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Robbins, Holly; Giaccardi, Elisa

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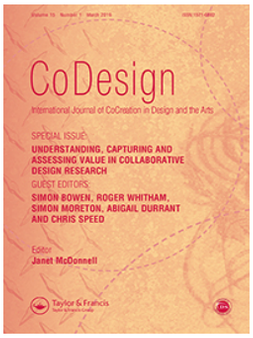

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# Generating value across academic and professional design practice in the Internet of Things

Holly Robbins and Elisa Giaccardi

Industrial Design Engineering, Delft University of Technology, Delft, The Netherlands

**ABSTRACT**

This article accounts for how value in design research can be derived from knowledge exchange that occurs through the collaborative discourse of doing design. To demonstrate this point, the article details the arc and impact of a design research collaboration that extended over several years with design practitioners in the field of internet-connected devices. As a result of this ongoing collaborative work, a programmatic set of design ideals and intentions concerning how to construct a more transparent and ethical relationship with technology was shaped. We examine this sustained and transformative collaboration as a series of knowledge exchanges. Within each particular collaborative project, worldviews and knowledge are exchanged among design researchers and practitioners, enabling them to traverse 'through practices' of academic and professional design. To unpack these exchanges and how they built and fed into each other, the article examines how collaboration unfolded and produced value on two levels: first on the scale of the academics and practitioners directly involved in a project; and secondly on the scale of the larger international community of design practitioners concerned with Internet-connected devices, with whom we had shared our work.

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Anthropology; value for design; Internet of Things; professional design practice; project; program; research through design

## 1. Introduction

This paper addresses the relation between academic design (research) practice and professional design practice, and how each can enrich and contribute value to one another. We suggest that this can fruitfully occur through discourses of design practice, which develop across a sustained arch of mutual exchanges between these two communities. It is not only a question of learning from one another; but more crucially the emerging, growing, and consolidating of a set of shared design ideals and intentions.

To illustrate the dynamics of this exchange and the emergence of a set of shared ideals, this paper offers an account of a collaboration that extended several years between the authors as academic design researchers, and a small group of professional design practitioners and entrepreneurs. Through this collaboration, our design practices overlapped, converged, and impacted one another. In this paper, we consider this impact on two levels: first in terms of its influence on one another's programmatic

**CONTACT** Holly Robbins h.v.robbins@tudelft.nl

values, and secondly how this mutual influencing of values extended the relevancy of the design research itself.

When we speak of 'value' in this paper, we borrow from Erik Stolterman's argument that the value of design research is in its impact for design practice (Stolterman 2008). In this paper, we consider the forms that this value can have on design practice. This kind of standardisation of output of a design research process can be easily disseminated and executed in other contexts. However, in this paper, we argue that other forms of output can become more complicated to identify, measure, or evaluate; such as the mutual exchanges of knowledge that occur in collaboration. Not every form of knowledge comes with a standardised or quantifiable metric that renders itself immediately recognisable to others. In our opinion, this nuance is often under examined and will be parsed in this paper, supported by examples from the authors' collaboration with design practitioners.

When we refer to 'values', we are also concerned with the hardcore of basic beliefs, ideals and intentions that make a design (research) program (Redström 2017). In our design research process, we found our collaboration both had an impact on shaping our research, as well as impacting the design practice of our collaborators. This mutual shaping of programmatic design ideals and intentions, and exchange of worldviews and knowledge took place 'through practice' with particular, repeated and sustained collaborations where the boundaries between the research experiment and the commercial product are difficult and perhaps futile to draw.

This paper will examine how value was produced through these sustained, mutual exchanges *on two scales*. First, we will speak on a more granular level of two case studies that illustrate these direct exchanges of ideals and intentions between individual design practitioners and ourselves as design researchers. Here, our analysis will be centred on interpersonal exchanges. Second, this paper will speak to the broader scale of how value was advanced among a community of industry practitioners, and how this contributed value to the academic research program itself *through* the projects undertaken in this sustained collaboration. Sections assessing these forms of value will anchor the analysis of each of these levels of value generation.

Before delving into these descriptions, we will first contextualise this collaboration in relation to the topic of our research in the space of the Internet of Things (IoT), and briefly touch upon our methodology.

## 2. Researching how to design for focal things and practices (FT&P)

While the topic of our research itself is not the subject of this paper, we will provide some background to situate our collaboration with design practitioners. Our design research program starts with a critique from the philosophy of technology. Albert Borgmann (1984) identifies that the conventional design tendency is to separate the *ends* of the technology (the outcome of the technology's use) from its *means* (the aspects of the technology responsible for the way it works) by masking their complexity from people. In laymen's terms, this is the essence of a 'black box.' This obfuscation becomes ethically fraught especially with technologies that are data intensive and have an Internet connection. Data about people is now collected, stored, and shared in ways that are not necessarily apparent or entirely legible to the people the data is being collected from.

Borgmann does offer some insights as to what qualities technologies should have in order to not fall prey to this paradigm, which he says can be found in technologies that are 'focal things and practices.' To be a focal thing and practice (FT&P), he suggests that the focus of the technology needs to be redirected to the context that this is situated in, and that such context needs to be bolstered by everyday practices.

With our research program, we sought to make inquiries into this theoretical concept of FT&P and make it useful for design researchers as well as practitioners. Specifically, our work sought to identify alternative design approaches that can contribute towards supporting FT&P in contemporary technologies (Robbins 2018; Robbins, Giaccardi, and Karana 2016; Croon and Stolterman 2003; Fallman 2009; Wiltse 2014). In doing so, we were not looking for a prescriptive solution or set of guidelines for instructing designers. Instead, we sought to contribute value to design practice by enmeshing ourselves in it and confronting ourselves with ways of understanding and designing for FT&P that searched for the 'breaking points' of the FT&P definition rather than its 'comfort zones' (Redström 2017). This meant also involving ourselves with broader communities of practice that surrounded the individual practitioners we had direct exchange with.

