VOLUME 14 ISSUE 4

The International Journal of

Design Management and Professional Practice

Sounding the Fuzzy Edge between Research Insights, Design Hints, and Design Concepts

MARGHERITA PILLAN, LAURA VARISCO, AND MILICA PAVLOVIC

COMMON GROUND

DESIGNPRINCIPLESANDPRACTICES.COM

The International Journal of Design Management and Professional Practice
https://designprinciplesandpractices.com
ISSN: 2325-162X (Print)
ISSN: 2325-1638 (Online)
https://doi.org/10.18848/2325-162X/CGP (Journal)

First published by Common Ground Research Networks in 2020
University of Illinois Research Park
2001 South First Street, Suite 202
Champaign, IL 61820 USA
Ph: +1-217-328-0405
https://cgnetworks.org

The International Journal of Design Management and Professional Practice is a peer-reviewed, scholarly journal.

Common Ground Research Networks, a member of Crossref

Sounding the Fuzzy Edge between Research Insights, Design Hints, and Design Concepts

Margherita Pillan,[1] Politecnico di Milano, Italy
Laura Varisco, Politecnico di Milano, Italy
Milica Pavlovic, Katholieke Universiteit (KU) Leuven, Belgium

Abstract: Within the last three decades, we have witnessed development of many theories on design approaches that render the process more solid and, thus, practiced by non-designer professionals. What is common for all of the design processes is that there is a moment of translation of research insights into design recommendations, and this point, however, has never been very explicit and it is rather seen as a fuzzy edge between switching between two activities. Within this article, we focus on this fuzzy edge reasoning to the extent this point can be demystified and explicit, or when it should remain fuzzy, reflecting on creativity and importance of engaging design professionals within the process. The discussion is based on a case study of students' works from the UX Design course taught by the authors, where we refer to design tools as tangible concrete support that renders the design process more solid.

Keywords: UX Research, Research Insights, Design Hints, Design Process, Design Tools

Introduction

The term "User-Centred Design" (UCD) originated in Donald Norman's research laboratory at the University of California San Diego in the 1980s and became widely used ever since (Norman and Draper 1986; Norman 1988). These works fed the growth of UCD, which we are focused on, and in particular the thing being designed (e.g., the object, communication, space, interface, service, etc.), looking for ways to ensure that it meets the needs of the user (Sanders 2003). In the context of UCD, the role of the designer can be seen as the one who conducts research on users and interprets the findings through a set of recommendations for the design concept. The designer, thus, empathizes with the users of the design projects and acts as an advocate, i.e., the voice of the users, within the project phases and among all the stakeholders involved. The term design empathy, in fact, has been used in the field from the 1990s for depicting the actual role of designers and user researchers (Battarbee and Koskinen 2005). The designer's predisposition to feel empathy toward the people for whom he/she designs is due to the sensitivity toward social issues, the culture in the artistic and communicative fields, and to the specific training for this profession.

UCD implies engaging and involving designers in the understanding of end users within a creation of a design concept (Carr-Chellman and Savoy 2004). The engagement could be done through many diverse stages of the design project, from novel concept generation to evaluation of an existing product. The design process has always reflected and considered ongoing societal needs, and we can find these streams happening long before the paradigm of experience emerged in the realm of the industry for digitized products and systems, all the way back to the Italian tradition on design and to the architectural designers working within the boundaries of wants and needs of the new house owners (Hooper 1986).

Designers have always recognized the role of knowledge deriving from research in supporting a suitable design process (Cross, Dorst, and Roozenburg 1992; Cross 2011). Long before the digital era, Munari (1981, 1977) clearly recognized the importance of conducting

[1] Corresponding Author: Margherita Pillan, Dipartimento del Design, Politecnico di Milano, Via Durando 38a, 20158, Milano, Italy. email: margherita.pillan@polimi.it

The International Journal of Design Management and Professional Practice
Volume 14, Issue 4, 2020, https://designprinciplesandpractices.com

ISSN: 2325-162X (Print), ISSN: 2325-1638 (Online)
https://doi.org/10.18848/2325-162X/CGP/v14i04/23-39 (Article)

research on human factors to understand the requirements of users, and he considered it as preliminary to any further design activity. The author referred to investigations of physical, psychological, geographical, as well as historical context characteristics. During last twenty years, especially with the development of Interaction Design (Preece, Rogers and Sharp. 2002), studies on users have become more structured and increased their impact on the definition of design strategies and decisions.

Design research includes a variety of approaches, methods, and techniques that have been developed to produce design-oriented knowledge about end-users, including quantitative and qualitative approaches, and dedicated tools for envisioning the outcomes. We focus here on the importance that, progressively, both design and management refer to the research in the decision-making processes. Norman and Verganti (2014) observe that the concept of research takes two different forms in the design field; one relates to advancement of knowledge and development of theories related to the field, while the other relates to collection and analysis of data for a better understanding of a topic. Design-oriented user studies aim to inspire innovation by intercepting human needs, wishes, and motivations. The flourish of digital technologies enables the blooming of innovative ideas and feeds the generation of concepts for innovative services and products. In the jungle of potential novelties, it is often very difficult to recognize promising and worthy solutions from explorative concepts, exercises of fantasy, and trifles. Industry managers refer to the outcomes of user research to reduce the risks of failure, and to optimize products and services while maximizing the potential number of customers. Even though design research has always been present in design processes, the decision-making within it has changed: the definition of industrial strategies and the proposition of novel concepts in the market is seldom based on the intuition (implicit knowledge) and reputation of the designer, and it relies instead on explicit and evidence-based information on individuals, on sociographic groups, and social communities.

Design research is fundamental for all industries working on the global markets, providing the necessary knowledge to feed, maintain, and evolve the relationship with users and customers; this is the ground for user experience (UX) designers, and for the specialized competences of knowledge extraction and envisioning (Patton and Economy 2014).

The outcomes of research are used as inputs for design concepts, and derived data is used as a starting point for laying out and envisioning potential novel solutions. The Design Thinking process (Cross 2011) considers research as a fuel for generating design concepts; furthermore, the availability of sound data should reduce the risks of failure, and the aim of reducing the uncertainties of innovation justifies the required investments.While the research methodologies evolve and become more robust and efficient, the design process seems to move toward a rational and quasi-scientific stream. Is that really so?

The Fuzzy Edge

The conceptual scheme of the design thinking process as reported by the Design Council (see Figure 1) is nowadays a standard for design-driven innovation. In a very simplified way, we can approximate the design research as the tangle of activities performed in the left-side diamond of the scheme: bringing from vague intentions to the definition of a clear design brief, specifying the Who, What, Why, and How to be designed. This first block includes mainly four tasks: (i) collection of data and information; (ii) processing of the gathered information to extract the useful insights (Morgan, 2017); (iii) envisioning and synthetic representation of most meaningful insights to be shared within the stakeholder system, and (iv) discussion, assessment, and decision making bringing to block 2. These tasks do not necessarily follow a linear flow, depending on the complexity of the project goal and environment, and on the level of innovation.

