

# Eksig 2023

“From Abstractness to Concreteness – experiential knowledge and the role of prototypes in design research”

# Proceedings

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DIPARTIMENTO DI DESIGN

# International Conference 2023 of the Design Research Society Special Interest Group on Experiential Knowledge (EKSIG)

## Conference Proceedings

From Abstractness to Concreteness – experiential knowledge and  
the role of prototypes in design research

19–20 June 2023

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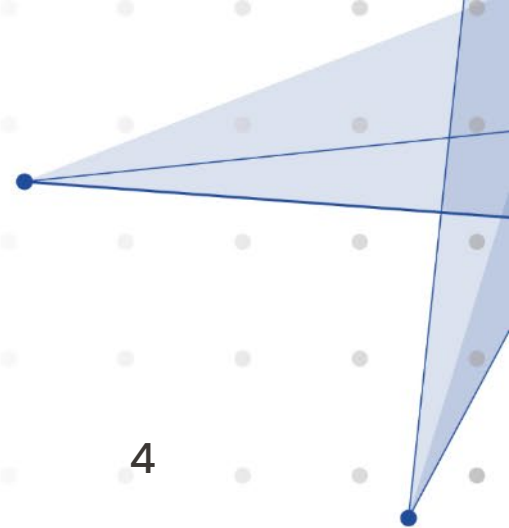
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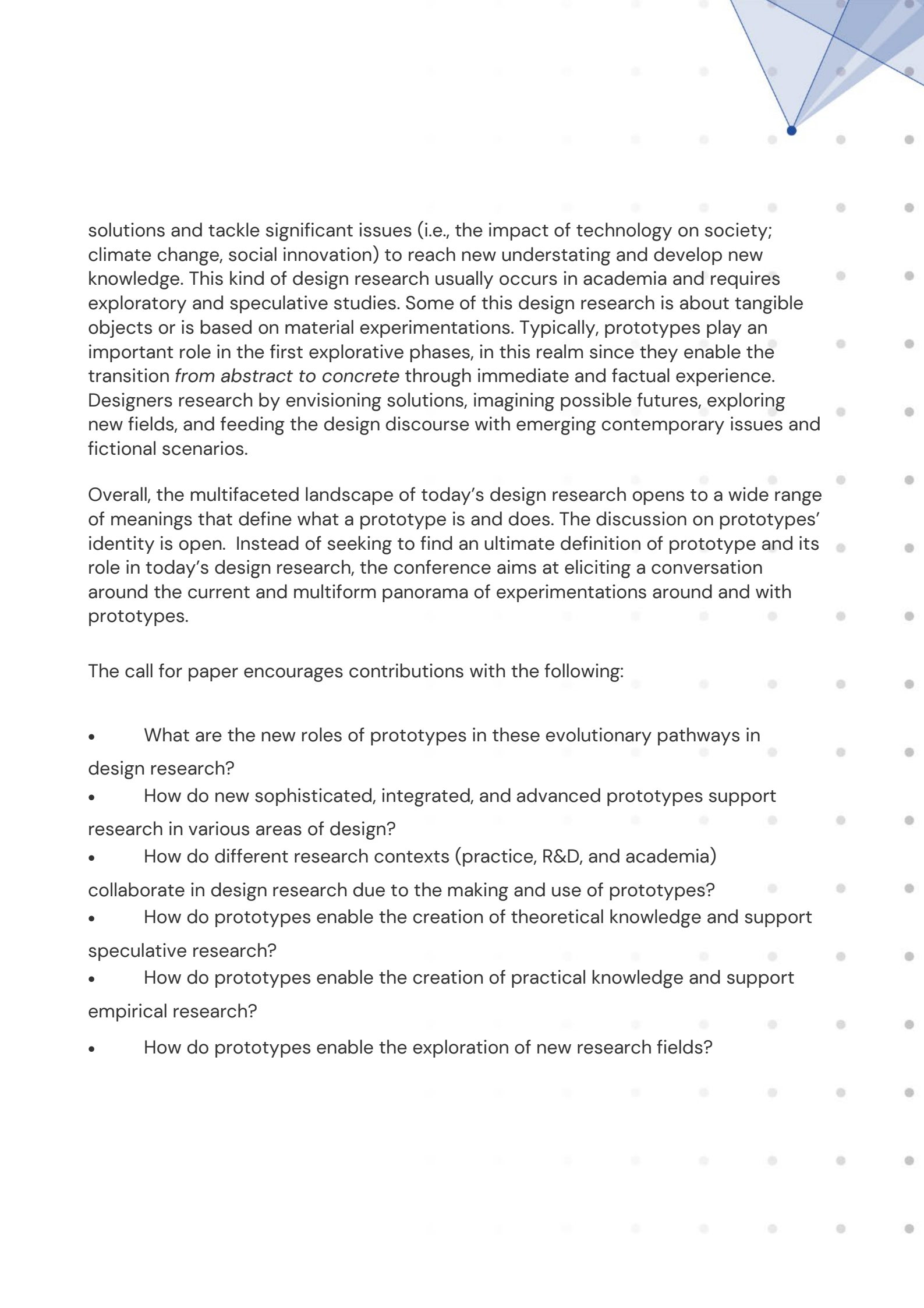
# Conference theme