Methodologically, this design research was pursed with a blend of research through design and design anthropology, which positioned us to work in cycles of framing and reframing the research topic, while also enabling us to engage in contextualising and engaging with actual design processes. With research through design, the making of artefacts feeds iteratively into the development of research itself in ways that are provisional and often hard to capture (Redström 2017; Durrant et al. 2017; Stappers and Giaccardi 2017). Our 'making' uniquely drew on the role of the first author as design anthropologist. The second author collaborated with the first author in analytically and theoretically framing this research in a supervisory capacity. In this paper, we will use 'we' to acknowledge the collaboration of the authors of this text in how the research work under examination is framed and discussed; and 'first author' to refer specifically to her role as design anthropologist doing fieldwork among her design practitioner collaborators and their community of professionals.

The potential of design anthropology is not in presenting a solution, as not all problems have simple answers. Its greater impact is in collaborative future making: shaping the way that a phenomenon is understood in the design process, with those involved in the design process (Otto and Smith 2013). In this paper, design anthropology serves as a lens to examine the 'breaking points' of when our practices of professional design and design research met, collided and framed a design research program.

## 3. Collaboration with IoT design practitioners

We were fortunate to conduct our design research inquiry into FT&P in a collaboration spanning approximately three years with a group of designers particularly active in the growing field of internet-connected devices. Each of these designers had established their own companies within the last six years located in either Belgium or the Netherlands (Afdeling Buitengewone Zaken 2017; The Incredible Machine 2017a; beyond.io 2017).

Our collaboration started around the idea to create a manifesto to frame discussions about how to support the responsible design and development of IoT products and services. Their concern was that the users of these products and services were being taken advantage of through their connective properties, and that designers could potentially intervene to remedy this circumstance through the design process itself. The first author was invited to join them in writing the manifesto as it aligned with her research on FT&P, which similarly sought to unveil what's at work behind black boxes and establish more legible and responsible relationships with these technologies.

Together we made a succinct manifesto of 10 principles intended for our local community of design practitioners in north-western Europe (Afdeling Buitengewone Zaken et al. 2015). Later we extended our collaboration by establishing the Just Things Foundation (Just Things Foundation 2016) to develop and promote this work in various forms, which we will discuss in the next section of this paper. We each developed this foundation in parallel to our own independent careers, be it in academia or running these agencies.

## 4. Generating value at the level of individual practice

Collaboration with design practitioners was instrumental in helping us understand how to advance a definition of FT&P and relate it to design practice. We needed to experiment with what language and framing of FT&P worked outside a purely theoretical and academic context. Upon entering into the collaboration, we did not expect its impact to exceed our academic design practice. We had hoped to develop a more informed and scholarly perspective on FT&P, and to assess the impact of that perspective within our academic community via peer-reviewed articles and conference work. Likewise, our collaborators were seeking to enrich their own design practice with new ideas and perspectives.

At the scale of those that we worked directly with, our collaboration would rotate around a project or a particular output. In this case, we approached these projects from a body of theoretical work on FT&P, and our colleagues approach it from their wealth of professional experience in the field. This functions as a form of exchange as we ultimately draw from the other's experience and practice to inform and shape our approach in later projects. To illustrate this exchange on the level of individual design practice we will look at two particular projects as exemplars.

### *4.1. Case study: thingformation*

Thingformation is a design concept commissioned from the Belgian design agency beyond/io (beyond.io 2017) to illustrate the parties that are involved with a particular Internet-connected consumer product. Thingformation achieves this through a pictorial labelling system to be displayed on the product's packaging to communicate information such as the different companies that may be utilising user data through this product, or supporting the platforms that the services run from (Figure 1).


**Figure 1.** Design concept Thingformation. Image: beyond.io.

The language that served as the basis, or design brief, of Thingformation was rooted in our design research program, aiming to explore how design can surface FT&P. It represents the effort to make our research program relatable to designers. Up to this point, we (the authors) had primarily been concerned with experimenting with ways to explain the importance of the concept of FT&P and convince designers of its merit. For example, in previous projects, we had pointed to examples that typified FT&P or its absence. But this had not resonated. We were consistently told that the concept of FT&P was compelling, but not 'actionable.'

The way the designers approached this project in practical terms illuminated that we had different understandings of the 'what' of this project. In our brief, we had defined 'what' the project should do as 'joining the *ends* and *means* together', thereby situating the technology in its social and ecological context. As Thingformation's lead designer explained to us, he understood instead the project to be about 'communicating what's invisible in an IoT product to an end user before they use it, and on a tiny canvas' (Tiete 2017). The designers at beyond/io needed to think in terms of the 'materials' they were working with: the end user, the packaging, the infrastructure. They were approaching the brief as a question of supporting consumer protection, the infrastructure necessary for that protection, and what materials they had available to communicate that.

In this joint project, we were able to understand what parts of our framing needed to be examined and where were the breakdowns in the formulation of our research topic. Up to this point, we had been thinking in terms of technical components: hardware and software, chips, and code. beyond/io's concern was more about the end user or consumer, the importance of the infrastructure that transcended those technical components such as the connectivity networks, the physical materials at hand such as the packaging, and the regulatory bodies that producers of technologies are responsible to, and questions such as production and scale-ability. beyond/io's approach with Thingformation highlighted the importance of the practical concerns such as the infrastructure and politics that are

necessary to support FT&P. Reflecting upon previous projects, we can see how this oversight had constrained previous projects, as reflected upon in great depth in a previous publication (Robbins, Giaccardi, and Karana 2016).

