, Archief van Claire Bataille en Paul Ibens Desgin, Vlaams Architectuutinstituut archief, Antwerp, Flanders, Belgium

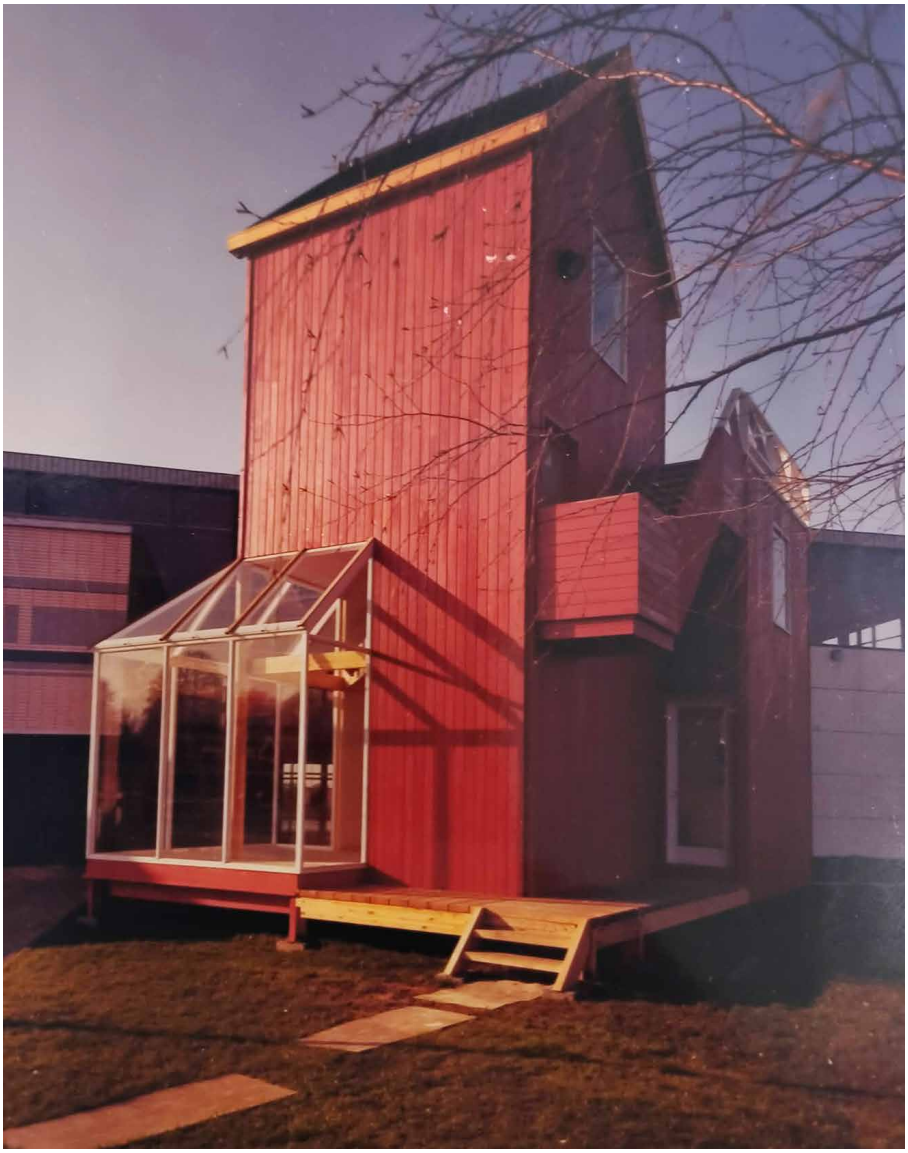

FIG. 5.10 The 78+ pavilion of the 1982 Biennale Interieur Kortrijk. Source: VAi

Besides the media attention, the designers worked with the system on urban development projects in the Belgian cities of Vielsalm, Virton, and Manderfeld, in addition to many private commissions (although, significantly, none appears to have been actually built). Furthermore, in late June 1980, Claire Bataille and Paul Ibens formed the *Prewood Construction Company* in the United States, in partnership

with Robert Huckins and Walter Van Elven, meant to “carry the trade or business of General Contractor”[503] – a development that probably explains the need for the structural analysis realized a few months later. Not long after, they were engaged in projects for neighbourhoods in Ruidoso, New Mexico, and in Rifle, Colorado, designing several different residential types, in many shapes and sizes. While these showcase the system’s potential for flexibility, depicting many possible spatial articulations that could be achieved with its use, once again, there are no evidences of any of these projects moving any further than the design phase.

Along with so much development and growth come the associated demands. As such, it would be reasonable for the designers to choose a method of representation most familiar to their practice. It is no secret that the work of architects involves the production of advertising material for both their own marketing and their client’s. Architecture and construction are economic practices that sell specific products, which, in the specific case of the 78+, converge into one. In this scenario, the marketing promotion of the system corresponded directly to the promotion of the design.

When starting the design of the 78+ system, B&I had existed for about 10 years and had designed many different things – an impressive collection ranging from furniture, with many tables, stools, chairs, couches, *dressoirs, canapés*, *commodes* and so on, to cutlery, glasses, dinnerware, doorknobs and even some sinks[504]. Claire Bataille and Paul Ibens did not hold architecture diplomas, but were trained as *interieurarchitecten* ('interior designers', in Dutch, or 'interior architects', more literally) at the *Hoger Instituut voor Bouwkunst en Stedenbouw*, in Antwerp, and their embraced cross-disciplinarity was reflected in their chosen name “*Studiebureau Bataille-ibens Designers*”[505]. This multi-faceted aspect of the office’s origin and work meant that B&I, intentionally or not, carried into their architectural work the modes of representation and practices from other fields of knowledge, effectively blurring the divide “between architecture and design, between garden and interior, between the ideal plan and the compromise of living, between art and craft”[506] – particularly in the realm of representation.

503 Archief van Claire Bataille en Paul Ibens Desgin, Vlaams Architectuutinstituut archief.

504 Koen Van Synghel et al, Claire Bataille, Paul Ibens : Projets et objets 1968-2002

505 Koen Van Synghel et al, Claire Bataille, Paul Ibens : Projets et objets 1968-2002

506 Koen Van Synghel et al, Claire Bataille, Paul Ibens : Projets et objets 1968-2002

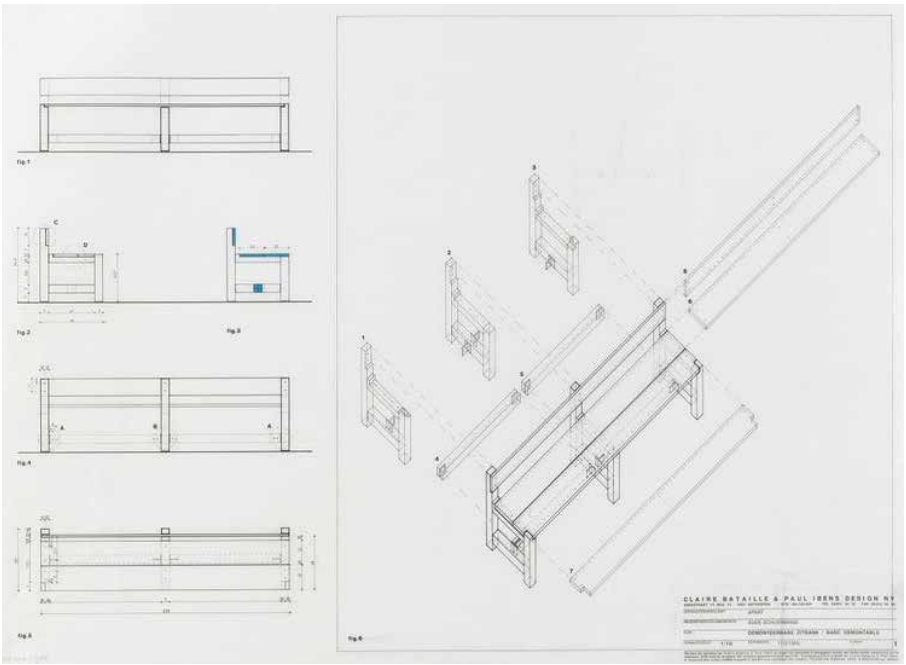

FIG. 5.11 Use of exploded isometric view for the design of a bench by B&I. Source: VAi

The representation choices for the 78+ system were probably connected to the office's involvement with interior and furniture design. As seen from B&I's other projects, the isometric and exploded views used to depict the *knooppunt* are common in their representative repertoire[507], as seen in FIG 5.11. These are methods of drawing frequently used to detail the assemblage of furniture, particularly customary in woodworking manuals. Favoured by makers because of their capacity to depict tridimensionality while maintaining the true dimension of lines, they require little knowledge of drawing technique, in contrast to perspectival drawing, and are easily understood by laypeople.

Therefore, it is reasonable to believe that the focus on the *knooppunt* as a representative element of the system is an emergent condition. While the joint's design seems to derive not from marketing or visual quality's sake, its form greatly resonates with the modes of representation commonly employed in B&I's

507 Archief van Claire Bataille en Paul Ibens Desgin, Vlaams Architectuutinstituut archief, Antwerp, Flanders, Belgium.

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professional environment. In the exploded view, the tectonic intricacy of the joint's assembly is shown on a symmetric, ordered composition – from the empty edges inwards, the elements progressively appear, orbiting the column, and their angled lines converge at the drawing's centre, culminating in the *knooppunt*. It is a powerful picture, able to maintain the ideal of technical prowess in a language of design and aesthetical quality, as seen in FIG. 5.12.

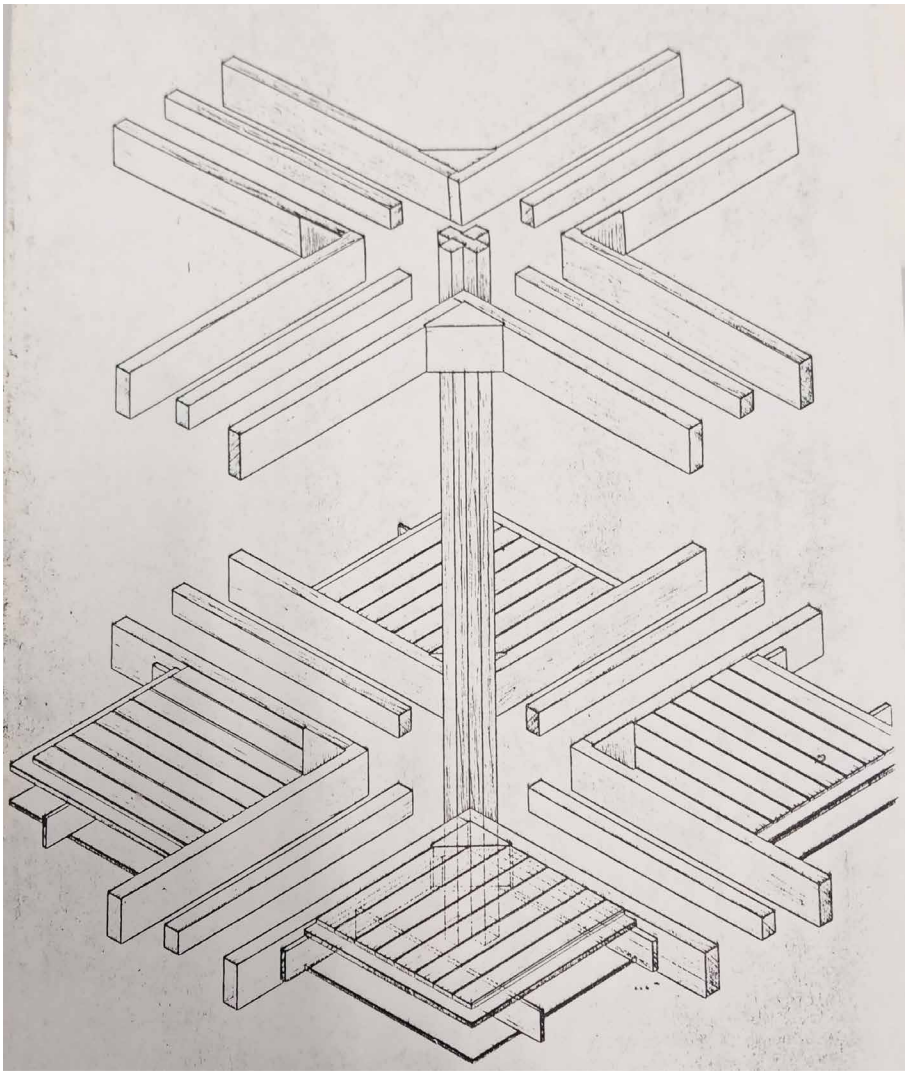

FIG. 5.12 Exploded isometric view of the knooppunt. Source: VAi.

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When compared to the square module, the *knooppunt* is far more appealing from a *commodity* point of view. While both elements share much of the same technical rationality, they possess specific qualities with opposite affordances in the dialectics of production and consumption. The *knooppunt* is easily portrayed as an independent object while maintaining its complex appearance and technical appeal. The qualities of the square module, on the other hand, can only be seen *in movement*, while it is being installed. Thus, the two elements tend to operate, discursively, in different realms – and, again, for different publics. The logic behind the square modules is that of the construction site, particularly significant to builders and contractors, but the *knooppunt* better portrays the product offered by the 78+, ultimately what most concerns potential clients. In other words, the logic behind the modular assemblage is more exclusively related to a process-oriented way of thinking, while the *knooppunt* affords connections with other regimes of representation and their associated telos.

This stylistic correspondence should not be deemed unsignificant, even if its connection in the work of Bataille en Ibens might seem loose. There is a shared genealogy of the isometric perspective and the exploded view in the design and production of material goods that connects the *knooppunt* to a broader history of representation and its relation to practical knowledge. The employment of the exploded view as a distinct aesthetical tool, for example, can be already found in the early fifteenth century, in the notebooks of Marino Taccola, whose work was studied by prominent Renaissance figures like Francesco di Giorgio and Leonardo Da Vinci[508]. As such, its origins date to a transition between two historical genres of representation deeply linked to the production of mechanical devices that, not coincidently, are particularly important in the history of architecture as well: the medieval *Kodex* and the Treatises of the Renaissance, all remarkable examples of how technical representations do not only inform – but, even more prominently, deploy a particular way of thinking via aesthetical means. On the one hand, a remarking feature of the drawings on medieval manuals, such as the *Loffelholtz Kodex*, is how the way in which they inform about the objects relies on the physical, perceivable aspects of the object. Being coloured and texturized, they clearly depict the materiality of the objects, despite not being perfect, realistic representations. While modern technical representation focuses on precision of form, these drawings are centred in a more 'ideal' dimension. Not the 'ideal' in a platonic way, but about how can an idea come into being. There is a shift in what kind of knowledge they present, directed towards the processes of making, instead of the objectual outcome.

508 .Alex Keller, "Renaissance Theaters of Machines (Review of: The Various and Ingenious Machines of Agostino Ramelli by E. S. Ferguson, M. T. Gnudi, Agostino Ramelli; Le Machine (1629) by Giovanni Branca)," *Technology and Culture* 19, no. 3 (1978): 495–508.

In Pamela Smith's words, the medieval *Kodex* employs illusionism and naturalism instead of the "lifeless completeness of an abstract image", in a form of empiricism that comes specifically from a "self-consciousness on the part of the artisan"[509]. This manner of illusionism is a device of perceptive engagement, and can be understood as referring to material qualities instead of properties, in Kuijpers's distinction.

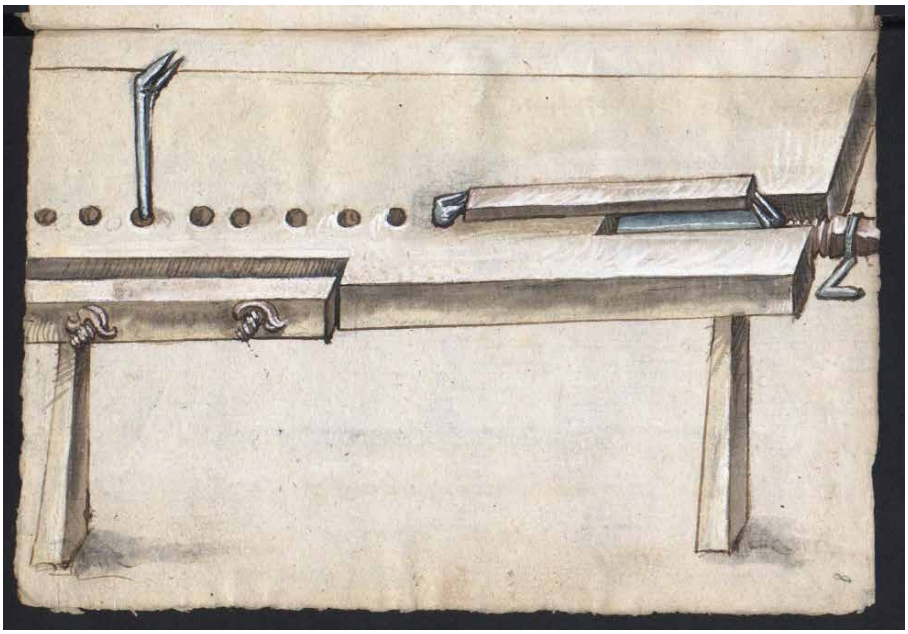

FIG. 5.13 Drawing of a workbench with double vices. Source: Loffelholtz Kodex

On the other hand, the *Treatises* of the Renaissance, although similar in appearance, already rely on a form of representation that departs from the concrete, material reality of things, towards a platonic ideal. These changes in the mode of representation or, to be more precise, in the *techniques* of representation, showcase the connection between the representation technique and a specific way of thinking of the Renaissance – in this case, connected to a secular approach and the drive for a machinic technological development. They possess, in this sense, a particular rationality or, in Alex Keller's words, a mode of portraying "not what was, but what might be; not in terms of spiritual improvement or social reform, but as the machines

509 Smith, *The Body of the Artisan.*10, 15 and 25°C p. 34

of a possible, mathematically guided future."[510] As it is well known, Vitruvius's books included chapters dedicated exclusively to the construction of mechanical devices, mostly war-machines – a thread that was continued in the Renaissance treatises. This historical connection between architecture and machinic construction remains visible through representation and discourse[511] - alive, one could argue, in Le Corbusier's dreams. At the time, they were often embodied in the same individual. Familiar names to architects are those of Leonardo da Vinci and Alberti, but one particularly significant case is that of Giovanni Branca, whose reputation nowadays is mostly constrained to history of technology, owing to his "precursor of the steam engine" found in the *Le Machine,* but whose work also comprises an architectural treatise, the *manuale d'architettura,* published in 1629[512].

As stated by Keller, the movement from the medieval *kodex* to the Renaissance treatise represents a progression towards a more rational and mathematical approach to representation, abandoning elements of sensorial perception in favour of clarity and ease of reproduction[513]. As discussed previously, the period (and its changes in the modes of representation) also mark a discursive shift related to an artisanal epistemological claim. In both of these cases, however, it is possible to identify an entanglement between technical and cultural forces with the modes of representation used to depict material productions and architecture. Thus, there is perhaps an unexpected parallel between the coexistence of architecture and war-machines in medieval and renaissance treatises and the use of an exploded isometric in the *knooppunt* with its industrial appeal. Seeing both, the treatises and the advertising material of the 78+ system as signs, they have to relate to the *zeitgeist* of their times to draw attention to themselves. In ancient times, we are reminded, wars were a contingent part of every land's life, and the topic makes its way to works of inventors and scientists. Accordingly, Agostino Ramelli for example, who lived in a time when these mechanism and fortifications were *on demand,* had to address and navigate them in such a way that "skirmishes and surprise attacks echo through his work"[514].

Similarly, designing in the late 70s and early 80s, Bataille and Ibens were immersed in an environment marked by a discursive drive for industrial and architectural convergence, under the umbrella of "industrial design" – which can be attested

510 Keller, "Renaissance Theaters of Machines (Review of: The Various and Ingenious Machines of Agostino Ramelli by E. S. Ferguson, M. T. Gnudi, Agostino Ramelli; Le Machine (1629) by Giovanni Branca)."

511 Keller. p. 495

512 Keller.

513 Keller.

514 Keller. p. 502

by the focus given to industry by the organizers of *De Wereld van het Design* in their reports of the exhibition's results, explicitly adding a list with the names of industrialists that attended special meetings with designers in the appendix[515]; and the statement by R. Urbain, then Minister of Foreign Trade, addressing the Parliament, reproduced in October 1980 in the *Vraag & Aanbod* magazine:

> Industrial design must be applied to our companies more than ever. the international economic climate and the worrying evolution of our trade balance make efforts in this sense absolutely necessary. In addition to being progressive, industrial design is undoubtedly one of the means that gives a product a specific added value, enabling it to differentiate itself on foreign markets.[516]

Based on their representation affordances, the *knooppunt* and the modular frames fall into different categories of use, or, to use Bourdieu's term, they figure in different levels of a social defined hierarchy of objects[517]. Particularly, the mode of representation afforded by the *knooppunt* sits well within the *"playing field"* of architectural canon, and it can be understood as a tool that transmutes a joint of particularly intriguing form but questionable carpentry quality into an object of architectural discourse, where form is key. As an object of representation, the *knooppunt* ceases to be only a structural solution and becomes an aesthetical device – its qualities are thus shifted, and the joint becomes detached from the entirety of the system and, particularly, from its *chaîne opératoire*. From the isometric (or the model) alone, the image is that the *knooppunt*, both in design and its employment on construction site, works as an autonomous element – which, as seen, is not true. In other words, the exploded isometric of the joint is a form of transporting the *knooppunt*'s teleological foundation from the realm of a construction craft – where it underperforms – towards one with the qualities proper of architectural objects, of *design*. This movement covers the traces of a process-oriented logic and stabilize the joint as a legitimate design entity. Nonetheless, the slight tension between the more traditional, standard modes of architectural drawings and the furniture-making style of the exploded view grants the representation of the *knooppunt* with a *flavour* of craft, without reproducing the full process-oriented episteme found in the *chaîne opératoire* logic from which the joint emerges.

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515 The list is mentioned in the document sent by the organizers to the participants but, unfortunately, was not archived by Bataille en Ibens.

516 Translated from the Dutch, "Industrial design moet meer dan ooit onze bedrijven worden toegepast. de internationale ekonomische konjunktuur, en de onrustwekkende evolutie van onze handelsbalans, maken inspanningen in die zin absoluut noodzakelijk. Benevens een vooruitstrevende, is industrial design ongetwijfeld een van de middelen die een produkt een speciefieke meerwarde verlenen, waardoor het zich op de buitenlandse markten kan diferetieren."

517 Pierre Bourdieu, "Alta Costura e Alta Cultura," *Revista de Sociologia e Política* 68, no. 26 (2006): 1–4.

The effect is the production of a phenomenon familiar to the markets of symbolic productions. In a small text that inaugurates his studies of the field of fashion, named *Haute Couture and Haute Culture*, Bourdieu argues that the establishment of these small forms of subversion is a strategy of distinction proper to cultural industries, such as that of high fashion[518]. According to the author, fashion and other cultural industries operate through the constant strife between their practitioners, where one seeks to replace the other as the main player, while the other tries to maintain its position. This dialectic movement creates two poles with associated strategies, or *modi operandi*. While dominant brands advocate for their hegemony in the creation of new products, based on the argument of previous success, experience and such, contendents try to slightly subvert the paradigms in which the industry operates, relying in notions like innovation, disruption etc. Old brands thus usually assume a more conservative practice, while new ones tend towards experimentation.

The fundamental point is that both sides have to play within the "rules of the game", that is, the innovative or disruptive practices evoked by newcomers, as well as the defences prepared by dominant brands, must manoeuvre their weapons without fundamentally breaking with the lexicon of their field. In this struggle, thus, whether the new Spring colour *pallete* mimics the pastel colours of the Autumn collection or goes for contrast is irrelevant, as long as the premise of seasonal wardrobe change is maintained. In this scenario, *appearance* is a formidable asset, for the capacity of something to *pass as* belonging to the *outside* of the field without being in reality foreign to its logics turns a product (or discourse) into a great tool in the fight for distinction. While perhaps easier to perceive in the case of modern fashion industries, the same is valid, as Nørgaard points out, to technological developments:

> leading to the acceptance of new techniques, and in a second step to new technologies within a society […] the driving factor is the desire of a minority for social differentiation. Motivated by this desire new forms and technologies are introduced into a society. Once the new form has been established, the new technique accepted and spread, the desire arises for a re-differentiation. This can lead to a local modification of the new techniques and the adoption of new technologies.[519]

It is perhaps not too farfetched to claim that the mode of representation of the *knooppunt* plays a similar role, simultaneously proposing renewal and innovation while maintaining the field's language and tacit norms. By focusing on the element

518 Bourdieu.

519 Nørgaard, *Bronze Age Metalwork: Techniques and Traditions in the Nordic Bronze Age 1500–1100 BC*.belt plates, pins and tutuli p. 262

that represents the final assemblage instead of the *chaîne opératoire*, B&I aligned the 78+ with a commodity-oriented aesthetics. In this framework, the depictions of the *knooppunt* not only serve to inform but, and even more prominently, they deploy a particular discourse, with a specific lexicon and aiming at an intended target. Through this process, the *knooppunt* can be interpreted as akin to a *dispositif,* or 'device' as Michel Foucault would put it[520], and as understood by Wakeford:

> The term 'device' is also appealing to us, then, because it helps us to recognize that knowledge practices, technical artefacts and epistemic things (Rheinberger, 1997) are encoded in everyday and specialized technologies and assemblages in which agency is no longer the sole privilege of human actors.[521]

Echoing the movement from the medieval *kodex* to the *treatise*[522], the focus on the *knooppunt*, especially through exploded isometric views, represents a progression towards a commercial logic of exposition, prioritizing elements that portray a technological product as an industrial commodity. In other words, the *knooppunt* was elevated as the avatar of the 78+ because it represents the product of the assembly rather than its process, a quality that resonates well with a market-oriented environment.

None of this means, however, that the *knooppunt* is particularly inefficient from a constructive and processual point of view. If the elevation of the *knooppunt* as the avatar of the 78+ system perhaps finds a better explanation in its visual power, its form is still a result of a long technical exploration that carries inheritances from many disciplines. A great testimony to this double value can be found in the way the *knooppunt* was further explored in later projects by B&I. Developed for serial production under the *Bulo* brand, B&I's design for the H20 table makes use of cross-shaped elements as its legs[523], as seen in FIG. 5.14. It was designed in 1994, not long before Bataille and Ibens would readdress the 78+ system (as discussed below). While not identical, the similarity with the 78+ is pointed out by many scholars[524]. This indicates that, nonetheless, there was still some development in the table's structure design. The abandonment of the corner block solution (which, in this case, could do well with the recessed joint) might indicate another case of iterative development.

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520 Foucault, *The Archaeology of Knowledge*.Michel Foucault, *The Archaeology of Knowledge* (New York: Vintage Books, 2010).

521 Wakeford, *Inventive Methods: The Happening of the Social*. p. 1

522 Keller, "Renaissance Theaters of Machines (Review of: The Various and Ingenious Machines of Agostino Ramelli by E. S. Ferguson, M. T. Gnudi, Agostino Ramelli; Le Machine (1629) by Giovanni Branca)."

523 Archief van Claire Bataille en Paul Ibens Desgin, Vlaams Architectuutinstituut archief.

524 Koen Van Synghel et al, Claire Bataille, Paul Ibens : Projets et objets 1968-2002

FIG. 5.14 The H2O table by B&I, in commission for Bulo. Source: VAi.

In architectural works, solutions resembling the *knooppunt* can be found in the metal structure of *Brants-Voets* house in Dwerp, and in an extension of a residence in Sint-Niklaas[525]. Finally, the 78+ was further developed in the 98+ construction system[526]. Compared to the prominent position of the model of the 78+ system inside the archive, the 98+ model can almost go unnoticed.

525 Koen Van Synghel et al, Claire Bataille, Paul Ibens : Projets et objets 1968-2002

526 Koen Van Synghel et al, Claire Bataille, Paul Ibens : Projets et objets 1968-2002

It sits low in a lateral shelf, almost at floor level and mostly hidden from a standing position point of view. It shows only three beams, instead of the original's four, and it is not as impressive in scale. The revision presented a version of the system without the modular square frames and replaced the corner blocks with aluminium L-shaped profiles. These modifications sought to further simplify the assembly process and drastically reduce the amount of wood required for its construction.

FIG. 5.15 the knooppunt of the 98+ construction system by B&I. Source: VAi.

In, fact, an analysis of the 98+ makes it clear that the 78+ system is somewhat materially inefficient. Given the modular nature of the square frames, the beams of the system are always doubled in the building's interior, which adds the necessity of another piece of timber filling the gap between them. All things considered, the now tripled beam solution turns the structure into an overshoot of structural capacity that, evidently, is not very economical. This strange consequence is especially significant due to B&I's attention to proportion and material: the two, Claire Bataille argues, "are inseparable, they are the core of the making"[527]. Yet, specifically in the 78+ case, there seems to be a conflict between them.

527 Koen Van Synghel et al, Claire Bataille, Paul Ibens : Projets et objets 1968-2002

FIG. 5.16 The knooppunt as seen in the interior of the 78+ prototype. Source: VAi.

To be fair, it is possible to see how the gap could be used to advantage when combined with sliding panels or doors. Still, in the 98+ system, the repeated beams issue was addressed. From photographs, one can see that its beams are unique, cornered only with aluminium profiles, making the appearance of the system much cleaner and modern, although somewhat saltless. While the new configuration solves the needless waste of material and the concurrent aesthetic discomfort it may cause in proportion-attentive viewers, the system no longer makes any use of the modular frames, so important in its predecessor's design. Additionally, the cross-shaped columns are almost entirely concealed, since the aluminium profiles protrude over the edges, leaving the wood barely visible.

Additionally, careful viewers will notice the joint's problematic connection with the flooring systems. While in the 78+ this detail is barely a nuisance, and affords an aesthetical affinity with fishbone flooring given the 45-degree angle of the corner blocks, in its 98+ successor the connection between structural elements and flooring is not so well resolved.. The replacement of the locking triangular piece of wood by the U-shaped aluminium profile requires an awkward cut in the flooring boards. From the photographs, it's possible to see the dismaying result. There is, in any case, the indication for an aluminium piece to fill the gap in the cross-section drawings. The

results of such solution, however, have no formal resonance with fishbone patterns and feel haphazard. They make evident the priority given by B&I in the choices surrounding the 98+ and showcase how questions of consistency and coherence were at play in their work, as discussed in the previous chapter.

These stories once again reflect how technology development is filled with choices that prioritize one or another way of thinking, hiding and undermining others in the process. If less visible, these inheritances are yet not fully removed from the history, and while tacit, they carry the epistemes of their making forward and into new areas, surreptitiously. The recurrence of the *knooppunt* in many different designs accounts for its visual, technical, and conceptual appeal, but also for the joint's capacity to bridge together different domains. As seen from the stories in this chapter, the *knooppunt* carries knowledge from many communities of practice, including the *savoir-faire* of carpentry, construction site logistics, and market strategies. Behind this repetition, however, lies yet another phase of the *knooppunt*'s history. As Christian Kieckens notes, the *knooppunt* reverberated with the designer's approach on a deeper level:

> An important part of [Bataille en Ibens's] oeuvre - not immediately visible and yet clearly present - deals with mastering this detail, with the materiality of the construction. It is part of their attitude that this mindset is transformed into a kind of wordless knowledge, a knowing 'how to deal with things'.[528]

The slow, re-iterative coming back to the *knooppunt* can be perceived as a way the designers related to materiality. B&I found in it a tool that allowed them to navigate the many agencies involved in material productions while trying to maintain their attentiveness to functionality and efficiency, and fostering their transdisciplinary stance[529]. Abstracted into a design approach, the *knooppunt* became a concept underlying the office's work, a way in which the network of different epistemic regimes was accessed. In other words, the *knooppunt* became a hybrid of concept and tool, employed by B&I in the performance of their draughtsmanship.