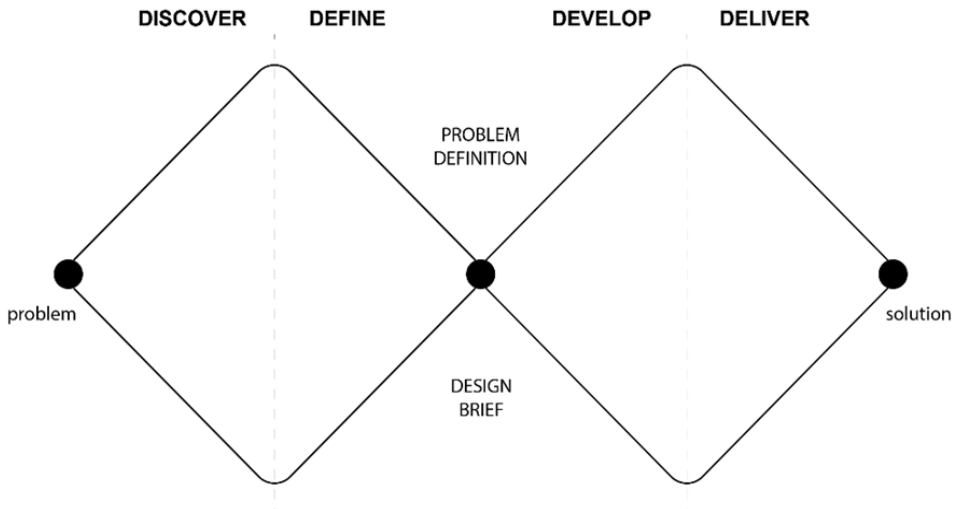


Figure 1: Conceptual Scheme of the Design Thinking Process Defined by the Design Council
Source: Design Council 2007

Most literature dedicated to the design thinking approach (Plattner and Meinel 2009) focuses on tasks and on the envisioning of the insights, but we argue that the job (and the responsibility) of extracting the meaningful insights out of the raw information is still not sufficiently evident, and it now represents a sort of a fuzzy or even obscure filter, possibly impacting on the soundness and reliability of the whole process. Furthermore, we point out the importance of bringing this transition under a magnifying lens in order to evidence common practices, understand implicit activities, and bring them to a conscious level so to make the process more effective or even more efficient.

We believe that it is significant to unravel the transition from insights to the definition of design hints as a contribution to design practices that are in constant fast-pace evolution; furthermore, the understanding of this design phase clarifies the unique contribution design professional figures bring to the table in multi-stakeholder projects, and it supports the identification of suitable contents for design education.

We remark here that in Design Thinking, research does not substitute the process of creativity and creative making itself; we believe in the importance of identifying the contribution of creativity in the process. However, it is also important to note that the outcomes of research can have a significant impact on creativity and decision-making processes, sometimes reducing the space for creativity within the frame defined by the research outcomes. Even though the decision-making process within the design field has changed toward being transparent, explicit, and compressive enough to be developed through a joint group effort, it is not stripped to a mere reduction toward ideas and concepts that do not overlap in total with research findings. To avoid this sort of a reductionism in design, we point out the importance of dredging the fuzzy zone between the collection of research insights and the generation of design hints. The “fuzzy edge” we refer to, thus, is the process of translating the insights deriving from design research and leading toward a definition of design hints that will further be used as a backbone for shaping final design concepts.

Research Objective

The authors of this paper conduct research in the field of UX Design and teach courses in this field. This work aims at investigating the fuzzy edge present within the design process, as it distinguishes the practices of design research employed within the marketing management and the design field. The fuzziness is an attribute of design practice, and we opt for the hypothesis that the design process can be rendered solid, transparent and repetitive only to a certain extent. The aim of this research is to make explicit the process of translating research insights into design hints, and further the generation of design concepts. We aim to reason on the extent to which it is possible to have very structured design processes, and which are the aspects of the design process that (need to) remain fuzzy.

Research questions that we address in this article are the following:

- What are the potentials and limits of user research within a design process?
- What can be rendered as more explicit on the fuzzy edge in translating research insight into design hints, and what remains fuzzy?
- What is the relation between research insights and creativity?

In order to respond to these questions, we base our discussion on case studies deriving from our teaching experience at the course for UX Design with master-level students at the University Politecnico di Milano. This education experience provided the opportunity to investigate different paths on the transition from insights to hints and supported the discussion reported in the following sections.

Framing the Fuzzy Edge: Case Study of a Teaching Activity

The students' curriculum for the master's course in Digital and Interaction Design at Politecnico di Milano includes a basic course of UX Design that provides the students with the tools and the methodology to approach UCD practices. The objective of the course is to set the basis for extracting knowledge from user research and envision new scenarios, nourishing the creativity of designers in formalization of meaningful solutions. The case study we present refers to the UX Design course carried out during the first term of the academic year 2019/2020. The students received a very generic brief from a partner company, which is designing digital interactive solutions addressing activities that could relate to banking and money management for GenZ. At the end of the course, each of the students reported the whole process in a written document comprised of personal thoughts and apprehensions regarding the whole of design phases from the research to the concept prototyping and validation, and regarding the tools they employed during the course. We consider this educational activity as a valuable source of knowledge for understanding how designer's creativity is driven and supported by user research through the use of tools that: i) help students in organizing, clustering and synthesizing the insights coming from desk and field research; ii) make sense of all the knowledge acquired so to formalize design hints; and iii) support the decision-making process that leads to formalization of the final solution concept. By analyzing both the activities conducted in class and the final report provided by students, as representations of the process of concept creation from insights coming from user research, we defined a model that we propose in Figure 2.

The model we propose frames the formalization of design hints from the insights gathered through user research, considering the hints as a nourishment for the generation of solutions. It further points out the phases in which design tools are used as support for the working process.