### 4.2. Case study: transparent charging station

One of our collaborating agencies, The Incredible Machine (TIM), had a client project that they thought our academic design research could contribute to. They were asked to create a transparent charging station for electric cars, to reveal how the station determined which cars could be charged and within what timeframe. The client commissioned a speculative design of a 'transparent charging station' that would make the availability of resources, and the decisions the station must make on how to distribute those resources, understandable to customers.

The specifications made by the client for the design led TIM to associate the brief with one of the early design approaches (traces of use) we had been exploring (Giaccardi et al. 2014; Robbins, Giaccardi, and Karana 2016; Robbins et al. 2015). The first author was invited to join a client meeting and ideation session. Indeed, the client's vision behind this charging station was very much in line with our work on FT&P, albeit for reasons different than what TIM had presumed.

During the ideation session, the first author pressed upon TIM that the client's project brief was in line with our argumentation of FT&P. She attempted to make this point without the jargon of FT&P, and instead with the historical metaphor of the tragedy of the commons, where limited resources have to be shared and distributed among a large community. With a well, the resource and the technologies that deliver it can be framed as FT&Ps. The well's supply varies upon the weather, the demand from others, and the echo and watermarks of the basin itself. These are contextual clues to help the user understand the relation between the *ends*, the availability of water, and *means*, what contributes to the availability of water. This not the case with petrol stations, where the resource is available on demand and the supply is hidden underground, there is little context about how the *ends* and the *means* of the petrol resource are related.

Thus, the opportunity for the transparent station, the first author argued, is in highlighting and making legible this fluid context behind the resource, and the impact of our use of the station. To be a FT&P, an electric charging station should more closely resemble the well, providing context as the to fluidity of the availability of energy on the electric grid, and to promote its judicious distribution. How can design make this station more like a well and less like a petrol station?

In subsequent ideation sessions, the designers engage with this idea of the first author, and point to some of its shortcomings. In this case, the first author attempts to make the point that traces help illuminate how the *ends* (low water table) and the *means* (dry spell) are connected. Yet one of the designers argued that such traces could only communicate so much as to the context surrounding that water level:

Harm: [Water tables] not enough to understand the whole system. The farm where I grew up was in an area in Holland that gets flooded a lot of the time. My Dad was always checking the water level. But he didn't even walk to the river to

look at the thing where there was a meter stick under the bridge, he doesn't care about that. He went onto Teletext, the TV text thingy, and checked all the levels all the way up to the Alps where the river was starting. Then can analyze how much snow was there last month and what's the temperature now, and what's the level at Lobith, and what's the level in Germany, because then he knows really what's going on. The material trace of the water level there is only one thing.

Holly: Yeah. We're talking about a much bigger system.

Harm: It's a bigger system, and he needed the Teletext, the information, to make a more informed decision on what he would do. Would he mow the grass and then that pasture that might be flooded?
(The Incredible Machine 2017b)

The traces of the watermarks were used as a design approach to discuss the larger metaphor of how the well communicates the resources available. The designers at TIM astutely point to what is problematic about this particular idea, again underlying the importance of how networked connections needed to be problematisated. In doing so reiterating a 'breaking point' that was also illuminated with Thingformation.

Despite it was apparent that our collaborators did not see the opportunity we saw for framing energy resources as FT&P, the final design concept of the Transparent Charging Station beautifully captures the point the first author was attempting to make regarding FT&P as an approach to reframe how we interact and conceptualise the energy resource, the technology that delivers it, and the network we exist with it in. The final design features a screen indicating the availability of electric energy based on factors such as demand from other cars charging or how much renewable energy was generated that day (Figure 2). Its interface shows the constraints of what energy is available on the network, and the user has the opportunity to negotiate their needs within those parameters with their turns of the dials. Using the dials for their charger, users adjust what percentage of their battery needs to be charged

**Figure 2.** The transparent charging station, a speculative design commissioned by a Dutch energy company and their partners who make electric charging stations for automobiles. On the right, a close up of its interface. Image: The incredible machine.

and within what time frame. In this dynamic interaction, one negotiates with the algorithmic constraints that govern this system to discover the available options suitable to their requirements. This provides the person with a sense of agency and insight into the functioning of the system and how to work with it – the station becomes a FT&P.

Based on the strong correlation between TIM's final design of the station, and the proposal we were attempting to put forth regarding the qualities of FT&P and how they relate to limited resources, we argue that this is an instance where our design research was able to contribute value to our collaborators' practice. Their final design had found the breaking point in our understanding of how to reveal complexity (physical traces can only demarcate a one to one interaction), and at the same time value in our notion of finding ways to demonstrate the fluid availability of resources and how their availability is impacted by the actions of others, thus broadening the scope of our collaborators' design practice, whether acknowledged or not.

### 4.3. Reflecting on value to individual practice

This last case study brings us to an important point that we must contend with, which is the subjectivity behind constructing and assessing programmatic value in these exchanges. As mentioned in the introduction, such as sets of values and beliefs don't lend themselves to quantifiable or easily defined metrics. This is especially true of collaborative design processes where the objective is not in parsing out individual contributions but supporting 'unstable and provisional' design processes (Redström 2017).