Forged across many phase shifts – from experimental model to design concept – the *knooppunt* weaved threads of craft, market practices, and design processes and subverted the roles of creator and creation, blurring the expected boundaries of knowledge in architectural production. Moving between concrete and abstract dimensions, the joint carries forward the processes of its development, in a renewed material inheritance wedged in architectural history and the shelves of the VAi.

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528 Koen Van Synghel et al, Claire Bataille, Paul Ibens : Projets et objets 1968-2002

529 Koen Van Synghel et al, Claire Bataille, Paul Ibens : Projets et objets 1968-2002

5.4 The tools of the architect

Informed by the particular rationality of crafts, the history of the *knooppunt's* development and transformations provides insights for understanding the knowledge inside architectural developments. In the *knooppunt*, the designers of B&I tested different possibilities of joinery, working between solutions that could facilitate its prefabrication or increase the system's sturdiness. Moreover, these explorations were developed cooperatively, with inputs from engineers and craftspeople. As such, this operation implies the performance of different perceptive fields, in the form of the specific skills of different communities of practice. The *knooppunt*'s mode of being, including the technical drawings, exploded isometric and the experimental models, bridges the different rationalities involving these skills into an abstract entity that possesses multiple bodies – each resonating, through material qualities and affordances, to the particular epistemic horizon possessed by specific professionals. The correspondence between these different media (model, technical drawings, axonometric views etc.) allows the development of overlaps between these fields and, consequently, a transfer of knowledge, as seen, for example, if indeed the blue inked markings on the exploded isometric were scribbled by a carpenter.

This multiplicity allows one to understand the particular operation and the specific qualities of the *knooppunt* within architectural production. Taking the *knooppunt* as embedded in the 1:1 scale model, for example: unlike other types of architectural models, the life-sized model of the *knooppunt* fosters a communication between production agents, not investors or clients, operating primarily a constructive purpose. As such, it acquires a particular mode of action, qualities and limitations. Being constructive, it better dialogues with the production dimension of architecture, at the cost of design fluency: the greater proximity between the model and the building diminishes the potential of the model to represent it in a simplified way, but, on the other hand, it allows for a deeper immersion in the material reality of construction and, therefore, in the rationality of other crafts of construction. That is, by becoming more similar to its referential, the constructive model loses part of the agility and the possibilities that a simplification (in scale, for example) affords but, in turn, it approximates architects to the specific material conditions of the actual construction. As such, it present to them a problem-setting more akin to that of crafts. This sort of constructive model, as the fishermen's harpoon, is 'building-like' from the perspective of the architect – and 'design-like', from the point of view of builders[530].

530 Sautchuk, "O Arpão e o Anzol: Técnica e Pessoa No Estuário Do Amazonas." p. 10

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In other words, the case of the *knooppunt* shows that architectural artifacts can be interpreted and understood as *tools.* As tools, the different formats (or media) used by architects thus have particular modes of action and their associated epistemic horizons.

In the case of the *knooppunt*, its empirical quality and tentative, experimental character is heightened because the model is made in the same scale and material as the projected building element. This similarity allows a form of testing that encompasses elements of its production and *chaine opperatoire*, affording the *knooppunt* a sort of processual similitude to craft's ways of knowing.[531] By employing the same matter in an equivalent scale, the *knooppunt* steps into the ground of carpentry, and creates a shared territory where the knowledge of the architects and the carpenters can meet. More than a tool of simple communication, the model acts as a bridge that opens to architects the landscape of craft. Overlapping the epistemic horizons of design and construction, it allows architectural practitioners to more clearly perform within the carpentry's perceptive field. Constructive models, such as the *knooppunt*, thus help to reduce the gap in the "enormous difference between the simulation of architecture and the simulation of construction" that plagues knowledge transfer in architectural productions and can understood, therefore, as translators between different epistemologies of making[532].

Moreover, the *knooppunt*'s history and mode of action shows that the architect and the builder, although historically divorced[533], still negotiate in the production stages and this relationship is permeated by questions of knowledge. The way buildings are made is a crucial reflection of these negotiations, where the skills of many craftspeople come in close contact with the architect's practice. It also expresses how architectural knowledge is shaped by material inheritances[534], and is the territory where these interactions take place. Different ways of knowing are incorporated in the way architects design and think spaces, as well as how constructions workers and contractors materialize these ideas.

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531 This specific quality of 1/1 models has not gone unnoticed by architectural scholars and practitioners. See Óscar José Andrade Castro, "Ronda: Architectural Education and Practice from the Construction of a Milieu in Common," *A+BE Architecture and the Built Environment* (TU Delft, 2021). Mara Trübenbach, "Material Dramaturgy: Tracing Trails of Dust in the Architectural Design Process" (The Olso School of Architecture and Design, 2024).

532 Manuel Couceiro da Costa, Bárbara Formiga, and Günsu Merim Abbas, eds., *Materiality as a Process*, *Materiality as a Process* (Lisboa: Caleidoscópio, 2019), https://doi.org/10.30618/9789896586577. p. 18

533 See Ferro, *Arquitetura e Trabalho Livre*.

534 The concept of "material inheritances" is explained in detail in Chantel Carr and Chris Gibson, "Geographies of Making: Rethinking Materials and Skills for Volatile Futures," *Progress in Human Geography* 40, no. 3 (2016): 297–315, https://doi.org/10.1177/0309132515578775.

In addition to the stories of collaboration, the history of the *knooppunt* depicts how an alchemical dimension is an essential part of architectural developments and the formation of the built environment. It shows the iterative and the explorative steps that are fundamental to the design development, but whose progressive formation is muted in the fully formed image of an architectural element. That is, this story brings to the fore some of the many possible paths faced by the designers and craftspeople in their creation, with their crossroads, experimental and incremental changes, failed attempts, returns etc. Dismissing the idea of what could be called the "fetishism" of the architectural element, the formation history of the *knooppunt* highlights that which cannot be seen from the finished object alone, including the difficulties of creative work, the skills of many professionals, the particularities of materials and the complications of socioeconomic context etc.

In relation to design, particularly, it is possible to perceive from this story that, as Jonathan Hale points out, the process of design involves an operation of "coherent deformation" of available significations equivalent to that described by Merleau-Ponty to clarify language[535]. Mingling design and construction realms and moving between diverse media, the iterative development of the joint produces an equivalent of a "tentative outline of a form that is […] being deliberately distorted or deformed to reveal some previously unrealized potential"[536]. As discussed previously, this concept is that of the abductive process of understanding. Thus, the very process of modelling can be seen directly as a form of rationalizing information, establishing knowledge by the clarification of a range of possibility. Hale points out that, in architectural design, this process of coherent deformation relies on the designer's *habitus,* encompassing not only a behaviour or mode of action, but a technical repertoire: a "personal library of shapes, forms, and arrangements of spaces can be used to begin the process of both creating and interpreting the emerging design idea"[537]. This means that, in this formulation, the design activity is referential to its own formulation. That is, the tools of design – drawing or modelling, for example – operate via an improvisational experimentation that weaves insights through the re-iterative manipulation of their own perceptive potential. If architecture has a material inheritance, therefore, it also has a *designerly* inheritance that stems from this technical habitus. In the case of design tools, this potential owns to their representative quality which, in essence, is a capacity to translate complex material assemblages into unitary, idealized unities

535 Jonathan A. Hale, *Merleau-Ponty for Architects* (London: Routledge, 2017). p. 98

536 Jonathan Hale, "Unlocked-for-Editing : Architecture and the Image," 2013, https://bodyoftheory.com/2014/02/14/unlocked-for-editing-architecture-and-the-image/.rch p. 1

537 Hale. p. 1

– spatial abstractions, *re-presentations*. This simplification is fundamental to design processes because provides designers with "a safe way of simulating and testing of new solutions – without the expense of building at full-size to find out how it might actually work"[538]. Thus, the operations within the architect's work are, just as the work of other craftspeople, employed within a process-oriented way of knowing. Architects come to knowledge *in* design by engaging in its practice, thinking through sketches, drawings, models and other such tools.

The boundaries of this rationality, however, are confined to the material of design – which does not correspond entirely to the material of building. Notably, Hale's choice of words (shapes, forms and arrangements) indicates how detached are the terms (and *telos*) of sketching from concrete, material conditions. Sketches, drawings or models invariably work as tools and, having the particular mode of operation of its kind – as entanglements of perception and action – they carry a particular way of thinking related their specific affordances and contingencies. That is, all these operations have limits, insofar as their engagement with the entirety of the process behind architectural production is bound to particular material conditions. Paper is flat, space is not; walls are not made out of graphite lines or cardboard sheets; a model does not respond to the same forces a joint would when integrated in the full-scale structure. Particularly, from the point of view of skill, design tools have their own ways of making that do not exactly correspond to those of the crafts in the construction site. Given that the establishment of modes of perception that characterises skill is effected in practice, the knowledge architects can gather from the use of such tools will invariably differ from that of builders. Ultimately, the tools of the architect represent design, not construction.

Even constructive models, such as the *knooppunt*, are not neutral. Seen from the perspective of craft, it is possible to perceive that in the production of architecture the division of labour is reflected in a second division – namely, a discursive division. The *knooppunt*'s progression from empirical exploration to abstraction within the history of B&I's work represents a movement away from the concrete reality of construction. Instead of witnessing a reappearance of the logic of the *chaine opperatoire* or the craft knowledge involved in the production of architecture, the lessons learned from the *knooppunt* become increasingly immaterial in B&I's work, in a process of abstract reification. Accordingly, the discursive development around the *78+* steered away from the logic of the construction site, fostering an object-centred view that downplays and obscures the participation of craft knowledge in the system's formation.

538 Hale. p. 2

This gap between design and construction has consequences not only in terms of the practical, constructive side of architecture – as seen in the confused development of the *knooppunt*'s carpentry – but also in what would generally be regarded as properly 'architectural' or 'designerly' in the field's discourse. Against the backdrop of architectural history, the 78+ system, approximating designers to direct matters of engineering, crafts and real-estate development, could be understood as a pushback, or a remedy, to the "distancing" that governs the architecture from the 1970s, as described at the time by Tafuri and Dal Co[539]. If modern architecture represented an "evasion" whose grounds are founded on its "prophetic role, ideological charge and utopian quality"[540], B&I's project moves away from the obsession with the "exceptional", tuning in with a constructive rather than utopian notion of technology. Countering the universalist, mass-produced pursuit of architects like Buckminster Fuller with the grease and grime of a small scale, low-tech system focused on the ease of production and assembly, the 78+ brought B&I to the threshold of the construction site instead of the industrial complex[541].

The manner in which this approximation is attempted, however, is laid on the same beaten path that both modern and post-modern architectural styles – or "languages"[542] – have threaded. While discoursing with different arguments, of DIY logic and modular rationality, B&I's mode of action (via, for example, their mode of representation) is no less intended to promoting a commodity than the proposals for "super-skyscrapers" that then shoot up in Chicago, New York or elsewhere. Additionally, despite their on-ground explorations with the *knooppunt* model, the prototype and the consultations with craftspeople, the ultimate expression of the 78+ system in B&I's work and the legacy picked up by architectural scholars remains that of abstraction over concrete reality. That is, the 'properly architectural' qualities that both the designers and the profession as a whole learnt and propagated, in terms of concepts and knowledge, stem from its formal constitution rather than the way it is made. It shows how architects perceive (and picture) the design over the construction, reaching the extreme in the Corthout house in Schilde, where the cross-shape element became a completely empty negative space – a purely spatial joint. With this movement, even if unintentionally, the distance, division and erasure of the epistemologies of making is reproduced in architectural knowledge. The corollary, as Tafuri would put it, is the permanence of a discourse in which "what architecture reveals is not the nature of its own relationship with

539 Mandredo Tafuri and Francesco Dal Co, "History of World Architecture: Modern Architecture 2," 1986.

540 Tafuri and Dal Co. p. 366

541 Francis Ching, Mark Jarzombek, and Prakash Vikramditya, *A Global History of Architecture* (New Jersey: Wiley, 2017).

542 Tafuri and Dal Co, "History of World Architecture: Modern Architecture 2."

the world but the difference between reality and the way forms are reproduced."[543] Thinking mostly inside of "the conceived space", the 78+ is not a shift in what Kapp would call "another history of architecture" that "focus lies more on the processes of production of space than on the products and their formal analysis", but its reprisal[544]. The *knooppunt*'s proximity with the craft and the site of construction, counterintuitively, tells more of a story of the division and contradiction of labour and knowledge in architectural production than their reconciliation.

In any case, through the microhistories of the joint's design and its employment in the construction site it becomes clear that, as Glenn Adamson and Chris Gibson point out, technological development is never fully independent of craft skill[545], but the process is not always harmonious. As a constructive analogue to Joseph Kosuth's *One and Three Chairs*, the 78+ system is one and many at the same time. In the 78+, market, industry, design and craft come together in an enmeshed artefact. These are all different dimensions of what can be understood as a single phenomenon – each representing, nonetheless, a specific skill set and way of knowing, and the values inscribed in an episteme. This multiplicity thus reflects the many fields involved in its formation and their specific directionality – some oriented towards the system's assembly in the construction site, while others focus on the aesthetic appeal for marketing material. Crystalizing schisms between intellectual and operative, conceptual and constructive ways of thinking, the constellations of skill, knowledge and agency in the 78+ reveal a shared but disputed environment of material, practical and discursive horizons. Thus, if one must accept that "there is no clear duality of existence / non-existence for buildings, but that they undergo different stages of existence", as Boucsein suggests, the question should also not be limited to the design of the architect and the physical building only[546], but include its construction. The story of the 78+ system, with its back-and-forth movement between design, construction and marketization serves as evidence that architectural knowledge is built across many phases or dimensions of its production, even if materialized or translated in distinct terms.

Contrarily to common idea that tools and works or art are intrinsically different, as voiced by Kubler (claiming that a "tool is always intrinsically simple, however elaborate its mechanisms may be, but a work of art, which is a complex of many stages and levels of crisscrossed intentions, is always intrinsically complicated,

543 Tafuri and Dal Co. p. 371

544 Kapp and Baltazar, "Out of Conceived Space: For Another History of Architecture." p. 7

545 Adamson, *The Invention of Craft*. Gibson, "Material Inheritances: How Place, Materiality, and Labor Process Underpin the Path-Dependent Evolution of Contemporary Craft Production."

546 Boucsein, "What the Files Reveal: Making Everyday Architecture Talk." p. 169

however simple its effect may seem")[547] it is possible to see, following the story of the *knooppunt*, that the reality is other. A tool, as well as the work of art, is multiple, multifaceted and complex in many levels, because, as Adamson states, "[e]very act of making is relative, embedded in a complex system of production"[548]. Metaphorically and literally, the *knooppunt* connects the many worlds surrounding the craft of architecture, forming and being formed by the different elements involved in its history.

5.5 Conclusion

The investigation in this chapter attempted to appraise how the connections between the built environment and the processes involving its material constitution can be understood through the lenses of my epistemology of making, using the 78+ construction system and its *knooppunt* as a case study. In contrast with the evaluation from the developments of the third chapter, the study of archival material proved a more fertile ground for a full analysis of architecture through an epistemology of making. Under the theoretical framework proposed in this research, the study of the *knooppunt* showed that architectural production can be understood as a complex endeavour with manifold cultural, economic and political implications that is actualized as a collective production involving many individuals and fields of knowledge, each carrying different practical and symbolic determinations – a constelation of crafts. In other words, as Silke Kapp phrases, "as a material network of things and physical actions, perceived through the senses, and constituting spatial practices"[549].

547 Kubler, "The Shape of Time: Remarks on the History of Things." p. 11

548 Adamson, *The Invention of Craft*. p. 32

549 Kapp and Baltazar, "Out of Conceived Space: For Another History of Architecture." p. 1

The history of the joint makes clear that architecture is produced under a constellation of crafts that possess different sets of skills and whose relationship is permeated by material inheritances, discursive divides, collaborations between communities of practice and non-linear developments. It shows that the entanglement between many disciplines does not mean a full or unbiased transmission of knowledge – in particular forms of knowledge that are already tacit. Importantly, it shows that knowledge is apprehended in architecture mainly via representation, or better yet, that it is mainly the representational side of craft knowledge that is apprehended, not its practical side, even in the development of constructive systems in close contact with the production processes. In other words, the history of the *knooppunt* does not show a significant overlap in the knowledge possessed by architects in relation to that of the construction site, but indicates the existence of different modes of reference and different directionalities that make evident the epistemic difference between architectural representation and production – they operate, as it were, in different realms.

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6 The Material Discourse of Architecture

Earlier versions of this chapter were published in Eric Crevels, "The Tangible Presence of Human Labor in Architecture," in *Ambiances, Alloaesthesia: Senses, Inventions, Worlds. Proceedings of the 4th International Congress on Ambiances.*, ed. Damien Masson (E-conference, 2-4 December 2020, 2 vol: Réseau International Ambiances, 2020), 184–89. and Eric Crevels, "Knowledge in Architecture: Draughtsmanship or Craftsmanship?," *Academia Letters*, no. December (2021): 1–5, https://doi.org/10.20935/al4289.

6.1 Introduction

To develop a study of the epistemologies of making in architecture, it is necessary to address the discipline from both material and discursive terms. So far, I showed how process-oriented ways of knowing can be found in the design and the construction of architecture, albeit not necessarily embodied or recognized by its namesake, the architect. It becomes increasingly clear that, while the skills of the architect and of the builders diverge, craftsmanship can be found in both instances, design and construction. The craft of architecture and of the architect, in this sense, seem to move in and out of phase, representing a constellation of skilled practice that, taken as a whole, escapes the modes of being of a craft and leaves evident an epistemic divide. Thus, if not craft, what sort of material discourse rules architecture? How to explain the way of knowing of architects and it's relation to material production?

In this line, examining the relationship between draughtsmanship and craftsmanship in architectural history, discourse and theory through the lenses of the epistemologies of making may provide an alternative framework to address architectural scholarship. From this study, it becomes possible to analyse whether architectural discourse reflects the complexities and particularities of practice as it happens empirically, or

instead steers away from understanding the adjacency of material productions and the production of knowledge through skill. In other words, understanding architecture as a material discourse, in this chapter I question whether its way of knowing is aligned with that of craft. The chapter can be therefore understood as a discourse analysis that explores how craftsmanship features in architecture's lines of discourse.

The chapter is composed of three sections. The first section presents a literature review of architectural canon exploring the implicit presence of craft and labour and its contribution to the experience and production of architecture. It examines how the design and the making of architecture are entangled in the field's discourse, and how it is addressed. Section two addresses a contemporary reflection of the rift between design and construction, showing the different ways of understanding materials between architect and builder. Exposing this epistemic rift within the production of architecture and drawing from Michel Foucault's theory, it develops the concept of *discursive materiality* to describe the phenomenon. In the third and final section, I investigate the distinct approaches of two architectural theoreticians – namely Sérgio Ferro and Manfredo Tafuri – and analyse how their different use of Marxist theory can be understood from the perspective of the epistemologies of making.

6.2 Craft and labour in architectural discourse

Based on the semiology of Peirce, Brazilian architect and theorist Sérgio Ferro argues that it is possible to follow the *index* character of materials to find traces of labour[550]. Understanding the history of the built environment as a collective history, he states that materials can be seen as *signs*. As such, vestiges of productive operations in the making and employment of these materials allow the examination of the production relations on the built environment. In other words, these marks are signatures of labour and skill in the objective manifestation of materials, as part of their semiological constitution. Being symbolically charged elements, they reverberate in perception, reflecting the sociocultural heritage of architectural production: they trace the movements, techniques and the cultural background of their production,

550 Ferro, *Arquitetura e Trabalho Livre*.

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and so, act as representatives of their makers. The argument is similar to that of Alfred Gell, reflecting on the distinction between art and artifact: artifacts, by their own material form and function, serve as ways in which the world of its maker can be read[551]. Being 'models' ingrained with the relationships encompassed in its production and its use, artifacts carry in themselves cultural, material and social relationships that trace back their emergence in a particular world-view. In his words: "there cannot be a hammer by itself; a hammer implies nails to be hammered, wood to hammer them into, saws to shape the wood, and so forth"[552].

One could say, then, that the performance of craftsmanship is imprinted in materials through these traces of labour, and gains a tangible presence in the built environment, indissociable from the physical qualities of architectural elements. As Ingold argues, it becomes part of "the forces and flows of material that bring the form of the work into being"[553]. However, identifying these flows is a process of *abduction*, that deals with the alignment of possibilities, rather than precise associations[554]. The level of recognition of the signified material relations depends on the knowledge and experience of the interlocutor: one can only "see in the beams traces of the movements of the axe that cut them" if one is familiar with axes and how they are used, as Ingold reminds[555].

This perceptive gap, nonetheless, can be fruitful for an analysis. It is expected that the attributes of labour are also perceived and incorporated in theoretical works, especially those with focus on material, given its presence in the objects of such studies. In other words, in many of the theories that fundament material culture and architectural experience, labour (and therefore craft) is implied in the constitution of material and, although seldom directly addressed, it is a determining dimension of materiality. Just like the physical qualities of materials, labour, skills and techniques are imprinted in the built environment and contribute to the creation of particular atmospheres. The importance of materials in the experience of architectural spaces is hardly questioned, yet most of the discussions stop short of addressing how it relates to its production dimension and how craftsmanship plays a part on it. Still, important insights can be drawn from the examination on *how* the question is presented in these works. Through these written manifestos, architects exposed the theoretical (and moral) reasonings they believe should fundament architectural

551 Gell, "Vogel's Net: Traps as Artworks and Artworks as Traps."

552 Gell. p. 33

553 Ingold, "The Textility of Making." p. 97

554 Gell

555 Ingold, "The Textility of Making." p. 99

design and construction, establishing normative backgrounds against which architecture could be evaluated and, through which, modelled as a profession. Through them, one is able to address how architects perceive and theorize the presence of labour and grasp some of their discursive basis (and biases) that, in turn, allow for a delineation of architecture's epistemology of making.

6.2.1 Corruption and substance

Starting from earlier works, interesting examples can be found in two of the most long-lasting and influential treatises on architecture, namely the work of Vitruvius, recovered during the Renaissance, and Alberti's treatise.

Vitruvius' *Ten Books on Architecture* correlation to labour seems timid, but the distinction of "practice" and "theory"[556] and their co-dependent relation shows that Vitruvius was well aware of the contributions of labour to the resulting environments. The author notes that the observation of the "mode of execution, or of the mere operation of the hands" is essential for the transformation of matter "in best and readiest way"[557], to the extent that architects who lack practical knowledge – the "frequent and continuous contemplation" of practice – fail to understand architecture properly, "grasping the shadow instead of the substance"[558].

Vitruvius's account might be understood as reflecting an earlier semantic transition, whose effects may have reverberated still in Rome. In a comprehensive study of the linguistic appearance of the 'architect', Jonas Holst shows that in Ancient Greece, the processes of separation between builders and architects started to take shape in a complex relation of division and inheritance. From Homer to Plato, the *tektones* (roughly 'craftsmen') fell from being regarded as "versatile, first-rate craftsmen who created wonders out of matter" to the "lower end of the epistemological and ontological scale" in Greek society[559]. Writing around four hundred years after this

556 Appearing in the 8th century *Harleian Manuscript* as *Fabrica* and *ratiocinatione* and translated by Frank Granger as "craftsmanship" and "technology" Vitruvius, *On Architecture*, 3rd ed. (London: Harvard University Press, 1955), https://doi.org/10.1109/MS.2006.52.. The translations "practice" and "theory" are present in the version by Morgan Vitruvius, *The Ten Books on Architecture* (Cambridge: Harvard University Press, 1955), https://doi.org/10.1130/SPE63-p36..

557 Interesting to note that, in his translation, Frank Grangers states on a footnote that "Vitruvius recognizes the genius of the craftsman". Vitruvius, *On Architecture*.

558 Vitruvius, *The Ten Books on Architecture*.

559 Holst, "The Fall of the Tektōn and The Rise of the Architect: On The Greek Origins of Architectural Craftsmanship." p. 1

original schism between architects and builders starts to take shape, Vitruvius's vision of the architect nonetheless reflects the emphasis on the need of a broad, cross-disciplinary knowledge for the craftsmanship of architecture. Notably, he argues that architects should be knowledgeable in the arts of medicine, astronomy and other disciplines, in a way that resonates the versatility of the *tekton.*

This interpretation might have a significant impact in understanding Vitruvius's principle of *firmitas*, generally referred to as the constructive stability of buildings. As Frampton highlights, the principle evokes the concept of tectonics, and ultimately to carpentry. The term *tectonic*, derived from the Greek *tekton,* undergoes a change in meaning across the centuries, shifting from expressing an active, verbalized instance of making – the "artisan working", or "the general notion of making" – towards "an aesthetic rather than a technological category", finally representing "a certain expressivity arising from the statical resistance of constructional form in such a way that the resultant expression could not be accounted for in terms of structure and construction alone"[560]. Notably, the term progressively relied on a differentiation between the act of making and its expression, seemly in a search for quality that emerges within but detaches itself from the making process and the material constitution of the building. Frampton's own position attempts to establish a middle ground between the two:

> Needless to say, I am not alluding to the mere revelation of constructional technique but rather to its expressive potential. Inasmuch as the tectonic amounts to a poetics of construction it is art, but in this respect the artistic dimension is neither figurative nor abstract.[561]

Frampton's attempt is worth of praise, for it went against a current of progressive detachment of an essentially material term from the material itself. Nonetheless, the need for an expressive potential to validate the poetics of construction, whether by itself or coupled with a 'revelation' of constructional technique implies that he believes that it is only *after* the process, once the object is completed and can be read as an expressive device, that tectonics can be found. Tectonics, in these sense, remains as a sort of post-assembly quality, specifically related to a materiality of buildings. Contradictorily, it lies not on the actual processes of building, but solely on its final shape, as if buildings were atemporal, ready-made entities that just pop-up into existence and whose qualities are disconnected from their production.

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560 Frampton, *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture.* p. 19

561 Frampton. p. 2

Such an expressive focus seems not to align entirely with the rationale of Vitruvius's *firmitas,* considering the similarities between the architect's way of knowing defended by him with the mode of skill of the *tektones.* Vitruvius dedicates many chapters on materials, going into a great degree of detail into describing their making, which raw materials to use, in which conditions to prepare them and so on. This focus on matter can (also) be seen as a reflection of the *tekton* inheritance – more precisely, on their capacity of bringing out of materials an *implicit order* that, nonetheless, is an active epistemic enterprise of equivalent value as theoretical developments[562]. In the words of Goldberger, Vitruvius envisages an ideal of architecture in which expression, usefulness and tectonics constitute a tripartite unity, presenting "these conflicting realities of architecture not as a paradox but as a matter of coexistence"[563].

While Vitruvius balance the needs for craftsmanship and theory, the question of labour in Alberti can be seen from its negation or, in other words, in Alberti's efforts to separate the role of the architect from that of the builder[564]. For Alberti, architecture "can exist as an image in the mind that is perfect, uncorrupted by matter and mistakes"[565], implying that the foundation for beauty stems primarily from mathematical order, but still depends on proper realization. The author's recognition that labour can poorly translate architecture into the built environment, *corrupting* its ideal form, is, nonetheless, a proof of its contributions and the importance of craftsmanship. His attempt to orient the work of artists, dedicating chapters of his *Res Ædificatoria* to matter, building techniques and restauration, can be seen as ways to remedy the lack of ability of artisans to properly realize the ideal mathematical models. On the other hand, it is also an attempt to control their labour. In his words, transforming builders into "no more than an instrument" in the architect's hand[566].

Standing at the twilight of the guild system, Alberti's defence for the division between intellectual and productive labours can be seen as a historical stance, aiming a rupture with medieval standards[567]. His words indicate a dissatisfaction with medieval models of production, which followed a structure in which theory and practice are undivided

562 Holst, "The Fall of the Tektōn and The Rise of the Architect: On The Greek Origins of Architectural Craftsmanship."

563 Paul Goldberger, *Why Architecture Matters* (London: Yale University Press, 2009). p. 7

564 Mario Carpo, "The Craftsman and the Curator," *Perspecta* 44, no. May (2018): 86–91.

565 Rebecca Williamson, "Thinking Through Building," *Montreal Architectural Review* 6 (2019): 11–27. p. 13

566 Leon Battista Alberti, *On the Art of Building in Ten Books* (Cambridge: MIT Press, 1988). p. 1

567 Joseph Rykwert, "On the Oral Transmission of Architectural Theory," *Res: Anthropology and Aesthetics* 3, no. 3 (1982): 68–81, https://doi.org/10.1086/resv3n1ms41625300.

and, thus, more propense to corruption. The change of this model, and the consequent changes in the form of production of architecture and the relationship between the architect and the construction site influenced Alberti's theoretical approach.

One such change is the division of labour and the instrumentalization of the construction site effected by Filippo Brunelleschi –to whom Alberti addressed a highly complimentary letter[568]. Brunelleschi's strategies sought to control and maximize the productivity of builders, interfering in the distribution of labour and the schedules of the construction site[569]. As Sérgio Ferro points out, for example, Brunelleschi used the prestige and authority bestowed to him by the church to confront the opposition of the builder's guild, laying off its workers and hiring craftspeople from nearby cities[570]. Under his rule, builders were even prohibited from descending the *duomo* to enjoy their lunch breaks, eating in the scaffolds surrounding the cathedral to save on the time needed to go down and up.

However, as Alberto Pérez-Gómez demonstrates, the division of labour in architectural production was far from complete in the Renaissance, albeit idealized and intended. The fundamental distance between "idea and matter" and "design and construction, would be reconciled through [the architect's] own involvement in building."[571] As evidence, Pérez-Gómez shows that, in his *Trattato*, Filarete "was well aware that the building would change in the course of construction, and that it could be enriched and even improved", suggesting that, despite the overall "Platonic overtones" of the treatises, the concrete processes of construction were not entirely removed from architectural ways of knowing[572]:

> The road was certainly open for the transformation of the builder into an efficient designer, capable of controlling practice through prescriptive methods and precise drawings. But the transformation did not happen overnight. Perhaps more importantly, this historical evidence shows that the perception of theory as method, and of drawing as its tool of reduction, should not be taken for granted. Only modern architects after Durand have assumed such a role of drawing as primary and unquestionable.[573]

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568 Leland M. Roth and Amanda C. Roth Clark, *Understanding Architecture: It Elements, History, and Meaning*, *Understanding Architecture: An Introduction to Architecture and Architectural History*, 2006, https://doi.org/10.4324/9780203238233.

569 Ferro, *Arquitetura e Trabalho Livre*.

570 Ferro.

571 Alberto Pérez-Gómez, "Architecture as Drawing," *Journal of Architectural Education* 36, no. 2 (1982): 2–7, https://doi.org/10.1080/10464883.1982.10758306. p. 2

572 Pérez-Gómez. p. 3

573 Pérez-Gómez. p. 3

Brunelleschi, too, relied greatly on his knowledge of construction within the gothic tradition to realize his "creation of a new building process"[574]. It seems that, while the premises of an epistemic labour division steered the organization of labour in the Renaissance construction site, the history of this developments possess other tributaries and, particularly, a material and technical inheritance directly connected to the craft guild system. Accordingly, despite being a defendant of the division between intellectual and productive labour in architecture, Alberti recognises the importance of the knowledge over matter and building techniques, implying that, even if secondary to design, the skill of construction crafts still belonged to the architect's skillset.