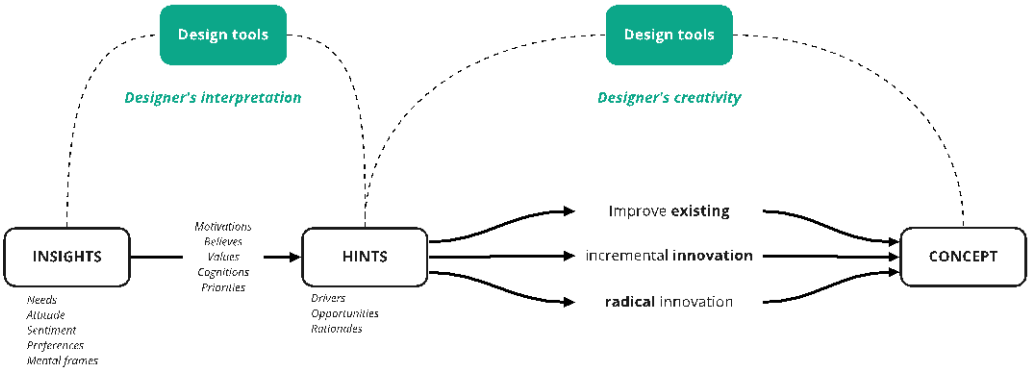


Figure 2: Conceptual Model Representing the Diverse Working Phases from Research Insights to Design Concept Generation
Source: Pillan, Varisco, and Pavlovic 2020

When it comes to fueling insights that further lead to design hints and generation of design concepts, designers deal with different sorts of data. They face the management of a variety of heterogeneous and large amounts of data coming from desk research and field research. This includes raw and massive data gathered from a large population aggregated into statistical indexes, but also specific, local and singular data including very personal information collected on restricted samples of people. These diversified typologies of data include accurate descriptions of physical and socio-cultural features and elements of paradigmatic stories that nourish the process of knowledge creation.

Desk-based research refers mostly to reviewing the literature deriving from different relevant sources, thus it implies research based on secondary data rather than collection of new data. Such research relates to many different types of reviews: literature review (critical and state-of-the-art); systematic review as meta-analysis, qualitative meta-synthesis, umbrella; and systematic rapid, scoping, and realist reviews (Robson and McCartan 2016). The output of desk research is a comprehensive acknowledgment of the current situation in terms of technological and social trends and resources.

Field research, instead, aims to explore potential users and target group's everyday activities and practices through the collection of primary data conducting interviews, participatory observations, shadowing, and non-participatory investigation. Such research helps in empathizing with users by comprehending their behaviors, peculiarities, and interactions in their everyday life and specific contexts. Ethnography as a research method has always shown good potential for providing data to be used within design projects (Hughes et al. 1997; Hammersley 2007). It is noteworthy that the natural setting in which ethnographic research takes part can refer both to physical as well as digital contexts in which human activities stake part. Namely, digital ethnography can be understood as a method for representing real-life cultures through storytelling in digital media (Underberg and Zorn 2013).

Making the Fuzzy Edge Explicit: Use of Design Tools as a Support

By analyzing students' activities and their use of design tools, we are able to make the fuzzy edge more explicit and formalize a model of the process taking part. The model helps identifying both procedural elements that can be considered as part of a structured method, as well as elements that cannot be reconducted to a structure as they refer to personal designers' creativity and attitude.

At the beginning of the course, we divided the class in four large groups (around fifteen students each), assigning to each of them a topic to tackle with desk and field research, leaving

them free to explore and decide among different possible approaches for the research and for the interpretation of derived insights. The four topics we assigned relate to users' activities, such as the following: (i) small everyday activities, (ii) shopping experience, (iii) commute and travel, and (iv) activities for personal passions. Many tools are applicable during UCD processes, starting from the ones that support the preliminary research on users and existing solutions to the ones that help designers in visualizing, organizing, and making sense of the data collected during research, and ultimately the ones that allow the design team to represent and envision the user experience with respect to a possible solution.

The main purpose of the use of tools to organize and visualize insights is to make sense of the research and extract the cognitions (Eastman, Newstetter, and McCracken 2001) and relevant pieces of knowledge coming from various and heterogeneous sources. Tagged Tables, Conceptual Maps, Affinity Diagrams, Mental Model Diagrams, and Empathy Maps are able to map together the insights coming from different types of sources such as interviews, ethnography, digital ethnography, and so forth. Mapping tools such as Affinity Diagrams and Conceptual Maps help designers in identifying relevant themes through the clustering according to commonalities, affinities and dissonances. Through the use of Empathy Maps and Paradigmatic Stories, the designers empathize with the people they are researching on by extracting information on their needs and behavior. Furthermore, the designers can integrate an alignment between people's needs and what current solutions provide them through tools such as Mental Model Diagrams, shifting attention to a comprehensive view of socio-technical systems composed by the technological solutions and the people who use them.

Phase of the process that leads to the extraction of hints splits in two different approaches in terms of tools' usage: (i) synthesis of the insights (identified elements referring to needs, attitudes, sentiments, preferences, and mental frames) coming from the research; (ii) envisioning that helps designers in interpreting the knowledge (extracted elements referring to motivations, believes, values, cognitions, and priorities) and giving it a meaning (Figure 3). To start the synthesis, we provided students with the knowledge and instructions about the use of Conceptual Maps, Affinity Diagrams, Empathy Maps, Paradigmatic Stories, and Mental Model Diagrams as possible tools they could take advantage of to visualize and process the insights. However, we gave them freedom of using these tools or other tools they already know and are comfortable with. For the envisioning, we provided them with the necessary knowledge on how to use Personas, Storyboarding, Journey Maps, and Experience Maps, asking them to use those tools only to interpret their knowledge, giving meaning to their insights, and bringing them toward the generation of design hints.

After the synthesis and envisioning, the students had to generate and process design ideas so to eventually come up with a single concept. Each student started the creative phase with an exercise on seed concept generation that led to the re-arrangement, merging and selection of the most promising ones during a collaborative activity. The outcome counted approximately one hundred concepts that were collectively discussed also with the hypothetical client company. In the following, the students have been divided into small groups (around five students each) to better manage the collaboration within design teams. Each group designed and prototyped a single concept using various envisioning tools for the definition of the final solution such as Value Proposition Canvas, System Map, User Identikit (seen as an evolution and refinement of the Personas), User Journey Map (specifically referred to the designed solution), and Service Blueprint.

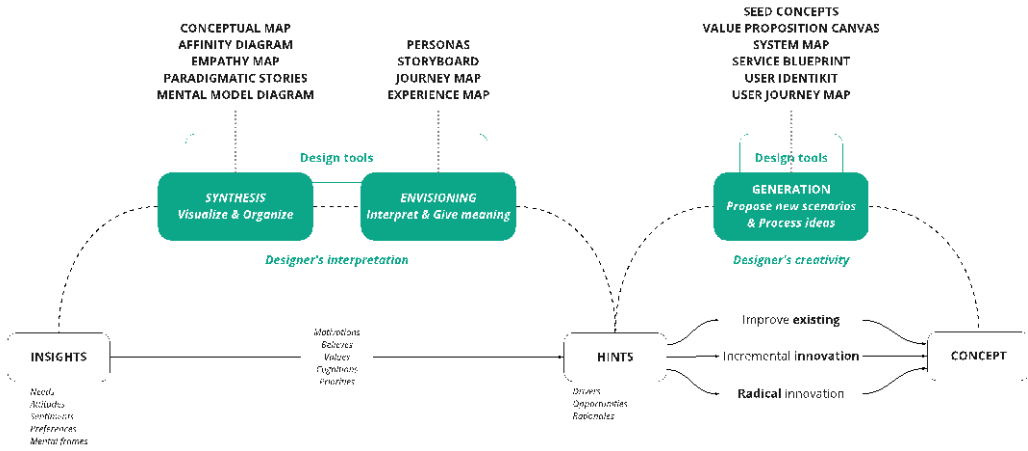


Figure 3: Conceptual Model Representing Diverse Types of Design Tools Adequate for Diverse Working Phases from Research Insights to Design Concept Generation
Source: Pillan, Varisco and Pavlovic 2020