As described in the previous sub-sections, we are very aware of how our own design program has benefitted from these discourses of doing design with professional practitioners: we were able to expand our own framing and conceptualisation of FT&P in ways that are more process-oriented. For example, with Thingformation our research program turned to also consider the infrastructure behind regulating IoT products and their legibility.

Based on our analysis of the field notes of our ideation sessions and exchanges with designers that have been notated, coded, and in some cases transcribed, we also observe that their design practice too has been impacted by our involvement in these projects. On more than one occasion, our collaborators have tried to engage with our theoretical design research, and had been clear with us that our research didn't seem applicable. However, as demonstrated with Thingformation and the Transparent Charging Station, the design concepts that they ultimately developed clearly encapsulate the ideas we were proposing, and advance their maturation.

## 5. Generating value at the programmatic level

The second level of value generation that emerged through the interlacing of academic and professional discourses of doing design occurred at the programmatic level; and will, therefore, be discussed in this section not in terms of interpersonal exchanges, but as the trajectories and influence of certain projects. The two case studies discussed in the previous section will be again addressed here; but we will analyse them in another light, in terms of how they permeated and influenced the programmatic values of a community of practitioners.

The way that our original research program on FT&P morphs into projects that are relevant to different communities is a representation of the exchange, emergence, understanding, negotiation, and normalisation of our research program among these communities of practitioners. Likewise, this trajectory also represents how we benefited from this exchange: understanding, negotiating, and normalising our research program in response to the needs of a community of practitioners. This section offers an account of such trajectories, detailing how one project related to another, and later maps out this programmatic impact.

### 5.1. IoT manifesto: the initial call to action

Our collaboration began with the IoT Manifesto to guide the ethical and responsible development of IoT products and services. While drafting the Manifesto we shared industry case studies, anecdotes, experiences and perspectives, and our values, to identify the dos and don'ts of IoT design. These were then grouped and categorised into a set of principles deemed critical to shaping a 'responsible' IoT product (Figure 3) (Afdeling Buitengewone Zaken et al. 2015).

There is one particular point of the Manifesto we posited that most closely echoes our academic design research work on FT&P, which is point VII: 'we make the parties associated with an IoT product explicit.' As our collaborators were collating their thoughts onto post-it notes, the first author grouped several of these and advocated for it to be characterised by this particular point (VII). Our collaborators' perspectives closely tapped into how we interpreted the problem space behind FT&P: that masking the complexities behind these products is problematic. The first author offered that the framing of this point was aligned with the perspective of our collaborators, and was adopted as a category that became principle VII.

The language and style of the Manifesto were deliberately chosen to promote readability and circulation among other designers, first in being complimentary to a poster format (Figure 4), as well with an online presence to collect digital signatures (Afdeling

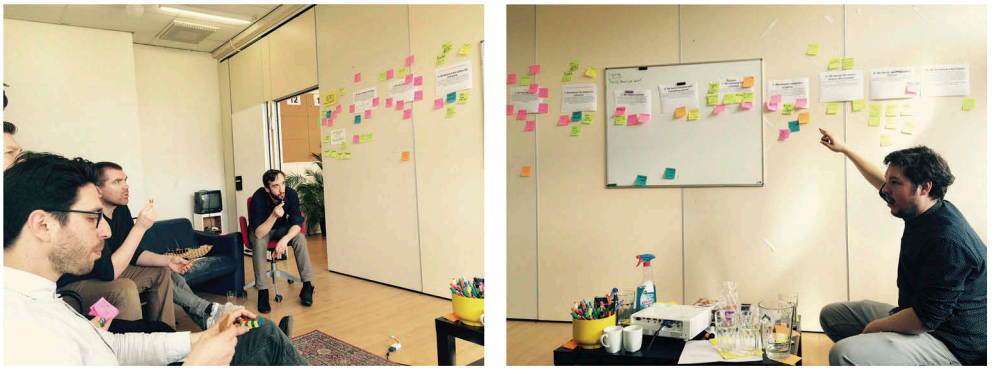

**Figure 3.** Drafting the IoT manifesto with co-authors. Case studies and thoughts regarding what constitutes the responsible design of IoT products and services are collected on post-it notes, discussed and grouped to arrive at what would become a principle of the IoT manifesto. Image: Holly Robbins.

Buitengewone Zaken et al. 2015). We have been nominated for awards for our work on the manifesto (Creative Heroes Award 2017), invited to give talks and workshops internationally, and received grants to develop this work further. We, the authors, don't claim ownership of this project and are happy to see others give talks on the Manifesto (Savič 2017) . These are all forms of dissemination that we greatly encourage and represents how this transformative knowledge is spreading among international communities of design practitioners. Additionally, the contribution of the Manifesto is also acknowledged within academia (Fritsch, Shklovski, and Douglas-Jones 2018; Wakkary et al. 2017).

