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# From Artifacts to Architecture

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**Abstract**

The vision and mission of research under the banner of Ubiquitous Computing has increasingly moved from focusing on the realm of “artifacts” to the realm of “environments”. We seek to scrutinize this very transition, and raise questions that relate to the specific attributes of built environments that set them inherently apart from artifacts. How does an interactive environment differ from an interactive artifact, a collection of artifacts, or an integrated suite of artifacts? Consequently, we ask what are the new user experience dimensions that HCI researchers should merge into their considerations, for example, by supplementing usability and engagement with occupants’ comfort across multiple dimensions, and shifting attention from (often) short lifespan and discretionary to durable and immersive experiences? In this contribution, we bring arguments from the literature of environmental psychology and architecture that highlight the points of divergence between artifacts and architecture, and then translate them into challenges for Human-Computer Interaction, and particularly for the emerging domain of Human-Building Interaction.

**Author Keywords**

Human-Building Interaction; Robotic Building; Smart Home; Smart City; Autonomous Vehicle

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### Background

The context-aware automation and interactivity that are increasingly embodied by our environments, exhibited in the evolving worlds of “Smart Homes”, “Robotic Buildings”, “Smart Cities”, and “Autonomous Cars”, have raised a wide span of questions about the future of our interactive experiences with and within built environments— concerns that have recently been discussed under the umbrella notion of Human-Building Interaction [3, 2, 13, 14]. We argue that such questions introduce a common set of conceptual and methodological requirements that may not be met by the concepts and methods developed to study experiences with artifacts.

#### *“Environment” in Psychology and Architecture*

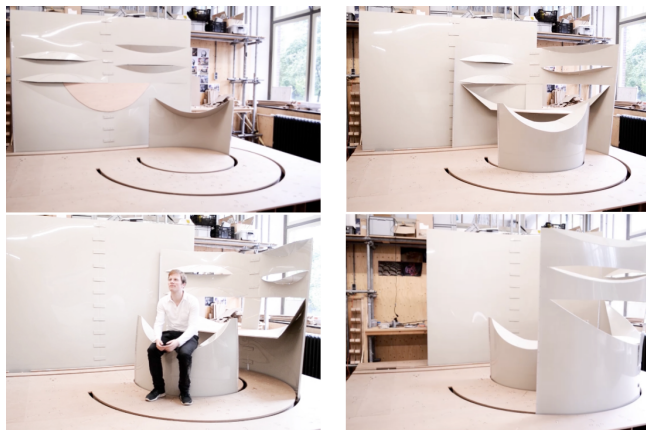
In initiating the discussion, it is natural and necessary to ask what makes artifacts “artifacts” and environments “environments”, and how these two are comparable. Some suggested answers are traceable in the study of “environmental perception”— a topic of shared interest to architects and perception psychologists that has been a subject of cross-referenced research since 1970s.

The architect Benedikt, for example, associates being perceived as objects with being self-contained and movable, as opposed to environments that are perceived to be open-ended and immovable [5]. He, however, takes the cases of cars, airplanes, and trains as interesting examples that may be considered as objects or environments depending on one’s viewpoint. Vehicles are argued to belong to the realm of environments because of the spatial experience of inhabiting that they create for their passengers [4], but also, in a

broader sense, due to their integration into the urban fabric and consequently their impact on the general experience of public spaces [7].

In perception psychology, the “surrounding character” of built environments, described with the type of experience in which the observer is *always* “immersed” in the environment, has been highlighted as the distinctive feature of environments. [8, 10]. Ittelson takes information provided by built environments as a lever to deconstruct the concept of immersion [11]. In his formulation “1) environmental experiences have no fixed or given temporal boundaries; 2) environments provide information through all the senses; 3) environments include peripheral as well as central information; 4) environments include far more information than can adequately be handled; 5) environments are defined by and experienced through action; 6) environments have symbolic meanings; and 7) environmental experience always takes on the systemic quality of a coherent and predictable whole.” [11]

Furthermore, in the concerted research attempts that are grounded in the theory of Space Syntax (developed by Hillier and Hanson [9]) and utilize its tools [1], “spatiality” is repeatedly verified to guide and constrain the occupants’ mental model of environments and their behavior. Hillier and Hanson in their 1984 book “The Social Logic of Space” [9] explain that built environments may be comparable to artifacts in terms of physical construction, manifesting form, and functional logic, but they are incomparable in that they create and order the empty volumes of space, and that it is this very ordering of spaces that constructs the meaning of the building, and shapes the occupants’ individual and social experiences. “Buildings are not just objects but transformation of space through objects.” [9]



**Figure 1:** Reconfigurable Apartment (TUD, 2012) demonstrates 'spatiality' as a transitory phenomenon ascribed to the varying configurations of artifacts.

#### *Interaction with(in) Environments*

By providing this brief review, we do not mean to convey that these are the only points of divergence between artifacts and environments, neither do we aim to imply that all of these distinctions are applicable or compelling to the discourses that are of relevance to the conditions of today and future. This is especially debatable considering the emerging types of digital artifacts and environments that - given the new physical-material possibilities - may dynamically transit between the two realms (e.g. Organic User Interfaces [12]).

Contributing to this discussion, however, the presented background underpins our argument for the recognition that built environments vary from artifacts in terms of some of the elements and mechanisms through which they create and shape user experiences. The challenge then re-

mains for the human-environment interaction researchers to convert these elements and mechanisms to concepts and methods. How can "spatiality", "immersiveness", or "open-endedness" be incorporated into the structure of user experience concepts and research methods? How does the consideration of stand-alone usability, engagement, integrative usability, inter-dependency, service decay, and obsolescence vary as we move our attention from studying episodic and discretionary experiences towards open-ended and instituted situations? Furthermore, it is conceivable that episodic interactions with certain artifacts influence immersive experience of an environment. For example, the nature and style of interaction with a smart thermostat (e.g. Nest Learning Thermostat), in particular the level of agency and awareness that it offers to the building occupants, may influence their perception of thermal comfort [15, 6]. Thermal and visual comfort have been meticulously studied in the research domain of architecture. Capitalizing on this knowledge, how do we complement the user evaluation of a tool like Nest, in connection with other building elements, and in light of their collective influence on the long-term experience of the environment?

#### **Research Objectives**

We propose bringing together experts from the fields of HCI, Architecture and Urbanism (including Transportation), and provide them with an occasion for sharing experiences discussing example projects of such kind that embody multidimensional questions about interactive experiences with(in) environments. The ultimate objective is to co-create a cross-disciplinary research agenda that can study and steer the evolution of our interactive experiences with built environments. Through contextualized analysis of concrete examples and inclusion of multiple perspectives from the related disciplines, we seek to capture and expand what is already known about interaction with com-

puterized environments, what is contested, and what are the opportunities for concrete prospective collaboration and a common scientific grounding for dialogues and discourses in this area. The gathering that we propose to be held in the format of a workshop aspires to reach three specific goals: 1) to identify unaddressed questions, challenges and opportunities. For example, this will concern artifact-use versus environment-inhabitation, addressing what makes environments more than their artifact parts, how interactivity reaches across those and what role does the data play in this context. 2) To collaboratively develop clusters of these into future research agendas, which are shared and critiqued among workshop participants. 3) And finally, to consolidate an international network of experts that will act on the developed research agendas through steering future funding streams that produce more instances of collaboration between the domain of architecture and HCI.

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