Prototype and prototyping play a key role in experiential knowledge since they support the interconnections and collaboration among researchers and practitioners in many design fields. The role of prototypes in design research is characterised mainly by the general function of representing ideas and giving intelligible form to undetermined and abstract concepts pertaining to design solutions. Such a principle of transition from vagueness to clarity illustrates views on the role of prototypes which dot the diverse landscape of design research. Indeed, the evolution of design research in the past twenty years has led the path to a wide range of new possible prototypes applications.

Originally, in the industrial context, prototypes were made to test, evaluate, and improve the product until the final design and production phase. When design became an academic discipline, the scope of its enquiry expanded, embracing new areas of interest (i.e., sustainable design, materials design, participatory design, service design, user experience design, etc.), and their methodologies and scopes. During this evolution, the role that prototypes play in design research started to be questioned.

Indeed, nowadays, the role of the prototype encompasses several possibilities that link to the context and aim of the design research. When a general aim of the investigation is to develop a new design solution and make it *real* and available to users at the end of the process, prototypes support the transition from the idea to the final product. In this realm, prototypes play a crucial role, as they visualise, validate, experiment, and create such new solutions. Interestingly, prototypes for this kind of design research can be simple paper models that anticipate interactions up to complete *working* prototypes that are very close to the final product. In the digital field, provisional solutions are released on the market and updated afterwards. Prototypes, in this case, merge with the *final* products. New boundaries are broken between a final design and what is not.

Furthermore, the products that designers call to envision are becoming more and more complex. They are equipped with sensors, processors, and connected devices that support the interaction with digital interfaces, applications, and complex services. Hence, prototypes are meant to support design processes that rely on the supplementation of new kinds of expertise – such as user experience design, interaction design, material design and computer science – besides those traditionally integrated – such as product design, mechanical and electronic engineering). In this regard, the prototype embodies the translation of different design languages into a developing concept. Moreover, design research that explores and discusses possibilities might go beyond the development of concrete



solutions and tackle significant issues (i.e., the impact of technology on society; climate change, social innovation) to reach new understating and develop new knowledge. This kind of design research usually occurs in academia and requires exploratory and speculative studies. Some of this design research is about tangible objects or is based on material experimentations. Typically, prototypes play an important role in the first explorative phases, in this realm since they enable the transition *from abstract to concrete* through immediate and factual experience. Designers research by envisioning solutions, imagining possible futures, exploring new fields, and feeding the design discourse with emerging contemporary issues and fictional scenarios.

Overall, the multifaceted landscape of today's design research opens to a wide range of meanings that define what a prototype is and does. The discussion on prototypes' identity is open. Instead of seeking to find an ultimate definition of prototype and its role in today's design research, the conference aims at eliciting a conversation around the current and multiform panorama of experimentations around and with prototypes.

The call for paper encourages contributions with the following:

- What are the new roles of prototypes in these evolutionary pathways in design research?
- How do new sophisticated, integrated, and advanced prototypes support research in various areas of design?
- How do different research contexts (practice, R&D, and academia) collaborate in design research due to the making and use of prototypes?
- How do prototypes enable the creation of theoretical knowledge and support speculative research?
- How do prototypes enable the creation of practical knowledge and support empirical research?
- How do prototypes enable the exploration of new research fields?