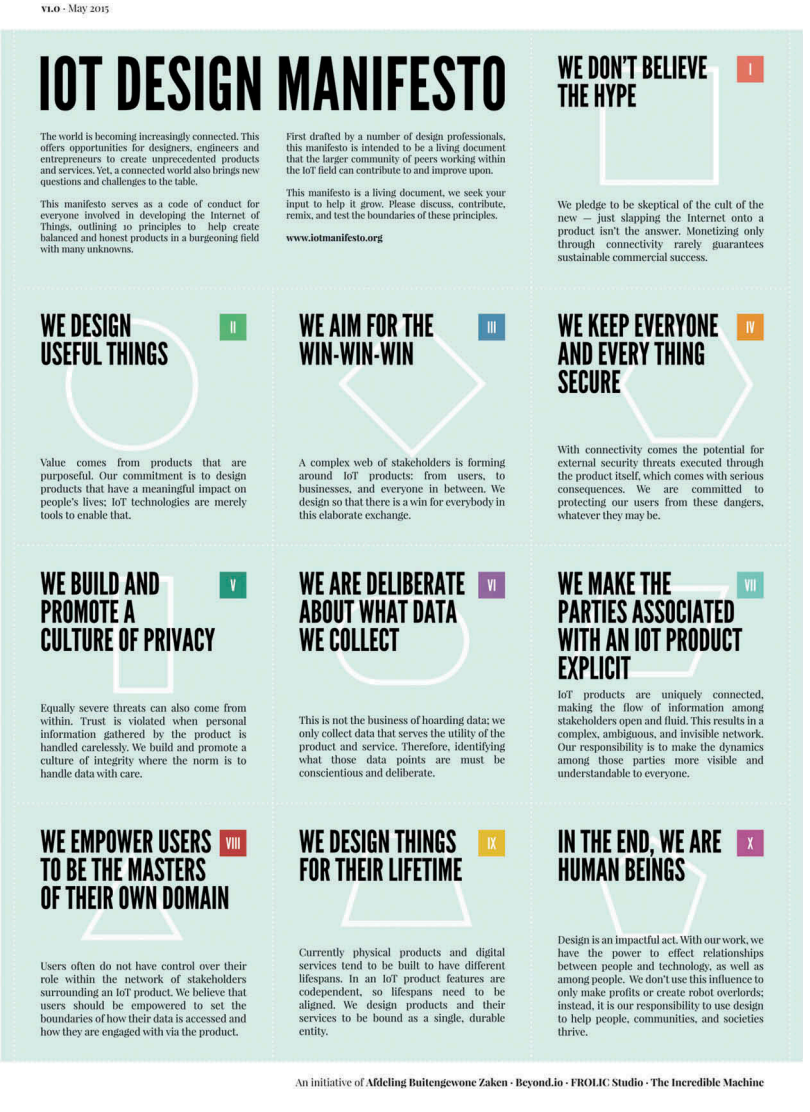


**Figure 4.** The Internet of Things design manifesto (IoT manifesto) is a collection of 10 principles to promote the responsible design of IoT products (Afdeling Buitengewone Zaken et al. 2015). Image: Just things foundation.

### 5.2. ThingsCon: shifting values of communities of practice

The Manifesto was unveiled in 2015 at ThingsCon, which identifies itself as 'Europe's leading conference about the future of hardware, connected devices and Internet of Things (IoT)' (ThingsCon 2017). It is a community of practitioners of different expertise: from developers to designers, user experience professionals to product managers, owners to manufactures, and an increasing number of design academics. They come from all over the continent for annual conferences, and organise smaller events around the world.

The Manifesto had entered into this practitioners' community at the right time, and generated a lot of enthusiasm both within the ThingsCon community (Sterling 2015) and international media (Sterling 2015). At the plenary meeting of the conference for the following year, the founders and organisers of the conference decided to incorporate the principles behind the Manifesto into the official stance of the organisation: '[foster] the creation of a human-centric & responsible IoT' (ThingsCon 2017). The following year the theme of the conference was orientated towards promoting a responsible IoT and members of our collaboration became active in the leadership of this community.

### 5.3. Just things foundation: affirming our collaboration

After the Manifesto was so well-received by our peers at ThingCon, most of the authors decided to continue our collaboration and formalise it as a non-profit foundation: the Just Things Foundation (JTF) (Just Things Foundation 2016).[1] As a foundation we develop the work related to the Manifesto through lectures and master classes for academic and professional contexts, exhibitions, commissioning speculative design projects, and consulting.

With our collaboration cemented as a single legal entity, we became a recognisable unit within the growing community of design practitioners concerned with IoT. This opened up opportunities for our research program to reach communities which would have not been accessible to us design researchers, had it not been for the established exchange and relation with the members of our collaboration and foundation.

### 5.4. Dutch design week: reaching a general audience

As a foundation, our first action was to prepare an exhibition for Dutch Design Week, the national design week in the Netherlands. The exhibition illustrated products that successfully executed each of the points of the Manifesto and also featured some speculative products to this effect (see 'Thingformation'). This exhibition targeted a general audience and drew a crowd estimated at about 10,000 visitors of all ages (Figure 5), and was featured in local media on the web, radio, and in TV interviews (Bright.nl 2016; BNR Radio 2016; Engle 2016). This again gave us opportunities to experiment with how to craft our narrative and research program in ways that would be accessible to different audiences, and to similarly benefit from these audiences' input about our work.

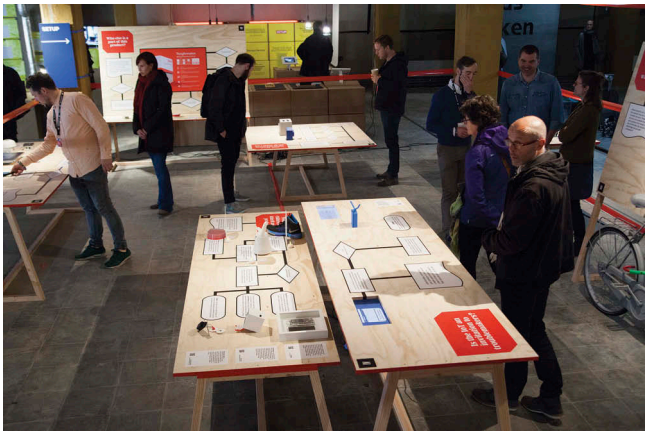

**Figure 5.** Part of our exhibition at Dutch design week 2012. Image: A/BZ.

### 5.5. Thingformation: design concept

The Just Things Foundation commissioned Thingformation as a speculative design concept for our exhibition at Dutch Design Week in 2016. It was commissioned to illustrate point VII of the manifesto, the principle that specifically addresses our research program on FT&P: to reveal some of the hidden elements behind IoT products. As described in the previous section, Thingformation is a pictorial label system, similar to clothing wash labels, which discloses product information that is typically not very obvious (Figure 1).