Also worth of note is the Albertian reference to material processes in the art of sculpture, found in his treatise *De Statua*[575]. By describing its epistemology from practical movements found in the craft itself (*adding* ceramics, *removing* stone etc.), Alberti echoes a process-oriented way of thinking akin to craftspeople. Nonetheless, with Alberti's blessing a discursive division between the architect and the builder is established, as well as the tools of its reproduction. Contiguous with the process, a possessive idea of authorship, accordingly, is inaugurated in the Renaissance. As Roberto Eustáquio dos Santos highlights, the first register of copyright – a project of a ship – also belongs to Brunelleschi[576].

6.2.2 Weaving bricks and stones

While assuming art's derivation from nature, as in the Greek temple's abstraction of the three, Gottfried Semper doesn't seek a simple return to nature as a way to further develop art. On the contrary, he states that "[t]he most primitive tribes we know present us with an image not of the primeval human condition but of its impoverishment and stultification"[577]. Art, in his perspective, appears to be closely related to the progressive change of nature's forms into human or artificial ones.

Evidently, Semper's formulation requires human activity; in other words, labour. The connection can be traced in his stylistic categories. It is easy to perceive how closely they are related to production processes by associating their terms

574 Pérez-Gómez. p. 4

575 Leon Battista Alberti, *Della Pittura e Della Statua* (Milan: Dalla Societa Tipografica de'Classici Italiani, 1804).

576 Roberto Eustáquios dos Santos, "A Armação Do Concreto No Brasil: História Da Difusão Da Tecnologia Do Concreto Armado," *Cadernos de Arquitetura e Urbanismo* 15, no. 16 (2010): 48–59.

577 Gottfried Semper, *Style in the Technical and Tectonic Arts; or, Practical Aesthetics* (Los Angeles: Getty Research Institute, 2004). p. 103

with the corresponding verbs: for "textiles" one would have *weaving*; "ceramics" could be linked to *moulding*, 'tectonics', *joining*; and 'stereotomy', *stacking*[578]. It is true, however, that Semper's focus on *shape* inverts the logic underlying his own classification, pushing the processes to the background, and leading him into a strange position that seemly contradicts his own premises:

> Conversely, there are objects that certainly belong to ceramics from the point of view of materials, inasmuch as they are formed from a soft mass that was hardened and fixed. *But they should be seen as relating to ceramics only secondarily, because formally they are in a different sphere.*[579]

This sort of contortionism is abundant, and it derives from a conscious decision to understand style in its own terms, in a form of aesthetic quality autonomous (yet related) to material processes[580]. Kenneth Frampton, following the reasoning of Harry Mallgrave, recognizes that Semper "remained somewhat undecided" in relation to the expressivity of materials and techniques, "hesitating between the symbolic expressivity of construction as a thing itself – rationally modulated from both a technical and an aesthetic standpoint – and a symbolic elaboration […] irrespective of its underlying structure."[581] In other words, the thought of Semper is tensioned between a recognition of labour and craftsmanship as active participants in the formation of style, and its appreciation only in terms of a visual effect whose connection to making remains superficial, only related insofar a particular process generates a specific pattern. Given his intended connection to what he names as "primitive arts", which include crafts, in search of an archetypical morphology, this tension leads Semper to the choice between a genealogy of processes and a taxonomy of forms. The problem can be stressed by considering that materials are often themselves products of human labour. In such a consideration, when analysing how bricks are made in relation to Semper's categories, they would be framed as ceramic, but considering "how they are used in production", they constitute masonry – in the Semperian stylistic view, however, they are considered as a textile, given the formal similarities with the patterns of woven fibres[582].

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578 This approach is loosely based on the lectures of Prof. Tom Avermaete, developing his initial thoughts on *architectural epistemes*, which can be found at "Architecture and its Epistemes" Tom Avermaete, "Architecture and Its Epistemes," in *Theories and Methods in Landscape Architecture*, ed. Ellen Braae, Savava Riesto, and Tom Avermaete, 2016, 8–14.

579 Semper, *Style in the Technical and Tectonic Arts; or, Practical Aesthetics*. p. 110 My highlights.

580 Bernard Cache, "Gottfried Semper: Stereotomy, Biology, and Geometry," *Perspecta* 33, no. 2002 (2002): 80, https://doi.org/10.2307/1567300.

581 Frampton, *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture*. p. 16

582 Semper, *Style in the Technical and Tectonic Arts; or, Practical Aesthetics*. p. 110

The dichotomy faced by Semper could be framed under the discussion of whether he considers the emergence of craftsmanship as a quality of things in their coming to be or in their appearance – which, in the words of Tristan Garcia, relies primarily in the differences between the *representation of an object* or an *object of representation*[583]. The problem of Semper, in this framework, is whether to treat styles as being represented by materials, or representing them. Perhaps this tension arises from the perception of Semper, as Adamson claims, that "form had always arisen through the logic of craft – the interaction of material, tools, and function – rather than through conscious imposition" but, in his time, "those various forms of resistance were banished"[584]. Failing to see both that these productive resistances never really vanished, just changed in terms of the processes and modes of production, and that design (or 'conscious imposition' of form) still operates within an interaction of material, tools and functions, Semper is lead to assume form as something *other,* something that once produced acquires an existence of its own, and that somehow could be described simultaneously related to and independent of making.

Aware of the tension, Frampton follows Semper, and argues that "this dichotomy must be constantly rearticulated in the creation of architectural form, since each building type, technique, topography, and temporal circumstance brings about a different cultural condition"[585]. This perspective, however, is valid only inasmuch the symbolical is not admitted as part of the act of building itself, i.e., if labour is instrumentalized as a mere mechanical process rather than considered a symbolic practice. The maintenance of this dichotomy in Semper and in Frampton, in any case, indicates the resistance of even modern authors to accepting that a symbolical value needs not rely on the production an expressive potential as an external quality, but can take shape as the very performance of craftsmanship.

Regardless of which interpretation Semper (or Frampton) prefers, it is possible to argue that in his theory labour is embedded in materials in a two-fold way: in how they are made and in how they are employed in construction. More importantly for him, however, is how they appear in relation to how architectural objects are perceived. As "every technical product is a result of purpose and material" [586], Semper identifies labour processes as defining features in the composition of style, and the question of craftsmanship can even

583 Tristan Garcia, *Form and Object: A Treatise on Things* (Edinburgh: Edinburgh University Press, 2010).

584 Adamson, *The Invention of Craft*. p. 88

585 Frampton, *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture*. p. 16

586 Semper, *Style in the Technical and Tectonic Arts; or, Practical Aesthetics*. p. 107

be recognise in his distinction between art and technology. In Semperian terms, “art has a language of its own, consisting of formal types and symbols” while technology categorises that which refers to the way things are made. In their link, labour becomes ingrained in the symbols and types as their primeval archetypes[587].

6.2.3 Marks of hands and freedom

The acknowledgement of the influence of labour in the discourse of architecture reaches a peak on the *Arts and Crafts Movement*. The movement owns much of its philosophy to John Ruskin and his “sublimation of the imperfect”[588], in which the author argues that it is possible to apprehend in materials whether there was “a care about them”[589], suggesting that the traces of craftspeople’s labour “which has visibly been employed upon them” express a “vital energy” in the built environment that is “no inconsiderable part of the essential characters of Beauty”.[590] This leads him to advocate for the “truth to materials and honest display of actual construction” [591], as in his defence that “the masonry of a building is to be shown” [592]. In Ruskin, labour is related to the attendance of beauty by associating architecture with nature – the “source and paradigm of all authentic beauty”[593] that become expressions of the mind “accepted” by nature as its representation[594].

Ruskin became concerned by the lack of spirituality of the constructions of his time, as opposed to the genuine inspiration of the Gothic. According to him, the Gothic spiritual inspiration was especially noticeable in its ornaments which bore the trace of the intimate association between hand and mind that characterized the medieval period.[595]

587 Semper. p. 105

588 Carpo, “The Craftsman and the Curator.” p. 91

589 John Ruskin, *The Seven Lamps of Architecture* (London: Smith, Elder, and Co., 1849). p. 157

590 Ruskin. p. 136

591 Cornelis J. Baljon, “Interpreting Ruskin: The Argument of the Seven Lamps of Architecture and the Stones of Venice,” *The Journal of Aesthetics and Art Criticism* 55, no. 4 (1997): 401, https://doi.org/10.2307/430927. p. 404

592 Ruskin, *The Seven Lamps of Architecture*. p. 74

593 Baljon, “Interpreting Ruskin: The Argument of the Seven Lamps of Architecture and the Stones of Venice.” p. 404

594 Baljon.

595 Antoine Picon, “Digital Fabrication, Between Disruption and Nostalgia,” *Instabilities and Potentialities*, 2019, 223–38, https://doi.org/10.4324/9780429506338-23. p. 226

More than a convergence between knowledge and labour, the connection between mind and hand in Ruskin acquires transcendental overtones. In his Lamp of Power, according to Baljon, Ruskin establishes a direct connection between "God as manifested in nature's sublimity" and the "efforts, physical or organizational, invested in construction by its builders"[596]. In such a way, the artisans are perceived by Ruskin as being "spirituality-infused" in their engagement with the nature in the act of building[597]. The power of such encounter generates the rough surfaces praised by the author and an aesthetic resonance between viewer and maker, where the former recognizes the skill of the latter, which ultimately is an expression of nature. It relates to his Lamp of Life, "where association is with joy and happiness of masons and stone carvers"[598]. For Ruskin, the perception of the imperfections on the surface of Gothic architecture, in this sense, combines the agency of builders and nature, as buildings age:

> In recalling the impressions we have received from the works of man, […] often happens that we find a strange pre-eminence and durability in many upon whose strength we had little calculated, and that points of character which had escaped the detection of the judgment, become developed under the waste of memory; as veins of harder rock, whose places could not at first have been discovered by the eye, are left salient under the action of frosts and streams.[599]

As pointed by Antoine Picon, "Ruskin's doctrine is permeated by nostalgia"[600] and his praise to the marks of labour follows a discursive development that greatly resembles that the scholastic views on art before the Fifteenth Century. As exposed in the second chapter, the skill of these makers was then regarded as an instance where they became conduits of divine power and will, which resulted in a piece of work for the inspiration of God's people. As Pamela Smith shows, ultimately, these artists and artisans fostered the notion of the expression of nature's laws and properties through their arts as a validation of their own empirical knowledge – departing from the metaphysical interpretation Ruskin would later turn back to. In any case, both lines of thought follow the premise that the work of craft can provide a connection to a deeper reality - that it produces a sort of mirror through which aspects of truth can be glimpsed, be it on divine or natural terms.

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596 Baljon, "Interpreting Ruskin: The Argument of the Seven Lamps of Architecture and the Stones of Venice." p. 401

597 Picon, "Digital Fabrication, Between Disruption and Nostalgia." p. 226

598 Carpo, "The Craftsman and the Curator."

599 Ruskin, *The Seven Lamps of Architecture*. p. 63

600 Picon, "Digital Fabrication, Between Disruption and Nostalgia." p. 225

To say that Ruskin's interpretation was highly influential is an understatement. Many artists, architects and craftspeople followed his ideas, and his undertone with which craftsmanship is understood in architectural scholarship and even craft theory is still recognizable in many recent works. It can be seen, for example, in Glen Adamson's explanation of the enchantment of the handmade, which he develops from Alfred Gell's concept:

> Our valuation of the craft objects centres on matters of touch, which we sometimes loosely describe as a form of 'reading', but is in fact non-linguistic in character. […] the source of enchantment is the same – the user's ability to imaginatively approximate the knowledge of the maker.[601]

In connection to Ruskin, Willian Morris' calls for beauty in everyday artifacts might seem like a pure reference to aesthetics, but are in reality deeply involved in questions of labour [602]. Morris claims involve the defence of *handicraft* over machinery production, implying a particular beauty contained in the products of human labour that cannot be replicated in industrial production[603]. Ultimately, it follows his understanding of art as the expression of pleasure in the process of work – in other words, as *emancipated labour* [604] – perceptible in his utopian piece *News from Nowhere*, from 1890, where "intellectual knowledge is one among other kinds of knowledge" and "people do not appreciate art … but instead produce it every day". It describes a society where "people discovered that the material exchange with nature can be fun, and that making things with one's own hands and mind can be a great pleasure" [605], resulting in the de-rationalization of many productions, under the realization that "machines could not produce works of art"[606].

Morris concept of art is fundamental to understand his contributions. Additionally, it exposes how dramatically can the perception of labour influence practice and ideology. It shows that, for trained eyes, the built environment can appear directly as a witness of the traditions, skills and social conditions of labour. In close relation to Ruskin, Morris is able to see beyond the objective shell of materials, through the marks of labour, into the hands and the experience of the craftspeople, and associate this perception to the emergence of beauty.

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601 Adamson, *The Invention of Craft*. p. 101

602 Kapp, "Construction Sites of Utopia."

603 "William Morris, Artist, Poet, Craftsman," *Bradley, His Book*, 1896.

604 Kapp, "Construction Sites of Utopia."

605 Kapp. p. 132

606 Thomas Morris, *News from Nowhere* (Longmans, Green, and Co., 1908), https://doi.org/10.1353/jhi.2007.0017. p. 98

W.R. Lethaby, one of the architects of the *Arts and Crafts Movement* and greatly influenced by Ruskin's and Morris's thinking, left an interesting private account of his experiences exploring what could be understood as the notion of architectural craftmanship exposed here. As exposed by Hugh Strange in a recent paper, Lethaby's private work is remarkably limited, having designed only six finished buildings by the end of his career[607]. In these designs, Lethaby tried to produce highly detailed, well-crafted buildings – exposing an idea that the making of architecture should be a compromise between a "*motive*", or an "overriding purpose to which all elements relate"[608], and the building processes. Being an "an accomplished draughtsman", Lethaby's first answer to the question of how to reach such a compromise was a prolific engagement in design itself, through drawing - what Bardt might refer to as form of "overdrawing"[609]. In the commission for the large Avon Tyren country house, in Hampshire, Lethaby produced over two hundred drawing sheets, containing "multiple sketches and details that describe its layout, appearance and construction comprehensively"[610]. After just ten years of practice, however, his approach had changed drastically. In his final project for a church in Brockhampton, the documentation was comprised of only eleven drawings, accompanied by a ten-page long text of written specifications. Instead of overdrawing, in this project Lethaby was "seeking to increase craftsmen's involvement in the design and construction of buildings through reconfigured site relations"[611]. According to Strange, this change is explained by a "sense of a developing political engagement", visible in Lethaby's texts, that "lead him to transform his practice by both reconsidering and reconfiguring the role of labour in the built works"[612].

The contrast between Lethaby's approach to his first and last buildings could not be more striking. At Avon Tyrell, his desire was to fix the project, prior to construction, in a fully-conceived, definitive design of his sole authorship, from which as few variations as possible were to be made once handed over to a contractor. The works on site were thus to be rendered as closely as possible to the prescriptive design drawings; the project, was to be unmediated by the process of building. In comparison, All Saints' Church witnesses a willingness to loosely define the project initially, and only later, on site, and with the assistance of others, to resolve matters fully. As such, the sense of a comprehensive, 'original' design,

607 Hugh Strange, "The Craftsmen's Drama," *AA Files* 77 (2020): 152–66.

608 Strange. p. 153

609 Bardt, "Recapturing Meaning : Toward a New Material-Based Design Theory for Architecture.

610 Strange, "The Craftsmen's Drama." p. 153

611 Strange. p. 165

612 Strange. p. 153

perfectly captured through drawings, is replaced by a strategy that enables the project to evolve through the process of construction. Rather than a routine act of realisation, of 'mere' building, construction might offer instead a richer fulfilment of the project's potential. The transferal of decision-making from the distant drawing board to the site might be said to have provided the church with a greater degree of site-specificity. More pertinently, however, through the collaborative construction process, the human endeavour of making is manifested, indeed celebrated, in the built work. One of Lethaby's great triumphs at All Saints' Church is that these qualities are gained without any sense of a loss of coherence.[613]

While ideals of beauty, style, art and aesthetics in these authors differ in form and content, they show a tendency of relating the product and effects of the traces of craftsmanship to a particular perceptual fruition of architectural objects – be it its corruption or otherwise. From the very words of Vitruvius, highlighting the importance of craftsmanship for architects to grasp the substance of architecture instead of its shadow; through the establishment of the authoritative figure of the Renaissance architect and the concurrent division of labour in construction; to the advocacy of the handmade by John Ruskin and the *Art and Crafts Movement*, craft also continues to resurface in discourse and influence architectural thought.

Underlying their theoretical developments, it is possible to recognize a missing connection, often underexplored, that suggests how skill is inscribed in the material manifestation of architectural objects, making its way in perception and shaping how the experience of the built environment is constructed subjectively. In that sense, the perception of the environment includes recognition of architecture as a collective endeavour, encompassing the ways of making performed in our social and historical contexts – in other words, as "part of a *zeugganzes* - a system of tools, a technical system forming a whole"[614]. On the other hand, what also surfaces is a tension between the acknowledgement of craftsmanship and an overruling force keeping it peripheric in architectural discourse. The immediate physical qualities of materials appear as the most important constituents of the architectural atmosphere, and their composition by the architect's careful curation becomes the primary concern, feeding arguments of authorship, personal interest, inspiration and innovation - a particular lexicon that doesn't include the material attunement and the negotiations of craftsmanship.

613 Strange. p. 166

614 Gell, "Vogel's Net: Traps as Artworks and Artworks as Traps." p. 23

6.3 Discursive Materialities

When one considers the entirety of the construction process, it seems that the history of architectural discourse is one of tension between the body and mind. Figures like Alberti and Brunelleschi, renowned as the precursors of the modern architect, actively advocated for this division, and, despite many attempts to reconnect them afterwards, the idea of design occupying the central position of the architect's practice remained. Even figures such as Semper, Ruskin and Lethaby fall into such a schism, and are lead to divide the field into architecture and construction, art and technology, "the soul and the body", the appearance and the formation, intelectual and manual and so on[615].

This skewed notion opposes the actual recognition of craft in the formation of architectural objects and twists the field's discourse and history. Sérgio Ferro argues that such contradiction arises when architectural discourse fosters an idealist notion that materials are primarily means of reference. As such, materiality becomes diminished to an image[616]. Following the framework of skill, if materiality can be thus instrumentalized, conveying a fabricated meaning, it should in turn shape the way architects understand and engage with the material world – the development of skill, after all, is the change in perception in relation to meaning. It owns to materiality – and ultimately to the *material discourse of architecture*.

Accordingly, Antoine Picon argues that the digital turn in architectural design, including parametric design, building information modelling (BIM) tools and digital fabrication represents a change is the understanding matter. To be more precise, he argues that more than transforming the way of how design is made, the digital turn shifts how architects know and conceive materiality. Concluding that "Digital fabrication is as much a new narrative as a technological and social program", Picon highlights the discursive dimension in this conception of materiality[617]. Additionally, from the case of the 78+, it is possible to perceive that its entangled stories are grounded in the ways timber structures and its crafts are developed and understood by different actors, being embedded into and giving rise to the general way in which a particular

615 William Richard Lethaby, "Architecture an Introduction to the History and Theory of the Art of Building," *Home University Library of Modern Knowledge*, 1955.

616 Ferro, *Arquitetura e Trabalho Livre*.

617 Picon, "Digital Fabrication, Between Disruption and Nostalgia." p. 233

conception of materiality is at play[618]. Materials, it would seem, are not so stable in architectural conceptions.

In Picon's words, materiality is a "co-construction of matter and subjectivity", and thus, "to say that something is material is not actually to attribute to it an entirely objective quality. Materiality denotes a kind of relation to certain objects and phenomena that seem to us more tangible than others". [619] Thus, materiality is what makes materials the entities that are recognized as such, while in a particular environment – somewhat counterintuitively, materiality is not purely material, in a physical sense. A similar thought can be found in Neil Leach:

> Clearly there exists, perhaps imperceptible in the materials and forms which the artist acquires and develops something more than material and forms […] For the forms, even the materials, are by no means merely given by nature, as an unreflective artist might easily presume. History has accumulated in them, and spirit permeates them.[620]

The existence of different conceptions of materiality has a profound significance in terms of the epistemologies of making. In the agentic networks of craftsmanship, materiality comprises the qualities and physical properties of substances, objects and artefacts, but also how they are made, what they serve for, and the meanings associated with them. These entangled affordances and contingencies shape the way things are used, understood and appropriated, being embedded into and giving rise to the particular ways in which they relate to different groups. In turn, the way people engage with materials feeds back into materiality. In other words, materiality describes the conditions of existence for a given physical entity in a particular (social) environment, that both defines its boundaries and the relations between its properties, techniques, aesthetics, economic, and symbolic values. It refers to how these different aspects interact in the productive and cultural life of materials, and how can they be understood, described and conceptualized. As such, materiality emerges from and regulates the relationships with materials, as a specific onto-epistemic condition crystalized in, associated with and reproduced in these interactions. In face of this volatile character of materials, this formulation allows one to think of materials as discursive, tensioned and co-constitutive of the world we live in – a parallel to Heidegger's "*Geschik*", as explained by Kenneth Frampton:

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618 Ingold, "The Textility of Making."Tim Ingold, "The Textility of Making," *Cambridge Journal of Economics* 34, no. 1 (2009): 91–102, https://doi.org/10.1093/cje/bep042.

619 Picon, "Digital Fabrication, Between Disruption and Nostalgia." p. 224

620 Neil Leach, *Rethinking Architecture: A Reader in Cultural Theory*, 2019, https://doi.org/10.7312/gott93206-004. p. 12

> This *Geschick* as Heidegger calls it embodies not only a material condition, specific to a given time and place, but also the legacy of a particular historical tradition that, however much it may be assimilated, is always in the process of transforming itself.[621]

A *discursive* understanding of materiality, thus, must emphasize the connection between different instances of a particular production with material output: understanding materiality simultaneously as a response to social conditions and as a creative practice with inventive potential. This interpretation allows for the analysis of complex phenomena involving materials and their seemly contradictory appearance in architectural practice and discourse. For example, Pier Luigi Nervi, writing in 1956, points to a seemly obvious complication in the question of the materiality of concrete, namely: the difference of interpreting materiality as a characteristic of the material (the properties of the material as an autonomous thing) and of the craft (the properties and workings in the processes of production of said material):

> It may be noted that although reinforced concrete has been used for over a hundred years and with increasing interest during the last decades, few of its properties and potentialities have been fully exploited so far. Apart from the unconquerable inertia of our own minds, which do not seem to be able to adopt freely any new ideas, the main cause of this delay is a trivial technicality: the need to prepare wooden forms.[622]

Following these threads with the question of how "such an amorphous material ends up as so many rectangular solids and cylinders?" Mark West delves into the problem, showcasing the role of engineering calculation techniques in the historical formation of concrete construction.[623] According to the author, these techniques were established alongside the development of machinery, in particular that of the single-axis production mill. Thus, they "rely on the analysis of (flat) sectional areas", and were constructed in ways "particularly suited to calculating the area of rectangles and uniform-section volumes"[624]. The materiality of concrete, in this sense, was shaped through the interactions of its potential for construction *in face* of a pre-existing material culture of orthogonal planning. This encounter, steered mainly by a technical rationale, produced an understanding of concrete based not on

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621 Frampton, *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture*. p. 24

622 *Apud* Mark West, *Fabric Form Book: Methods for Building New Architectural and Structural Forms in Concrete* (London: Routledge, 2016). p. 4

623 West. p. 4

624 West. p. 4

the affordances and contingencies of the material as in its production stage – that is, a pliable and fluid mass – but on the processes of structural analysis that address primarily its condition after construction, as a solid, static volume.

The corollary is a culture of production in which, as the authors put it, "conventional industrial methods of construction and design in concrete take place in a highly evolved traditional system where prismatic forms are a foregone conclusion"[625]. Such a statement can be construed as slightly exaggerated, having in mind that prismatic forms, although hegemonic, were often dismissed in the history of concrete architecture, as can be seen in the works of Brazilian architect Oscar Niemeyer. Notably, instead of following a path of least resistance in regards to the calculation of his designs, Niemeyer opted for exploring the possibilities that the concrete could afford in its plasticity. Thus curves, to Niemeyer, were the natural form of the concrete. Often this would result in nightmarish calculations to the engineers, but it afforded also many innovative solutions, especially with the work of structural engineer Joaquim Cardoso, with whom the architect maintained a long partnership. Echoing the construction of the Gothic Cathedrals that pushed stonemasonry to its full potential[626], Niemeyer wrought his works at the limits of structural analysis of the time, frequently prompting engineers to extend its boundaries.

However, considering only the agency of materials *per se* – such as the form of concrete before its cure – could still lead to a hylomorphic interpretation of materiality. As Picon reminds, materiality is fluid, and it can be recognized from the changing "tangibility" of things.[627] In this respect, he shows that "with the development of sustainability issues, sensors and computer simulation temperature gradients are becoming more material than when they were before"[628]. In other words, the perception of how tangible (and therefore material) things are is dependent on the particular concerns of the environment, and their associated potential – what they can do and what meanings are associated with their action.

In this line, it is possible expand the analysis of materiality from Glenn Adamson's concept of "tooling", representing the framework of material objects that provides the infrastructure allowing other things to be made, defining the territory within which this materiality is developed[629]. In the author's words, the tooling surrounding

625 West. p. 4

626 Ferro, *Arquitetura e Trabalho Livre*.

627 Picon, "Digital Fabrication, Between Disruption and Nostalgia." p. 224

628 Picon. p. 225

629 Adamson, *The Invention of Craft*. p. 31

a material production is “the whole palette of skills and material infrastructure lying behind its fabrication”, making it possible. Adamson argues that, while complex and owning much to historical development and discursive formations, tooling is “objective”, in the sense that it can be proven by its “physical effects”[630]. Thus, it refers primarily to practices and operations that, while perhaps epistemic in nature, are embedded in material processes:

> Tooling can be defined as the making of objects that go on to make other objects. It is best understood as an on-going process – not the supply of actual physical tools, lying ready to hand, but rather the whole system by which an infrastructure of making is brought into being and subsequently transformed to suit various tasks. Tooling is thus a distinctive form of research and discovery, one that operates only indirectly on the finished product, whether that is an object, a building, or a digital artifact. […] At each stage within this ‘linear’ progression, there is also a ‘horizontal’ connectivity between the tolling strategy and other variables, such as space, materiality, supply, labour, and skill, all of which interact in a complex and often unpredictable ways. The generation and application of a tooling system always has potency inscribed into it.”[631]

The concept of tooling is particularly significant to study the production of architecture, allowing for an interpretation of building crafts as elements of the architectural “tooling”. It provides a foundational notion that can be extrapolated to include, apart from the material infrastructure, a set of techniques, skills and craft knowledge that support architectural production beyond design, painting the image of architecture as a 'constelation of crafts'. As seen, within the development of the 78+ system, these inheritances can be subtle inclusions of process-oriented ways of thinking, in the form of procedures within the construction site or through exchanges of knowledge (crystalized in a blue-ink scribble over a drawing), but also owning to a rationale linked to market distinction and architectural representation.

In the case of concrete, the “tooling” shapes the formal tendencies, as pointed by West: “if you are casting into a mould made of sheets and sticks, then the casting will likely be both flat, straight and built with 90-degree joints.”[632] Therefore, a closer look on Nervi’s quote, from the point of view of “tooling”, makes explicit that the differences between the prismatic tendencies and Niemeyer’s curved surfaces are superficial, and the critique made by West still holds – even if not in exact content,

630 Adamson. p. 32

631 Adamson. p. 31

632 West, *Fabric Form Book: Methods for Building New Architectural and Structural Forms in Concrete.* p. 4

but in directionality. Whether by following its intrinsic biases or stretching them to their full potential, both practices follow the modes of operation of machines and calculations without an actual consideration of the processes of making in their full performance. Nervi's main insight is not the perception of a lack of imagination of architects, but the recognition of the preparation of the wooden mould as constituent of the technique of building with concrete. This "trivial technicality"[633] is, indeed, the touchstone of the whole question, when it is seen from the perspective of crafts and within the framework of a discursive materiality. From a process-oriented way of thinking, the form of a concrete structure moulded by wooden frames has to be considered in terms of the modes of operation of woodworking, which in turn is based on the agency of wood. As a productive condition to the formation of concrete, wood predates it – and the production of curved and organic volumes, in this framework, appear as a great challenge, if not entirely irrational.

Following the reasoning of the *chaîne opperatoire*, one finds not only the wood used to build the moulds, but the steel used in its armature. Being made with the same single-axis mill processes, its form also follows an orthogonal logic. Builders can bend it along its longitudinal dimension, but complex curves and shapes can be difficult to achieve with precision. Being part of the reinforced concrete structure, the very materiality of steel plays into its materiality, and thus *entangle* itself with it. Unsurprisingly, steel has forms, affordances and contingencies that follow an industrial episteme:

> While naturally occurring metals contain all kinds of impurities that change their mechanical behaviour in different ways, steel and other industrial metals have undergone in the last two hundred years an intense process of uniformity and homogenization in both their chemical composition and their physical structure. The rationale behind this process was partly based on questions of reliability and quality control, but it had also a social component: both human workers and the materials they used needed to be disciplined and their behaviour made predictable. Only then the full efficiencies and economies of scale of mass-production techniques could be realized.[634]

What seems to surface from this thread are the agencies present in the already discussed performance of material productions, when set within the broader frameworks of distinct material discourses. Unsurprisingly, different *material discourses* engender the particular ways with which *materiality* is understood and

633 *Apud* West. p. 4

634 DeLanda, "Material Complexity." p. 18

conceptualized within their territories, even if tacitly. In other words, it is possible to notice, like did Nervi, that processes and even other materials take part in the epistemic formation of concrete and that the materiality of architecture "relates directly to its construction, to its physical construction"[635], but this connection remains veiled to most architects. Back to the case of concrete, plasticity, for example, is cleverly noticed by Glenn Adamson as particularly related to the modern drive to abandon skill and to understand materials solely from an industrial point of view:

> Plasticity seemed to short-circuit traditional understandings of making. For the first time, 'technique' was formulated as something that could operate on its own, independently from the work of human hands. The artifacts made from these materials, accordingly, seemed to close the yawning gap between principle and practice. In this sense, they perfectly matched the cultural program of the South Kensington system, which sought to infuse all production with the uplifting powers of draughtsmanship and principle and disregarded artisanal skill in the process. Though no Victorian improver would have seen it in this way, this was in fact another kind of magical thinking. Substances were treated as if they were subject to any purpose humans desired – the pure emanation of design. This fantasy of control over materiality is one of the signature elements of modernity[636]

Paraphrasing Marshal Berman, it is possible to recognize in this process the sensuous, perceptive material qualities melting into the air of abstract, object-centred epistemologies[637]. Following a process established within industrial production, in the discursive formation of architecture as a discipline, as DeLanda phrases it, "the variability and complexity of real materials was replaced with the uniform behaviour of a philosophically simplified matter about which one could only speculate symbolically."[638] In other words, while still significantly dependant and connected to the crafts and trades of construction, the architect's perception and understanding of materials follows a tendency of reduction, abstraction and idealization instead of one based on direct material engagement. Picon points to a similar process, happening anew in digital fabrication, where the remove takes shape as the separation of matter and information:

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635 Couceiro da Costa, Formiga, and Merim Abbas, *Mater. as a Process*. p. 16

636 Adamson, *The Invention of Craft*. p. 89

637 Marshal Berman, *Tudo Que é Sólido Desmancha No Ar: A Aventura Da Modernidade*, 1986, https://doi.org/10.5533/1413-9073-20092707.