# Organisation

## Programme Committee

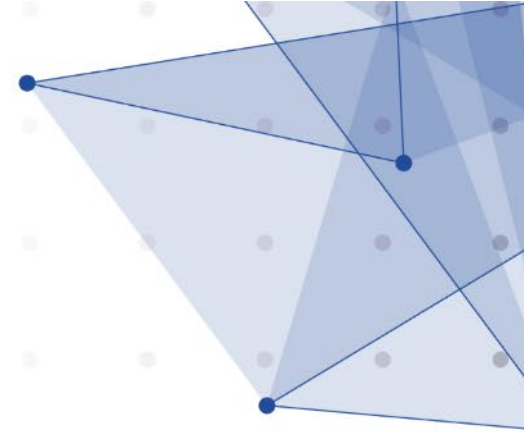
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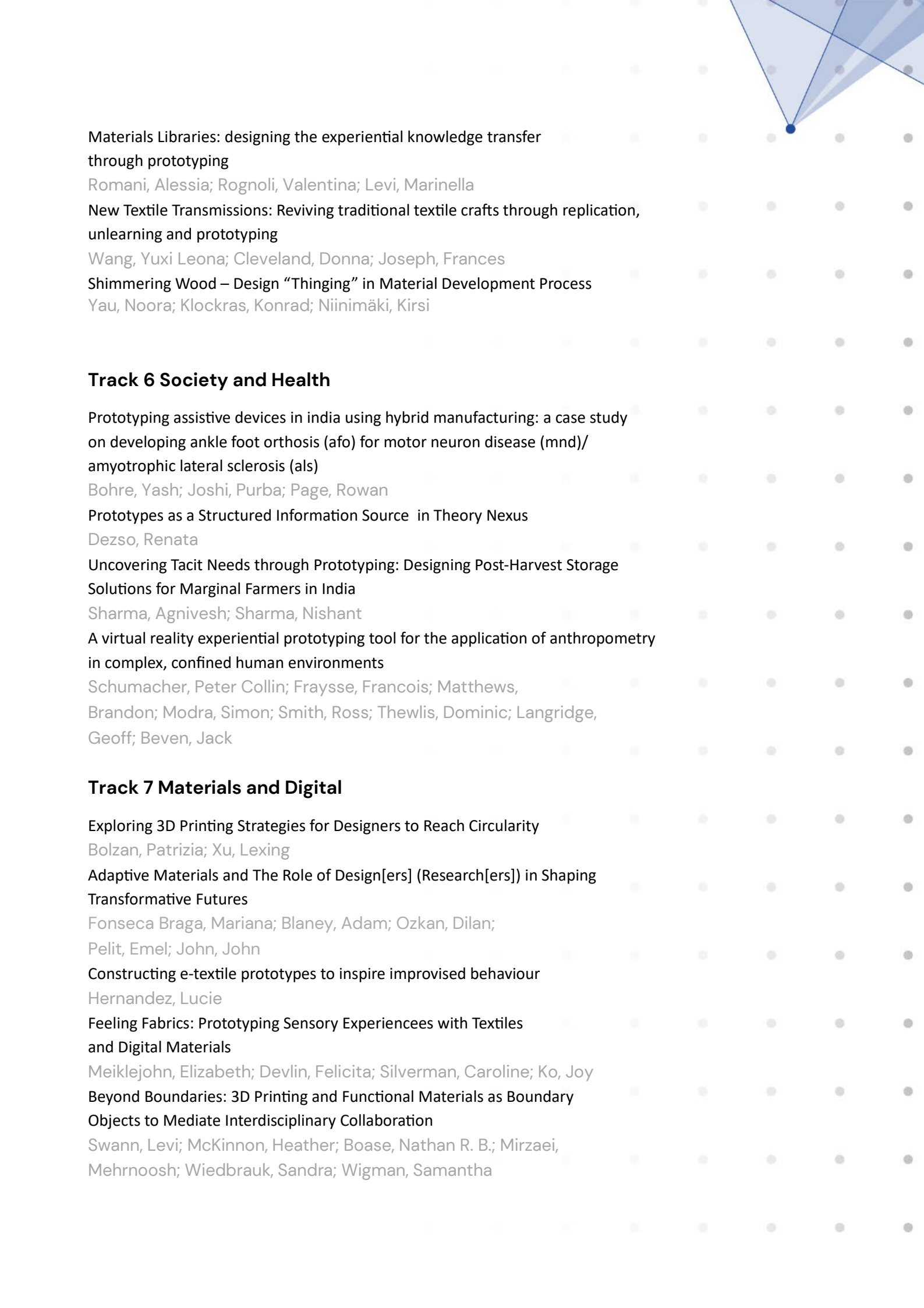
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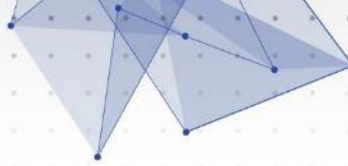
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## Design prototyping for public technological solutions as a social learning practice for policymaking