From Insights to Hints

Design tools that support the translation from insights to hints are those that support designers in interpreting the insights from the research into design hints, by analyzing motivations, beliefs, and values and mapping them on tangible features of the design solution. According to the Cambridge English Dictionary, the noun "insight" implies (the quality of having) an understanding of something.[2] More precisely, it is a clear and deep understanding of a complicated problem or situation, which synonym is the noun "knowledge." The noun "hint," instead, implies an indirect suggestion of a thought or feeling. Hint stands for a statement that passes on information without giving it openly or directly, it is seen as a helpful suggestion. Synonym is the noun "advice," as it can be seen as a piece of advice which helps one to do something, thus implies providing recommendation for undertaking further action.

Design professionals interpret the research data by shaping insights on needs, attitudes, sentiment, preferences, and mental frames toward the design product. Within the design research field, insights are found to be more than observations or statistics, as they tell us not what people do, or when, but why they do something (Zalla 2014). Insights are the knowledge used to produce hints and inform the design process; they are the evidence that justifies the choices in the contexts in which one seeks for an objective choice. Hints are found to be generated recommendations for guiding and shaping the design concept. They are, thus, drivers of the design process and development of design concepts, and they are design opportunities that can be tackled further on within the design team workflow.

Bridging from insights towards hints happens through interpretation from the side of design professionals. When designers apply user research as a source of insights for the creative process, they end up having a huge amount of information coming from traditional and digital ethnography and from qualitative and quantitative data collected during desk research. The nature of this information is scattered, heterogeneous and messy. Designers face the need to organize and cluster all the data they got summarizing the insights, thus creating the base for further interpreting and exploiting the synthesized knowledge.

[2] https://dictionary.cambridge.org/. Accessed March 25, 2020.

The four groups of students approached the use of tools to formalize hints through different strategies. In this phase dedicated to synthesis, all of the groups followed the inferential path of organization, simplification, clustering and formalization. However, the specific tools they used to follow this path were different for each group (Table 1). They started with a systematic organization of all the information following a path from the scattered data to an organized and selected knowledge through an iterative process of tagging, re-organization and linking of different insights. Starting from the scattered and messy information collected during desk research, the teams organized the information through mapping of insights in order to create comprehensive knowledge.

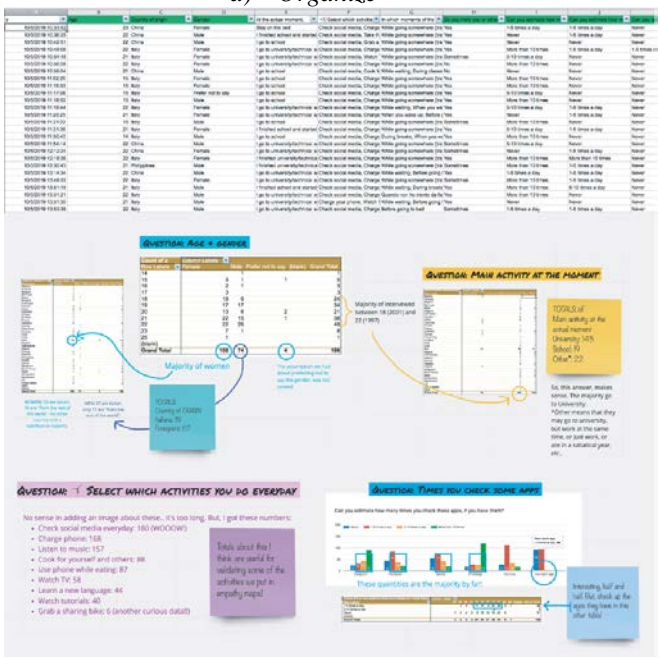
Group 1 structured its path using a Tagged Spreadsheet to organize the insights while Empathy Map has been used with a double purpose. First, the students used it as a tool to structure all the insights gathered in a Comprehensive Map creating a web of connection between elements, then they clustered the elements splitting them into four different maps according to the connection they identified, for representing the different situations that emerged. They created a Paradigmatic Story for each of the clustered Empathy Maps inserting the various elements as a formalization of the synthesis of elements deriving from the research. Differently, Group 2 decided to organize the insights in a Conceptual Map starting the activity of connecting elements at an early stage. Also Group 3 decided to organize elements though a Conceptual Map, however, instead of using the Empathy Map as a support for the simplification of the elements, this group selected and re-organized the elements of the Conceptual Map. Group 4, even though following the same strategy as Group 1 for the organization and simplification of elements, decided to directly cluster the elements through Paradigmatic Stories.

Table 1: Design Tools Used by Students for the Synthesis of Research Insights

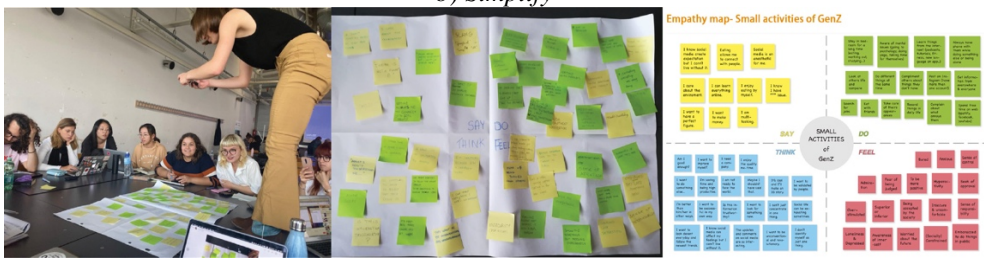
	Organize	*Simplify*	*Cluster*	*Formalize*
Group 1	Tagged Spreadsheet	Comprehensive Empathy Map	Clustered Empathy Map	Paradigmatic Stories
Group 2	Conceptual Map	Comprehensive Empathy Map	Clustered Empathy Map	Paradigmatic Stories
Group 3	Conceptual Map	Simplified Conceptual Map	Clustered Empathy Map	Paradigmatic Stories
Group 4	Tagged Spreadsheet	Comprehensive Empathy Map	Paradigmatic Stories	