638 DeLanda, "Material Complexity." p. 15

> Contrary to what it claims through notions such as material computation, the digital era has extricated information from matter. It has separated the two and recorded information as a series of zeros and ones that can be stored on all sorts of devices, regardless of their nature, before being re-injected into the physical world using laser cutting machines and 3D printers.[639]

In the framework of skill, this remove is all the more problematic. The 'extrication of information from matter' is not, as the semantic construction would suggest, an opposite of hylomorphism, but its complementary flipside. The origins of both are related to the rift between labour and knowledge that characterizes modern forms of design and of construction – in both discursive and objective realms. As Picon shows, "before the industrial revolution, the distinction between the inorganic and the organic was porous. Making was more in sync with the spontaneity of materials", which meant that, as DeLanda argues, the "de-skilling of craftsmen that accompanied mechanization may be seen as involving a loss of at least part of that knowledge, since in many cases empirical know-how is stored in the form of skills"[640]. For now, it suffices to show, as the author argues, that "not only the production process was routinized" in accordance to an understanding of material as a homogenic, uniform entities; but that, to a lesser extent, so too was the design process[641]. In face of this industrialized, idealized conception of materiality, architectural design itself becomes disconnected to the real, objective materials that, for example, are not isotropic[642]. Designers then lost sight of the agentic negotiation in the grainy, gritty territory of construction, and instead fostered an idea of architecture based on purely imaginary (in the sense of *image*, not poetic) grounds, where form is everything. Design, thus, is equated to the imposition of form into matter or, as DeLanda puts it, "the historical processes of homogenization and routinization have promoted the 'hylomorphic schema' as a paradigm of the genesis of form."[643] As seen in the examples explored above, however, it is possible to perceive that the phenomenon, while perhaps intensified in the industrial revolution, dates far back from the detachment of design as an autonomous process that disregards the construction site.

639 Picon, "Digital Fabrication, Between Disruption and Nostalgia." p. 226

640 Picon. p. 225. DeLanda, "Material Complexity." p. 19DeLanda.

641 DeLanda, "Material Complexity." p. 20

642 DeLanda. p. 20

643 DeLanda. p. 21

What this stance fails to properly address and incorporate is the specific knowledge contained in productive skills, techniques and processes. In other words, the share of knowledge that is directly connected to the practical "making possible" side of productions, and one that is all the more important when it comes to productions with a material output. Accordingly, not all practices tributary to the making of architecture are valued or recognized in the same way, both economically – and thus politically, as have been repeatedly addressed by Brazilian theorist Sergio Ferro[644] – and epistemologically. Despite the deep entanglement between architecture and the material dimension, the production sphere of architecture is often relegated to a secondary role and the voices of those directly involved in its construction are generally left out of the theoretical and historical accounts of architecture[645]. As phrased by Bardt, "the abstract and representational framing of architectural design positions material engagement as less central to the design process". "Material engagement", thus, is "denied the authoritative epistemic status found at academic and liberal arts institutions, including schools of architecture" and perceived as an "ancillary activity" to the "cerebral art" of design.[646] In other words, the knowledge of craftspeople rarely reaches the architect's ears.

A telling story can be found in the construction of the Barbican Centre, in London, and the use of bush hammering for texturizing the bare concrete pillars, "one of the most distinctive features of the Barbican"[647]. Christine Wall, through interviews, presents the accounts of builder and architect in their opinion on the technique. On the one hand, architect Piers Gough argues that "[t]he bush-hammered stuff is amazing— you can see where the point of the hammer went in, Yes. It's a bit dirty. But it's a piece of craftwork". The builder's account, in the other hand, shows that, in reality, the bush-hammered 'stuff' is "[a] horrible dirty job and, again, people weren't given the amount of protection they would have been given today, […] there was lots of problems of white finger vibration and so on."[648] Differing diametrically, these quotes indicate the contrast in the terms with which each professional appraises and understand the materiality of the building. Notably, the architect refers to an ability to see the work of the craftspeople in the marks of their tools, echoing the romantism of John Ruskin and focusing on the visual qualities

644 Ferro, *Arquitetura e Trabalho Livre*.

645 See Christine Wall, ""It Was a Totally Different Approach to Building!": Constructing Architectural Concrete in 1960s London," in *Speaking of Buildings*, ed. Janina Gosseye, Naomi Stead, and Deborah vand der Plaat (New York: Princeton Architectural Press, 2019). Ferro, *Arquitetura e Trabalho Livre*; Silke Kapp et al., "Arquitetos Nas Favelas: Três Críticas e Uma Proposta de Atuação," *ELAC: 2do Encuentro Latinoamericano*, no. 48 (2012): 19...

646 Bardt, "Recapturing Meaning : Toward a New Material-Based Design Theory for Architecture." p. 3

647 Wall, ""It Was a Totally Different Approach to Building!": Constructing Architectural Concrete in 1960s London." p. 64

648 Wall. p. 62

of the final product. The builder instead speaks of the dangers and difficulties of the making process, indicating the gap between the interpretations of craftsmanship as a resulting quality or as the conditions within the performance of practice.

Unsurprisingly, the work was "was given mainly to newly arrived Caribbean workers", indicating the relationship between the precarity of labour and issues of immigration and colonialist practices inside the production in architecture[649]. As exposed by Lisa Berntsen, migrant workers are particularly vulnerable to these exploitative conditions, precisely given their mobility and loose association with national institutions and labour organizations:

> Many migrant workers, however, do not settle down in particular places, but move between contracts, worksites and countries on a regular basis. This group of workers is relatively tolerant of substandard employment terms and reluctant to resist their employers individually or collectively, as opportunities for effective action are often limited […] Although these are skilled workers moving across borders within an industry that is relatively well regulated and amenable to migrant labour, they still regularly face substandard conditions at work and irregularities in their employment contracts. [650]

Such an environment lead Wall to state that, "while the Barbican is architecturally magnificent, it is also the historic site of unsafe working practices, unnecessary injuries, and deaths"[651]. Pointing at the human price paid for the magnificence of the Barbican, Wall's work is a reminder that architecture, even in its most expressive forms, cannot be dissociated from construction. The case is a stark reminder of Ferro's claims that, as commodity, architectural objects have a *morphological fetishism*, hiding the relations of production of the construction site[652]. The architectural magnificence of the Barbican is the discipline's excuse for the exploitation of labour - a discourse possibly sustained by an intrinsic disciplinary fear that following Wall's line of research would lead one to agreeing with Raph Adams Cram and claim that "[by] itself, architecture is nothing; allied with the structural crafts and the artist crafts, it is everything"; or that, "[w]ithout the craftsman an architectural design is worth little more than the paper on which it is drawn"[653].

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649 Wall. p. 64

650 Lisa Berntsen, "Reworking Labour Practices : On the Agency of Unorganized Mobile Migrant Construction Workers," *Work, Employment and Society* 30, no. 3 (2021): 1–21. p. 2

651 Wall, ""It Was a Totally Different Approach to Building!": Constructing Architectural Concrete in 1960s London." p. 72

652 Ferro, *Arquitetura e Trabalho Livre*.

653 Ralph Adams Cram, "The Craftsman and the Architect," *Art an Progress* 4, no. 12 (1913): 1119–31, https://doi.org/10.1111/0044-0124.00544. p. 1124

In any case, as Wall points out, the "high specifications set by the architects" were not accompanied by a corresponding knowledge allowing its realization[654]. The "architects and the consulting engineers did not have any clear strategy for how to construct this complicated structure", and this "was left to the contractors to work out on site"[655]. Moreover, "[despite] Higgs and Hill's own detailed construction drawings, the site process still proved to be unexpectedly difficult",[656] which indicates, once again, the inadequacy of design tools for addressing constructive problems and conceiving materiality in the full extent of its productive complexity. Being "extraordinarily complex and difficult to construct"[657], the Barbican building is exemplary of how architectural draughtsmanship is often out of phase with craftsmanship, and how such contradictions reflect on the labour (and, in this case, even physical health) of construction workers.

6.4 Production and Ideology

The influence of Marxism on architectural production and scholarship is as difficult to overstate as it is to clearly delineate. According to Peggy Deamer, Marx's works (and of those influenced by him such as neo-Marxism and the Critical Theory of the Frankfurt School) have "shaped the thinking of the various cultural analysts who direct architectural debates in a given architectural era, influencing the intellectual arena of cultural production of their time."[658] Directly and indirectly, many architects have engaged with and fostered Marx's ideas, and incorporated tenets of socialism and communism in their designs and militance. Examples are abundant, both well-known and not so commonly recognized, and include figures like the already mentioned William Morris and William Lethaby, but also Frederic Jameson, Enzo Mari and many others. As Jonathan Hale points out, "[the] school of thought that today believes in the critical capacity of the work of art […] still for the most part draws its theoretical model from the work of Karl Marx".[659]

654 Wall, ""It Was a Totally Different Approach to Building!": Constructing Architectural Concrete in 1960s London." p. 67

655 Wall. p. 68

656 Wall. p. 65

657 Wall. p. 65

658 Peggy Deamer, *Architecture and Capitalism: 1845 to the Present*, ed. Peggy Deamer (New York: Routledge, 2014). p. 4

659 Jonathan A. Hale, *Building Ideas An Introduction to Architectural Theory* (New York: John Wiley & Sons, 200AD). p. 172

Despite the overwhelming presence of these traces of Marxism, however, seldom have Marx's theories and concepts themselves been directly used for the production of theories and critiques of architecture – or, in other words, to understand the field instead of trying to steer it towards a particular direction. Still, there are at least two authors that engaged in such endeavour: Italian architecture critic Manfredo Tafuri, widely praised for being "the first intellectual in the field of architectural history and criticism to advance a critique of architectural ideology"[660], and Brazilian architect and scholar Sérgio Ferro, whose work has recently attracted more international attention. Both architects, each stressing their own points of view, remained pessimistic about practice under a capitalist model of production, focusing their efforts instead on scholarship. Prolific writers, reluctant builders, as Aureli might say[661] - they are nonetheless shapers of architectural discourse. Yet (somewhat unsurprisingly if we compare the situation to other discussions in Marxism), the two authors follow rather distinct paths for developing their insights.

Manfredo Tafuri's writings are located in an environment of rapid change in the left-wing thinking in Italy, represented in the progressive rise of two important social movements. The first movement, prevalent mostly in the 1950's, had a reformist nature. Focusing on technological development, under the tenet of the development of the productive forces, the movement advocated for "the possibility to reform capitalism toward a rational and socially sustainable form of economy"[662]. In this context, to "modernize not only became a political and intellectual imperative, it also became a diffused cultural mentality" which, within creative industries, was expressed in the adoption of "Avant-guard techniques such as collage, estrangement, and technological experimentation" devices" through which activists expected to "sublimate the effects of industrialization on social relationships"[663].

The second movement, to which Tafuri was closely aligned, became known as the Operaists[664], and was largely directed in opposition of its predecessor. The Operaists's goal focused on a critique of ideology aimed at "demystifying the cunning of ideology embedded in the reformist agenda of the progressive left"[665]. In both movements, as shown by Aureli, the focus of critique befell mostly on the attitude of the left-wing

660 Pier Vittorio Aureli, "Manfredo Tafuri,Archizoom, Superstudio, and the Critique of Architectural Ideology," in *Architecture and Capitalism: 1845 to the Present*, ed. Peggy Deamer (New York: Routledge, 2014). p. 135

661 Aureli.

662 Aureli. p. 134

663 Aureli. p. 132

664 Aureli. p. 136

665 Aureli. p. 135

movements, often generalized under a veil of intellectuality and culture. Similarly, both movements constructed their understanding of Marx (although mirrored in terms of their imagined approach) chiefly from the idea of this "critique of ideology"[666].

Following the Operaists' thoughts, for Tafuri, "you can intervene in thinking about architecture but not in the building of it."[667] Such a feeling, common to the "revolutionary" branches of Marxism (in opposition to 'reformists')[668] is based on the idea that from "within the system you cannot hope to generate anything that negates the system as a whole or portends the experience of something other than the system, or outside of the system."[669] Armed with this 'critique of ideology', Tafuri is able to develop his critique, transcribed mainly in two works: *Theories and History of Architecture*, and *Architecture and Utopia*, respectively published in 1969 and 1973.

Understanding how Tafuri's critique of ideology is formulated requires a clarification of what precisely he means with 'ideology". Notably, Marx's use of the concept of ideology is difficult and, according to philosopher Allen Wood, represents three different phenomena. The first, used in *The German Ideology*, can be equated to *idealism,* in the form of "any metaphysics which, like Hegel's, regards ultimate reality as a cosmic mind or spirit" or a "thesis about how progressive social change is to be brought about" and "that ultimately reality is mental". This form of doing philosophy was believed to be "a *false* doctrine" by Marx, as a way of thinking aloof from any sort of direct political engagement in regards to the material conditions of society. The second meaning, referred to by Wood as "functional ideology", refers to forms of "widely held or influential belief and forms of social consciousness" that "either sanction the social relations determined by the existing stage of productive powers or express and promote class interests".[670] In other words, "functional" ideology represents the influential thoughts and discourses that occupy people's minds and steer, in one way or another, their perception and understanding of the world. Notably, since Marx is evidently a materialist, he understands that this form of ideology has its origins within the complex dynamics of the development of the productive powers and of class struggle. Importantly, in a Marxist setting, functional ideologies are neither 'good' or 'bad' – or rather, the category does not distinguish between them. The opposite is true for the third and final use of ideology by Marx, which is, essentially, a derivative of the functional ideology involving some

666 Leach, *Rethinking Architecture: A Reader in Cultural Theory*. p. 246

667 Leach. p. 247

668 Rosa Luxemburgo, *Social Reform or Revolution* (London: Militant Publications, 1986).

669 Aureli, "Manfredo Tafuri,Archizoom, Superstudio, and the Critique of Architectural Ideology."

670 Allen W Wood, "Karl Marx" (London: Routledge, 2004).

form of false consciousness or "unaccompanied by any awareness of its economic basis"[671]. This "ideological illusion", as Wood calls it, is therefore the target of Marx's critique, for it impedes the recognition of the true materialist foundation that produces ideology, fostering instead "ignorance of its own real social and historical significance" and "serves the interest of the ruling class by diverting people's attention from the real causes of their alienation"[672].

Since "Tafuri's critique was aimed at demystifying the progressive aspirations of modern architecture, especially the practices of the more socially engaged architects"[673], it is possible to understand that he identifies (the discipline of) architecture as a 'functional ideology' and sees it as the historian's task that of avoiding it becoming an 'ideological illusion'. His method, therefore, is to criticize architecture whenever it perpetuates capitalist hegemony through its forms, styles, and spatial configurations. It is in this framework that he exposes "instrumental historians", like Bruno Zevi, claiming they "applied a deforming filter to specific ages of the past, transforming them into mythical ones endowed with ideal values in order to designate them as models for design"[674].

In these lines, Tafuri sketches the "dual crisis of history and the object", which represent a fundamental challenge to traditional understandings of architecture and its historical narratives. Tafuri refuses architectural history's current notion that architectural objects possessed a fixed meaning or represented immutable rules, and sought to make evident that architecture exists not outside of broader socio-economic and ideological frameworks. Instead, buildings were thought of as contingent and open to multiple interpretations, shaped by the historical, social, and political contexts in which they are situated. The 'crisis of the object' therefore, was the destabilization of the object as a historical category, as a process of de-coupling between things and immediate, solid meanings.

Linear and teleological, in Tafuri's view, the traditional approaches that relied on essentialist interpretations of architectural objects proposed a progressive evolution of styles and forms or, in other words, a purely architectural history running in

671 Wood. p. 120

672 Wood. p. 120

673 Aureli, "Manfredo Tafuri,Archizoom, Superstudio, and the Critique of Architectural Ideology." p. 134

674 Tafuri's critique extends also beyond "architecture's complacency with capital": he targets the "reformist impetus of modern architecture since the eighteenth century", which, in his view, fails to "contain and direct the development of the modern city". See Carla Keyvanian, "Manfredo Tafuri : From the Critique of Ideology to Microhistories," *Design Issues* 16, no. 1 (2000): 3–15. p. 4

parallel to socioeconomic conditions[675]. This is his "crisis of history", and it demands a re-evaluation of the role of the historian and the methods of historical research for architecture. In opposition to this biased mode of writing history – personified in "instrumental historians" such as Bruno Zevi – Tafuri advocates for an "operative history"[676] that actively engages with architectural contradictions to reveal the underlying ideological forces at play. In Lipstadt and Medehlson's words, practicing this form of history meant "operating sometimes as an epidemiologist, who can trace the spread of 'dream ideology' and other delusions in contemporary architectural polemics and aesthetic theories".[677] In other words, sorting, in historiography, the grains of history and of ideological illusion.

Tafuri's goal is not to correct or fix the twin crisis. Rather, Tafuri relied on the thought of Hegel, interpreting that, to the German philosopher, the "end to the traditional concept of art" was a dialectical development that served "to make room for a higher form of knowledge".[678] In this sense, the movements of the avant-gardes, for example, could be viewed as a response to the eclecticism's "instrumentalization" of history, in a reaction that "pushed aside history in order to build a new history"[679]. While the operation, as Tafuri warns, may be "somewhat violent", it carried the "capacity to bring out […] the dialectical link between historicity and the permanence of the ancient textures and the values of the present, the changeable, the arbitrary, the energetic, typical of contemporary life and architecture"[680].

Thus, against the modernist trope of "antihistoricism", Tafuri sought to demonstrate that the drivers of change in modern architecture were not anything new. The premise of a 'breakage with the past' has accompanied architecture since the Renaissance, and this very impulse of cutting ties with tradition was, paradoxically,

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675 This form of separation between what is meaningful to architecture and to general history or the social sciences can still be easily recognized in architectural scholarship. It is perceptible in Lucas' *Research Methods for Architecture* book, published in 2016, in which the author advocates that architectural research involves only an "architectural history", instead of "the history of architecture"; "architectural social science" instead of a "social science of architecture" and "architectural philosophy" instead of a "philosophy of architecture". His meaning is clear, in the sense that the "architectural" disciplines are understood as practices "in service of design". Thus, Architectural History", for example, "can and should serve the needs of architecture as a whole, responding to the role of designers". See Ray Lucas, *Research Methods for Architecture* (Laurence King Publishing, 2016).

676 Aureli, "Manfredo Tafuri,Archizoom, Superstudio, and the Critique of Architectural Ideology."

677 Helene Lipstadt and Harvey Mendelsohn, "Philosophy, History, and Autobiography: Manfredo Tafuri and the 'Unsurpassed Lesson' of Le Corbusier," *Assemblage* 22, no. 22 (1993): 58, https://doi.org/10.2307/3171170.

678 Lipstadt and Mendelsohn. p. 65

679 Lipstadt and Mendelsohn. p. 65

680 Lipstadt and Mendelsohn. p. 67

"the symbol of an authentic historical continuity" in architecture. The modernist impulse for change represented the new revolution of a dialectic process, mirroring Marx's historic materialism and the unrelenting development of the production forces that characterizes it. Tafuri thus assigns this same quality of Marx's forces of production to architectural approaches, in a way that it becomes possible to understand architectural history as a progressive (although not linear) development. This association allows him to interpret that Borromini, for example, "anticipates twentieth-century avant-garde attitudes" with his collages of memories, detached from their historical contexts, expressing the volatility of the historical material and "questioning history itself"[681]. In Tafuri's "new history", therefore, the possibilities of an operative history could be developed.

Thus, as with the artist in Hegel, the autonomy of the architect becomes a primary concern of Tafuri's historical project, in both its scholar and activist sides. Primarily, he sets out to show that never was the architect an "interpreter of the cosmic order", and neither had architecture lived a 'golden age' as the "expression of the order of the universe"[682]. On the contrary, he "dismantled the traditional model of the Renaissance as the age of the 'return to antiquity' by showing the existence of a multiplicity of models of traditions operating simultaneously"[683]. Tafuri instead shows that the Renaissance architect, including most prominent figures like Alberti, was but "a professional figure that clashed, compromised, negotiated, attempted to resist, and had to come to terms with patrons, authorities, and political protagonists"[684]. No doubt, Tafuri's refutal of architectural autonomy relies heavily on Marxist notions of emancipation and self-determination which, ultimately, are set in opposition with the notion of the false consciousness caused by ideological illusions. It is in this search for ideological illusion that Tafuri, for example, investigates the (Venetian and Roman) styles of the projects by Sansovino, in Renaissance Venice, based on the political alliances of his patrons.[685]

Architecture's power of expression can be perceived in Tafuri's writings, therefore, as a political tool that can expose or hide the ideologies and the dialectical processes underlying its own development. Specifically, Tafuri focuses on this power as his main object of concern, and asserts that by "clarify[ing] historical

681 Lipstadt and Mendelsohn. p. 65

682 Keyvanian, "Manfredo Tafuri : From the Critique of Ideology to Microhistories." p. 14

683 Keyvanian. p. 9

684 Keyvanian. p. 14

685 Keyvanian.

situations, architecture charges itself with critical values"[686]. Based on the Marxist idea of ideology, the task of the historian becomes imbued of pollical significance, operating in the duality between description and activism, "diagnosis" and "war" or yet between being a "polemicist" and a "philologist", as pointed by Lipstadt and Mendelsohn[687].

It is possible to perceive, therefore, how Tafuri's perceived his own work within such a framework, seen as a "Historical Project" that would at the same time denounce instrumental history and clarify "the possible margins of operation left to architecture".[688] The challenge, evidently, was how to make such a history without falling prey to the same contradiction, without falling into instrumentalism: Keyvanian writes that, throughout Tafuri's writings, "one can clearly perceive the struggle with the need to write a history that would have political relevance, but that would avoid being distorted by this purpose"[689]. To remedy this problem, one of Tafuri's strategy was avoiding a solid, complete description of history. This aversion to a linear way of narrating history is translated in his texts, in what Lidstadt and Medhelsohn call a "Barthian assemblage"[690]. It was a way of doing history not as a grandiose expression of architecture's linear and progressive development, but instead following Carlo Ginzburg's model of "microhistory":

> In "The Historical Project," Tafuri proposed a model of history that was a montage of fragments (which, in architectural terms, often meant unbuilt projects or anachronistic designs that resisted the dominant "style"). Each of the fragments inevitably would have been selected to the exclusion of others. This montage, a construct of the historian, obviously could not claim any absolute validity. Behind every history, including his own, there was, admittedly, a "project," an agenda. Deformations thus were inevitable for both operative criticism and his own history. But, he still claimed, it's a question of the ends one proposes.[691]

Underlying this focus on an historical activism, however, lies Tafuri's disbelief in architectural design to offer resistance to the capitalist ideology and be 'political'. For Tafuri, "architecture had been such an integral part of the capitalist project

686 Lipstadt and Mendelsohn, "Philosophy, History, and Autobiography: Manfredo Tafuri and the 'Unsurpassed Lesson' of Le Corbusier." p. 67

687 Lipstadt and Mendelsohn.

688 Keyvanian, "Manfredo Tafuri : From the Critique of Ideology to Microhistories." p. 15

689 Keyvanian. p. 5

690 Lipstadt and Mendelsohn, "Philosophy, History, and Autobiography: Manfredo Tafuri and the 'Unsurpassed Lesson' of Le Corbusier." p. 63

691 Keyvanian, "Manfredo Tafuri : From the Critique of Ideology to Microhistories." p. 6

that it was an illusion to hope that it could opose it with a counter project"[692]. This pessimism led many to see Tafuri's works as nihilistic, and accuse him of being a herald of the "death of architecture"[693]. Whether or not that is the case, Tafuri's work became and remained highly influential in architectural discourse, representing to many a model of a Marxist analysis in architecture, including in places far from Italy, across the Atlantic ocean.

Amongst Brazilian architects, perhaps the best-known example of Marxist influence in architecture to international audiences is the work of Oscar Niemeyer, the charismatic pioneer of what is sometimes called a "tropical modernism", and his partner in the planning of Brasília, Lucio Costa. Both self-proclaimed communists, Costa and Niemeyer famously incorporated socialist ideas in the form and design of the new Brazilian capital while following the tenets of the Charter of Athens. Notably, the idea of a democracy built upon public participation is stated as the reasoning behind the planning of the *Praça dos Três Poderes* in Brasília[694].

At the wake of the construction of Brasília, much of the national left-wing movements were similarly engaged with president Juscelino Kubitscheck's modernization project for Brazil, and so did architects. Vilanova Artigas, a leading figure teaching at the University of Sao Paulo (USP) in the 1960s, interpreted the task in the form of a need for industrialization of the country's construction sector[695]. This project continued even with the 1964's *coup d'état* and the beginning of the twenty-years long military dictatorship in Brazil. According to Pedro Fiori Arantes, the young and recently graduated architect Sérgio Ferro, along with his colleagues of Arquitetura Nova (namely Rodrigo Lefebvre and Flávio Império), was disheartened by this non-radical response of their masters and tutors at USP, perceiving it as a shy form of resistance, or even as an opportunist alignment to the new political regime[696].

Ferro defended a more direct opposition. In political terms, this meant his enrolment in the Brazilian Communist Party and engagement with forms of direct activism and resistance, actively antagonizing the military dictatorship and ultimately leading to

692 Keyvanian. p. 4

693 Keyvanian. p. 3

694 In the 2013 protests during the FIFA Confederations Cup, a running critic within architecture schools is that, despite Costa and Niemeyer claims, the plaza was designed precisely to better control and underscore any type of political demonstration. The plaza and its surrounding buildings have no immediate reference of scale and their monumental size is difficult to grasp in footage or picture. Comparatively, since great numbers of protesters are needed to fill the plaza's esplanade, demonstrations tend to look small and unsignificant next to the government's buildings.

695 Ferro, *Arquitetura e Trabalho Livre*.

696 Ferro.

his arrest in 1970[697]. In disciplinary temrs, Ferro delved into the writings of Marx and of prominent Marxists available to Brazilian audiences at the time, particularly those of the so-called Frankfurt School, like Walter Benjamin, Theodor Adorno and Max Horkheimer. After producing the study *A Produção da Casa no Brasil* about popular Brazilian housing through the lenses of Marxist concepts (and highly influenced by the work of Thorstein Veblen), he proceeded to write what would become his most influential essay: *O Canteiro e o Desenho* ('the Construction Site and the Design") in which he draws the relationship between the architect's design and the labour at the construction site.

What is so significant about Ferro's development in both of these early texts is that, instead of pursuing to understand the question from inside the discipline, Ferro opts to step out of its boundaries and place architecture amongst the overall picture of society as described by Marx's theory. That is, first and foremost, Ferro assumed that, if the world indeed operated according to Marx's writings, architecture was not *outside* of the capitalist relations of productions, but existed and operated within it and in accordance to its tenets. The goal of Ferro, therefore, was not to develop a theory of architecture that stood on its own terms, but one that could fit *inside* that of Marx and described how architecture was situated in the greater scheme of the capitalist mode of production. It was a way of understanding that architecture "necessarily works for and within the monetary system", as phrased by Peggy Deamer[698].

In simpler terms, Ferro's initial effort is not properly a theoretical endeavour, in the sense of constructing the concepts and describing the relationships that could explain the context of study and direct analysis. The general theory necessary for his work was already given by Marx himself. What was missing, and needed correction, was an *analysis* of architecture inside this wider framework. What Ferro saw as his primary goal, thus, was especially not an architectural one – architecture was rather the object of study – and, after the initial attempt with the case of Brazilian housing, neither were from architecture the terms, methods and references chosen by Ferro to write *o Canteiro e o Desenho*. The process is well described by himself in a research report presented to the ministry of culture, from the time of his teaching in Grenoble:

697 Following his arrest, Sérgio was fired from the University of São Paulo and, with no hopes of getting any other contract and no other form of income, he fled to a self-exile in France, becoming a professor at the University of Grenoble. He taught there until his retirement and continues to live in the city. See Ferro.

698 Deamer, *Archit. Capital. 1845 to Present.* p. 1

> We started taking a step back: it was convenient to take distance. We suspected the exclusive consideration of the architectural object: it faced the risk of having an unclear vision by the excess in proximity. We inserted it, therefore, in the universe of the political economy. Consequently, most of the learned concepts, insufficient in their poor immanence, fell to the ground. The roots of what was framed as an autochthonous criterium revealed the networks of dependency and the hidden refractions that produce it. The found heteronomy broke the supposition of the autonomy of architecture.[699]

Thus, in line with the primacy of the relations of production in historical materialism, Ferro's analysis addresses firstly the position of architecture inside a broader economic environment, understanding architecture as a form of production that, as any other, is realized in reflection to the specific social conditions within which it operates. In other words, Ferro considers that architecture, inside the capitalist mode of production, operates under the processes of capital reproduction – which means that, in accordance to Marxists tenets, "the interests at stake in producing constructions are so important and so contradictory that nothing surrounding them is spared the pressure"[700]. As Silke Kapp explains, this means that, "in modern and contemporary society, architecture is produced, distributed and consumed as a commodity"[701]. The first question addressed by the Ferro, therefore, is about what role does architecture perform in this broader economic realm. Reading from Marx's capital, Ferro is quick to notice that architectural production – or construction, in general – falls under the category of 'manufacture'[702], a form of production that sits in-between artisanal and industrial. Manufacture is not structured by mechanization, but through the fragmentation, rationalization and control of the operations of production. In other words, it is a model of production in which the production of commodities and the extraction of surplus value (which, for those unfamiliar with Marxist theory, roughly describes the origins of profit) is performed via the careful and intensive division of labour in the production site. It is characterized, in the grander scheme of political economy, by being labour-intensive and, since value can be only be produced by labour, it allows for a great production and extraction of value. Manufacture sectors are thus called "pockets of surplus-value" in Marxist

699 Sérgio Ferro, *Architecture From Bellow*, ed. Silke Kapp and Mariana Moura (London: MACK, 2024). p. 256-257

700 Ferro. p. 257

701 From the original in Portuguese: "Na sociedade moderna e contemporânea, a arquitetura e produzida, distribuída e consumida como uma mercadoria", *in* Kapp, "Por Que Teoria Crítica Da Arquitetura? Uma Explicação e Uma Aporia." p. 119

702 Marx and Engels, *Marx and Engels Collected Works. Volume 3, Karl Marx, March 1843-August 1844*.

theory[703], meaning that the value they produce contributes to the development of other, 'capital-intensive' areas that do not produce large immediate value but are essential for capitalist production as a whole – for example, high-tech research and development. In this sense, Arantes points that Ferro

> makes a provocative analogy by comparing the position of construction in the national economy to the role performed by underdeveloped countries in global economy. Underdevelopment in the construction, thus, should not be understood as anomalies or stages to be surpassed, but as a coextensive parcel of the unequal and combined development of capitalism.[704]

Understanding the production of architecture as a manufacture, therefore, the division of labour in the construction site becomes the core of Sergio Ferro's critique. Ferro argues that the production of architecture is not a continuous, unified process, but a conglomerate of segregated labour - or, as he phrases it, the "separated labour"[705] - brought together by the architectural design and subsumed under its rule:

> the present manufacture form of the production of the architectural object […] is a discontinuous, heterogenic, heteronomous process, in which the totalization of the collective worker, at the process's root, comes inevitably from the outside, from the side of the owners of the means of production[706]

What Ferro means is that the collaboration between the builders performed to materialize the architectural object in the construction site, in a capitalist production, in realized according to the rulings of an external logic, that of the capital. The connection between workers, therefore, is purely instrumental, and their relationship is established, within the particular case of architectural production, by the mediation of the architect's design. In Ferro's theory, design serves primarily as an instrument for the production of architecture as a commodity. The contents of

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703 Ferro, *Arquitetura e Trabalho Livre*. p. 106

704 From the original in Portuguese: "Sérgio faz uma provocadora analogia ao comparar a posição da construção civil na economia nacional com o papel que cumprem os países subdesenvolvidos na economia mundial. Subdesenvolvimento e atraso na construção, por isso, não devem ser entendidos como anomalias ou etapas a serem vencidas, mas como parte coextensiva do próprio desenvolvimento desigual e combinado o capitalismo." in Ferro. p. 14

705 Ferro.

706 From the original in Brazilian Portuguese: "a forma manufatureira atual da produção do objeto arquitetônico […] e um processo descontinuo, heterogêneo, heterônomo, no qual a totalização do trabalhador coletivo, sua raiz, vem inevitavelmente de fora, do lado do proprietário dos meios de produção. *in* Ferro. p106

design in terms of form, volume, spatial regulation and so forth are only secondary to this more fundamental operation. Under the strict guidance of the architectural design, the separated workers under the capitalist division of labour are reunited and controlled. Design is the "glue", to use the author's term, that binds together this "collective worker" indispensable to Marx's manufacture[707]. As such, for Ferro, architectural design is first and foremost an "instrument of domination of the construction site"[708]. Knowingly or not, architects perform the role of producing this instrument and legitimizing it with their discourse and authority, in such a way that "even decisions about form as space, imagined as free, contribute to the hegemony of value, even without willing it"[709].