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### Abstract

This theoretical article explores how design prototyping for technological solutions with public and social dimensions (e.g., data-centric public services) might represent a practice that fosters social learning for policymaking. The paper contributes to two contemporary strands of design research: i) design prototyping in public service innovation processes as a means for designing with institutional arrangements; ii) the role and object of design prototyping in “*design for policy*”. The central thesis is that, through prototyping, the designing of public technological solutions could become a source of policy knowledge and a driver of policy learning. Therefore, the contribution of designers and design practice might go far beyond the prototyped solution and impact the policy dimension. The article develops an interdisciplinary review to support this perspective, connecting three blocks of theory: i) the enactivist framework, from cognitive science; ii) the social learning framework, from social studies of technology; and iii) the policy learning concept, from policy studies. The review highlights that an enactivist approach helps in appreciating the difference between professional design settings and other social settings in the context of technological innovation, essentially by conceiving cognition driven by the practice of design prototyping as deeply entangled within social and cultural dynamics. The article then attempts to connect theory with practice by discussing an example of service prototyping of a data-centric service for social purposes and its policy implications. In conclusion, authors propose open points for making prototyping meaningful for design for policy and designing with institutional arrangements, starting with the conscious role designers must assume toward institutional constraints during practice.

Enactivism, social learning, technological innovation, public innovation, design for policy

Already ten years ago, some authors keenly noticed that “*the landscape of design is constantly changing*” (White et al., 2012, p. 1). Until the Eighties, most design profession specialisms regarded graphics, textile, and industrial products (Julier, 2017). Later on, new design specialisations emerged with designers entering into new professional areas (e.g., interaction design, design management, service design, etc.) (Cooper, 2019; Julier, 2017; White et al., 2012). As design education and research followed these changes (Cooper, 2019), design curricula and disciplinary boundaries expanded into new areas (Buchanan, 1992). Already seventeen years ago, some scholars advanced that the product of design would no anymore be an artefact but: “[...] *an event-oriented toward a result.*” (Manzini & Bertola, 2004, p. 20) and designers would play the role of “[...] *design specialists which use their specific capacities and competences to make event oriented toward a result happen*” (Manzini & Bertola, 2004, p. 22).

These specific remarks captured two paradigm shifts that characterised the design evolution toward complex systems (Buchanan, 1992): the *object of design* moving from the tangible world (i.e., artefacts) to the intangible (e.g., end-user experiences, systems of production) (Göransdotter, 2021); the design action becoming a form of collaborative problem setting and an inquiry process (Julier, 2017). These changes have resulted in design being seen as a specific form of practical intervention for responding to social problems (Markussen, 2017). Under these circumstances (Julier, 2017), design professions — e.g., UX and service designers — have increasingly entered the public sector, mainly through innovation units and labs (Bason & Schneider, 2014; Buchanan & Junginger, 2014), not only to design better services but also to address social issues in line with existing policy agendas. Designers in these contexts often use rapid prototyping to prefigure future solutions and mediate between institutions’ and stakeholders’ views (Kimbell & Bailey, 2017; Vink & Koskela-Huotari, 2022).