Source: Pillan, Varisco and Pavlovic 2020

a) Organize



b) Simplify



b) Cluster

c) Formalize

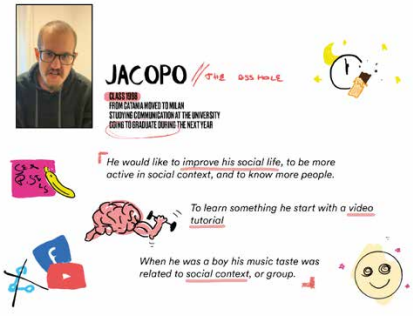


Figure 4. Working material and tools used by Group 1: a) Tagged spreadsheet and its analysis; b) Comprehensive Empathy Map from paper to digital version; c) One of the Clustered Empathy Maps; d) One of the Paradigmatic Stories. *Source: Chen Y., Noseda, Minazzo, Deplano, Zhang, Mannarino, de Denaro, Stevenin, Chen L., Gargiulo, Sun, Saravia, Citterio, Alessandrello, Im 2019*

During the envisioning of research outcomes, the design team conceptualizes design drivers, opportunities and rationales to consider during the following concept generation phase (see Figure 3). Starting from the formalization of archetypes for targeting the solution, different identified elements of complexity are progressively added: the activities that these archetypes perform, the touchpoints and technological elements of the socio-technical systems, and the emotions referred to the activities. In UCD great importance is given to the identification of Personas and the related Journey and Experience Maps. These tools allow designers to: (i) envision the opportunities and synthesize the problem to solve and/or the space for innovation; (ii) communicate the results of the research to the clients and stakeholders; (iii) formalize and define the rationales that will help in decision making in next phases.

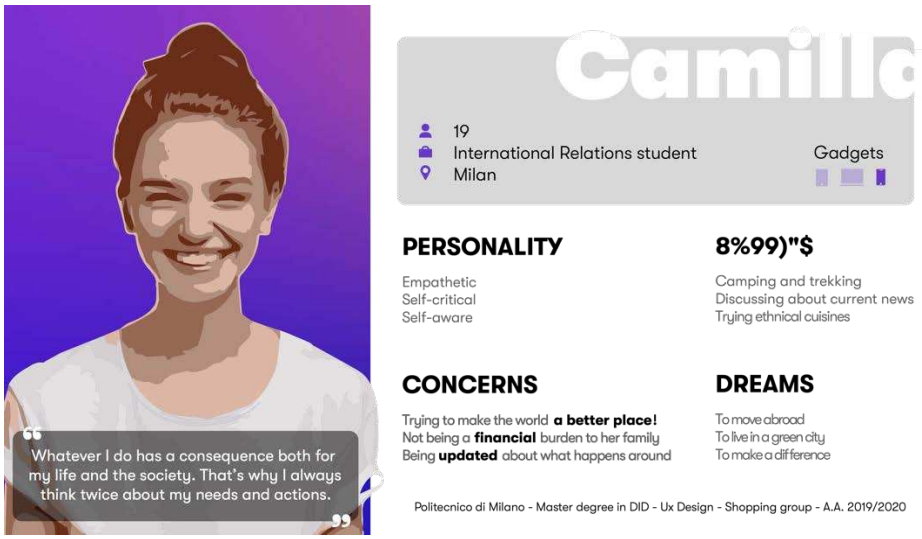
For this step we asked students to use the provided tools only to follow the path of envisioning. However, we did not indicate them to follow rigid steps and we gave them freedom to include elements in the tools they consider suitable for their scope. As reported in Table 2, while all the students used Personas to define the archetypes of the target for the solution, the majority of the groups decided to use Journey Maps to represent the activities and functions of their concept including touchpoints and emotional states. Only Group 2 used Storyboarding as representation for the single activities and created Journey Maps later on to add touchpoints and emotional states to the activities.

Table 2: Design Tools Used by Students for the Envisioning of Hints

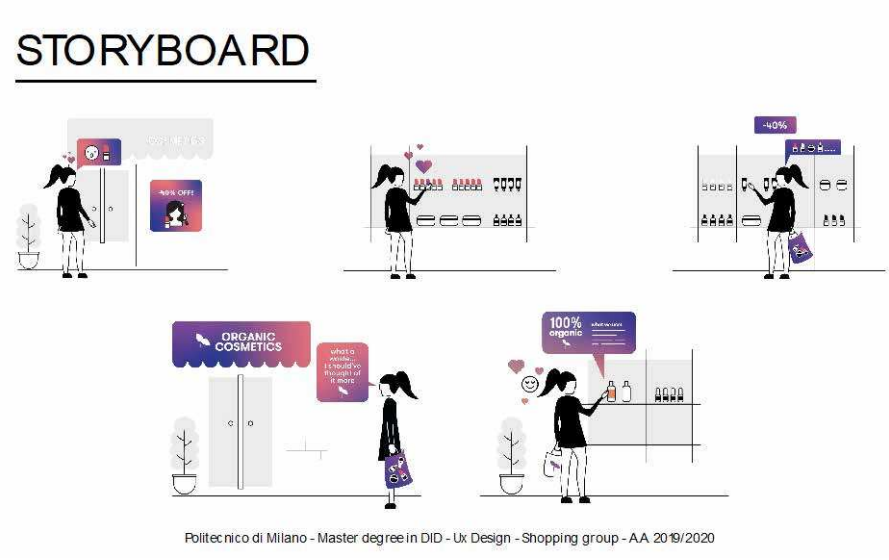
	Archetypes	*Activities*	*Touchpoints*	*Emotions*
Group 1	Personas	Journey Map		
Group 2	Personas	Storyboard	Journey Map	
Group 3	Personas	Journey Map		
Group 4	Personas	Journey Map		