This design concept propelled our design research program further by triggering the interest of other communities. We were invited by the ThingsCon community to write about this project for a report regarding the 'State of Responsible IoT,' which was made available on an online platform for general and technical audiences (Robbins and Just Things Foundation 2017). This article caught the attention of an academic community who analysed it as a voice in a growing 'revolution' for ethical internet-connected technologies (Fritsch, Shklovski, and Douglas-Jones 2018), as well as the attention of the authors of a report being commissioned by an industry partner, for which we consulted (Bihr 2017). Our framing and approach to the research behind point VII of the manifesto clearly benefited from our collaborators' practical approach, becoming relevant and applicable to design practitioners in industry.

### 5.6. Fisherman's IoT: thought experiment in industry context

A branch of the Mozilla Foundation,[2] the Open IoT Initiative, invited several members of the foundation, including the first author, to join a week-long design sprint to envision alternate approaches to what an Open IoT could look like. The first author joined a small observational field study of a local fisherman's boat for this purpose. We were introduced to sailors and restorers of a fishing vessel from 1902 to consider how the IoT could help them. After a thorough tour of the boat, it became apparent that we

had more to learn than to offer these fishermen. The ship hosted a unique technological ecosystem or network that resembled FT&P, while also representing an analogue predecessor to the IoT.

With two other participants of the sprint, the first author wrote an essay on the lessons we extracted, and how these can be applied to the vision of how to design an Open IoT. This 'fieldwork' and essay became an important case study in FT&P, and also ultimately a provocation that was included in the initiative's annual report (Thorne, Rogers, and Skelly 2016).

### 5.7. Transparent charging station: contributing to client projects

As discussed in the previous section, one of our collaborators, The Incredible Machine (TIM), had a client project that they believed our academic design research could contribute to. They invited the first author to join a client meeting and conceptualisation session to offer an interpretation of the project through the lens of our design research. As illustrated in Figure 2, the final design by TIM involves a system where people can understand and negotiate with the station itself how much energy will be delivered to their vehicle and when.

The station has debuted at industry conferences and is now the centrepiece of an academic initiative on the 'Smart City' (De Ingenieur 2017; Amsterdam Institute for Advanced Metropolitan Solutions 2017). It has also received national recognition and was recently awarded the prestigious Dutch Design Award in the product category (Dutch Design Awards 2018).

### 5.8. Reflecting on mapping the programmatic impact

This section speaks to how these exchanges of design practices led to the research program being carried to new communities of practice. Each of these communities likewise contributed to developing the program in the context of a particular project, and in doing so part of our research program unfolds into their practice. We can see how Figure 6 maps the shape that the impact trajectory takes. For example, the work impacted the course of an industry organisation (ThingsCon), reached industry communities outside this organisation (with the Transparent Charging Station project), spoke to general audiences through exhibitions and media (Dutch Design Week), and was sought out for consultation (Mozilla Sprint, Trust Mark Report, State of Responsible IoT).

Each project represented an opportunity to develop the program of the work, but additionally invited other communities of design practitioners to developing and owning that program with us. Here the value of our mutual exchanges is being demonstrated with each new community or project impact, and likewise by encouraging us to expand our notions of the research topic and applying it to new contexts. These projects and communities brought us to new and unexpected 'breaking points' in how we understood and constructed FT&P, while simultaneously shaping how it would be re-framed. The exchange of worldviews and knowledge taking place within each particular collaborative project enabled us to traverse 'through practices' of academic and professional design. The trajectory that