These new practices are emerging with several critical questions. For example, design is often irreconcilably presented as both a positive force and a neutral and value-free instrument (Prendeville & Korja, 2022), and factors such as aesthetic knowledge get downplayed in favour of a cognitivist view of design methods (Wetter-Edman et al., 2018). Two main areas in design research seem to be particularly touched by these critical questions: public sector innovation through service design (van der Bijl-Brouwer, 2022; Vink et al., 2017) and “design for policy” (Kimbell & Bailey, 2017; Mortati et al., 2022). The former focuses on the potential *value of service design for reflexivity* (Vink & Koskela-Huotari, 2022), where prototyping could make stakeholders involved in the public sector design process aware of existing social structures and power imbalances (Vink et al., 2017). The latter advances that design prototyping could be a space for new experimental and collaborative forms of policymaking (Deserti et al., 2020; Kimbell & Bailey, 2017) and an essential step of policymaking as designing (Villa Alvarez et al., 2020).

This paper adds to existing work on the role of design prototyping in the public/social sphere and for policymaking, asking: *what could be the value of design prototyping when used for technological solutions with public and social dimensions?*

## Theoretical review

The presented interdisciplinary theoretical review aims to understand the role of design prototyping for technological innovation and solutions in public and social domains and building a conceptual tool for argumentation. The review employs an opportunistic approach by considering theory from several disciplines according to the potential roles of design prototyping at the micro-/meso-/macro-levels (Table 1).

Table 1: Synthesis of the theoretical review levels presented in this section

Level	Design Prototyping might affect..	Theoretical framework or perspective considered (discipline)
Micro	individual cognition	Enactivism (cognitive science)
Meso	social interactions and groups	Social Learning in Technological Innovation (STS)
Macro	norms and policies	Knowledge utilization in policy and policy learning (policy studies)

## The enactivist framework

The *enactivist framework* (Ward et al, 2017) represents one of the most articulated critics to the *cognitivist* paradigm, hegemonic in cognitive science until recently, which conceives cognition as an individual process, situated in the brain. Cognitivism advanced that the central nervous system is analogous to a computational machine that receives inputs from the environment, utilises them to produce representations of the world and organises behaviour accordingly (Watson and Coulter, 2008). In contrast, enactivism essentially proposes that the human mind is inseparable from the functioning of an organism's body as a whole.

This proposal emerged from foundational scholars of enactivism, who were interested in studying cognition as a way to clearly distinguish between living and non-living systems (Maturana and Varela, 1987). They recognized two conditions that distinguish a living system: (1) it features *self-organisation*, since it can reproduce its own internal constitutive elements and processes, by letting in energy (impulses on sensory organs) and matter (oxygen and food) coming from the environment; (2) the self-organisation process demarcates the organism from its own environment, entailing some degree of systemic 'closure'. Such conditions imply that self-organisation is a process of mutual definition between an organism and its environment, since one would not exist in absence of the other:

*“Cognition and world are interdependently originated via the living body. [...] a cognitive being's world is not a pre-specified, external realm, represented internally by its brain, but rather a relational domain enacted or brought forth by that being in and through its mode of coupling with the environment”* (Thompson, 2016, p. xxvii).

Following the enactivism framework *cognitive processes are necessarily also social* (Di Paolo, 2018), since the environment with whom an organism couples itself is social as well as physical. While a definite enactivist description of social processes is still unsettled (McGann, 2014), enactivism is fostering a reformulation of the social side of cognition. The tacit coordination involved by social relationships (Heft, 2007) entails *the mutual co-definition of self-organizing patterns of individuals*, which synchronize and let emerge what is perceived as a shared and objective environment (Durt et al., 2017). The concept of *affordance* — i.e. the set of possibilities and the constraints that a particular environment represents for an organism (Gibson, 1966) — helps further in collocating enactivism in social dynamics. Affordances are reframed within enactivism as socially constructed and shared, because they coincide with the coupling of self-organisation patterns of different individuals (Elias, 2017; Rietveld et al. 2018).