Source: Pillan, Varisco and Pavlovic 2020

a) Archetypes



b) Activities



c) Touchpoints - Emotions

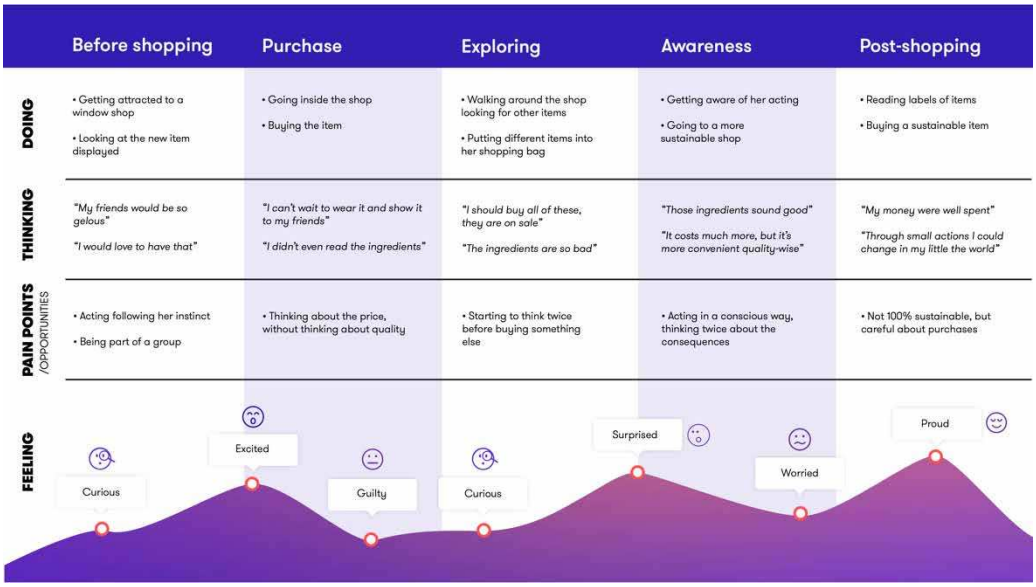


Figure 5: Envisioning of Hints by Group2: a) One of the Personas; b) Storyboard; c) Experience Map.
Source: Andreani, FAulenta, Chen, Cinelli, Dayyani, Fazio, Fesce, Ivanova, Landra, Lezzani, Mete, Narayanaswamy, Re, Sorrentino, Tobia 2019

Contriving and Managing Design Research Outcomes

The phase of synthesizing and envisioning, that leads to the definition of design hints, can be seen as the management of the socio-technical elements that take part in the complexity of phenomena observed and recorded in the form of insights. In the process of excerption of meanings from this complexity, the designers face not only the large amount of the insights

coming from the research, but also their interconnections and relations. Tools have a key role in this phase helping the designer in facing this complexity by visualizing extrapolated concepts and their interconnections and relations. Furthermore, tools allow organization of the results and identification of valuable clusters and topics, and ultimately, they give form to the drivers, opportunities and rationales through envisioning. The conceptual scheme that represents bridging between design research and concept generation becomes tangible in practices through the usage of design tools. Embodiment of communication among design team members happens through tangible concrete tools. Within the project, the tools are used not only to synthesize the knowledge and envision the opportunities, but also to sequence, track, and analyze progress (Patton 2014).

From our observation and analysis of the teaching activity some reflections on contrivances to manage complexity have emerged: (i) the identification of contradictions between insights; (ii) the evaluation of the relativity of the evidence; (iii) the explication of correlations; (iv) the traceability of the inferences; and (v) the active role in team communication.

Rendering Explicit the Contradictions

Within the synthesis part of bridging the gap between insights and hints, the tools allow to make explicit, identify, and clarify contradictions between insights. These contradictions depend on the reference of the data as well as the context of the observation. In the context of our educational activity, one of the student groups faced the contradiction between the evidence coming from desk and field research that claimed that GenZ representatives often declare themselves as depressed, sad, and anxious. Further investigation through digital ethnography pointed out that they frequently use hashtags related to negative feelings such as depression when posting content that is actually not expressing any sadness, depression, or anxiety. They were using sad words as reinforcement for sarcastic or even funny contents. Therefore, we noted that exploration of the incoherencies in this case can lead toward development of deeper and more meaningful understanding of the phenomena. Design tools here assisted designers in revealing the tensions that reside in the complex modelling of the hints by highlighting the contradictory information, constraints, and goals.

Evaluating Data Relativity

In the presented case study, a set of key insights emerged related to the attitude of younger GenZ representatives toward sustainability. Several sources confirmed the attention of GenZ toward climate change and the importance of the preservation of the natural environments and resources. While statistics are quite eloquent to this respect, the adhesion to the sustainability values is too vague to provide sound hints, and it required further investigation. We noted that the nature of the data collected can be relative to the group of representatives in question that are the primary source: not all the data can be considered as “true” for the whole targeted group, and neither “true” in every condition. While using the tools to synthesize the insights, the designers consider the data relativity as a discriminant that can increase or decrease the very value of the data. Designers should consider the fast evolution of contexts and people by recognizing different types of insights, differentiating native and permanent characteristics of people and contexts from the contingent and temporary ones.

Finding Correlations

One of the main utilities of design tools is their ability to support the identification of correlation and interconnections between heterogeneous insights. In fact, during the teaching course, all the synthesis approaches started with the organization of the knowledge (Tagged Spreadsheets and Conceptual Models) and then its simplification (Simplified Conceptual

Models and Comprehensive Empathy Mapping) supported by the visualization of connections among the pieces of information and their mutual relations. The formalization of the web of conceptual connections is the main driver for identification of clusters that the team can refer to for further developments and decision making.

Keeping Traceability

Cross (2011) observes that visualizing ideas through sketching provides a temporary, external store for tentative ideas, and supports the 'dialogue' that the designer has between a problem and a solution. While making decisions among different possible options and choices, the design team has to assure that identified user needs and values are addressed. The act of materializing the entire process through the use of design tools creating tangible (or at least visible) outputs is key in keeping the traceability of the design process inferences. During the whole working process, the designer can go back to previous phases to verify that the decisions are made following evidence, identified needs and values, and/or considering the rationales formalized through the synthesis and sense making of the insights. Moreover, while for the designer there might be sometimes no need of tracing back the source of information, it is also true that stakeholders and clients could express the need of knowing why certain decision has been made and where the decision discriminant comes from. Tools as track keepers are, thus, useful for the designers to justify and reinforce the design choices with the client and the stakeholders, making the whole process more robust and objectified.

Communicating among Team Members

The complexity of the design process has to do also with the alignment and communication of thoughts among the team members. Even though designing for experiences aims for an intangible final product, it still requires some defined steps of the design process, to be established for supporting a creation of a common and shared language in this field (Buxton 2007; Erwin 2013). It is to note that drawing has always been the main tool for expression within design projects, where it is employed as a communication of reasoning and analysis of a design issue. The tools, seen in this perspective, are a support for the alignment and communication among the design team members, enabling the internal dialogue and reinforcing the cooperative decision making. Additionally, tools outputs are explanatory materials that support and advocate for the solidity and coherence of the design process toward individuals external to the design team.

From Hints to Concepts

After defining insights from design research, and interpreting them into hints, the following step within the design workflow (see Figures 2 and 3) is the generation of novel and case-tailored design concepts. Generation of concepts is directly influenced by the type of strategy the working team intends to exploit, as well as the openness towards levels of creativity the team can play with. In regard to these premises, the decision-making process that the design team undertakes directly influences the levels of innovation that the concepts represent.