The thought of Sérgio Ferro was long regarded by many of his contemporaries as pessimistic, exceedingly radical and even professionally self-destructive, which he turned into the self-given penchant of being a "suicide of the *métier*"[710]. However, based primarily within the state of São Paulo, a small following maintained alive his thought and endeavoured to apply his teachings, seeking other forms of practicing architecture[711]. Throughout the decades, their attempts gained traction, expanding to other states in Brazil, and his work is now attracted renewed attention and international interest.

From the work of these two authors, Tafuri and Ferro, it is possible to see how radical can the difference between the two Marxist approaches to architecture be – most notably when in regards to the role and power of the architect. While for Tafuri "the problem of modern architecture" sat on "its impossibility to contain and direct the development of the modern city", seen primarily as an ideological battle; for Ferro, the problem is precisely that of is power to control and direct the construction site. In other words, Tafuri sees the architect (and urban planner) from the point of view of their seemly unfavourable position in relation to the forces directing the development of the urban environment (for example, market speculation). Looking upwards towards 'the Capital' and its operatives, Tafuri engages his colleagues and offers them another history, free of (or at least less defined by) bourgeois biases. As if enticing them to act critically, his efforts are focused on criticizing their wrongs and exposing the mystifications and ideological developments that cloud their judgement

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707 Ferro.

708 Ferro.

709 Ferro. p. 110

710 Ferro. p. 9

711 Perhaps the most noteworthy of these practices result from the work of Coletivo Usina CTAH, the Grupo de Pesquisa em Habitação e Sustentabilidade (HABIS) of Universidade de São Paulo and the Grupo Morar de Outras Maneiras (MOM) of the Universidade Federal de Minas Gerais.

– as in, for example, his critique of architectural history as "written with the specific and ideological goal to legitimize the tradition of modern architecture"[712]. Sérgio Ferro, on the other hand, sees architects from the point of view of those beneath them, those whose labour is directly exploited in the production of architecture. In his own words, his critique "was not a formal critique of architecture, not a critique of making houses for the bourgeoisie or houses for the proletariat, but it was, in a certain way, a critique of the profession as a whole"[713].

The difference in the of Tafuri and Ferro can be understood as resulting from a difference of focus: respectively, "ideology" and "production". Sérgio Ferro examines architecture as a territory in which the capitalist mode of production is actualized and capital is reproduced. Only from this "analysis of labour, of labour's dimension, the division of the kind of producer" he proceeds to describe "the role of design, the importance of design to exploit labour, the power of the architect's figure as an essential force to transform that separated labour into commodity"[714]. On the other hand, Tafuri analyses architecture looking from inside out, challenging the ideological production of architectural history and discourse. His characters are thus mostly architects, reproducing different functional ideologies within the discipline, and it is the historian's role to examine whether these are illusions or not.

Naturally, as often is the case inside Marxist debates, there is plenty room for the defence of one or the other's approach. Solely from a broader perspective of Marxism, however, both approaches sit perfectly well within the general its theoretical tenets and produce, if distinct, equally rigorous applications of its conceptual framework. Tafuri and Ferro, in their particular interests, display a deep knowledge of Marxist tradition, and successfully translated it for the reality of architecture.

The problem that surfaces, then, is that their theories are irreconcilable. This difference can be seen, for example, in the way the two thinkers address the work of Le Corbusier:

Tafuri's vision of Le Corbusier is based upon an ideal figure that, while bound to the socioeconomic contingencies of his time, performs the interpretation of history in accordance to historical materialism. In this way, acting as "the architectural analogue of the artist Paul Klee"[715], Le Corbusier reconstructs history, "setting up a new code of values and a new frame of references" in favour of a new modernity

712 Aureli, "Manfredo Tafuri,Archizoom, Superstudio, and the Critique of Architectural Ideology." p. 137

713 Ferro, *Arquitetura e Trabalho Livre*. p. 117

714 Ferro. p. 117

715 Lipstadt and Mendelsohn, "Philosophy, History, and Autobiography: Manfredo Tafuri and the 'Unsurpassed Lesson' of Le Corbusier." p. 63

and utopian thinking. This is the so-called "unsurpassed lesson of Le Corbusier" repeatedly complimented by Tafuri[716]: the thread that modern architecture failed to spin, and therefore missed an opportunity of "dissolving of the traditional function of history, of the artistic object, of the concept itself of art, recovering, from a radically new starting point, the values of memory, of history, of the indefinite"[717]. In other words, Tafuri sees in Le Corbusier a sort of champion of the "Illuminist dialectic", embodied by Piranesi, that accepts "at the right moment, all the instances of 'memory' and of new critical (even self- critical) symbolism".[718]

The reason why Tafuri might consider Le Corbusier on such high regards is puzzling[719], but it is possible to consider that Le Corbusier, along with some singular figures like Gropius and Mies van der Rohe, was seen by Tafuri as an "operator", in the Benjaminian sense: an actor that could "identify the new laws of the equipment, and solve, by entering into it, its irrationalities and contradictions".[720] In this sense, perhaps Tafuri thought that Le Corbusier could produce a "ambiguous 'historicity' of architectural images" that would not so easily fall prey to ideological illusion.[721] This could explain, as Lipstadt and Medehlson argue, why Le Corbusier "provide the standard for judging many other architects" for Tafuri, appearing "as the indirect cause of, the 'yardstick' for, and the temporary 'cure' for the situation in Italy"[722] and, perhaps, of historicity itself:

> Le Corbusier is enlisted immediately, allowing Tafuri to demonstrate that structuralism, while useful for its scientificity, is, for the critic, inferior to historicity. The architect here makes his first appearance as prophet, for he, alongside the Dadaists, some members of De Stijl, and Russian constructivists, had already foreseen what Levi- Strauss had yet to postulate, the "end of the myth of humanist anthropocentrism" in history.[723]

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716 Lipstadt and Mendelsohn. p. 68

717 Lipstadt and Mendelsohn. p. 68

718 Lipstadt and Mendelsohn. p. 66

719 Such high hopes of rescuing the project of modernity Tafuri places on Le Corbusier that he claims that "[in] spite of Le Corbusier (...) there remains an insuperable contradiction in contemporary architecture" and that, for example, "the Plan Obus as the most lucid architectural anticipation of welfare state logic in which the city was reduced to one economic and spatial system, that of a linear infrastructural support." See Pier Vittorio Aureli "Manfredo Tafuri,Archizoom, Superstudio, and the critique of architectural ideology" in Deamer, *Archit. Capital. 1845 to Present.*

720 Lipstadt and Mendelsohn, "Philosophy, History, and Autobiography: Manfredo Tafuri and the 'Unsurpassed Lesson' of Le Corbusier." p. 64

721 Lipstadt and Mendelsohn. p. 67

722 Lipstadt and Mendelsohn. p. 67

723 Lipstadt and Mendelsohn. p. 64

Ferro's account of Le Corbusier differs radically from Tafuri's. From archival research on the construction work of *La Tourette*, the author shows that, in contradiction to the discourse of rationality of brutalism, the building process of the monastery was anything but rational.[724] Marked by all sorts of mistakes, improvisation, inadequacy, etc. the way in which the monastery was built also disagreed greatly with a discourse of material primacy. Ferro recovers testimonies of Xenakis and Wolgensky, Le Corbusier's assistants, claiming that "despite his declarations, Le Corbusier cared little with the techniques and with the materials that should be used"[725]. The architect, for example, did not design the monastery's church in accordance to a chosen material and technique, and only after "the definition of its volume" was the church's form "studied successively in metal, in blocks of concrete, to finally be made in moulded concrete"[726]. Far from the constructive honesty it represents, the example shows that material appearance can be manipulated to *simulate* a model of production, stimulating a false interpretation of the actual material trajectories of a building. Ferro understands this movement with the aid of Peirce's philosophy:

> The 'semantization of the technical gesture' […] is one of these movements by which the vestige of a building operation is covered in a different meaning. Its prototype is the brushstroke tasked to express the author's *'pathos'*. In architecture, this movement becomes very complex and proper of the games of prestige, because that who semantizes is not that who produces the gesture.[727]

Underneath this veneer, Ferro argues that there is a form of analysis that "disperses the material in components" in Le Corbusier – a way of thinking in which "the instinct, the trial and the empiricism are replaced by the scientific principles of the analysis, by organization and classification"[728]. It is possible to summarize Ferro's critique by understanding that, to him, Le Corbusier represented, in architecture, the effacement of what Adorno understood by 'material' in his analysis of musical production: material is "all that serves for the construction of the *oeuvre*, from

724 Ferro, *Arquitetura e Trabalho Livre.*

725 From the original in Portuguese: "Xénakis e Wolgensky, seus auxiliaries diretos, afirmam que, apesar de suas declarações, Le Corbusier preocupava-se pouco com as técnicas e com os materiais que deveriam ser utilizados". Ferro. p. 248

726 From the original in Portuguese: "A igreja, depois da definição de seu volume, foi estudada sucessivamente em metal, em bloco de concreto, para, finalmente, ser feita em concreto moldado". Ferro. p. 249

727 From the original in Portuguese "A semantização do gesto técnico […] é um desses movimentos nos quais o vestígio da operação construtiva é coberta com outro sentido. O seu protótipo é o pincelada cuja função é expressar o páthos do autor. Na arquitetura, esse movimento se torna muito complexo e próprio dos jogos de prestígio, por que quem semantiza não é quem produz o gesto." Ferro. 115

728 Ferro. p. 245

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the organization of the sonic universe, for example, to the available, possible imaginary"[729]. In Ferro's view, this formulation would mean that, in architecture, "the material is the matter plus the men that work it. The active support of the works of conception and realization."[730] Instead of grounding itself in this concrete support, Le Corbusier's design is directed "as if seeking the gradual differentiation of a neutral material […] as if the design impose itself, little by little, to an amorphous, purely imaginary material"[731].

The difference in position between the two authors clearly reflects, yet again, the schism between construction and design in architecture which, in a Marxist perspective, can be construed in the distinction between "base" and "superstructure". In the words of Peggy Deamer, architecture operates in both, but divided as such: "the construction industry participates energetically in the economic engine that is the base, architecture (particularly as a design practice) operates in the realm of culture, allowing capital to do its work without its effects being scrutinized."[732] This division thus affects the analysis of the two authors: on the one hand, Tafuri's critique of architectural history shows clearly that the production of architectural discourse plays a greater role in the production of the built environment than Ferro recognizes. Missing this point, Ferro's critique of architecture remains bound and limited to the immediate relation between design and construction site, forgetting or subsuming much else as a minor particularity of a general process. Contradictorily, focusing on the construction site to step out of architectural discipline confinement makes Ferro lose sight of the other realms in which architecture is operative and that influence labour in architectural production – such as Tafuri's "instrumental history". Policies, regulation, technical developments and other processes become less important, almost footnotes in comparison with design in the control and so-called domination of the construction site. Ferro's analysis, ironically, seems thus abstract, simplistic of the real complexity of architectural production and lacking the nuance such a claim would require – a critique often directed to Marxists by anthropologists.

For Tafuri, the problems of facing Ferro are more grievous. His critique of modern architecture and urbanism failing to steer the production of the built environment ignores a core premise of Marxism, in whatever form it assumes – that of *materialism*. By failing to consider the relations of production *before* and *outside*

729 Ferro.

730 Ferro. p. 249

731 Ferro.

732 Peggy Deamer, *Architecture and Labor*, *Architecture and Labor*, 2020, https://doi.org/10.4324/9780429325182. p. 1

architectural discourse, in the actual construction of architecture, Tafuri is bound to commit the same mistake he so often criticizes, becoming an idealist himself. This fall on idealism becomes clear when, introducing the text *L'Armonia e i Conflitti*, Tafuri writes that the quality of the artistic object as a witness "to the roles that were assigned to it by the mentality (or mentalities) of the era"[733]. Notably, this mentality serves as an umbrella, or re-presentation, containing the conditions that are otherwise fundamental for Marxism, namely "its economic meaning, its public function, the means of production incorporated in it, the structures of representation (= ideologies) that condition it"[734]. In light of the descriptions of the role of architecture and construction in political economy by Ferro, Tafuri's defences seem out of place and sight, as if placed altogether in the wrong battlefield. His questions, arguments and critiques, insightful as they might look, present simply the counterpoint that proves Ferro's point that architectural discourse, with its back-and-forth motion, often misses the point entirely and simply ignores its own role[735]. In other words, Tafuri falls prey to what Ferro would describe as the fallacy of autonomy in architecture[736].

Under the framework of the epistemologies of making, it is possible to see that Tafuri falls critically into an object-oriented way of thinking, even if an informed one. Relying on philology, his "architectural microhistories" are historiographical attempts to avoid the biased character of operative history – but they reflect a canonical focus on the architectural object, namely "architectural models, drawings [and] the built works themselves"[737]. As most critics of architecture, Tafuri once again centres his gaze on the architect's agency, intention and influence as a gauge to examining the reality of architecture, albeit in connection to a broader set of power relations. Precisely because of this approach, the world he depicts corresponds not the built environment as a whole, but remains mainly within disciplinary boundaries. Accordingly, the terms of his analysis follow those of an architectural canonical theory and history that he is so eager to criticize: as with his critique of a search for "ready-made solutions" in history that develops into a targeted critique of postmodern architecture, a standard category of architectural tendencies following the tradition of thinking time through 'styles'[738].

733 M. Tafuri, LArmonia e i conflitti. La chiesa di San Francesco della Vigna nella Venezia del '500 (Torino: Einaudi, 1983), 7.

734 M. Tafuri, LArmonia e i conflitti. La chiesa di San Francesco della Vigna nella Venezia del '500.

735 Ferro, *Arquitetura e Trabalho Livre*.

736 Ferro.

737 Keyvanian, "Manfredo Tafuri : From the Critique of Ideology to Microhistories." p. 8

738 Keyvanian. p. 13

> [The] fundamental questions on the role of architecture and, therefore, the architect, remain. […] Attempting to answer these questions was Tafuri's lifetime endeavour. His whole production could be read as the struggle to clear the ground of illusions in impossible roles for architecture, in order to identify the possible ones.[739]

One could expect that, coming from a Marxist background, Tafuri would be cautious about the fetichism of the commodity in architecture, that is, the power of the commodity to hide its productive history. But, as typical to architectural historians, Tafuri repeats the mistake of accessing a field and a profession solely by the work of the architect: seeing the products for the production and, consequently, taking the design for the building. The "crisis of the object" and its "twin crisis of history", so important for Tafuri, betray his reliance on the architectural design as an expression of intent, a carrier of ideology – but it misses most of the very realization of design. Tafuri's reference to the construction of the architecture is limited solely to understanding the political economic tendencies that incur in the realization or not of different designs according to their expressions within power relations. A form of social assessment and appraisal of the architects intention, based on the specific flows of the economic forces is not without value. The negotiations of architects in their historical contexts (for example, in renaissance) can clearly be described as being part of the architect's performance of craftsmanship. But, in Tafuri's writings, the architectural object as a thing of production, as a fruit of labour and knowledge beyond that of the architect, performing itself an economic and epistemic operation, ultimately, is lost.

Sérgio Ferro, in contrast, is strikingly more aware of the production processes underneath architectural practice and their significance in terms of knowledge. Ferro's critique of the "collective worker" is weighty, for it understands that the collaboration between workers is paramount to a greater development of the 'productive forces' of architecture – or, in other words, the tooling architecture, which includes techniques, skills and ultimately knowledge – in a way best befitting of its production. In other words, to the best the development of process-oriented ways of knowing in architectural production. The "collective worker" in the construction site, however, does not simply perform such a collaboration and Ferro is aware that, for such skills to be developed, it would be necessary for decision making and material transformation to be coupled in practice. This need stresses the importance of improvisation and exploration in practice, or in action, to use Schön's terms. Thus, Ferro recognizes the lack (and the need) of the premises of craftsmanship in the general production of architecture and the impact it has on the knowledge of both construction worker and architect.

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739 Keyvanian. p. 13

Ultimately, however, Ferro's theory is incapable of decisively explaining how (and why) such impoverishment of knowledge is caused by the division of labour in the construction site. As with many other writers from a Marxist doctrine (myself included), Sérgio finds in it not a clear description of what such knowledge is, how it is created and why it is important. Neither does Ferro's critique explain precisely why and how the craft knowledge of construction differs from that under manufacture. Instead, the question is framed under the terms of the "alienation of labour" in a Marxist vocabulary.[740]

I have elsewhere dealt extensively on the intricacies of the concept of alienation both as a philosophical concept[741] and inside the production of architecture. It suffices here to point that Marxian theory comes as far as recognizing that the separation between the maker, the product and activity of making that happens in the alienation of labour – or, in other words, the maker and the material reality of the production –is a problem of knowledge. That is, this separation is not a mere physical divide, but indeed concurs into an epistemic distance: when Marx states that workers are separated from the product of their work, for example, he means that they do not define what it is in terms of form, materiality, function, symbolism etc. They effectively do not need to know (and most probably do not know) the reasoning behind its particular historical formation, the social and economic conditions behind it, and also the terms of its conception and design. In architectural terms, the equivalent is the builder that does not understand the meaning or reason behind an ornament or a particular material choice.

The critique of alienation, however, does not describe how and why such a material distance corresponds to an epistemic schism. In simple terms, the question of how the alienation of labour is also an alienation (in the sense of a forceful removal)

740 As powerful and enticing as the concept of alienation has proved itself, it often raises more questions than it answers. Partly, the problem is that, in writings of Marx and many Marxists, it is considered frequently under a self-evident mantle of a moral problem: alienation is a bad consequence of capitalist production and therefore must be shunned and countered. Being a form of false consciousness, it produces an ideological illusion that contributes to the maintenance of an unequal, unjust state of affairs. Evidently, the concept is not so simple. In the manuscripts of 1844, Marx explains the process of alienation and its four expressions (reproduced here in a very short description): alienation is a separation between the workers and the product of their work; it is a separation between workers their productive activity; a separation with their "ontological position" as a "generic member" of human kind – in other words, a separation of an individual with oneself as a productive being (which, to Marx, constitutes human nature); and the consequent separation between individuals and their peers.

741 Crevels, "Aspectos Da Conceituação Do Trabalho Em Marx : A Alienação Como Abstração Concreta." Eric Crevels, "Trabalho, Receituário e Alienação Na Arquitetura: Apontamentos Críticos à Prática Do Arquiteto," *Thesis* 7, no. 13 (2022): 28–43.

of knowledge, while posited, is not explained or described in concrete terms. This limits Ferro's critique: in many instances, Ferro accuses the division of labour in the construction site and the imposition of design of effecting an "effacement of skill", and points to the division of labour as the culprit. Yet, the terms of this causality remain bound to either the supposed potential unalienated practice – the work that "awakes, reveals, reunites"[742] – or framed in relation to the *telos* of production, concerning the "reasons of the design, calculation, opportunity etc".[743]

While this aspects of production are important for the development of skill and a process oriented epistemology, as seen previously, they do not represent the full knowledge of production, and it is not far-fetched to consider that Ferro indeed recognizes the absence of something important: he specifically and repeatedly positions the builder's labour at the core of his concerns, writing that at "the centre of our gravitation is the very essence of the act of building"[744]; and, in an interview to Pedro Fiori Arantes, admitting Marx's limitation, he confesses:

> I always had difficulties in accepting the defence of industrialization by Marx. He can only see labour as suffering, the ideal of the communist man for him is the man who has vacations, who can have leisure and remake himself. […] nothing develops here (head) if it does not develop here (hand). It is essential that all that is here (in the head) passes on, loses itself completely. It is in this sense that Hegel is much more radical than Marx, this 'loss' of the head in the matter must be complete, it is not just making a hobby to fixing the hand, there must be a dive in matter, deep, and when one comes back, that matter is not matter anymore, it is material, a living thing, in which you are inside. It reconstructs you, modifies you, and you dive again. The exchange between man and the world is to me of extreme fertility, rich, joyful.[745]

742 Ferro, *Arquitetura e Trabalho Livre*. p. 145

743 Ferro.

744 Ferro. p. 284

745 From the original in Portuguese: "A defesa que o Marx faz da industrialização, eu sempre tive dificuldade em aceitar. Ele só consegue ver o trabalho como sofrimento, o ideal do homem comunista para ele é o homem que tem férias, que pode ter o lazer e se refazer. […] Nada se desenvolve aqui (na cabeça) sem não se desenvolve aqui (nas mãos). É essencial que que tudo o que está aqui (na cabeça) passe, se 'perca' totalmente. Nesse sentido Hegel é muito mais radical do que Marx, essa 'perda' da cabeça na matéria tem que ser total, não é fazer só 'hobby' para ajeitar a mão, tem que haver mergulho na matéria, a fundo, e quando volta, aquela matéria não é mais matéria, é material, é coisa viva, na qual você está dentro. Ela o reconstrói, modifica, e você remergulha. A troca do homem e do mundo é a meu ver de uma fertilidade extraordinária, rica, alegre." Ferro. p. 284

This 'exchange between man and the world', for trained ears, sounds as the so-called 'dialectics between men and nature': Marx's version of a human essence, or nature[746]. Still, it would seem that this is how far Marxist theory goes in terms of developing the kind of knowledge produced in such encounter. Sérgio longs for it, but is ultimately unable to fully describe its operation in his Marxist theory of architecture. Remarkably, when expressing his disappointment with Marx's theory, Ferro's terms much approximate to those of craft theory: the 'head' and the 'hand'; the dissolving of oneself in the process and the consequent subjective transformation; the 'living', agentic material. They all sit on the periphery of Marxist thought, but at the centre of craftsmanship. In this sense, the 'exchange between man and the world' is entirely within the realm of the epistemologies of making, and not at all difficult to further explain, as seen in previous chapters. From the perspective of craftsmanship, therefore, it is possible to remedy the gap in Ferro's critique.

Sérgio Ferro's critique of the effacement of skill, and ultimately the separation of "abstract" and "concrete" knowledge can be understood as the establishment of an imposed path of performance for construction workers. Then, instead of having a full horizon of possibilities when facing a new challenge of fabrication, these artisans are offered a readymade path, predetermined in the architectural form and materiality. In other words, a path laid in design terms, offering a finished object as the goal – thus hylomorphic. Being object-centred, this operation defines to a great extent the tools and techniques to be used in the construction site (not to mention the professionals themselves, to a lesser extent), as seen in the example of the Barbican, in which the choice of surface finish dictates the use of a bush-hammer. Tools and techniques, however, are of ultimate importance in the development of skills. If one considers that the relationship between body, tool and technique in the act of making is not a solid, hermetic encounter, the magnitude of the problem starts to become clear. To borrow Haraway's term, craftspeople in the performance of making, in the enactment of craftsmanship, are *in effect* cyborgs – hybridized bodies struggling in the establishment of an intersubjective relation. Thus, in Ferro's critique, the logics of the entanglement between artisan, tool and technique, so significant for the notion of personhood (as seen with the case of Brazilian fishermen) and the agentic negotiation of craftsmanship are developed outside the very realm of production. This is why, as seen in previously, the materiality that rules the decision making in design is not the materiality that would follow the logic of construction. Being both commonly unknown to the workers and operating on a different way of knowing, this materiality reaches the construction site, via the design, and control the work

746 Arthur, *Dialectics of Labour: Marx and His Relation to Hegel*.

of builders. In terms of craftsmanship, it replaces most of the epistemic negotiation it implies. Without negotiation, the realization of the artisan's agency is lessened, and consequently so is the knowledge produced in action. Moreover, the effacement of skill is the loss of a way of producing knowledge and, ultimately, of process-oriented ways of knowing themselves. What is lost, therefore, is not only the material knowledge, but the attunement with the material implied in skilled practice. It is the ability to immerse oneself within the material processes; of becoming tool-like and, ultimately, material-like, to use Sautchuk's reasoning[747] – or letting the mind flood into the things around us, as Ryle would put it.[748] Since the performance of craftsmanship establishes the subjectivities of the making process, it is no wonder that craftspeople, under the tutelage of a design (or blueprint, to use Farleigh's words) portray a diminished identification with their own production.

6.5 Conclusion

The material discourse of architecture is not purely economic, nor a mere fruit of the fetish of the commodity or even an autonomous field of knowledge. Production and ideology both are at play in the material and epistemic formation of architecture, as a discipline and as a practice, and there is a strong reciprocity between these two realms – which does not imply harmony. While architectural knowledge is indeed shaped by the material reality, as seen in the case of the materiality of concrete in the construction of the Barbican, the way of knowing and perceiving the material of architecture is subject to discursive formation – the cultural and historical conditions that rule, as Foucault would put it, the *epistemes* of its particular operation. This "culture of knowledge", as phrased by Pamela O'Long[749] cannot be simply understood under the threefold terms of ideology, must also be interpreted from the perspective of material production. Material production is ultimately connected to both epistemic and productive history, and reflect even their contradictions.

747 Sautchuk, "O Arpão e o Anzol: Técnica e Pessoa No Estuário Do Amazonas."

748 Ryle, *The Concept of Mind*.

749 O. Long, *Artisan / Practitioners and the Rise of the New Sciences , 1400 – 1600*.

The notions (and concepts) brought from crafts in this research make these contradictions more apparent. They show that the discourses in architecture betray its object-oriented structure, despite its focus on the process-oriented work of the architect. Architects design the object a priori – builders realise it. The object is the main focus of the operation of design, and its language – it is through design that other aspects of construction are defined, and rather than liberating process, this operation limits it. In this sense, design can be understood as a prescriptive technology, in Ferro's terms[750], akin to what happens in industry: the encapsulation of process-oriented ways of thinking, articulated in an overall object-oriented structure. As becomes clear from the history of architectural discourse, the tension between craftmanship and design traverses the discipline's body of knowledge. The division of knowledge and labour, established in the act of making, produces contradicting ways of knowing that separates architects and builders. Architects, in this framework, are also encapsulated in their own process-oriented bubble, removed from the material production of architecture that takes place in the construction site. Since skills are qualified shifts in perception and imply an ability to perceive meaning in the material, both architect's the construction worker's skilled practice is dimished in epistemic potential because of such divide.

750 Sérgio Ferro, "Concrete as Weapon," *Harvard Design Magazine*, no. 46 (2018): 1–33.

7 Knowing with and against the grain

The episteme of architectural design

7.1 Introduction

From the studies in this research, it seems that architecture faces an epistemic standstill in relation to the work of architects: on the one hand, the tools of the architect are powerful instruments that allow for specific concerns to be negotiated within the complex constellation of architectural production; on the other hand, draughtsmanship is often at odds with craftmanship in the production of architecture, in the construction site. The skills of architects are tuned to the daily lives and sensorial experience of user and their resonance with material composition, entangled with technological possibilities, market dispositions and regulatory conditions. The architectural design's mode of action, however, divides conception and construction in the construction site, structuring a hylomorphic logic in the production of architecture. This divide is reproduced in discourse, in a culture of self-referential isolation that denies the architect's material inheritance, maintaining a fundamental gap between the knowledge of architecture and craft.

In this chapter, I reflect on the networks of knowledge, skill and material production as represented and analysed from the perspective of the epistemologies of making, elaborating on the complexity of architectural work and its relationship with the crafts of construction. The first section exposes the material attunement and the agentic negotiations proper do architectural design, explaining, from the perspective of craftsmanship, its potential of 'objectifying abstract space' and

exposing the process-oriented character with which architects sketch, model and design. I propose that design methods can be understood as perceptive tools that open the possibility of manipulating spatial relations in a virtual materiality; and as epistemic artifacts that embody the networks of skill, knowledge and agency in the production of architecture. In the second section, I address the chronical distance with the material reality possessed by modern architectural design practices, as essentially hylomorphic endeavours, and how it contributes to the reproduction of an object-oriented way of knowing in the broader relations of production in architecture. Reflecting on the interdependent relation between design and construction in the performance of craftsmanship, architectural design in its institutionalized form appears as an obstacle to both the skilled exploration of builders within the construction site and the architect's own engagement with the material transformations of architectural production. The corollaries of this divide can be seen in architectural cultures of stardom and materially-detached forms of research and education that further neglect the equivalency between construction and architecture.

7.2 The world of design

Focusing on the first side of the paradox, for the moment, the epistemologies of making architecture can explain the operation of design as a creative yet epistemic practice. It is possible to interpret that the methods, the techniques and the processes used to build and design define the development of skills within the field and, consequently, the very concept of architecture. They make their way into discourses, pedagogies and theories and get naturalized in the history of the profession. Embodying specific ways of knowing, the ways of making architecture coalesce in its lore, reproducing both its potentials and its biases. The architect's processes of design mediate this lore and its practice, merging the many crafts and fields of knowledge involved in its production. Design processes can, therefore, be understood simultaneously as *perceptive tools* that allow architects to deal with the specific qualities of their craft, making them explicit and ready at hand; and as *epistemic artifacts*, where material, social and economic considerations can be found interweaved, reflecting societal ways of making the built environment; embodied in the translation of technical, theoretical and aesthetical domains into spatial and constructive languages, besides effecting a synergic middle ground between different communities of practice.

Understanding architectural design as a perceptive tool *vis-à-vis* the framework of this research, the history of the 78+ system shows that by the analysis the tools of architects much of their knowledge can be brought to the fore. Similar to the woodcarver's chisel, the blacksmith's hammer and the potter's scraper, albeit of a more mediated relation, an architectural tool – a sketch, for example – allows architects to develop a feeling over the spatial configuration. Questions of dimensions, boundaries, flows and interactions between material elements and environments can be accessed by drawing a floor plan, for example, aiding architects as they imagine possible solutions – it is the *negative* character of design, as explored previously from KSA's philosophy. This is possible because, from the mind to paper, ideas acquire a less ephemeral existence and become more stable. They no longer are dependent on the immediate focus of the architect to remain real and, as such, free their makers to address other questions, include more layers of complexity in the study. Perhaps most significantly, architect can then distance themselves and analyse the potential and limitations of that idea. In other words, by being drawn, sketched or modelled, ideas become part of the material repertoire of skilled practice, and become entities that possess a particular agency in the negotiations of draughtsmanship.

The re-iterative nature of this process is well known in architectural design studios[751], and it is easily perceivable from archival collections. The countless sketches by Belgian architect Eduard van Steenbergen, held at archives of the *Vlaams Architectuutinstituut*, provide a telling example. From his project for the *Districthuis*[752] in Deurne, it is possible to see that all kinds of questions were addressed in his sketches, and they take on many forms – perspectives, technical drawings, details etc. He explored different aspects of the design in this way, fitting the stereotypical image of the architect drawing at a napkin. These drawings also show a link between the practice and its materiality. Benefitting from the transparency of tracing paper, van Steenbergen would fold drawings over each other, trying out subtle changes and variations in the floorplan. In other sketches, he progressed through ideas using pencil and pen, as if solidifying what pleased his judgement, and demonstrating awareness of the potentials afforded by a not-quite-permanent quality of sketches, and the differences in contrast between graphite and ink.

751 Schön, *The Reflective Practitioner*.

752 Documents from the Districthuis, BE/653717/0003-EVS/0091, Archief van Eduard van Steenbergen, Vlaams Architectuutinstituut archief, Antwerp, Flanders, Belgium.