## Social Learning in Technological Innovation framework

The concept of *social learning* was developed to overcome the inadequacies of the previous deterministic accounts of sociotechnical development. Early social studies of technology conceived technology as an embodiment of social structures and values, realised by engineers and designers (Noble, 1978). Use and diffusion of technology were seen therefore as unidirectional processes, with a linear movement from designers to final users. Choices taken during design time were assumed to determine final use and its social consequences. Further research on innovation processes, however, highlighted the fact that *technical*

*improvements emerge often from the very use of technologies.* Gradually mastering a particular artefact, users can apply their expertise backwards and improve the artefact itself (Sørensen, 1996).

Such research framework, labelled as *Social Learning in Technological Innovation (SLTI)* (Williams et al., 2005) highlights the circular dynamics between the creation of human expertise and technical innovation, underlining also how this is deeply embedded in wider networks of relations, between different expertise, industries, and social groups. Power and economic interests, as well as political and social conflicts were integrated as factors that influence the learning process entailed by the interaction with a technology.

SLTI pointed out that innovation coincides with the back-and-forth of different actors around technology (Stewart and Hyysalo, 2008), thus, innovation has been recognized as a process that includes designers, users, and other intermediary actors. Accordingly, the terms *innofusion* and *diffused innovation* emerged to indicate that diffusion and innovation should be considered two sides of the same historical process (Fleck, 1988; von Hippel, 1988).

The core element of the SLTI framework is that not only the design, but also the use of technology is an active process. SLTI acknowledges that social groups tend to re-collocate a new technology within their existing knowledge, practices and routines, following their interests and purposes. The process of re-collocation, called *appropriation or domestication*, is crucial to effectively use a technology within a new social environment; while implementation involves a re-shaping of the technology role itself, necessary for users to interact effectively with it. Technical systems trigger changes of social routines, which need to be adapted to construct an efficient environment of use. The users' appropriation of a new technology is therefore unavoidably social also because they acquire expertise by interacting with each other, rather than only with the technology itself.

## **Knowledge utilization and policy learning**

The studies of knowledge utilisation for policy have a long history, particularly relevant during the 70s/80s (Radaelli, 1995) and briefly revived by the evidence-based policy movement (EPM) (Strassheim, 2018). While EPM advocated for policies to be based only on scientific evidence, knowledge utilization and recent ethnographies on public officials work (Maybin, 2016) clarified that policy-relevant knowledge is not only produced by experts (e.g., policy analysts), researchers or scientists. Policy actors might be willing to incorporate scientific/expert evidence, but are often limited in doing so because of the controversial nature of policy problems and tight time constraints for deciding and acting (Strassheim, 2018). Under such circumstances, certain policy decisions might be informed by scientific/expert knowledge, while others privilege other types of knowledge/ evidence (Wesselink et al., 2014). For these latter contexts, policy workers might privilege non-scientific but more accessible sources (Pawson, 2002; Strassheim, 2018; Tenbenschel, 2006), largely relying on their experiential knowledge (Maybin, 2016). What counts as relevant policy knowledge/evidence is therefore highly dependent on specific contexts and policy problems under question, as well as the strategy of knowledge utilisation of policy workers (Wesselink et al., 2014).

These knowledge utilization practices had been regarded as the micro-foundations of policy learning. Policy learning has been considered a type of social learning that can be institutionalised to drive policy change (Hall, 1993). Accordingly, change and innovation at the policy level could be not only dependent by political power plays, but the “puzzling” of policy actor on public problems (Heclo, 1974). Policy learning became a well-established field of the policy studies and potential interpretative lens of the policy process (Dunlop et al., 2018). In contrast with knowledge utilisation, policy learning is intended to explain also unintentional dynamics of knowledge within networks of actors involved in policy (Heikkila & Gerlak, 2013). However, policy learning as explanatory variable of policy change presents limitations, since it remains difficult to isolate the causes of learning or even when learning does not occur. As a consequence, the link between policy learning and policy change remains investigated by many but never presented as obvious (Moyson, 2017).

## **Insights for design prototyping from the reviewed theoretical frameworks**

This section highlights the main concepts and perspectives emerging from the reviewed theoretical framework, highlighting how they can support design prototyping in public/social domains and policymaking.