Norman and Verganti (2014) discuss two types of innovation as incremental and radical. The authors use a metaphor of hill climbing to describe the main difference between the two types. Incremental innovation is attributed to the process in which the design team tries to reach the highest point of the current hill that is being climbed, while radical innovation seeks for the highest hill among them all. Incremental innovation is a process of continuous communication with the users that will lead to enhancement of existing products. On the other side, radical innovation is rooted in the definition of design as "making sense of things" (Krippendorff 1989; Heskett 2002), but it is also notable that it can be driven by advances in technology as well. In this context, incremental innovation implies improvements within an already set design frame

solution (i.e., "doing better what we already do"), while radical innovation implies a change of the frame (i.e., "doing what we did not do before"). Norman and Verganti (2014) state that both forms of innovation are necessary. Radical concepts bring towards new paradigms and major changes, while concepts of incremental innovation capture further values and potential for improvement. For the purpose of our paper, we take as reference these diverse levels of innovation when bridging from hints to concepts. More precisely, we observe levels spanning from slightly improving an existing product, toward incremental and finally radical innovation within design concepts.

In the educational activity we take as a reference, during the concept generation phase, we encouraged the students to feel free to explore and propose both conservative and disruptive solutions. This activity also enabled the generation of ideas inspired by tacit knowledge gathered by the students as individuals during the research. In fact, we recognize that the processing of information within the group has an impact on the filtering and organization of the final research outcomes. This phase of the process is supported by the use of diverse envisioning tools like Seed Concepts, Value Proposition Canvas, System Map, Service Map, Service Blueprint, User Identikit, and User Journey Map. These tools emphasize the main and secondary sources of value associated to the proposed solution and clarify the strategical approach in terms of innovation levels. Diverse motivations for using these tools within this design phase are underlined in Table 3.

Table 3: Purpose of Design Tools Used by Students during the Generation of Concepts

Seed Concepts	Removing constraints to creativity
Value Proposition Canvas	Defining the goals and strategical approach
System Map	Identifying involved actors and socio-technical context elements
Service Blueprint	Defining inner elements and single touchpoints of the entire service
User Identikit	Refining and improving the target user archetypes
User Journey Map	Exemplifying the experience of interacting with the solution for achieving the goal

Source: Pillan, Varisco, and Pavlovic

In the educational activity we are referring to, we organized two events for the presentation and discussion of the almost hundred seed concepts generated by students: one as a peer-to-peer validation activity, and one with the company hypothetically commissioning the work. We consider as noteworthy that the company's representatives were (not only) interested in receiving compelling winning ideas by design: the company considered the spread of ideas produced by the students as an opportunity to have an ample overview of the possible solutions that could be taken into account in the search of the most suitable answer to their brief. Furthermore, the company considered as highly valuable the conversation and the debate with the design students, considering them as meaningful interlocutors and scouts of trends and tendencies. In our opinion this situation describes a paradigmatic design scenario for the development of innovative digital services and systems: in the cloud of emerging solutions, design and design research play a role as compasses orienting companies in search of a strategy, and as generators of rationales to be used in strategic choices.

With respect to the role of designers, we wonder about the evolution of the authorial characteristics of the profession in a context that seems to adopt an approach based on the generation/gathering of ideas and selection of best fits. With respect to authorship, we do not restrict to the aesthetic contributions offered by designers, but we consider also the political

impact and the potentials of divergent thinking for the purpose of fostering individual critics and visions in the definition of new design concepts.

Conclusions

In this work we point out the importance of managing the Design Thinking process by making transparent and replicable those activities referred to as design research and requiring a rational approach for orienting design strategies and decision making. On the other hand, we also aim at avoiding the risks of a reductionist simplification in the creation of the new. Design is an activity where sometimes the best solutions can be generated by designers violating the prescriptions coming out from a trivial interpretation of needs and context constraints.

In bridging from insights to hints, we recognize the importance of exploding (dilatate, make more robust, support with tools and methods) what happens in between the interpretation of information and data and the proposition of strategies. We consider this goal as relevant with respect to both the proposed issues: driving design research toward more reliable results and contrasting reductionist interpretation of the role of creativity in design. Indeed, within this fuzzy zone we see an opportunity to unravel the process by investigating and describing exact activities that are taking part. The unraveling and the activities can be put in evidence in a tangible manner by analyzing the use of envisioning design tools that support the design process.

In this work, we focused on two main phases within the design process: the first one is the interpretation of insights coming from the research to formalize the design hints; the second one regards the generation and development of the concepts based on design hints. The investigation of the first phase brings us to the identification of its procedures and mechanisms and helps us in the demystification of the fuzzy edge. The second one, instead, bring us to consider the impacts of the research outcomes in the process of idea generation and the potential limits it poses to creativity.

Demystifying the Fuzzy Edge

In our design practice and in the education programs we are involved in, we stress the importance of complexity of human nature and social environments hosting the design process. The assumption that design research can provide an absolute (intended in the Latin original sense, as *absolutus*, free from any constraint, limit, conditioning) representation of reality is naive and misleading, and authors such as Floyd, Jones, and Twidale (2008), Turner and Turner (2010), and Bordalo (2016) have proposed discussions on the implicit criticalities of the methods and tools commonly employed in research on users. Structured methods for research on users are quite popular among the students, since they correspond to the requirements of the contemporary job-market and reduce the anxiety of being ready for the professional life. To this respect we recognize the importance of the envisioning tools commonly employed to report the outcomes of the research.

Design processes that have a core focus value based on user experience rely on the designer's capacity to consider and balance at the same time: (i) human needs and behaviors, (ii) technological trends and resources, and (iii) strategical constraints and opportunities of a project or business (Tschimmel 2012). The balance is leveraged in a decision-making process for creation of a design system that would fulfil human needs through technological solutions with different levels of exploitation of opportunities. In the search of such a balance, designers should be aware that the selection and envisioning of the research outcomes should not be considered as simple and neutral task, and we point out the importance of introducing some activities in education programs aimed at developing awareness on the criticalities connected to this phase of the design process.

Things That (Have To) Remain Fuzzy

The investigation of activities performed by the design students and the usage of envisioning tools support a conceptual modelling of the design process. In this modelling, we recognize the irreplaceable importance of creativity; the unmissable presence of "gut" decisions and the basic role of empathy. These elements remain fuzzy and rely on designers' personality, individual history and cultural background and sensibility.

The ability of extracting meaningful information and design hints from research evidences is not only made out of pure deductive processes. We consider the importance of developing further studies on the subjectivity of the research outcomes, also exploring the correlation between the mental frames and background culture of designers and the hints generated using same starting information.

Acknowledgment

Part of the contribution of this article comes from the input of students attending the UX Design course of Politecnico di Milano, involved in the presented projects.

REFERENCES

Battarbee, Katja, and Ilpo Koskinen. 2005. "Co-experience: User Experience as Interaction." *CoDesign. International Journal of CoCreation in Design and the Arts* 1 (1): 5–18. https://doi.org/10.1080/15710880412331289917.