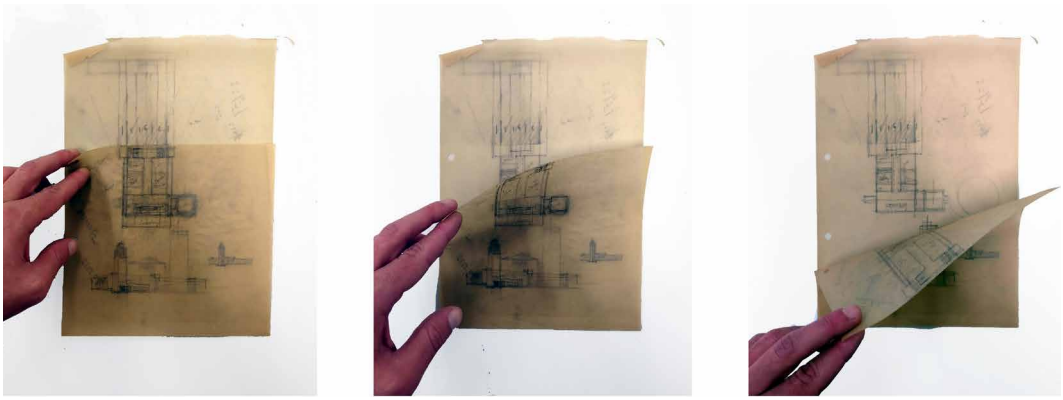

FIG. 7.1 Eduard van Steenbergen's folding sketch. Source: VAi

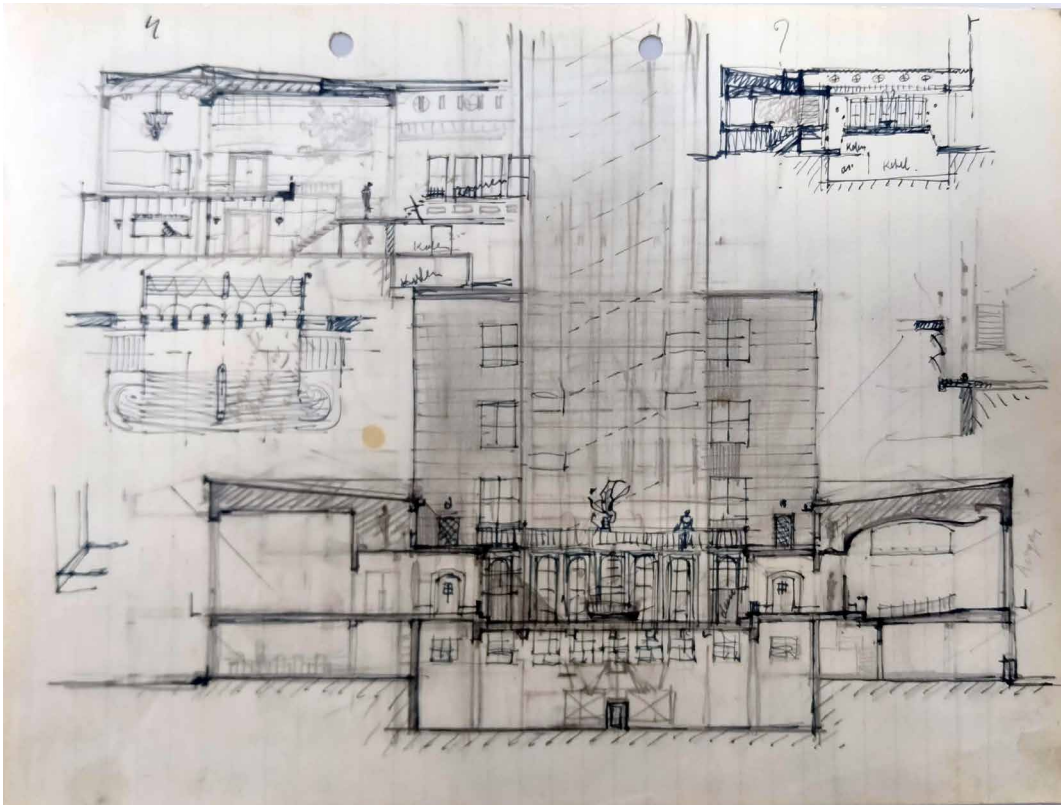

FIG. 7.2 Eduard van Steenbergen graphite and ink sketch. Source: VAi.

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A similar consideration, evidently, can be elaborated regarding models, albeit of a different quality. Often requiring relatively slow, hands-on work, instead of allowing for quick explorations of spatial configurations, models provide architects with qualities that stem mainly from its tridimensionality and materiality. As varied as sketches, models are used to explore many aspects of design, such as the incidence of light, providing architects with a way to directly test how light behaves in a specific volumetric setting; they can be used to visualise the aesthetic interaction between the materials chosen for an environment, and how they affect its "atmosphere"[753]; or they can allow one to explore the intricate workings of a roof structure in a way that can it be easily manipulated, turned around and flipped over. In other words, modelling allows for the tridimensionality of space to be manipulated, tested with and engaged in its full expression, materialized in an equally tridimensional object.

> the sketch, along with the model, is still a tool that is used today in connection with serious architectural design. Regardless of the external form, whether analogue or digital, the ability to sketch spatial situations is a fundamental requirement for creative work in architecture. The processes that take place during the development of spatial ideas in drawings are procedures which, in the case of practicing architects, mature into schematic experiences, or, in other words, into a 'procedure know-how' that is difficult for outsiders to understand or comprehend.[754]

Sketching and modelling, evidently, are not the only tools architects have at their disposal. From the development of perspectival drawings in the renaissance[755], through the plaster castings of the *Beaux Arts* model of education[756], to the algorithms of parametric design[757], the history of architecture professionalism is populated by many methods and practices that can be analysed under the concept of *perceptive* design tools. These tools allow architects to explore, in a craft-like, tentative way, many aspects of the spatial-material configuration of the built environment. They allow the development of a particular awareness to the interplay of dimensions, materials and elements, climatic and environmental phenomena, the particular ways of living and desires of different groups and communities and so forth; and how they can be addressed in the form and substance of buildings.

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753 Peter Zumthor, *Atmospheres: Architectural Environments Surrounding Objects* (Basel: Birkhäuser, 2006).

754 Peter Schmid, "The Architectural Drawing as a Profession-Specific »Know-How«," *Dimensions. Journal of Architectural Knowledge*, 2021. p. 174

755 Pérez-Gómez, "Architecture as Drawing."

756 Lara Schrijver, ed., *The Tacit Dimension: Architectural Knowledge and Scientific Research* (Leuven: Leuven University Press, 2021).

757 Cache, "Gottfried Semper: Stereotomy, Biology, and Geometry."

These connections, or "leaps of associations made between materially engaged things and abstract ideas of architectural order and space", as phrased by Bardt[758], establish the common ground within which disparate concerns – as KSA's consistency, coherence and resonance – and modes of being (structural, sensorial and social, for example) can be addressed in a single 'problem', as Schön or Marchand would say[759]. They bring "architecture into a symbiosis of language-like, symbolic and as physical experience".[760]

In other words, architectural design tools afford a particular kind of skill, related mostly to the conception of spaces and their objective form and substance, but also in their meaning as socially situated objects. The specifics of how that is performed are particular to the concerns of the architectural practitioner – the preoccupations of KSA, as shown, are often at odds with those of other architects – but the general range of possibilities remains similar throughout the discipline. As Bardt argues, "designers face their sketches or some strange physical model and ask what it could be, what it suggests, what it wants to be, they are giving themselves over to the situation in order to imagine."[761] It is not too difficult to notice, then, that these tools also operate as epistemic artifacts, helping architects to close the gap between the diverse affordances and contingencies in a particular material challenge and their theoretical, accumulated disciplinary knowledge – that is, between a particular, specific spatial demand and the social conditions of architectural production. In other words, these tools allow architects to *perform* their skills in the objective, material world, and characterize it as a form of knowledge.

The *knooppunt*, as such, can be interpreted as a tool that not only archives the knowledge contained in its development, embedded in the history of its formation and preserved in the VAi archive, but it also carries knowledge across disciplinary boundaries, and operates in its production. In this line, particularly interesting is how it operates as a communication device, helping designers to address the qualities of a particular detail as part of a collective endeavour across diverse communities of practice. From the point of view of architectural design, the model (as well as drawings and other tools) can serve as a facilitator in the negotiations with other

758 Bardt, "Recapturing Meaning : Toward a New Material-Based Design Theory for Architecture."p. 8

759 Schön, *The Reflective Practitioner*; Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making.*

760 Bardt, "Recapturing Meaning : Toward a New Material-Based Design Theory for Architecture."p. 8

761 Bardt. p. 8

professionals and stakeholders[762]. As such, the *knooppunt*'s communicative quality is primarily related to its *reason d'être* of being a constructive model. Both as a tool and as a product, the *knooppunt* sit in-between crafts, and establishes their connection.

The tools of the architect express a kind of knowledge whose horizon is wide, for it is directly related to a poetic, imaginative pursuit of simulated possibilities. In this sense, such knowledge is performed by experimentation and by the use of these tools and, therefore, it resonates with the explorative attitude and way craftspeople address the constellation of concerns in their practice:

> In contemporary craft, too, the creative processes of designing and making things involves a scientific attitude. Chairmakers, for example, must consider the tension, compression, torque, torsion, and sheer that loads will exert on the legs, seat, arms, and backs of the chairs they design; potters experiment with the chemistry of glazes to establish correlations between kiln temperature, timing, and resulting colours, effects, and the resilience of surfaces;[763]

These experimentations, translated in the principles of practice and explored on empirical terms rather than relying on abstractions, are proper to crafts – but Marchand's terms can be misleading. Rather, I argue that craftspeople, when experimenting, will often relate to a more alchemical kind of experiment, not quite 'scientific'. As DeLanda recognizes, "sixteenth-century alchemists recovered a certain respect for a direct interaction with matter and energy". [764] Similarly, artisans use possible variations in processes, techniques and materials, working with the concrete tributaries of their production, and not solely their abstract and isolated properties. While material properties make their way into practice and now explicate many of the operations at play, it is mostly by "direct interaction" that they are employed at work. That is, it is still mostly by material qualities that innovation is pursued in crafts.

Since architects seem to operate in design via similar explorations and tentative processes, a question remains: what is the material of design?

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762 Gosseye, Janina; Zaugg, Maxime, 2021. *The emergence of urban design and the public agency of the maquette* [paper]. In: Society of Architectural Historians (SAH) 74th International Conference, online, 13-17 April 2021

763 Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making.* p. 15

764 DeLanda, "Material Complexity." p.15

Jonathan Hale claims that it is possible for the architect "to discover something new about the emerging design with the act of drawing"[765]. Considering the matter by the framework of skill, the design is emergent from the plural agencies woven together in the act of drawing. Particularly, in the case of architecture, this takes shape as deep entanglement of objective and subjective human capacities, in relationships between space, matter and meaning. Working with representations of these entities, some kept mental and some sketched or modelled, the architect is able to create a simulation of the building to be. More than its status as the object to be produced, the power of this construct is in its performance as the territory of making, as the arena in which the intersubjective process of craftsmanship can take place.

The establishment of this territory allows the development of an ambiguous form of awareness that relates to an unconscious or subtle perception. It presents itself as a form of perception of the environment to which knowledge is to be applied that is somehow 'out of focus'- a sort of 'peripheric awareness', akin to a peripheric sight – but is nonetheless present. Precisely *because* it is out of focus and not the central of attention, it allows for the development of the design in a specific concrete way (that is, dealing with the multiple possible relations of an entity). Being in periphery of consciousness, it opens the space for the designer to deal with other aspects of practice simultaneously, while still connected with the contents perceived, creating the possibility for creativity in the form of improvisation.

More specifically, the peripheric awareness made possible by design tools allows for architects to maintain the multiple particular agencies and entities of the design's virtual reality as a background while they find their way in the problem as a whole – or it can function the other way around: when dealing with techniques and details that require a lot of attention, some partial, peripheric attention is directed to the production as whole, allowing for particular solutions to be developed directly in relation to with the overall design. This form of *shared* awareness, switching from active and perhaps, *passive* forms of attention, allows for what Ingold describes as another characteristic of the making epistemology, in which the craftsman is able to work simultaneously on different scales - simultaneously in both concrete *and* virtual realities, dealing with objective processes at hand *and* with the possibilities that might take place further ahead in the production[766]: a process marked by the entanglement of perception and action that conditions skill. It is a great example of a specific *tacit process* in architectural design. One cannot properly explain how to control and articulate this *shared awareness.*

765 Hale, "Unlocked-for-Editing : Architecture and the Image." p. 1

766 Tim Ingold, "Ways of Walking," *New Scientist*, 1999, https://doi.org/10.4324/9781315234250.

Evidently, in contrast with an activity of direct material production, this endeavour requires a great dose of imagination and previous knowledge, a "stored ability to recall and deploy a range of spatial and formal elements", as pointed by Hale[767]. Somewhat counterintuitively, the greatest power of design, in the very process of design, is the ability it gets to be imbued with the architect's "personal library" and offer a sort of resistance to its maker. Without this recipient in which the designer's knowledge can be invested, Hale argues, "there is nothing to assist and record the complex thought process involved in developing the design"[768]. Once started, however, slowly and reiteratively, the design gains a sort of quasi-autonomy that mimics the contingencies and affordances of material reality. From the engagement with this virtual reality (as in possible, latent – not necessarily digital) created by themselves, designers can enact perceptive-active processes that simultaneously gather and rationalize information. In other words, the process establishes an epistemic horizon and, therefore, knowledge:

> the design drawing offers a freedom to the architect to engage in a more radical level of invention. By providing a safe way of simulating and testing of new solutions – without the expense of building at full-size to find out how it might actually work – the drawing provides a realm of exploration and experiment that would otherwise be unavailable[769]

In short, architects effectively *invent* a reality. Space and the relationships therein, via the tools of design, cease to be entirely abstract and become somewhat malleable, workable, and the intentionality of designers can coalesce (in the terms of consistency, coherence and resonanc, for example) and be imprinted in the project. In other words, design makes possible for space to be worked as a material. In a parallel to Roy Wagner's notion of culture, design is an objectification of the architect's practical "world of thought and action"[770] – akin to how anthropologists perform an ethnography. The tools of design allow this objectification and its exploration through the comparison between multiple possibilities, by using as study object the very experience of the architect. By developing a proxy, or a "prop", designers use it as a methodological instrument to recognize the differences between the spaces known to them and this new assemblage, 'inventing' it by the arising contrast and making analogies between them, until it becomes 'believable'. In this process, designers transform their knowledge by engaging within the different

767 Hale, *Merleau-Ponty for Architects*. p. 11

768 Hale. p. 11

769 Hale. p.12

770 Wagner, *The Invention of Culture*. p. 13

conditions presented by the design, tensioning and testing imagination into a new reality. In other words, the design fabricates an (virtual) experience, expanding the designer's epistemic horizon to incorporate this other spatial possibility. In the process, designers invent their own understanding – their ability to give meaning to, attend and address a particular problem, by experimenting it. Design can thus be seen as a bridge between realities, a method of comparative relationship between assemblages that renders them visible to the architect by "objectifying the discrepancy as an entity"[771]. In this sense, design accepts the virtual experience as a source of knowledge before it is made explicit. By becoming, to certain extent, the users of the space being designed, architect becomes their own object of study.

It is important to stress, however, that the virtual reality created in the process of design acts upon itself only insofar as it is energized by the architect's engagement – that is, through the knowledge and labour of the designer. As such, this reality relies directly on the architect's ability to perceive the matters of the world and transfer their relationships into its format. There lies its limitation, for the design tools, as any other tool, are constrained into their own realm, and the drawing can only work within its own mode of action. To manifest real relationships in the design, the architect has to frame them into its language. In simpler terms, a drawing can only record things that can be represented and, as such, their other qualities (for example, people's moods, needs or intentions) must remain in the architect's mind and be constantly revitalized to remain present (and significant) in the drawing. There is always a loss, as seen in the case studies of this research, coming from the translation into a different mode of action, and this loss represents a realm that cannot be ignored in the account of tacit knowledge. This can be perceived in the development of the 78+ system and the disparate histories of the *knooppunt* and the assembly logic of the modular frames that compose it. While both are tributaries to the same arising technical object, the morphological affordance of the joint grants it a visibility that the assembly logic lacks. The knowledge later retained from the experience by the architects followed this privileged appearance, and the *knooppunt* became a paradigm to think materiality (and even space) in their other works, while the assembly *rationale* of the square frames disappeared from discourse. In other words, the connection between the telos of design and the technique of construction is not outside epistemic schisms and, – and, as *epistemic artifacts*, tools also deploy a particular rationality.

771 Wagner. p. 17

7.3 Design despite the world

In the development of skill, since it is founded upon an active engagement with matter, proxies do not suffice. Invariably, proxies provide makers with a re-presentation of activity that removes some of its perceptive qualities, replacing them for communicable codes, either metaphorical or mathematical. This way, proxies are operations that, in opposition to skill, reduce the horizon of the craftsperson to navigate the possibilities of production, and thus can be damaging to craftsmanship.

John Farleigh, already in 1947, reminds of the importance of design and labour acting together for the possibility of fine craftsmanship. Clearly voicing an anti-hylomorphic position, he claims: "Let me remind you once more that I am not talking of the potter who is reproducing a known form, or working to a blueprint, which would be an act of imposing an idea on to the clay"[772]. From the perspective of craftsmanship, working with blueprints is a way of thinking materials (and processes) as inert, disregarding their agency and affordances and replacing them with surrogates, reduced and abstracted – domesticated. It ignores the possibility Kuijpers talks about, that the material tweaks the idea and, although some feedback can occur, the process itself does not foster it. 'Blueprints' limit the scope of attunement with the production since they reduce the possibility of exploration within the making process. In other words, external control over the outcome of a production diminishes the wayfaring and consequently the inventive engagement of the craftsperson with the production.

Blueprints are, evidently, design media. As Marchand argues, "the notion that problem solving is a linear process, dealt with at the point of design, is at odds with the iterative nature of craft"[773]. Because of design, instead of working with a loose directionality, builders are faced with an end goal whose form is already given, with little to no wiggle room for transformation. In Ingold's terms, "the textility of building [gives] way to an architectonics of pure form"[774]. In such situation, any changes, discoveries, or experimentations must not alter the blueprint, the design – which means, evidently, that any possibility of exploration is cast completely *outside* design. As Adamson points out, "any gesture that absents an artist or manufacturer from production tends to bring about exploitation or at least effacement of

772 Farleigh, "THE CRAFTS — THEIR PAST, PRESENT AND FUTURE." p. 28

773 Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making.* p. *XVII*

774 Ingold, "The Textility of Making." p. 93

making."[775] The more detailed, all-encompassing and enforced the design, the more removed from the realm of craft design becomes: a lesson learned by Lethaby, as previously shown.

The creation of every design in such a way is platonic by its operation, since its objective is precisely to perform an hylomorphic process, to impose form into matter. The mode of action of the architect's tools implies thus an abstraction of material qualities and processes into form-based, object-centred terms, whose Euclidian dimensions describe them as spatial entities ready to be 'arranged' by the architect. What Hale's quote (referring to the categorical apparatus of forms, shapes and arrangements, shown previously) demonstrates is that, while "the design drawing offers a freedom to the architect to engage in a more radical level of invention", design technique is limited to its own scope[776]. Architects, within this framework, are limited to realizing the *changes in domain,* pointed by Sennett as powerful drivers of innovation, mostly inside of their own design-constrained universe.[777] Insofar as any material production solution designers seek to explore is translated *a priori* and by default as a design problem it becomes, by association, removed from the material conditions proper to the actual construction site. The problems of production appear, and thus are dealt with, through imaginary, non-material projections or more or less poor representatives – to the point where modelling is often regarded as the *de facto* craft practice in architectural offices[778]. As such, design is constructed based on a knowledge-lacking, reified imagination of the construction site that predates its realization – what Sérgio Ferro appropriately names as an "imaginary construction site"[779]. Accordingly, the history of the *knooppunt* makes explicit not only the entanglements between design and construction but also the dichotomy of their performance – it serves as an example of how architects imagine this virtual construction site without possessing the process-oriented knowledge to fundament it.

Perhaps is this sort of imagination that leads Picon, quoting Gustave Flaubert's Dictionary of Accepted Ideas – that says "Architects. All idiots: they always forget the put in the stairs" – to correct it to: "[r]ather than idiots, architects are dreamers. They are dreamers with material agency, which constitutes a potentially disruptive

775 Adamson, *The Invention of Craft*. p. 44

776 Hale, "Unlocked-for-Editing : Architecture and the Image." p. 2

777 Richard, *The Craftsman.*

778 Riedijk Michiel, *Architecture As A Craft*, ed. Riedijk Michiel (Amsterdam: SUN publishers, 2011).

779 Ferro, *Construção Do Desenho Clássico.*

combination"[780]. However, considering the etymology of *idiocy*, as referring to someone without a craft or trade, a *layperson*, Flaubert's radical statement might have a closer meaning to Picon's critique than he realized. Not to be idiots, craftspeople must instead couple knowledge and labour, developing skills in the material engaged performance of craftsmanship.

In this line, sieving through an extensive literary review, Colin Campbel states that "the craft producer is someone who exercises personal control over all the processes involved in the manufacture of the good in question", meaning that a crafted product is essentially "both 'made and designed by the same person'."[781] While Campbel's assessment would indicate the necessity of an individualized production – replicating a focus on the singular knower that, as seen in chapter two, is not in line with the notion of knowledge dealt in this research – it is a good demonstrative of how the convergence of design and making is considered as paramount to craft in *craft theory*. "Design and craft are synonymous" to the craftsperson, defends Farleigh, which means they are activated in a single form-finding, problem solving activity – what Ingold would call a *morphogenesis*[782].This is performed as craftspeople "have an all-embracing knowledge of each tectonic detail", as Holst put it, which includes matters of constructive and designerly nature[783]. Diametrically opposite to the idiot, the *arché-tekton*, in this sense, would be a craftsperson that addresses the production of a building from the points of view of spatial relations *beyond* design, and, like Odysseus, "displays a thorough knowledge of every step in the procedure of building"[784]. The creations of an imaginary construction site, however, is not a real coming together between these too realms, but a proxy that, consciously or nor, reduces the material complexity of the task at hand and, as such, objectify the skill and labour of others. As Sérgio Ferro argues, it is an imposition of a mode of action that divides and separates craftspeople from an essential part of what their craft is – by removing from their labour the capacity (and possibility) of addressing the design, their work and skill is also diminished.

Ultimately, the way of knowing of architect's is process-oriented only insofar as it relates to design, but becomes objectifying when related to the production of architecture as a whole, because its primary function is precisely that of giving form to things *a priori,* to set up an ideal shape to which materials should be formed

780 Picon, "Digital Fabrication, Between Disruption and Nostalgia." p. 234

781 Campbell, "The Craft Consumer: Culture, Craft and Consumption in a Postmodern Society." p. 23

782 Farleigh, "THE CRAFTS — THEIR PAST, PRESENT AND FUTURE"; Ingold, "The Textility of Making." p. 36

783 Holst, "The Fall of the Tektōn and The Rise of the Architect: On The Greek Origins of Architectural Craftsmanship." p. 3

784 Holst. p. 3

into. As Frampton notices, "we must produce things that look as if they were always there"[785], which is part of the problem. Architectural tools serve primarily to produce an autonomous thing that, therefore, cannot represent – in both the sense of being an 'avatar' but also of being a 'messenger' of construction, presenting 'again' – the technical rationality of how it was built, i.e., the collective epistemic horizon of the crafts and labours involved in its production. Thus, by following this object-oriented approach when relating to the processes of building, architects become bound with that which can be identified as an object, what can be abstracted as an element that can stand autonomously as a concept (and so be analysed and evaluated as such). This contributes to the primacy of form in architectural ways of knowing, since form is the primary aspect that defines what an 'object' or 'element' is inside an hylomorphic discourse.

The phenomena can be described in terms of the different modes of association that technical objects can assume, and how individuals relate to them – as in the case of the Brazilian fishermen. In this perspective, design is a tool akin to the harpoon, bounded to the agency of the architects as an extension of their capacities towards a particular task, but operated within the realm of their modes of action. The architectural industry, on the other hand, is a parallel of the fishing boat, to which rules individuals must abide to belong into. In this sense, however, the fishboat is constructed as an hylomorphic structure. Architecture remains thus bound to an abstract notion of representation, self-referent and, as such, in the form of a simulacrum, a copy without original. It persists thus stuck into a metalinguistic form, at the expense of its existence as the "transformation of space by human labour"[786].

This is a flipside of every process-oriented episteme and of the knowledge developed by the intermediation of tools – 'to a hammer every problem is a nail', as the saying goes – and it is particularly easy for crafts to develop similar self-referential truisms and mystiques. The difference, in the case of architecture, is in its scope and reach. For this abstraction reaches the processes outside the realm of design, and these, as well as their makers' skills, are reified, silenced and subsumed under the self-affirmative operation of design within architectural production. In other words, in most other crafts, the self-referentialism does not break the unity between design and production. In architecture, it does. As Sérgio Ferro argues, within the production of architecture, design is a tool to imposes its form in the construction site[787].

785 Frampton, *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture*. p. 26

786 Kapp, "Por Que Teoria Crítica Da Arquitetura? Uma Explicação e Uma Aporia."

787 Ferro, *Arquitetura e Trabalho Livre*.

The design process, actualized as the objectification of material processes, own this mode of action to the way the production of architecture is structured in general. It is directly caused by the division of labour in the material production of architecture, the "gradual separation of the 'conceptual' process of design from the hands-on process of building" that, as pointed by Hale, is "one of the key consequences of the professionalization of the role of the architect"[788]. As seen in the previous chapter, the process is probably not so simple, and it is possible to question whether the professionalization of the architects is not a fruit of the separation instead of this cause, for example. Nonetheless, the relationship between professionalism and the division of labour – and its associated episteme – in architecture remains worth of critique. While Schön's defence of professional knowledge is in many ways insightful, the obscure nature of this type of knowledge is still problematic. The critiques on professional knowledge claim that they frequently align with a particular ideology. Professions, unlike academy, dwell much deeper and are much more dependent of the economic and financial structures that rule society i.e., the mode of production. Therefore, is all the easier for them to absorb and reproduce its biases - just like exposed in technology by Feenberg, and even accepted by Popper, in his critique to "conspiratory theories of society"[789] - the unchallenging acceptance of efficiency, private propriety, progress and their underlying driver, profit (or, to be more specifically, the extraction of surplus value) and, not less importantly, the hylomorphic model of production as a technique of production.

Accordingly, Janina Gosseye and Naomi Stead state that "Professional and contractual hierarchies of the industry had created a great distance between architect and building workers"[790]. While some degree of division of labour in the production chain of architecture is understandable and expected, given its complexity and scale, it is not unproblematic. This is a phenomenon not exclusive to architecture and it is generally linked to the concept of modernity itself[791]. So-called intellectual work (which, although problematically, includes artistic creation) is generally accepted as more important and considered as the primary legitimate source of knowledge, in detriment to manual and bodily skills. Production in modern society is arranged accordingly and, amongst other problems, it is based on a structure of separation between conceptual, abstract and operative, practical labour. The latter is usually considered inferior, less important and replaceable, in

788 Hale, "Unlocked-for-Editing : Architecture and the Image." p. 2

789 Feenberg, "Tecnologia, Modernidade e Democracia"; Feenberg, "Ten Paradoxes of Technology"; Karl Popper, "Conjectures and Refutations," *Narratives of Therapists' Lives*, 2014, 231, https://doi.org/10.1055/s-2008-1040325.

790 Gosseye, Stead, and vand der Plaat, *Speak. Build.* p. 53

791 Ingold, "The Textility of Making."

addition to holding little decision power over the production as a whole and its own performance[792]. In political economy studies, the argument is that the organizational schemes of production in modern society follow hierarchical structures that subjugate so-called manual labour to intellectual work[793].

If indeed, as DeLanda claims, craftsmanship depends on the process of "following where [the material] leads by connecting operations to a materiality instead of imposing a form upon a matter"[794], the overall organization of the production of architecture, based on a division of labour, is a scheme bound to be problematic. As seen with the case of Korteknie Stuhlmacher Architecten, it is not necessarily a matter of lack of interest or capacity, or a dissimilarity in the concerns between architects and builders. The production of contemporary architectural design actually follows a line of thinking that greatly resembles the notions associated with crafts – especially in terms of quality, value and use. The notions of consistency, coherence and resonance used in this study to explore these aspects in the work of KSA are, given the very nature of the research, specific to the office – but the architects of KSA are not alone in their preoccupations and methodology.

Rather, what becomes apparent from their approach is how limited by external boundaries is the architects' scope of action and how rigid is the structure they work within. The division between architecture and construction is ingrained in the way the industry operates, institutionalized in the regulations, laws and the economic processes that rule how buildings are envisioned, planned and constructed. In other words, although there are several inspiring examples of practitioners following a different approach, the divide between design and construction is not one that can be properly addressed by architects in their private enterprises alone. Surely, the involvement with crafts and their exploration by architects is a rich source of knowledge primarily related to the materials and techniques of making, but while set within institutionalized formats of production that imply such a division (as the separation between design and construction inscribed in the format of competitions and tenders), these attempts will be limited in scope. In this framework, for example, no school in the Netherlands or Belgium would ever be a direct product

792 Marx being the greatest critic of the results, which can be seen in his concept of alienation.

793 The main arguments defending this hypothesis are found in scholars from Marxist schools of thought, with especially significant contributions from Critical theory thinkers of the so-called Frankfurt School. Evidently, perhaps the most significant work in this line of inquiry is that of Karl Marx himself. Amongst his many contributions, this is particularly clear in his developments on the concept of alienation, first coined by Rosseau and deepened in Hegel. See Marx and Engels, *Marx and Engels Collected Works. Volume 3, Karl Marx, March 1843-August 1844*.; Arthur, *Dialectics of Labour: Marx and His Relation to Hegel*; Crevels, "Aspectos Da Conceituação Do Trabalho Em Marx : A Alienação Como Abstração Concreta."

794 DeLanda, "Material Complexity." p. 19

of craftsmanship – at the most, it would benefit from the craft knowledge acquired elsewhere, in the production of small private commissions, building workshops and other instances where the boundaries between architect and builder can be more volatile.

Moreover, this model of understanding architecture constantly reproduces the division between design and construction as a given, for it is all the more omnipresent in education, where architectural design and architecture are hegemonically thought of as synonyms, and construction is dealt almost solely from an abstract distance. In this environments, architects learn the process-oriented ways of knowing and skills proper to design only, at the expense of the rationality of other construction crafts.

Ultimately, as Viveiros de Castro reminds, Western, modern ways of learning and knowing are mainly object-centred, focused on a dichotomy of subject-object of their objectivist epistemology. Marxists would say that this phenomenon is a reflection of its mode of production, based on the idea of commodification (or reification) of all human relations, especially labour. Reification (a particular form of abstraction) is the lens through which our worldview is shaped in a capitalist mode of production. If true in most of disciplines, it also the case in the so-called creative industries, including architecture. The contradiction is that, being especially connected to material production, practice itself is in those industries even more significant. The 'black box' effect spoken by Banham is therefore not coincidental, but a symptom of this artificial distance, a side effect that arises from directing the sight to the partial rather than the whole[795]. This distance relegates the production to the periphery of discourse while fostering an individualist, personality-centred design approach – known lately as the culture of *star-architects*. The institutionalised and established figure of the architect is still the current way of understanding (or mostly explaining) architectural practice. It involves, almost immediately, a great divide between the creative and production stages of construction, and this phenomena acts in favour of the capitalist social division of labour - creating a shadow over the creativity aspects of other crafts involved in architecture. It that sense, the architect can even be considered the embodiment of this epistemology. So accustomed to this way of looking, architects struggle to perceive the complexity of making as paramount to the epistemology of architecture, and remain stuck in an object centred approach, legitimized by 'style', 'language' etc. The process is also related, as Da Costa *et al* argue, to the "transformation of a society into a mediatized common ground [that] has pushed architecture to become media itself, image, representation, anticipated

795 Reyner Banham, "A Black-Box-The Secret Profession of Architecture," *A Critic Writes: Essays by Reyner Banham*, 1996, 292–99.

reality, simulated concept"[796]. In this environment, specialized architectural media, especially following the reach granted by the star-architect era, became a powerful driver of an object-oriented ideology, apprehended early by students and young architects that then tend to search for their "own style" and learn to treat the building by an objective approach, leaving the process-oriented thinking to design processes only. As Kubler points out, the "canonical view of style, long dominant in architectural history […] largely ignores both the practical aspects as well as the tactical aspects of expertise"[797]. The picture seems to show that, to quote Ralph Adams Cram critique, "as a result of the economic revolution of the past three centuries the architect has fallen into the habit of thinking that architecture is all there is to architecture"[798].