### **The concept of Co-definition: challenging status quo through prototyping**

Enactivism describes the mutual shaping between organisms and environments through *co-definition*, i.e. the circular constraining of minds and environments (Di Paolo, 2018), thus confirming, through a cognitive science perspective, the active role of users in the use of artefacts. Co-definition implies that cognition and perception emerge in individuals only by interaction with their environment, which is both physical and social. At the same time, the emergence of an individual's mind is not linearly determined by the incoming stimuli. The reception of stimuli from the environment depends on individuals' self-organisations. It follows that cognition and perception are always potentially creative processes rather than mere recognition and representation of external objects (Varela et al., 2016).

The enactivist framework helps us to change how we conceive design prototyping activities. The continuative use of the same artefacts impacts the self-organisation of an individual's cognition (Kirsh, 2013). Such *'incorporation'* of tools is not automatic and depends on repeating interactions between the subject and the artefact. It represents a learning process, which also entails a profound shift in the user's mind since it changes the boundaries of what is thinkable and perceivable. Enactivism provides a strong argument for the power of design prototyping to disrupt perceptions at the micro-level through bodily and aesthetic experience (Wetter-Edman et al., 2018), which in turn might be the first step to invite stakeholders to challenge the status quo in the public sphere.

### **Design as social learning and co-definition processes**

The SLTI framework has been applied to professional design settings, describing 155 social learning processes within wider innovation networks (Stewart & Williams, 2005).



In contrast to the claim that designers inscribe a defined set of affordances within artefacts, SLTI has pointed out that innovation should be conceived as a continuous integration of choices outside of design and engineering laboratories (von Hippel, 2009). By considering innovation as designers' prerogative, the user-centred design theories have not entirely overcome a deterministic and linear view of innovation (Woolgar, 1991), thus missing the possibility of understanding innovation processes in broader social contexts (Bogers & West, 2012).

SLTI presents interesting affinities with the concept of co-definition from Enactivism. STLI opens new insights about the continuity between professional design and socially diffused innovation. From such a perspective, designers inscribe in artefacts a spectrum of the possibilities of affordance rather than a closed set. During diffusion, some affordances of the such spectrum are suggested to users through other channels, like printed instructions, training programs, organisational routines, etc. These explicit affordances are the more likely to be used. However, drawing on Enactivism, the affordances that the artefact furnishes to users depend ultimately on the specific co-definition enacted by the latter with their environment. It is such a process of co-definition that allows users to activate artefact-dependent 'sleeping' affordances or even create new ones.

These perspectives support the idea that design prototyping in the public/social sphere is an effective way to collectively explore and learn about a public issue. Prototypes offer more possibilities to non-expert stakeholders to take an active and creative role in the design of a policy, due to the capacity of prototypes to open different paths for co-definition to which stakeholders can react.

### **Design prototyping as a strategy to impact policy learning**

Research has already highlighted how prototypes can be understood as tools through which professional designers reflexively orient their agency (Dalsgaard, 2017). Such role of prototypes is pointed out also in the case of team or participatory work: different expertise and points of view can interact successfully through the shared playground represented by a prototype. Indeed, research has widely recognised prototyping as a tool to synchronise a team, focusing teamwork towards realising a precise output (Star & Griesemer, 1989; Vinck & Jeantet, 1995).

Drawing on enactivism, prototyping is so effective because it allows designers to experiment with different kinds of co-definition with the environment in a rapid and trial-and-error manner (Kirsh, 2013). In this way, designers can purposely challenge what participants think and perceive, stimulating the emergence of new possibilities and ideas. The use of prototypes helps designers not only notice new affordances but actively create new ones that did not exist before the very creation of the prototype.

In policymaking, prototypes can become tools that designers use for translating between tacit experiential and professional knowledge into policy frameworks. As experiential knowledge of policy workers and civil servants is essential to translate high-level directives into actual policies and services (Maybin, 2016), design prototyping could be strategically used to increase the degree of possible choices in front of policy makers, and to integrate perspective from stakeholders active on the operational level.

## An example from practice: prototyping a data-centric system for food donation

In this section, we provide an example of design prototyping practice from the experience of one of the authors, intending to provide a clear context in which our argument applies.