British Design Council. 2007. "Eleven Lessons: Managing Design in Eleven Global Brands- A Study of the Design Process." Accessed 11 April 2020. https://www.designcouncil.org.uk/sites/default/files/asset/document/ElevenLessons_Design_Council%20(2).pdf.

Bordalo, Pedro, Katherine Coffman, Nicola Gennaioli, Andrei Shleifer. 2016. "Stereotypes." *The Quarterly Journal of Economics* 131 (4): 1753–1794. https://doi.org/10.1093/qje/qjw029.

Buxton, Bill. 2007. *Sketching User Experiences: Getting the Design Right and the Right Design*. Burlington: Morgan Kaufmann.

Carr-Chellman, Alison, and Michael Savoy. 2004. "User-design Research." In *Handbook of Research on Educational Communications and Technology*, edited by [editor names here], 701–715. New York: Taylor & Francis. https://doi.org/10.4324/9781410609519.

Cross, Nigel. 2011. *Design Thinking: Understanding How Designers Think and Work*. Oxford: Berg.

Cross, Nigel, Kees Dorst, and Norbert Roozenburg. 1992. *Research in Design Thinking*. Delft: Delft University Press.

Eastman, Charles M., W. Newstetter, and M. McCracken, eds. 2001. *Design Knowing and Learning: Cognition in Design Education*. Amsterdam: Elsevier Science.

Erwin, Kim. 2013. *Communicating the New*. New York: Wiley.

Floyd, Ingbert R., Malo Jones, and Michael B. Twidale. 2008. "Resolving Incommensurable Debates: A Preliminary Identification of Persona Kinds, Attributes, and Characteristics." *Artifact: Journal of Design Practice* 2 (1): 12–26. https://doi.org/10.1080/17493460802276836.

Hammersley, Martyn. 2007. "Ethnography." In *The Blackwell Encyclopedia of Sociology*, edited by G. Ritzer, 1479–1483. Wiley Online Library. https://doi.org/10.1002/9781405165518.wbeose070.

Heskett, John. 2002. *Toothpicks and logos: Design in Everyday Life*, vol. 1. Oxford: Oxford University Press.

Hooper, Krishna. 1986. "Architectural Design: An Analogy." In *User Centered System Design: New perspectives on Human-computer Interaction*, edited by D. A. Norman and S. W. Draper, 9–24. Hillsdale: Lawrence Erlbaum Associates.

Hughes, John A., Jon O 'Brien, Tom Rodden and Mark Rouncefield, Steve Blythin. 1997. "Designing with Ethnography: a Presentation Framework for Design." In *Proceedings of the 2nd conference on Designing Interactive Systems: Processes, Practices, Methods, and Techniques*, 147-158. https://doi.org/10.1145/263552.263598.

Krippendorff, Klaus. 1989. "On the Essential Contexts of Artifacts or on the Proposition That 'Design is Making Sense (of Things)'". *Design Issues* 5 (2): 9–39. https://doi.org/10.2307/1511512.

Morgan, Michael. 2017. "What Makes a Good Research Insight Great?" *UX Matters.* June 19, 2017. https://www.uxmatters.com/mt/archives/2017/06/what-makes-a-good-research-insight-great.php.

Munari, Bruno. 1981. *Da Cosa Nasce Cosa* [One Thing Leads to Another]. Bari: Laterza.

Munari, Bruno. 1977. *Fantasia* [Fantasy]. Rome: Laterza.

Norman, Donald Arthur, and Roberto Verganti. 2014. "Incremental and Radical Innovation: Design Research vs. Technology and Meaning Change." *Design Issues* 30 (1): 78–96. https://doi.org/10.1162/DESI_a_00250.

Norman, Donald Arthur. 1988. *The Psychology of Everyday Things,* vol. 5. New York: Basic Books.

Norman, Donald Arthur, and Stephen W. Draper. 1986. *User Centered System Design: New Perspectives on Human-computer Interaction*. Boca Raton: CRC Press.

Patton, Jeff, and Peter Economy. 2014. *User Story Mapping: Discover the Whole Story, Build the Right Product*. Sebastopol: O'Reilly Media, Inc.

Plattner, Hasso, and Christoph Meinel. 2009. *Design-thinking*. Landsberg am Lech: Mi-Fachverlag. ISBN: 978-3-642-13757-0.

Robson. Colin, and Kieran McCartan. 2016. *Real World Research*. Hoboken: John Wiley & Sons.

Sanders, Elizabeth B. N. 2003. "From User-centered to Participatory Design Approaches." In *Design and the Social Sciences*, edited by [editor names here], 18–25. New York: Taylor & Francis. https://doi.org/10.1201/9780203301302.ch1.

Preece, Jenny, Yvonne Rogers and Helen Sharp. 2002. *Interaction Design*. Hoboken: John Wiley & Sons.

Tschimmel, Katja. 2012. "Design Thinking as an Effective Toolkit for Innovation." In *Conference Proceedings of the International Society for Professional Innovation Management* (ISPIM) 1. https://doi.org/10.13140/2.1.2570.3361.

Turner, Phil, and Susan L. Turner. 2010. "Is Stereotyping Inevitable When Designing With Personas?" *Design Studies* 32 (1): 30-44. https://doi.org/10.1016/j.destud.2010.06.002.

Underberg, Natalie M., and Elayne Zorn. 2013. *Digital Ethnography: Anthropology, Narrative, and New Media*. Austin: University of Texas Press.

Zalla, Mary. 2014. "Five Fundamentals of Great Design: Insight." *Landor,* September 15, 2014. https://landor.com/thinking/five-fundamentals-of-great-design-insight.

ABOUT THE AUTHORS

Margherita Pillan: *PhD:* Associated Professor, Department of Design, Politecnico di Milano, Milan, Italy

Laura Varisco: Postdoc Research Fellow, Department of Design, Politecnico di Milano, Milan, Italy

Milica Pavlovic: Postdoc Research Associate, Electrotechnical Industrial Engineering Techniques (ESAT) Unit, Katholieke Universiteit (KU) Leuven, Leuven, Belgium

The International Journal of Design Management and Professional Practice is one of six thematically focused journals in the family of journals that support the Design Principles and Practices Research Network—its journals, book imprint, conference, and online community. It is a section of Design Principles and Practices: An International Journal.

The International Journal of Design Management and Professional Practice explores the organization of design, design work, and design as a professional practice. As well as papers of a traditional scholarly type, this journal invites presentations of practice—including case studies documenting professional practice, accompanied by exegeses analyzing organizational purposes, processes, and effects.

The International Journal of Design Management and Professional Practice is a peer-reviewed scholarly journal.

ISSN 2325-162X