> The present-day culture of images indisputably exerts immense influence on our ideas about architecture. We 'know' many buildings from photos on the internet, from magazines or books. Architects, developers and public authorities too increasingly focus on the value of a design in terms of its image when assessing it[799]

Discursively, this departure makes the disciplinary field of architecture autophagic and, therefore, chronically self-referent. Theoretically and practically, architects maintain a successive and largely unquestioned relationship with canonical history, or, in Picon's terms: "designers usually prefer theorists and historians to directly endorse their agenda without pointing out its contradictory aspects"[800]. Noticeably, this history of architecture possesses a cyclical character, mostly based on artificial dichotomies, as exposed by Tafuri: the classic and baroque, neoclassical and eclectic, modern and postmodern[801]. This culture of rupture maintains the conditions for the constant renewal of the architectural discourse without major changes in its underlying mechanisms, in a model similar to Bourdieu's description of fashion industry[802]: big names of yesterday, the *stararchitects*, are contested by new offices, with seemly disruptive approaches that, nonetheless, work under the same premises of authorship, innovation, creativity, change etc.

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796 Couceiro da Costa, Formiga, and Merim Abbas, *Mater. as a Process*. p. 15

797 Kubler, "The Shape of Time: Remarks on the History of Things."

798 Cram, "The Craftsman and the Architect." p. 1125

799 Avermaete, Havik, and Teerds, *Architectural Positions: Architecture, Modernity and the Public Sphere*. p. 113

800 Picon, "Digital Fabrication, Between Disruption and Nostalgia." p. 234

801 Manfredo Tafuri, *Architecture and Utopia: Design and Capitalist Development* (London: The MIT Press, 1976).

802 Bourdieu, "Alta Costura e Alta Cultura."

The corollary of these processes is the perception, or practical (and pragmatic) acceptance - even if undeclared and unconscious – that every architecture being made is the architecture of the *end of history*. At every turn of the cycle, practitioners of architecture foster an idea that the new model of architecture is the pinnacle of its expression, contrary to their own assumption of time-relatedness. Be it a regress to the primaeval, or vernacular, or by the overcoming of the predecessor's shortcomings by technological advancement, the premise of a final rupture remains. Behind it, the general assumption that architecture can resolve itself in its own history. From a step back, the same discourse and practice remains, especially when analysed in light of the production. They possess the same epistemic foundation, even if built under new perspectives and translated in different arguments.

The necessity of classification of architectural history in such 'styles' and the search of the new, contemporary end of history reflects architecture's narcissistic complex. 'Modern' architecture famously doesn't refer to the same concept or period of modernity as interpreted by other disciplines. Besides of working as an initial gatekeeping for the architectural community, the imprecision is not coincidental. It refers, once again, to itself; it is a self-contained notion that works solely when looked from within the field. Similarly, 'contemporary' architecture implies an architectural production that is unavoidably connected and a perfect reflection of its time, an avatar of its *zeitgeist* – or, as Mies van de Rohe puts it, "the will of an epoch translated into space"[803]. It is a discursive tool that dismisses the possibility of thinking architecture outside the realm of design by, contradictorily, positing that architecture is a perfect mirror of its time.

On the other hand, architectural discourse has, since Alberti, maintained a fascination with the *tabula rasa* when it comes to the construction site. By following a premise of an imaginary construction site, architects imagine away the actual networks of skill, knowledge, material and tooling that produced the built environment. It is a way of throwing the networks of skill and craftsmanship to a future phase of architectural production that, ideally, would be causally disconnected with the design. This procedure would ideally keep the flow of information (both in terms of data and of *in-formation*, the giving of form) one-sided, from design to production, and never otherwise. Still following an Albertian view, these are professed to be different *realms* that are better off without *corrupting* each other. In other words, this way of thinking silences the agentic network of construction.

803 Goldberger, *Why Architecture Matters*. p. *XII*

In the material discourse of architecture, the *tabula rasa* is unfortunately still the *modus operandi* of design in relation to the processes of making buildings – and it is no wonder that Picon recognizes the paradoxical relation between digital fabrication and labour:

> one finds a strong attachment to authorship and the traditional prerogatives of the designer. We live in an age of super-authors like Rem Koolhaas or Jean Nouvel. Instead of promoting the new forms of collaboration that makes it possible, the rise of digital architecture and digital fabrication have often led to the notion of a designer that concentrates even more power than in the past since he can now both design and fabricate. In a number of cases, the ideal of the craftsman leads paradoxically to the reaffirmation of the hegemony of the designer. Ruskin would certainly have been surprised to see the quasi-absence of discussion of the worker's role in many digital-fabrication debates, as if designers and machines were to remain the only protagonists on the stage.[804]

This sort of uncritical assumption can be seen in the words of Christian Norberg-Schulz, stating that the question "Why does a building from a specific epoch have a certain appearance?" is the "main problem of building history and theory"[805]. It is not hard to perceive, from this statement, the hylomorphism of his approach[806] and that accounts it only for what is visible, seeing only the conditions of the finalized object, as it appears to the viewer. It is a good example of an architectural perspective that assumes architectural objects as fixed entities with no historical formation. Contradictorily, this form architectural history tends to ignore the very history of buildings, how they came to be both in design and in material terms. The focus on the thing itself, if not done carefully, has this implicit immediatism through which the present becomes hegemonic and things lose their historicity, casting shadows in the processes behind the production of buildings.

Ways of thinking like Norberg-Schulz's are problematic for architectural research. While design is usually safeguarded in the teleology of studies that possess an object-oriented basis – the idea being that the knowledge obtained from it will inform new designs – they rarely refer back to the construction itself. Firstly because, while the production processes of the construction site can leave traces on the finished product, that is not guaranteed. In fact, the contribution of labour is generally subtle, and often requires prior knowledge to be perceived as such. The awareness to the craftsmanship

804 Picon, "Digital Fabrication, Between Disruption and Nostalgia." p. 229

805 *Apud* Boucsein, "What the Files Reveal: Making Everyday Architecture Talk." p. 165

806 A much better question, based on the findings of this research, would possibly be: 'how and why buildings *appear* in certain epochs?' if one considers 'appearance' here not as the looks of a building, but as a becoming present, tangible – a *coming to being*.

of the hand forged details of a hand-rail or a gate comes from familiarity with the craft. Additionally, as can be seen from the history of the La Tourette and the Barbican buildings, materiality may well be deceiving. What is perceived in the object, in the product of the making process and is referred to as craftsmanship is the recognition of a past event, the perception of its prior existence. An experience that, given its subjective and perceptual nature, can be misplaced, forged or simulated. It is, nevertheless, real, as in *objective*, albeit perhaps misinterpreted. It is the perception of some relation between agency and process, between telos and technique – even if precisely that of a false connection, a forged harmony. Secondly, some of the design decisions and construction processes are not always immediate tributaries of how a building looks, and will, therefore, be treated with less interest, if not completely disregarded by such an analysis. This approach to architectural history and theory produces simultaneously a set of biased lenses and a hierarchical episteme that defines what is and will be said about a building. In turn, knowledge of some specific processes that contribute to the overall production of architecture remains tacit, but, in this case, simply by being unseen, untold or disregarded.

7.4 Conclusion

In different moments – or "occasions", to use Aldo van Eyck's terminology"[807], architecture is materialized in different forms. From the early budget assessments and building permits, through technical drawings and structural calculations, until the installation of the LED lightbulbs, architecture coalesces from the interplay of knowledge-embedded processes and objects. Some are directly absorbed into the building, such as building materials, and are spent; others traverse it, as technical drawings, and are preserved in archives – sometimes outliving the physical buildings themselves. Materializing these interactions, one finds that drawings, models, sketches and other documents reflect the knowledge contained, performed and translated in these encounters, and, as such, allow architects to manipulate spatial relations. Through this quality, it is possible to understand the techniques and methods at the architect's disposal as *perceptive tools* and get, from them, insights on the complex history and ways of knowing of the built environment. As such, Latour and Yaneva's proposition – that "buildings exist equally in representations

807 Aldo van Eyck. Collected Articles and Other Writings 1947-1998, ed. by Francis Strauven and Vincent Ligtelijn (Amsterdam: Sun Publishers, 2008), p. 70

such as plans, renderings, and photographs, and a building's physical form cannot be understood separately from these media", as phrased by Boucsein – gains weight[808]. In this chaopter, architectural methods are shown to possess an epistemic quality embedded in them, and act as tools that can be used as sources for investigation and development of architectural knowledge. In other words, these material productions surrounding architecture (both in design and construction) can be seen as photonegatives of their environments. As such, they can be understood as Gell's artifacts – reflecting not only the technical rationalities at play in construction, but also the ways of making and knowing of their makers.

On the other hand, separated from the construction site, the purpose of design becomes that of reifying it. It removes from the construction site the conception, the imaginative potential of production and, imposing a form – for that is precisely the reason of being of an architectural design, 'giving form' – it imposes as well a limitation to the craft of others. It is the removal of the 'verb' as focal point in its production and the victory of the 'noun' regime. Together with other many instruments of control, organization, management and specialization, it participates in the double division of labour and knowledge that is fatal to craft. This hylomorphic mode of production *in action* fuels an object-oriented discourse and mode of learning. Accordingly, design education lost its original in the historical departure from crafts. Starved from the actual practice of architecture – the act of building, architectural discourse feeds solely on its own memory and became a sort of autophagic, self-referential soundbox. These twin separation is grave: it impedes the active exploration of matter required for the development of skill and ultimately encumber the agentic negotiations of craftsmanship under discursive silence and a veneer of a self-serving autonomy.

808 Apud Boucsein, "What the Files Reveal: Making Everyday Architecture Talk." See also Bruno Latour and Albena Yaneva, "«Give Me a Gun and I Will Make All Buildings Move»: An ANT's View of Architecture," Ardeth 01, no. 08 (2017): 102–11, https://doi.org/10.17454/ardeth01.08.

8 Conclusion

The Epistemologies of Making Architecture

"there is no true craftsman who is not the personal designer of what he fashions"[809]

If not well known in architectural circles, it is a well-established historical fact that builders, working in the construction of Gothic cathedrals, would sometimes trace the outlines of the stonework on the sites' floors[810]. Perhaps inadvertently, this practice produced, beyond its immediate constructive functionality, a source of information regarding their work in terms of management and technique. These traces, literal and figurative, carry stories about the division of knowledge and organization of labour in medieval construction of cathedrals: they portray that decisions of conception or regarding ornamentation - which now would be framed as *design* - were not defined away from the construction site, and that tools like drawing likely performed a dual function of project and template (the commonly called *jig*, in craft environments), therefore traced in one-to-one scales.

If, according to Sérgio Ferro semiological interpretation, the imperfect toolmarks on stone carving noticed by Ruskin are *indexes* of craftsmanship, from the viewpoint of historiography, these floor tracings would be the *icons* that allow one to peer even deeper in the universe of skill of Gothic stonemasonry[811]. They allowed a particular form of architectural production to be performed, in the form of a material-symbolic exploration that took stone to its full structural potential[812], while creating spaces full of meaning.

809 Cram, "The Craftsman and the Architect."

810 Nicholas Webb, James Hillson, and John Robert Peterson, "Documentation and Analysis of a Medieval Tracing Floor Using Photogrammetry , Reflectance Transformation," in *Anthropologic: Architecture and Fabrication in the Cognitive Age - Proceedings of the 38th ECAADe Conference*, ed. L Werner and D Koering, vol. 2 (Berlin: TU Berlin, 2007), 209–18, https://doi.org/https://doi.org/10.52842/conf.ecaade.2020.2.209. Irénée Scalbert, "The Nature of Gothic," *AA Files*, no. 72 (April 17, 2016): 73–95.

811 Ferro, *Arquitetura e Trabalho Livre*.

812 Ferro.

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Particularly, these traces show that architecture and craft share a long history. The way buildings are made is a testimony to this fact. Architects do not work alone, but still rely on the knowledge of carpenters, bricklayers, painters and other artisans for the materialization of atmospheres, solutions and environments. The study of craft knowledge, therefore, should not come as a surprise in architectural environments. Craft theory permeates many accounts of contemporary society: in the new waves of the *craft revival*[813] in creative industries; in the human desire for work well done[814]; in enchantment of skilfully made artifacts[815]; or in ever-changing practices surviving through adaptability and innovation[816]. Craft is no subject of the past. In the search for practices that can better respond to challenges such as social inequality and sustainability, the so-called "craft renaissance"[817] — the current theoretical and experimental growth in attention to making and crafts as potential drivers for change — is defended as a promising field of study[818]. Deriving findings from a multidisciplinary standpoint, authors engaged in this area try to respond to both material and subjective conditions surrounding craft heritage, skills and industries, often with remarkable insights. Once again, crafts are on the spotlight, and their presence grows in the discussions of architecture as well.

Therefore, understanding craft practices can benefit architectural thought, providing it with new perspectives that can adequately explain the material transformation taking place in the production of architecture, and how it relates to knowledge. For such an endeavour, however, a traditional description of the relationship between craft and architecture cannot properly grasp the complexity of their entanglement: crafts prove to be more complex and more varied than the old categories would allow, and design-focused theories of architecture fail to properly address the depth of their connection. To better understand craft's implications in architecture and avoid the old dichotomies, their link needs to be analysed with contemporary theoretical and conceptual tools and methods. Less uniform, less romantic notions of craft are necessary, as well as less self-referent, less autonomous impressions of architecture.

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813 Susan Luckman, *Craft and the Creative Economy* (Hampshire: Palgrave Macmillan, 2015).

814 Richard, *The Craftsman*.

815 Gell, "The Art of Anthropology. Essays and Diagrams."

816 Adamson, *The Craft Reader*.

817 Gibson, "Material Inheritances: How Place, Materiality, and Labor Process Underpin the Path-Dependent Evolution of Contemporary Craft Production."with sensitivity to materiality of labor process, product design, and accompanying place mythologies. Craft production— increasingly interpolated as a form of creative work—is shaped by concerns about retrieving archaic tools and ways of making things, celebrating provenance and the haptic skills of makers, and delivering (and marketing

818 Adamson, *The Craft Reader*.

In this dissertation, I addressed this necessity from the point of view of knowledge or, more specifically, understanding craft and architecture as material discourses. Through this coupling of material and epistemic dimensions, the knowledge of material productions can be analysed from the perspective of making as the information rationalized via skilled practice, contingent to the presence, affordance and the distribution of material agencies.

In this framework, skill is conceptualized as an operative, practically immediate and abductive establishment of perceptive-active fields. Skill is the invention of a new *umwelt*[819] - a situated mode of perception enacted by tools, movements techniques etc. In other words, skill is developed in the individual experimentation of one's own *self* through the mediation of a material or process, being therefore intimately anchored in one's own experience. The way the body moves, how strong and agile it is and how it is engaged to perform a particular task, as well as more subjective processes, such as how sensorial inputs are made sense of, are all tributaries of this epistemic construction. It is, in this sense, private — one cannot fully describe the processes required to perform an action, or the particular character of such experience. Within material productions, craft knowledge relates to this self-mediation processes of labour, being effectively built in the relation between subject and object, in which the subjects *produce* themselves in relation to other agencies in a particular production.

The navigation of this network of agencies characterizes the performance of craftsmanship, and it is the territory from which craft knowledge emerges, through the active engagement between maker and material in a meaningful and productive endeavour. Given this basis on the very act of making, such knowledge follows a process-oriented rationality. The techniques, tools and the operation of materials under the processes of their transformation are the syntax of craft's episteme. Craftspeople, as Ingold suggest, know things in their morphogenetic relations. That is, craftspeople know things not by objectification, as in the framework of classical epistemology, but within a realm of potentials: how they can be worked, changed, used. Because crafts work in material reality, craftspeople need to understand materials (and tools) in relation to what they do, how they react — in other words, in their possible concrete manifestations. Thinking in crafts follows the formula, and can only take form as *thinking through making*: thought is process-oriented in crafts. Thus, what qualifies crafts in terms of knowledge is that they are founded in the processes, in practical dimensions, and can only be learned in the stances of

819 Paul Bains, *The Primacy of Semiosis An Ontology of Relations* (Toronto: University of Toronto Press, 2006).

practice. This relationship between processes and objects is the structuring logic of crafts' know-how or, in terms more directly connected to the dialectics of knowledge and labour, the *savoir-faire*. Knowing, in crafts, means implicating oneself with the material, and coalescing in the processes.

This process-oriented logic operates in the constitution of craft practices in relation to cultural, economic and symbolic aspects in a historic, material and discursive construction. The particular forms of craft emerge from this material-discursive historicity, structuring how myriads of entities, elements, techniques, skills and process that traverse material practices are known. In other words, crafts denote particular forms of production within a specific epistemic practice, an encounter between ways of making and ways of knowing characterised by the primacy of process-oriented ways of knowing. As such, craft can be understood as a skill-based material discourse, a socially constructed model of production in which knowledge is gained primarily through skilled practice.

This elaboration is the basis of the epistemologies of making as described in this research, and it describes the production of knowledge within material productions based on skilled practice. As such, it makes possible the investigation of the relationship between architecture and crafts from the perspective of knowledge. In this thesis, I investigated this possibility in three movements, or case studies, testing the theory in an ethnographic exploration of the workings of an architectural office, an archival research on the development of a construction system, and an analysis of the discourses of architecture.

In the first case study, I employed the theory of craftsmanship to analyse the architectural practice of Korteknie Stuhlmacher Architecten (KSA). On the one hand, by emphasizing the relationship between intentionality and problem-solving in their work, the case study showcases the kind of spatial relations that are being explored within architectural design. Through this analysis, the chapter demonstrates how a theory of craftsmanship can be used to provide a valuable framework for understanding and evaluating architectural practices, offering insights into the complex interplay between design, context, and user experience. In relation to KSA's specific work, the study illustrates how the architects imbued their projects with different, eminently architectural qualities, reflecting a deep understanding of their clients' needs and a nuanced engagement with the built environment. In this sense, the epistemologies of making unveil how the development of spatial virtuality weaves the telos of architectural design into a meaningful entity. On the other hand, however, it must be noted that the study of architectural firms yields little in terms of actual material transformation. From the architectural office, the relations of production in the construction site remain difficult to access and evaluate (a fact that

was accentuated by the advent of the 2019's Covid pandemic, making any form of site visit impractical).

The following case study showcased how the epistemologies of making can shed light on architectural technique, specifically through an analysis of the 78+ construction system developed by Battaile en Ibens. Focusing on the *knooppunt* model, the chapter weaves togethers histories of design, construction, economics, and marketing that shaped the timber construction system. From the epistemologies of making, it becomes possible to understand the development of the 78+ as a complex amalgamation of various crafts and skills, highlighting the intricate relationships between different stakeholders and knowledge domains. The chapter demonstrates the potential of my theory to generate insights on the epistemic implications of architectural productions, probing into the nature of architectural tools and the perceptual affordances they offer. It reveals that architectural production involves a multiplicity of crafts and skills, each with its own practical and symbolic determinations, and underscores the epistemic schism between architectural representation and production. Through the lens of the *knooppunt*, it becomes clear that the epistemologies of making are particularly useful for the analysis of architecture in realm of production, where the material transformations of construction became visible. Similarly, the theory proved to be remarkably powerful in the performance of an historical study, illuminating the complexity of architectural knowledge and the dynamics of its transmission, both between professionals and also through time, in the archival practices of architectural institutions.

Finally, in the last case study of this research, the epistemologies of making were used to analyse architectural discourse, aiming to understand how architectural knowledge is constructed and conveyed within the field. This analysis shows that, historically, architects struggled with the notion of craft, and never fully recognized its process-oriented directionality and the potential it represents. Accordingly, while material reality certainly informs architectural knowledge, the perception and understanding of materials are subject to discursive formations rooted in the professional history of architecture. Moreover, the perspective of craftsmanship makes possible the revision of Marxist approaches to architecture, offering a bridge between the analysis of production and ideology, or structure and superstructure, and addressing gaps in Marx's conception of the knowledge contained in labour. The analysis of discourse thorough the concepts of my theory accentuates these contradictions, revealing a tension between architecture's object-oriented design focus and the process-oriented reality of construction. This tension manifests as a divide between the knowledge of architects and builders, limiting the epistemic potential of both and underscoring the challenges of integrating theory and practice in architecture. Ultimately, this divide diminishes the epistemic potential of

architectural practice, highlighting the need for greater integration between design and construction knowledge. Therefore, it is possible to perceive that the application of the epistemologies of making in a discursive study yield significative results, producing analysis whose contents are remarkably distinct from other approaches of architectural theory.

In specific studies, the theory of the epistemologies of making, when used to address the specific networks of skill and knowledge within an architectural practice, produced different results depending on the kind of case study it was applied, but its potential seems to be more closed related to the scope of its usage. Particularly, as seen from the KSA case study, the application of the theory for the study of architectural practices removed from the broader relations of production is somewhat limited. While research of this kind offers great potential in further describing the particular knowledge and skill of architects, it is limited in terms of material analysis. A proper interpretation of the theory itself should already make this gap evident and serve as a cautionary alert to any endeavour of the kind, making it clear that a full description of any craft or practice must encompass the totality of its processes of material transformation. In contrast, the epistemologies of making demonstrate a stronger analytical potential when applied to investigate a material setting. That is, when used to analyse a case in which the complexity material transformation is either visible or embodied in epistemic artifacts – such as the case of the 78+ system explored here. The theory also thrives in complex discursive scenarios involving multiple and different ways of knowing, and shows a particular potential for disciplinary self-assessment and autocritique.

Considering the coarse epistemes that traverse crafts and the case studies of the previous chapters, it is thus possible to address the main questions of this research, in relation to the usefulness of an epistemology of making to address tacit knowledge in architecture: can such a theory explain what is the craft of architecture and, particularly, what is the specific craftsmanship performed by the architect?

These questions include two sides of architectural knowledge and their relative communities of practice – design and construction – and can very generally describe how their specific knowledge take shape or, in other words, through what kind of skilled practice it is manifested. Considering that the two share an apparently mutual focus on the production of physical objects, that, however, extrapolate their material dimension and reproduce a cultural environment, these two dimensions of architectural production can be generally framed under two terms: craftsmanship

and draughtsmanship. For clarity, these words can generally indicate the skillset, or *system of thought*, of the professionals in these fields[820].

In architectural literature these two terms, craftsmanship and draughtsmanship, are often used interchangeably, as can be seen in Richard Sennett's famous *the Craftsman*[821], in *Architecture as Craft*, edited by Michiel Riedijk[822], and many others[823]. However, considering Sennett's advocacy for the reunion of the mind and the hand, should draughtsmanship with craftsmanship so easily be equated in architecture? Many authors, like Juhani Pallasmaa[824], defend this position. Sketching and modelling, as methods in the development of design, are usually accepted and fostered as efficient and ever-lasting processes that are in the very core of the construction of ideas and navigation through the many tributaries of design[825]. They are ways of both creating and controlling the creation, of seeing and exploring what is designed, establishing feedback loops in which, seemly, the object informs the architect about its own design – inverting the roles between creator and creation. Through these methods, architects design spaces according to the needs of clients and communities, and compose materials and techniques to raise buildings and structures. These practices are the territory in which architects develop the making of design and engage with its specific agentic network, exploring spatial solutions and steering the design towards a particular direction. In other words, architects use these tools to experience and experiment with an imagined environment:

> the sketch, along with the model, is still a tool that is used today in connection with serious architectural design. Regardless of the external form, whether analogue or digital, the ability to sketch spatial situations is a fundamental requirement for creative work in architecture. The processes that take place during the development of spatial ideas in drawings are procedures which, in the case of practicing architects, mature into schematic experiences[826]

820 Foucault, *The Archaeology of Knowledge*.

821 Richard, *The Craftsman*.

822 Michiel, *Architecture As A Craft*.

823 Schukken, "Craft & Architecture: The Redefinition and Relevance of Craft in Contemporary Production."

824 Juhani Pallasmaa, *Eyes of the Skin: Architecture and the Senses*, *Architect*, vol. 95 (Chichester: John Wiley and Sons Ltd, 2006).

825 Pérez-Gómez, "Architecture as Drawing"; Ingold, *Making Anthropology, Archaeology, Art and Architecture*; Reinier Dr Graaf, *Four Walls and a Roof: The Complex Nature of a Simple Profession* (Cambridge: Harvard University Press, 2017).

826 Schmid, "The Architectural Drawing as a Profession-Specific »Know-How«." p. 174

This iterative process resonates with the way in which craftspeople engage in production, generating a specific form of knowledge: the knowledge of the thing from the process of making, apprehended by the active engagement with the agencies inside a production process. In these negotiations, architects learn contingencies, possibilities and tendencies that surround their task, and come to understand the design-in-the-making. In other words, they navigate a range of possibilities linked to a particular problem, aided and guided by the directionality of their tools, and establish a path towards their desired goal. Throughout this process, specific architectural qualities coalesce in the design as architects reiteratively craft these virtual artifacts. In the case of KSA, for example, such explorations make possible for questions of consistency, coherence and resonance to be brought together and confronted to a simulated, represented reality. In this sense, it is possible to understand that the material of the architect's craft is the design itself, as a virtual spatiality – an objectified representation of spatial relations. In this simulated network of agencies, lines, volumes and other codes embody specific spatial qualities and properties and the let architect weave meaningful spatial, constructive and affective relationships. From the explorations of the *78+* system and the *knooppunt,* for example, it is possible to perceive how the affordances and limitations of materials and processes are made known to a design language through the use of representation. Draughtsmanship, therefore, can describe the practice allowing the architect to imprint knowledge of many dimensions (symbolic, functional, material etc.) in a particular medium, as a representation (be it a sketch, a technical drawing or a model). Since it is through this process that the architect relates to the other agents and elements of the object of his practice, draughtsmanship indeed represents the craftsmanship of architects, indicating the material engagement and skills performed by them.

However, the tools used by architects operate primarily in design terms. As such, they make the specific network of agencies within the production of architecture appear fundamentally as 'design-like' – That is, as fully formed objects, passible of representation; objects whose interaction can be thought primarily by their appearance as purely spatial beings. In this framework, form (or shape), as the very means through which representation is made possible, becomes the fundamental quality to which others are bound to. In Schön's terms, it constitutes the basis of the professional knowledge of the architect. It has a particular value in dealing with the complexity of architectural design, as the author argues, but, as any other tool, it is bound to its particular point of view.

Theodor Adorno, in his *Negative Dialectics*[827], warns readers of the irreconcilable gap between the concept and the thing itself. Similarly, if one considers architecture as a whole, the craft of architecture – not of the architect – cannot be reduced to drawing, sketching or modelling, as seen from the case study of the 78+ system. Focusing solely on draughtsmanship to describe the craft of architecture (not to mention the question of tacit knowing) as a whole would prove misleading. Draughtsmanship addresses only architectural design and lacks the agentic negotiations of construction. Thus, equating draughtsmanship and craftsmanship in architecture would limit craftsmanship to the sphere of design, and ignore the knowledge in the laying of bricks, in the shaping of wood etc. Accordingly, Farleigh, speaking of the relationship between design and craft, warns about the limits of sketching and drawings:

> [It] must be remembered that design is not something that is evolved on paper only. When the object is three-dimensional the true designer evolves his form from his material and with his tools. The fraction that must come off the thickness of the leg of a chair can be perceived only in wood. General shapes may be sketched and working drawings must be prepared on certain occasions, but the lessons have been learned while making the forms.[828]

A parallel can be traced with music. A musical score is a tool for the composer to communicate and direct the musicians, and might as well be central in the process of creating a new song. However, it can't be considered to embody the art of music as a whole. Music only becomes music when performed, be it live, recorded or through digital means, and that requires more than the knowledge to write it. Drawings are not inhabited, constructed, or in any way address the same needs buildings do. They offer a possibility but don't realize it in concrete reality. As influential as they may be, and as valuable embodiments of knowledge, they represent one part of the overall endeavour of making architecture. One that, as shown in *Architecture Without Architects*, by Bernard Rudofky, is not entirely necessary for its production[829].

827 T. W. Adorno, *Dialéctica Negativa*, *Madrid, España: Taurus* (Madrid: Taurus Ediciones S.A., 1984).

828 Farleigh, "THE CRAFTS — THEIR PAST, PRESENT AND FUTURE." p. 35

829 Bernard Rudofsky, *Architecture Without Architects: A Short Introduction to Non-Pedigreed Architecture* (New York: Doubleday & Co. Inc, 1964).

Especially outside the global north, architecture is mostly practiced (including design, management and construction) in the craft realm (even if it not recognized as such and often not carrying the values of accredited 'crafts') because, in peripheral countries and areas, architects and engineers are mostly a luxury, whereas housing (and other forms of dwelling) is a fundamental need. In Brazil, for example, this architecture is mainly practiced by construction workers who, besides carrying themselves a great deal of tacit knowledge on construction, also reproduce a somewhat general tacit knowledge involving the ways of living in space: the common ways space is organized and how it is appropriated; the way building elements like windows, roofing, hydraulic and electrical systems work; and some aesthetical notions surrounding buildings, for example, the symbolic features and ornaments that constitute what a beautiful building is for a specific social environment. In short, these builders display knowledge about what qualities are fundamental for making architecture for that specific culture and context.[830]

In this line, one could argue there are at least two cultures of knowledge in architecture: one derived from formal architectural circles – how architecture is designed – and one from the construction sphere – how it is physically made. Evidently, they meet, overlap, interact and influence each other, but their relationship is not necessarily harmonious. Understanding the ways of knowing in construction, therefore, sheds lights in the material inheritances of architectural design, but it also reveals a general epistemic schism in the discipline, founded in the inconsistency between abstract, designerly knowledge and the craft of construction. In other words, while architects in many way possess the same problem-setting[831] and problem-solving[832] ways as craftspeople, what is usually 'at hand' for architects is not the building itself, but its design, and that has deep consequences. The situations faced by the architect are not those of the building processes, and instead orbit primarily the workings of finished object, dealing with its forms, finishes, atmospheres etc. As seen, this focus reflects in the way materials are known in design, and architects thus deal with materials chiefly from a narrow conception of

830 These determinations are evidently tied with socioeconomic and geographical factors. Nonetheless, the existence of this knowledge is general, because it is associated with and arises from the fact that people use architecture — they live it on daily basis. Craftspeople and construction workers are part of these populations (for example, in Brazil, many of the *favela* dwellers are construction workers) and in fact, one can assume that they produce their own space, their own architecture. Moreover, since they are part of its culture and share this tacit knowledge, it is possible to argue that such buildings better reflect (not forgetting, of course, the contingencies of such buildings) the general discourse on what architecture must be and how buildings must be made or look alike, a 'popular' discourse of architecture. Although frequently distant from grand academic and specialized debates, they are indeed creating architecture, and not only reflecting a culture, but producing one.