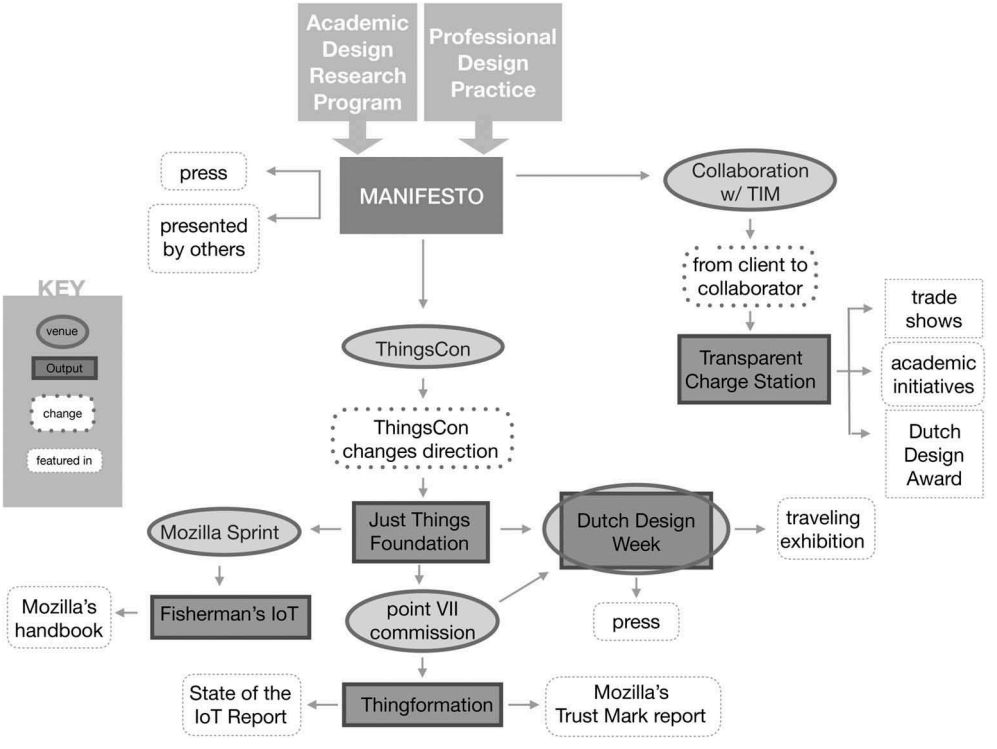


**Figure 6.** This map charts the trajectory of projects that our design research program was incorporated into. It demonstrates the progression and dissemination of the collaborative work that originated with our initial project of the IoT Manifesto.

the resulting program took illustrates how its themes are being interpreted, adapted, applied, understood, normalised, and negotiated within yet another context.

Assessing value at the programmatic level though comes with its own complications. It becomes complicated to try to parse out the programmatic value of our design research on the scale of a community of design practitioners. For example, what was our contribution to triggering ThingCon's program shift? How do we identify our research's contribution to this change, compared to that of the collaboration? Or was it an inevitable tidal change for the ThingsCon community? Part of what made it possible for our voice to even reach this venue is the fact that it was strengthened by our collaboration. What matters perhaps the most is that the voice of our research was somehow contributing to this mix, which made it possible for us to continue to further a research program with and within this community (Robbins and Just Things Foundation 2017; Bihr 2017).

## 6. Conclusion

Where we, the authors of this article, expected the programmatic value to reside in this collaboration shifted as this collaboration unfolded. As authors, we entered into this collaboration with the intention of making our academic design research relevant to

professional design practice. Yet this collaboration produced much more than dissemination: a shared program emerged, formed on design ideals and intentions mutually shaped by the encounter of these two communities. Value is found here in the mutual shaping of design programs that was generated through the sharing of discourses of design. The knowledge being exchanged across varying design practices in turn shaped and contributed to the maturation and shaping of knowledge from the other.

In such a dynamic, the emphasis needs to shift from considering the output of a collaboration as carrier of knowledge in and by itself, to examining the exchange that occurs through the discourse of doing design and how its value (of design ideals, intentions, etc.) 'carries' into future projects. In doing so, our design research program was able to transverse different sets of unstable and transitional world views (Redström 2017, 95) The impact isn't so much in the Manifesto itself, for example; but the mutual exchange that comes from writing it, and the subsequent projects it engenders (Figure 6).

This is a different type of engagement than an isolated occurrence of collaboration with design practitioners. Instead, with this work, we are advocating for *long-term, sustained engagement in discourses of design across practices of doing design*. It is with this deep level of engagement that it becomes possible to create an impact not just at the level of individual design practices, but also at a programmatic level.

In this paper, we have discussed how certain modes of working collaboratively across academia and professional design practice can provide unique avenues to creating value. We do this by discussing how value was generated through a several yearlong collaboration with a cohort of professional design practitioners to develop our design research into a critique from philosophy of technology on FT&P. Through this discourse of doing design, we found our collaboration both had value in shaping our program, as well as impacting the design practice of our collaborators. This dynamic generated value both to the designers we collaborated with directly on projects, but also extended to a larger community of design practitioners.

Redström observes that programmatic design research looks for structures (of practice) that 'somehow cater to the need of a worldview, a hard core' but argues that these structures should be set-up in a way that 'enable us to work with a diverse set of inherently unstable and transitional worldviews' (Redström 2017). Thus, the activities of design research should unfold this worldview 'searching for its breaking points rather than its comfort zones' (Redström 2017). Through the collaboration accounted in this paper, we were able to extend ourselves beyond the comfort zone of both academic frameworks and commercial design trend of the device paradigm, to understand what were the breaking points of our own conceptualisation of FT&P. This had value not only because it helped design research in FT&P, but also because it helped form a core set of design ideals and intentions among a broader community of practitioners.

We encourage design researchers to seek value beyond the particular artefact itself and even beyond the particular way of collaborating to a particular artefact. Instead, attention should be attuned also to the exchanges that transpire when different design practices engage with one another. Staying flexible and open to alternative design practices and discourses is not only an opportunity to expand and enrich design research programs, but perhaps more importantly, an opportunity for such programs to create an impact on a more diverse sets of design practices and communities.

## Notes

1. There was one additional design agency, FROLIC studio (Netherlands), which participated in co-authoring the Manifesto, but did not continue our collaboration with the foundation.
2. The Mozilla Foundation is affiliated with the Firefox web browser.

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## References

Afdeling Buitengewone Zaken. 2017. "Ab/Z." *Afdeling Buitengewone Zaken*. Accessed November 30. http://afdelingbuitengewonezaken.nl

Afdeling Buitengewone Zaken, beyond.io, FROLIC Studio, The Incredible Machine, and Robbins, H. 2015. "The IoT Manifesto." *IoT Manifesto*, May. http://iotmanifesto.org

Amsterdam Institute for Advanced Metropolitan Solutions. 2017. "AMS Science for the City #5 – Democracy by Design – 22 Nov." *Ams*, November 20. http://www.ams-institute.org/news/ams-science-for-the-city-5-democracy-by-design-22-nov/

beyond.io. 2017. Accessed November 30. https://www.beyond.io

Bihr, P. 2017. "A Trustmark for IoT." 1st ed. ThingsCon. https://github.com/openiotstudio/general/raw/master/publications/a_trustmark_for_IoT_thingscon_report.pdf

BNR Radio. 2016. *Eye Openers*. https://www.bnr.nl/player?type=column&audioId=2618692

Borgmann, A. 1984. *Technology and the Character of Contemporary Life*. Chicago, IL: University of Chicago Press.