The example described was part of “La Cucina Collaborativa”<sup>1</sup>, a citizen engagement project jointly developed by The Design Policy Lab (DPL), a research lab at the Department of Design (Politecnico di Milano) and Caritas Diocesana Reggio Emilia – Guastalla, a charitable organisation based in the city of Reggio Emilia (Italy). From September to December 2021, “La Cucina Collaborativa” took place in Reggio Emilia as a co-design process of circular solutions against food waste, involving more than one hundred individuals of a charitable food donation system (including diners, volunteers, representatives of food donors companies and public servants).

The rapid prototyping session represented the last steps of a broader co-design and involvement methodology that aimed to improve the food donation system delivered by Caritas against food waste. The session lasted only one afternoon and was designed by the DPL staff to refine and get feedback about one of the ideas that emerged in earlier ideation stages, involving only Caritas’ staff and volunteers. The idea prototyped had emerged previously due to stakeholders’ interest in improving the food donation systems through digitalisation and better use of digital data. The idea proposes to optimise the logistics of donated food according to the nutritional profile data of beneficiaries thanks to food warehouse management software and to customise the packages with appropriate food and specific messages from food donors (sent through QR codes on the packaging) (fig. 1).



Figure 1: Pictures from the rapid prototyping session held within La Cucina Collaborativa. Physical and digital mock-ups were used to visualize a fictional logistics dashboard interface and the packaging with the QR code.

<sup>1</sup> The project was funded under the call “Cross-KIC New European Bauhaus Call for Proposals for Citizen Engagement published in 2021 by EIT Food as part of New European Bauhaus. More info are available at [www.designpolicy.eu/cucina-collaborativa](http://www.designpolicy.eu/cucina-collaborativa)

The prototyping of the envisioned data-centric food donation system was a way to explore a broader design opportunity area, i.e., the digital innovation of food donation, rather than the specific idea *per se*. The prototypes allowed participants to comment on the social acceptability of the proposed technological solutions, also based on their tacit and experiential knowledge as volunteers. In particular, volunteers were keen to point out that the data-centric solutions envisioned were assuming a notable level of transparency in the system, which could clash with the social stigma they knew was felt by many among the people resorting to food donation.

## **Conclusions: designers as conscious players in public sector prototyping**

Applying the enactivist concept of *co-definition to prototyping* activities enriches the definition of design as a social learning process. Enactivism highlights a difference between professional designers and other social settings of innovation.

Design practices seem to be more aware and prepared to take advantage of the deep reflexivity, i.e. co-definition, that happens during interactions between humans and artefacts. Designers can envision to policy stakeholders future possibilities through prototyping and affordances and challenging existing institutional boundaries (Vink et al., 2017). However, in line with the SLTI framework, the difference between professional designers and users appears to be just a matter of degree; or, in other words, a more developed expertise of the strategies and resources needed to trigger reflexivity in participants of collaborative work.

On the basis of the analysis proposed here, we conclude by advancing three open points that can support the emerging innovative perspective on design prototypes in the social and public domain and for policymaking:

- 1) Within policymaking and public sector settings, designers should act as conscious players of institutional and political dynamics. The attention usually given by designers to non-designers as active actors in prototyping should enlarge the broader systems of governance and social structures surrounding the context of prototyping. In this sense, designers must be increasingly trained with the same soft skills and knowledge common among civil servants and social workers.
  
- 2) To point out the expertise of designers as only incrementally different from non-designers and, in parallel, to point out that professional design expertise involves an enhanced capacity of reflexively interacting with experimental artifacts, essentially means that *designers are trained into forms of knowledge connected to materiality*. The tendency to de-materialise the object of design has hindered one of the main tenets of design contribution to the social and public sphere. Dissipating the object of design may unwarrantedly suggest that design could contribute to these areas through an overly disembodied approach to cognition, leaving outside the importance of material culture and aesthetic knowledge (Wetter-Edman et al., 2018). The connection between broad governance and political levels and materiality should be something that is not only understood in experimental and artistic environments but also in rapid prototyping for collective public settings.

- 3) To envision a new theoretical framework on the use of design practices in policymaking, which would defend an important degree of autonomy for social actors' agency, while at the same time avoiding to postulate a radical individualist conception of agency, as in neoliberal policies (Fraser, 2011).

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