831 Schön, *The Reflective Practitioner*.

832 Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making*.

materiality. While this conception of materiality provides architects with meaningful information for design – for example, regarding the sensuous feeling materials can generate on users and how they relate to culture, social values and meanings, etc – materials are not featureless outside the spectrum of design. On the contrary, materials present a completely differently agency in the way they are worked: the grain of wood gives it the visual and tactile 'feel' of wood, but it also gives wood a particular way of being cut, drilled, joined etc. Related to the material qualities and properties as engaged in the act of making, this agency historically steered the way materials are used, as well as the tools and procedures needed to shape it in a particular way. It imposes limits, but also tendencies and possibilities that are discovered and dealt within the epistemic horizon of craftwork.

The primacy of object-oriented over productive qualities in the conception of materiality has significant impacts for architecture. It creates a discourse that qualifies materials primarily by their aesthetic qualities, in disregard of the ways they are worked with. The progressive move of the *knooppunt*, from experimental constructive model to abstract design concept shows how deep this way of thinking is ingrained in the architect's very development of knowledge. This overvaluation of design over construction permeates the imaginary of what good architecture is, how it looks like and what is made of, culminating in nonsensical ideas such as that 'all good architecture leaks'; all in detriment of how architecture is made (a parameter that could, in my opinion, revolutionize what is accepted as being 'good architecture' within the discipline's discourse).

The same should be considered in the duality of draughtsmanship and craftsmanship in architecture. Ultimately, this duality reflects on the knowledge of architecture itself – it poses the question if the knowledge architecture is only about making things possible in a virtual, projective realm, or about creating this potential *and* its materialization in the actual, material world. In other words, if architecture is only about design or about design *and* construction. On the one hand, if it is the former, one has to consider the lack of *self-realization* that architecture is bound to have, meaning that it can only be realized (or actualized, in Hegelian terms) outside its scope. The term architecture itself would refer solely to the abstract dimensions of design and lose its hold upon the material built environment. Moreover, it would imply an accentuation of the already challenging division between the design table and the construction site, upholding a distinctive schism between *A*rchitecture and *a*rchitecture[833], to follow Lina Bo Bardi's terminology, and refusing to recognize what is essential to the making of the architecture itself. If not suicidal, this abandonment

833 Lina Bo Bardi, "Arquitetura Ou Arquitetura," *Cronicas de Arte, de História, de Costume, de Cultura Da Vida. Arquitetura Pintura. Escultura. Música. Artes Visuais*, September 21, 1958.

of its empirical object of study seems destructive to architecture as a practice beyond a field of knowledge.

On the other hand, the recognition of architecture as more than design (following the etymological nature of the term *re-cognitio* as "knowing again") entails a disciplinary transformation. If not immediately, in practice, given the social challenges of such endeavour; then theoretically. This recognition implies a necessary shift in the way architectural design is thought of and how the practice of the architect operates, ultimately reaching the understanding of architecture as a whole. Moreover, not only the particular skillset of architects must be looked at new light, but the epistemological hierarchy between different crafts in architecture must be revised. This hierarchical 'flattening' is required to re-sensitize the discipline's analytical gaze towards other skillsets present in architecture and the rationality behind them – the *epistemes*, to use a Foucauldian term[834]. For example, if building craftsmanship is wanted in architectural production, the conditions for the iterative process between maker and what is made (including its conception; its design) must be granted – which would require breaking the boundaries of professionalism in the discipline or finding a common ground between thinking and making that is not solely dependent on design.

Thus, if architecture is concerned with conceiving *and* producing, then craftsmanship in architecture cannot be reduced to draughtsmanship, but must include the skills that, similarly to drawing, sketching and modelling for the architect, allow builders to manoeuvre the diverse aspects of their craft, making possible the material formation of architecture. The same goes for discussions of tacit knowledge in architecture. As long as one takes design as a given, as a background of knowledge and not as a tool whose employment in modern construction implies a structural division, any epistemology of architecture will be ignorant to skill – and therefore, half-blind.

To summarize, the question of craftmanship and draughtsmanship in architecture is not a simple matter of terminology, but concerns the core of the discipline's practice: on the one hand, the work of architects can be understood through the analysis of their tools and methods as a craft practice. Within the confines of architectural design, this draughtsmanship operates through the same mechanisms of skilled practice, and can be understood via the same concepts of material engagement, agentic negotiation etc. The practice, however, has a particularity, because it deals not with a material reality, but one that is constructed virtually, as an imagined entity of spatial relations. This virtual creation is the most important artifice of architectural design and operates as the primary material of the architect's craft. On the other

834 Foucault, *The Archaeology of Knowledge*.

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hand, this same virtuality becomes problematic when set within a productive structure that disconnects it with its material counterpart. Given the distance to the construction site and the building crafts (and the severe lack of feedback from these areas to design), there is little space for the kind of knowing-in-action of construction workers and craftspeople to reach architectural ears. It creates a certain 'noise' in architecture discourse that obfuscates discussions and possible contributions on the matter by other disciplines and fields of practice. They dwell on a different layer, or even a different dimension – based on a different concept of materiality, for example, and a different approach to the act of building. The discourses produced within this eschewed relation to material processes reinforces the divisions of knowledge and their hierarchy in ways that end up impacting the very profession of architecture.

The exposition of this epistemic schism and the craft-like nature of the architect's practice represents the main findings of applying my theory to architecture, in general terms.

Regarding the former, to confronting the contradictions between draughtsmanship and craftsmanship, historiographical reviews on architecture by the perspective of labour are particularly important. Researches of the kind already exist, but are few in number and timid in scope. A first opportunity that may arise from this research thus relates to this gap, contributing to the development of historiographical studies that focus on the material production. The results of this research can provide a new perspective for these studies – one that employs the conceptual framework of crafts to investigate material practices in architecture and focuses on its implications. Given the close link between historical studies and the theoretical interpretation of architecture, these new historical accounts may fuel architectural scholarship that better incorporate the skills, traditions and labour of craftspeople. In short, the theory developed in this research may contribute to bringing architectural studies closer to material culture, an exciting and growing field of investigation. It is a first step to incorporating other epistemologies on architectural production, and it may offer new ways to understand how materials and productive processes affects spatial experience and how to take advantage of these potentialities, while clarifying the political and symbolic hierarchies underneath its surface. In the very least, it may open the discourse to other voices outside the traditional circles of architecture and help pave a way for a production that better reflect its social, material and historical environment and, thus, carries greater potential as an epistemic construction. In turn, this may help the argument that the knowledge contained in crafts and performed by craftspeople should be better recognized, incorporated and valued in architectural production, theory and historiographical accounts.

> There are several things that can be done to expand the map of architectural history and its historiography. First, architectural historians could acknowledge that those who use, occupy, and construct buildings possess unique spatial knowledge.[835]

Of particular significance, the theory developed here also shows that other ways of thinking – that is, other epistemologies – are not only possible, but indeed contain answers to questions the discipline historically struggles with (such as the difficult relationship architectural authors have with matters of craft, failing to recognize that the core of the issue lies in the process). There is every reason to think that the same applies to the pressing issues of society, particularly those concerning material production. As Marchand argues, "we face many challenges in the modern world, and craft will play an important part in answering them – as it has done for centuries".[836] In relation to these challenges, this form of analysis recovers the sight of the potential and the instrumentality of the architect's knowledge and, more specifically, its main tool, *design*. On the other hand, it allows for a similar question concerning the output of design and its position in a broader teleological network – understanding the role of design's potential in the production of architecture and its discourse beyond the immediate projective capacities. The dive into the productive side of architecture, proxied with craft in this research, thus poses the question of which possible associations architectural ways of knowing foster, and highlights the necessity to remember the duality of architecture as *fiction*, a *signifier*; a representation of society. Accordingly, it also highlights the more transformative side of material productions, related to the potential and capacity of architecture to change the given environment, participating in its development and steering it according to particular epistemic premises: the discursive aspect of a material production that is present in the active (historical and present construction) construction of society. More specifically, a discursive take on materiality describes architecture's (or other material production's) form of technological agency.

In this sense, my theory offers architects with the ways of knowing and interacting with material culture expressed in craftwork, and that opens the possibility for structural change. For example, Antoine Picon's final question in a text questioning the contradictions and idiosyncrasies of digital fabrication in relation to craftsmanship concerns where should "the frontier between amateurs and professionals be situated in the future" [837]. In this way, he argues for a critical

835 Gosseye, Stead, and vand der Plaat, *Speak. Build.* p. 19

836 Marchand, *Craftwork as Problem Solving: Ethnographic Studies of Design and Making.*

837 Picon, "Digital Fabrication, Between Disruption and Nostalgia." p. 231

focus on the relationships between machines and different professionals in the production of architecture – ranging from construction workers to designers. Mario Carpo's essay *The Alphabet and the Algorithm* is analogous, nostalgic for "a somewhat mythical medieval period that allegedly saw the cohabitation of rigor and variation, systemic thinking and customization"[838], in Picon's words. These are in fact important issues, but the theory of craftsmanship I propose here brings yet another possible focus – that of the processes of production within architecture and the associated agentic networks that they imply and reproduce. And not only in terms of addressing a question "between the need for repetitious mass production for technological and economic reasons and the longing for alternative, non-standard variability"[839], which proposes again a focus on the products, but focusing on of how things are made.

My aim here is not to advocate for a 'construction honesty' in architecture as procured in brutalist adventures, but to argue that a focus in the process should be re-established in architectural thought. I don't mean it as a fetishization of process, or, in other words, the abstraction of process: it is not about process in and for itself, but precisely about process in the context of its existence. This is a problem with the common call for an '*artification*' of craftwork, whose greatest advocate is probably Glen Adamson, that fundaments the potential of crafts in artistic value. The problem with these approaches that try to give an artistic aura to craft productions is that is reduces craft. It considers craft as solely a way of making, and a way of making dissociated from its conditions of existence – in other words, it *instrumentalizes* craft. It treats the way of making as an isolated technique that focuses solely on its objective effects, its direct productive results. Craft is indeed oriented to and centred around production, but it is a point of convergence, where other aspects of craftwork meet and are dealt with. In other words, a way of making is not only a method (or a methodology) of the making itself, but of the making in relation to the overall reality of crafts. Every real concern of crafts, in such an interpretation, turns gaseous, metaphorical, and ethereal in this process, losing their grips and foots on reality. Craft conceptualized as art (or design, for that matter) is an empty copy of itself that loses its referents and connection to the material reality that gave rise to it - then repositioned, without any sort of compromise, into a foreign environment. The focus on process that I argue for must incorporate the reality of the process and the tributaries to its formation. Economic, politic and social issues become as important as the processes themselves, for the latter must be reconstructed in the contingencies established by the former. It is about the processes in their contingent

838 Picon. p. 231. See also Mario Carpo, *The Alphabet and The Algorithm* (London: The MIT Press, 2011).

839 Picon, "Digital Fabrication, Between Disruption and Nostalgia." p. 231

reality, and the *poetics* that these entanglements produce. Processes, and in particular productive processes, only make sense inside their concrete contexts. A focus that implies a displacement of process is, contradictory, an objectification of process. Thus, the process is of interest not as a thing in itself, but as a relationship between things, as a point of convergence between subjectivity and objectivity, design and construction and between mind and hand[840].

If accepted in their actual (and perhaps humble) manifestation, crafts relatively unprivileged status can help to demystify architectural practice, doing away with the myth of the architectural genius as an demiurgical figure, "the voice and intent of the architect— and the myth of the genius designer along with it" that, according to Janina Gosseye, **"**stubbornly continued to dominate modern architectural historiography."[841] Through the perspective of the epistemologies of making, the *telos* of architectural design and the intentions of the architect need always to be analysed against the techniques of production. As such, the voice of crafts may help the profession face its contradictions and challenges with some grounding. As Kapp argues, "reflecting upon construction destroys architectural illusions"[842]. Moreover, the practice of design performed by architects is, in many ways, similar to that of other craftspeople. It is not coincidental that craftsmanship and draughtsmanship are concepts that, whenever employed in the scope of architecture, tend to get confused. The design process involves knowledge that is not easily made explicit**.** The relationship of craftspeople and designers towards buildings thus diverges not in terms of form, but in content: while the objects in the former are processes, for the latter they are things **–** or, in Ryle's terms, "how" and "what"[843]. In the making of design, architects act as craftspeople, employing process-oriented ways of thinking. Yet, seldom do architects understand clearly their own processes and the

840 Moreover, while there is a beauty in the calls for the reunion between mind and hand – or between body and material, for that matter – this notion can be counter-productive if not gazed with proper rigor. If the hand thinks, it doesn't think in the same way the as the brain does. Perhaps even, it would more productive not to consider not that the hand 'thinks' at all, for that would be already framing the mode of operation of the hand in the brain's terms. What should not be forgotten, nonetheless, is that the hand *shares in* thought. The hand contributes to, shapes, and takes part in thinking. In turn, the mind – or the brain, or conscious thought – affects the hand reciprocally. This does not mean that the phenomena is the same in both ways. The opposite is true; the encounter between mind and hand, their continuities and differences has to be considered by the terms as well as by their relationship, for not only their polarity is important, but their position and directionality are also of significance – the contingencies and tendencies of the mind and the hand are both at play throughout the spectrum mind-hand, but are not smoothly distributed nor producing the same effect all over. What this means is that the question should be considered not as a duality or a continuum, but as a *superposition*. Mind and hand are simultaneously polar and concentric, dichotomic and dialectic. They struggle and disagree as much as they converge and cooperate.

841 Gosseye, Stead, and vand der Plaat, *Speak. Build.*

842 Kapp, "Construction Sites of Utopia." p. 123

843 Ryle, *The Concept of Mind*.

value (and origin) of their knowledge. Architects, after all and much like the common craftsperson, are more often than not workers[844], and suffer frequently from the external pressures on their non-objective, non-rationalized, tacit knowledge. Understanding the labour in making, architects can better understand the craftspeople they work with and the craftspeople in themselves.

> Beyond economic value, education in and through craft contributes to cognitive development and engages learners. Through engagement with materials and ideas, it develops creativity, inventiveness, problem-solving and practical intelligence. And making fosters wellbeing. It is a vital part of being human.[845]

Perhaps most significantly, the analysis of architecture from the perspective of making makes it clear that architecture wastes the possibility to enjoy the gains from exploring materiality in its fullest. Understanding how craftspeople know can approximate and better harmonize design and construction in ways that both products and processes are benefited. In short, while the division of design and craft in architecture – or between Architecture and construction, for that matter – has epistemic, practical and institutional manifestations that curb the development and the spread of skills, the divide is not complete – and probably never will be. Architects can thus use the epistemologies of making to better understand and empathize with craftspeople and incorporate, in the design itself, decisions that conform to process-oriented ways of thinking and better fit the craftspeople's practice. If design is a form of conveying meaning[846], it can function also as a communicative tool, in its dialogical sense, establishing a better language between designers and builders. Better collaboration might arise, with less conflicts and better working conditions for both management and production spheres. Moreover, and perhaps more importantly, these apertures in the architectural practice can create a design that is more permeable to the knowledge of craftspeople, in ways that they might also work in its further development, fostering innovation and inventiveness.

A deeper relationship between architects and craftspeople – horizontally and in all phases of the production process, can serve as a significant anchor and rescue the design practice in a direction away from its current, materially-aloof rationality. If a structural change of such proportions is difficult to envisage in this day and age (and beyond the scope of this thesis), the possibilities of how to re-arrange

844 Peggy Deamer, The Architect as Worker, 2015.

845 Crafts Council, "An Education Manifesto for Craft and Making," 2014.

846 Frampton, *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture.*

the relationship between architects and craftspeople are still worth imagining. Remarkably in line with what has been discussed so far, an opportunity sketched by Ralph Adams Cram in 1913, writing for the Art and Progress Journal remains impressively insightful:

> now it is the manifest duty of the architect to search out these individual craftsmen and to bring them into alliance with himself. You will note that I speak of an 'alliance', for this is almost the crux of the whole matter; whoever the craftsman is he must work with and not for the architect […] really the architect is, or should be, more a coordinator than a universal designer; he should be a kind of universal solvent, by means of which architectural designers, workmen-artificers, craftsmen and artists should come together and, while preserving their personality, merge their identity in a great artistic whole, somewhat as the instruments of a great orchestra. […] each group would form its own independent guild, self-governing, self-controlled guild: united, then, in a general guild which would have a broad supervision of all that was done, and provide models, books, teachers, while the architect himself would go daily through all the works, suggesting here, correcting there, inspiring everywhere.[847]

The building itself might, in this way, operate in a similar way as the sketch and the model[848], gaining protagonism in its own making, in a process that brings together different agents and regimes of knowledge and flourishes in the process. Acting as a mechanism of inventiveness, the building can become a pedagogical tool, in which architects can improve their making and designing skills, deepening their understanding of the built environment and the crafts of architecture – not as a product but as a process. After all, as Leinhardt reminds, craft knowledge is the *wisdom of practice*.[849]

847 Cram, "The Craftsman and the Architect." p. 1129

848 Marco Frascari develops a similar analogy, although in slightly different terms, between drawing and building as practical operations with significant processual qualities, see Marco Frascari, "The Tell-the-Tale Detail," *The Building of Architecture*, 1984, 23–37.

849 Gaea Leinhardt, "Capturing Craft Knowledge in Teaching," *Educational Researcher* 19, no. 2 (1990): 18–25, https://doi.org/10.3102/0013189X019002018. p. 18

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TOC

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Curriculum Vitae

Eric Crevels is a Brazilian architect, urban planner and craftsman whose research focuses on material culture, investigating the built environment from the perspective of labour, and the interfaces between craft and architecture. His work connects architectural, anthropological, and philosophical studies to understand the social and epistemic dynamics between design and construction and practices that bridge theory and practice. His approach is critical, experimental and transdisciplinary, weaving together craftwork, hands-on pedagogical practices and scholarly research.

Education

2018 Master: Architecture and Urbanism – Programa de Pós-Graduação em Arquitetura e Urbanismo, NPGAU, Universidade Federal de Minas Gerais – UFMG. Theory, Production and Experience of Space

— Thesis: “Essays on Resistance: a proposal of an architectural practice by the perspective of labour”. Supervisor: Prof. Dr. Silke Kapp

2015 Diploma: Architecture and Urbanism, Universidade Federal de Minas Gerais – UFMG

— Graduation Thesis: “Autonomy and Construction: the Milton Santos Library” Supervisor: Prof. Dr. Margarete Maria de Araújo Silva

Teaching Experience

2023 Research Tutor. [AR1A061] Graduation Studio ‘A Matter of Scale’. Master Level. Studio 15 ECTS. TU Delft, Faculty of Architecture. Coordinators: Prof. Dr. Ir. Klaske Havik, dr. Willemijn Vloets, dr. Jorge Mejia Hernandez.

2023 Research Tutor. [IGO505] Make/Shift Studio. Master Level. Studio. 12.5 CE. Rotterdam Akademie van Bouwkunst coordinators: Marcel Musch, Hinke Majoor, York Bing Oh.

2023 Tutor. [AR1A061] Positions: Lectures on Architectural Design and Research Methods Master Level. Lecture. 15 ECTS. TU Delft, Faculty of Architecture. Coordinators: Prof. Dr. Ir. Klaske Havik, Marieke Berkers, Ir. Elsbeth Ronner, Ir. Robert A. Gorny.

2022 Tutor. [AR1A061] Positions: Lectures on Architectural Design and Research Methods Master Level. Lecture. 15 ECTS. TU Delft, Faculty of Architecture. Coordinators: Prof. Dr. Ir. Klaske Havik, Marieke Berkers, Ir. Elsbeth Ronner, Ir. Robert A. Gorny.

2020 Tutor. [AR1A061] Positions: Lectures on Architectural Design and Research Methods Master Level. Lecture. 15 ECTS. TU Delft, Faculty of Architecture. Coordinators: Prof. Dr. Ir. Klaske Havik, Marieke Berkers, Ir. Elsbeth Ronner, Ir. Robert A. Gorny.

2020 Design Tutor [AR2MET011] Transdisciplinary Encounters: Architecture, Material Culture and Craft Master Level. Studio. 15 ECTS. TU Delft, Faculty of Architecture. Coordinators: Prof. Dr. Ir. Klaske Havik, Dr. Ir. Jorge Mejia Hernandez.

2019 Substitute Professor. Universidade Federal de Ouro Preto – UFOP.

- Course [ARQ101] History and Theory of Architecture and Urbanism I
- Course [ARQ102] History and Theory of Architecture and Urbanism II
- Course [ARQ301] Brazilian Architecture II Undergraduate Level. 12h / week.

2017 Teaching Assistant. [PFLEX-08] Projeto Flexibilizado – 'Arquitetura de Estruturas' Undergraduate Level. Studio. 8h / week. Universidade Federal de Minas Gerais – UFMG Instructors: Prof. Dr. Silke Kapp

Research Practice

2021 Archival Secondment – Vlaams Architectuurinstituut – Antwerpen

- Five-month archival study as a resident researcher at the Vlaams Architectuurinstituut, investigating the networks of knowledge in the technical development of Bataille en Ibens's 78+ construction system.

2021 Ethnographical Secondment – Korteknie Stuhlmacher Architecten – Rotterdam

- Five-month ethnographical research on the inner workings of the Korteknie Stuhlmacher Architecten, exploring the relations between craftsmanship and draftsmanship in the designs of five schools and the general approach of the office.

2016 FAPEMIG Research Scholarship – Theory, production and experience of space-NPGAU, UFMG Funding for the development of empirical and theoretical research for pursuing a master's degree in architecture and urbanism by the Fundaçaõ de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG).

2015 PIBIC Scientific Initiation Researcher – LAGEAR, UFMG

— Research on data collection and the development of maps for the analysis of the impacts of the Vila Viva housing program of the URBEL, in the favela Aglomerado da Serra, in Belo Horizonte.

2014 CNPq Scientific Initiation Researcher – Grupo MOM, UFMG

— Research on the evictions processes happening in the favelas of Belo Horizonte. Applied structured interviews, surveys and worked on field studies in the areas of Vila das Antenas and the Aglomerado da Serra.

2013 CNPq Scientific Initiation Researcher – Grupo Praxis, UFMG

— Research on the dwelling conditions in the federal housing program Minha Casa Minha Vida's buildings, investigating the insertion of the units in the urban context, its impacts on the surrounding areas and in the overall quality of life of its inhabitants.

Professional Practice

2015 Architect, Founder – No Prumo Escritório Oficina, Belo Horizonte, Brazil

— Co-founded a studio specialized in the interface between architecture and crafts. We worked in designing and renovating residences and offices, creating custom furniture and equipment, and organizing and teaching metalworking classes and workshops.

2016 Architectural Assistant – 1 pra 1 Arquitetura e Construçaõ , Belo Horizonte, Brazil

— Worked in the design and execution of renovations in residences and the development of custom furniture, presenting the ideas to clients and managing the production with professional artisans and contractors.

2012 Internship IAESTE – Harry Brand Architects and Town Planners, Tel-Aviv, Israel

— Worked in the development of technical drawings and 3D representation for large scale industrial and commercial projects in Israel.

Journals and Book Chapters

Forthcoming "Epistemic Horizons: Embracing Tacit Understanding and Generative Potential in the Appraisal of Knowledge". Journal article. Accepted for publication in Footprint Journal. In Press.

Forthcoming "Telos and technique: Craftsmanship as a Cross-agentic Negotiation." Book Chapter in Noetics Without a Mind. Book project by of the Ecologies of Architecture Research Group of the Department of Architecture, TU Delft. In Press.

Forthcoming "Crafting Landscapes or Mountains, Forests and Farms: indigenous entanglements of culture, environment and technique". Book chapter in Under the Landscape. Book project by the Boulouki International Research Collaborative. Athens, Greece. In Press.

2023 Coarse Epistemes: "Skill, Craftsmanship and Tacit Knowledge in the Grit of the World". Book Chapter in Perspectives on Tacit Knowledge in Architecture. Edited by TACK: Communities of Tacit Knowledge: Architecture and its Ways of Knowing International Training Network. Tack Publishing Platform.

2023 "One and Many Details: Considering the Contingencies of Building as Empirical Evidence for Architectural Pedagogy". With Jorge Mejia Hernandez (TU Delft), Paper published at the Tack Publication Platform. digital format.

2022 "Trabalho, Receituário e Alienação na Arquitetura: Apontamentos Críticos à Prática do Arquiteto" (Labour, prescription and alienation in architecture: critical notes on the architect's practice.). Journal article (in Portuguese). Revista Thesis. 7, 13, p. 28-43 15 p.

2022 "Política de Remoções em Belo Horizonte" (Eviction Policy in Belo Horizonte Book Chapter (in Portuguese). Co-authored with Baltazar, A. P., Costa, M., Melo, C., & Furiati, L. in Moradia e Outras Margens. Kapp, S. & Baltazar, A. (eds.). MOM edições, p. 459-479 20 p.

2021 "Knowledge in Architecture: draughtsmanship or craftsmanship?" In: Academia Letters. Article 4289, 5 p., 4289.

2020 "Aspectos da Conceitualização do Trabalho em Marx: Alienação como Abstração Concreta (Aspects of the Conceptualization of Labour in Marx: Alienation as a Concrete Abstraction)". Journal article (in Portuguese). Marx e o Marxismo vol 8-14 . Niep. UFF. Niterói, Brazil

2013 "Urban Contagion". Journal article (in Portuguese). Revista Parahyba – vol 3. Programa de Educação Tutorial (EAUFMG), Belo Horizonte, Brazil

Conference Papers

2023 "Building Other Tales: heterodox historiographic practices of construction workers". Co-authored with Debora Andrade Moura. Paper presented at Production Studies International Conference PSIC 2024 – Transforming knowledges of architecture, design and labour, Newcastle Upon Tine, UK, March 2024.

2022 "Crafting Landscapes or Mountains, Forests and Farms: indigenous entanglements of culture, environment and technique".Paper presented at Under the Landscape Symposium, Greece, June 2022.

2022 "A Joint of Many Worlds: Entangled Stories in Battaile en Ibens's 78+ Construction System in Timber". In Timber and Construction: Proceedings of the Ninth Conference of the Construction History Society. Campbell, J., Baker, N., Driver, M., Heaton, M., Ruamsanitwong, N., Wall, C. & Yeomans, D. (eds.). 1 ed. p. 551-562 11 p.

2021 "The Tangible Presence of Human Labor in Architecture".In “Ambiances, Alloaesthesia: Senses, Inventions, Worlds”: Proceedings of the 4th International Congress on Ambiances. Damien Mason (ed). P. 184-189 5 p.

2021 "Labor, prescription and alienation in architecture: critical notes on the architect's practice." (in Portuguese). Anais do VI ENANPARQ, vol 11, Brasília, Brazil

2021 "Urban Predation: the symbolic economy of Pixo". With Alice Queiroz. Digital Proceedings critic|all International – Conference on Architectural Design & Criticism, São Paulo 25-26 March 2021. Colmenares, S. & Medrano, L. (eds.). Madrid, São Paulo: critic|all PRESS , p. 479-487 9 p.

2020 "One and Many Details: Considering the Contingencies of Building as Empirical Evidence for Architectural Pedagogy". With Jorge Mejia Hernandez (TU Delft), presented at the “VII Simposio de Investigación en Arquitectura: Proyecto, Tradición, Procedimientos”

2017 "Social Housing Policy in Belo Horizonte: Road design, investment in capitals and evictions X improving socio-spatial conditions." With Ana Paula dos Santos (UFMG), Márcia Helena da Costa (UFMG), Cíntia Melo and Lucas Furiati. Paper publication (in Portuguese). Anais do XVII ENANPUR, vol 17. São Paulo, Brazil

Thesis and dissertations

2018 "Ensaios de Resistência: Uma Proposta de Prática Arquitetônica pela Perspectiva do Trabalho" (Essays on Resistance: a proposal of an architectural practice by the perspective of labour).Dissertation defended as requirement for obtaining the Master's Degree in Architecture and Urbanism at the Programa de Pós-Graduação em Arquitetura e Urbanismo da Universidade Federal de Minas Gerais (NPGAU-UFMG), under the supervision of Prof. Dr. Silke Kapp.

2015 "Autonomia e Construção: A Biblioteca Milton Santos"(Autonomy and Construction: The Milton Santos Library) Dissertation defended as requirement for obtaining the Bachelor's Degree in Architecture and Urbanism at the Escola de Arquitetura da Universidade Federal de Minas Gerais (EA-UFMG), under the supervision of Prof. Dr. Margarete Maria de Araújo Silva.

Other Publications, Lectures, Workshops and Events

2023 Curatorial board member, "Unausgesprochenes Wissen / Unspoken Knowledge / Le (savoir) non-dit" Exhibition, ETH Zurich. 2023 – Editorial board member "Tacit Knowledge in Architecture" Conference, ETH Zurich.

2022 "Capitalocene" Glossary entry for the Women Writing Architecture online platform. Available at: https://womenwritingarchitecture.org/.

2021 Editorial board member and moderator at the TACK TALKS "How to? A guide to knowing" with Sophie de Caigny (Vlaams Architectuurinstituut), Dirk van den Heuvel (Het Niewe Instituut) and Monika Platzer (Architektutzentrum Wien). (Round table live presentation)

2021 "Canteiros da Utopia" Online book review for the Women Writing Architecture online platform. Available at: https://womenwritingarchitecture.org/.

2021 "KSA" Fanzine. Presented at the Intermediary Training Meeting of the TACK Network at Politecnico de Milano.

2021 "Being an in-house researcher at VAi" online article. Available at: https://tacit-knowledge-architecture.com/

2021 "Some Impressions of the Venice Architecture Biennale" online article. Available at: https://tacit-knowledge-architecture.com/ 2020 – Speaker, "Epistemologies of making: dialectics of knowledge in craft and architecture" at PhD Seminar of the Faculty of Architecture and the Built Environment, TU Delft

2020 Respondent at the TACK TALKS "How do we know?" with Mechthild Stulhmacher from Korteknie Stulhmacher. (Round table live presentation)

2020 Moderator at the Situated Architecture Research Group discussion with guest lecturer Sami Rintala (from Rintala Eggertson Architects), TU Delft

2016 "O que você sabe sobre o Lixo?" Research and production of an informative banner for PISEAGRAMA's Urbe Urge Project, Belo Horizonte, Brazil

2016 Technical consultancy and production in Flavia Regaldo's "de Passagem" installation at Palácio das Artes, Belo Horizonte, Brazil. 2015 – Speaker, "Autonomia e Construção: a Biblioteca Milton Santos" at Debates TCC Seminar, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil

Grants, prizes, awards and distinction

2020 Innovative Training Network Communities of Tacit Knowledge – TACK, Marie Sklodowska-Curies Actions, European Union's Horizon 2020 research and innovation programme under grant agreement No 860413.

2017 XI Bienal de Arquitetura São Paulo; Exhibition of the work 'O que você sabe sobre o lixo?' Saõ Paulo, Brazil

2016 UAI-LINE competition; Honorary Mention: Uai Line: Concurso de ideias + Crowdfunding, Instituto Metodista Izabela Hendrix.

2015 OPERA PRIMA competition; Selected to represent the UFMG in the national competition with The Milton Santos Library project.

2015 ARCHDAILY The Best Student Work Worldwide: Arch Daily Readers Show Us their Studio Projects. Featured the project of the Milton Santos Library.

2015 AU-Pini magazine: Abrigo de Bambu. Dedicated article about the Milton Santos Library. São Paulo, 2015.

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Epistemologies of Making

A Theory of Craftsmanship for Architecture

Eric Crevels

This research addresses how different ways of making entail different ways of knowing, exploring how material production and knowledge intersect and inform one another. Specifically, it investigates the knowledge within crafts — examining how skill is developed in the way craftspeople work – and hypothesises that the material and social conditions surrounding craft practice produce a specific rationality: a process-oriented way of knowing. These considerations are brought together in a theory of knowledge in the material productions – an epistemology of making – whose tenets are subsequentially tested within the field of architecture. Through this set of conceptual and theoretical tools, the research thus analyses the dynamics of knowing and making in architecture. Ultimately, this study reflects on the implications of approaching architecture from the vantage point of its production, offering valuable insights into the dialectics of design and construction.

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