Bright.nl. 2016. *Gevaren Van Internet of Things: Kun Je Je Broodrooster Nog Vertrouwen? Dutch Design Week*. https://www.youtube.com/watch?v=U9SMGU0qfHw

Creative Heroes Award. 2017. "Samenwerking - Creative Heroes Award." https://creativeheroesaward.com/genomineerden/product/samenwerking/

Croon, A., and E. Stolterman. 2003. "Everyday Aesthetics and Design of Information Technology." In *The 5th European Academy of Design Conference (EAD), TECHNE—Design Wisdom*, 1–9. Barcelona: University of Barcelona.

De Ingenieur. 2017. "Paal Maakt Laadproces Elektrische Auto Zichtbaar." *De Ingenieur*, October 2. https://www.deingenieur.nl/artikel/paal-maakt-laadproces-elektrische-auto-zichtbaar

Durrant, A. C., J. Vines, J. Wallace, and J. S. R. Yee. 2017. "Research through Design: Twenty-First Century Makers and Materialities." *Design Issues* 33 (3): 3–10.

Dutch Design Awards. 2018. "Dutch Design Awards 2018." *Dutch Design Awards*, June. https://www.dutchdesignawards.nl/nl/gallery/product/the-incredible-machine/

Engle, E. 2016. "17 Dutch Design Week Events to See This Week - Core77." *Core 77*, October 24. http://www.core77.com/posts/57239/17-Dutch-Design-Week-Events-to-See-This-Week

Fallman, D. 2009. "A Different Way of Seeing: Albert Borgmann's Philosophy of Technology and Human–Computer Interaction." *AI & Society* 25 (1) 53–60. doi:10.1007/s00146-009-0234-1.
Fritsch, E., I. Shklovski, and R. Douglas-Jones. 2018. "Calling for a Revolution: An Analysis of IoT Manifestos." In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, Paper No. 302. New York, NY: ACM. doi:10.1145/3173574.3173876.
Giaccardi, E., E. Karana, H. Robbins, and D. Patrizia. 2014. "Growing Traces on Objects of Daily Use." 473–482. New York, USA: ACM Press. doi:10.1145/2598510.2602964.
Open IoT Studio. 2016. *Practices for a Healthy Internet of Things*. Edited by M. Thorne, J. Rogers, and M. Skelly. Dundee, Scotland: Visual Research Centre, Duncan of Jordanstone College of Art and Design, University of Dundee.
Otto, T., and R. C. Smith. 2013. "Design Anthropology: A Distinct Style of Knowing." In *Design Anthropology*, edited by W. Gunn, T. Otto, and R. C. Smith, 1–29. London, UK: Bloomsbury Academic.
Redström, J. 2017. *Making Design Theory*. Cambridge, MA: MIT Press.
Robbins, H., and Just Things Foundation. 2017. "The Path for Transparency for IoT Technologies." *Medium*, June 12. https://medium.com/the-state-of-responsible-internet-of-things-iot/hollyrobbins-6d2f81512242
Robbins, H. 2018. *Materializing Technologies: Surfacing Focal Things and Practices with Design*. Delft, Netherlands: Delft University of Technology.
Robbins, H., E. Giaccardi, and E. Karana. 2016. *Traces as an Approach to Design for Focal Things and Practices*. *The 9th Nordic Conference*. Gothenburg, Sweden, ACM.
Robbins, H., E. Giaccardi, E. Karana, and D. Patrizia. 2015. "Understanding and Designing with (And For) Material Traces." *Studies in Material Thinking* 13 (1): 1–24.
Savič, D. 2017. *Alja Isaković: IOT Design Manifesto. IOT Meetup Temni Vitez Usode*. Vimeo. https://vimeo.com/214926003
Stappers, P. J., and E. Giaccardi. 2017. "Research Through Design." *Interaction Design Foundation*, August. https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/research-through-design
Sterling, B. 2015. "Casa Jasmina: ThingsCon 2015." *Casa Jasmina*, May 13. http://casajasmina.cc/casa-jasmina-thingscon-2015/
Stolterman, E. 2008. "The Nature of Design Practice and Implications for Interaction Design Research." *International Journal of Design* 2 (1): 55–65.
The Incredible Machine. 2017a. Accessed November 30. https://the-incredible-machine.com
The Incredible Machine. 2017b. "Kick-Off and Ideation Session on Design Brief [Letter]." February 27.
ThingsCon. 2017. "About Us." *ThingsCon*. Accessed November 30. http://thingscon.com/about/
Tiete, A. 2017. "Interveiw on Thingformation Design." *Skype Interview*, May 29
Wakkary, R., D. Oogjes, S. Hauser, H. Lin, C. Cao, M. Leo, and T. Duel. 2017. *Morse Things: A Design Inquiry Into the Gap Between Things and Us*, *The* 2017 *Conference*. New York: ACM. doi:10.1145/3064663.3064734.
Wiltse, H. 2014. "Unpacking Digital Material Mediation." *Techné: Research in Philosophy and Technology* 18 (3): 154–182. doi:10.5840/techne201411322.