

Design Thinking Methods and Tools for Innovation in Multidisciplinary Teams

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ABSTRACT

Design Thinking (DT), a human-centered approach to innovation, is regarded as a system of overlapping spaces of viability, desirability and feasibility. Innovation increases when these three perspectives are addressed. This position paper proposes DT methods and tools to foster innovation in a multidisciplinary team by facilitating decision-making processes. We discuss how DT methods and tools reflect one or more DT perspectives, namely, the human, business and technology perspectives. We also discuss how these DT methods and tools can support decision-making processes, collaboration and engagement in a multidisciplinary team.

Author Keywords

Design-thinking; design-thinking method; design-thinking tool; innovation; multidisciplinary team.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Design Thinking (DT) is not an easy concept to define. From a designer's or Human Computer Interaction designer's perspective, this methodology incorporates ideation and creative process attributes, such as empathy for the user, and methods like rapid prototyping and abductive reasoning [11]. DT's ability to solve more complex problems, so-called Wicked problems [3], has designated this approach in the business milieu as the best approach for innovation and creativity. From a business perspective, one important component of DT is the establishment of a deep understanding within a team of the targeted users [14]. In this context, the goal of DT is to understand, observe and identify what users want from a product, service or experience [5].

The DT process is regarded as a system of overlapping spaces, in which viability refers to the business perspective of DT, desirability reflects the user's perspective, and feasibility encompasses the technology perspective.

Innovation increases when all three perspectives are addressed. The DT process consists of five stages, namely, empathizing, defining, ideating, prototyping and testing [2]. Empathizing relates to direct interaction with users, on whom the definition is based. The ideation phase includes brainstorming and generating solutions, while the prototype phase implies rapidly making numerous prototypes. Finally, the test phase can also include the final implementation. From a design perspective, it is possible to address DT as the creation of meaning [12] and making sense of things [4]. These standpoints offer an additional understanding of why each of the five stages are important. For instance, empathizing, as an instinctive, emotional, affective, shared and mirrored experience [21], is crucial both when making sense of things and in the creation of meaning. The defining phase in a DT process is a combination of user needs and insight. Both aforementioned perspectives are enriched by the perspectives established in a defining stage. Many design methods and tools currently available attempt to make use of and address the aforementioned stages.

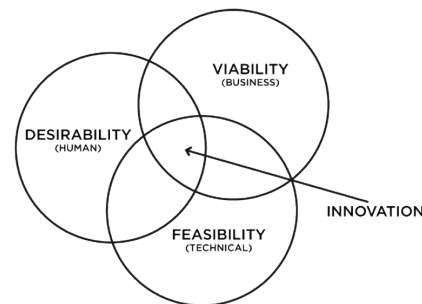


Figure 1: DT innovation as overlapping area [2].

DT can also be viewed as “the application of design methods by multidisciplinary teams to a broad range of innovation challenges” [17]. A large number of design methods and tools facilitate the DT process, and are also supportive of decision-making processes; nevertheless, this aspect has received little attention in DT research. The design methods include, among others, data visualization methods, business model prototyping, innovation strategy, and qualitative and quantitative research. Moreover, companies adopt multidisciplinary teams during DT processes as a strategy to increase teams' performance [23].

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Yet, teams with functional diversity, consisting of, e.g., designers, managers, developers and users, need to make use of multiple forms of communication for efficient problem solving and decision making. This position paper aims to propose DT methods and tools that foster innovation in a multidisciplinary team by facilitating decision-making processes. We suggest a list of DT methods and tools that highlight one or more of the three perspectives previously mentioned (human, business and technology), and we discuss how they support decision making, collaboration and engagement in a multidisciplinary team.

BACKGROUND

Companies and organizations need to innovate in response to the competition and rapidly changing market demands. Harhoff, Henkel and Von Hippel [9] argue that “innovation is often a process to which several actors with complementary capabilities contribute”. Meanwhile, Baregheh et al. [1] focus on multi-disciplinarity and the multi-stage process of innovation. The process of innovation and the way in which it is managed constitute a key strategic issue for companies that rely on multidisciplinary teams. The adoption of multiple design perspectives is, in turn, expected to increase performance in terms of the quality of decision-making or the innovativeness of problem-solving [23]. Moreover, higher degrees of multidisciplinaryity are associated with a broader range of knowledge, skills and abilities available to a team [23]. In the innovation process, models of brainstorming imply that group creativity can benefit from multidisciplinaryity, as brainstorming groups often generate creative and novel ideas, and the group setting is believed to provoke a higher level of cognitive stimulation [6].

On the other hand, DT methods and tools allow teams to make informed design decisions, based on a cyclic, iterative process of prototyping, testing and refining a product, a service, an experience, and the like [5]. A large number of design methods or tools facilitate the DT innovation process. The tools can be physical, such as a pen, paper and whiteboard, or software tools with rich graphics that are supportive of the DT process. The tools can also be used to help the team to adopt a broader perspective on design, to balance the requirements and to visualize the systems' complexity. From a DT research perspective, the research community has not prioritized or properly analyzed decision-making processes. For instance, in the design process, the communicative act is often focused on content and process analysis, while discussions about process and content decisions are underrepresented [19]. Selecting the right methods and tools is thus important for effective decision making and communication in a multidisciplinary team.

DESIGN-THINKING METHODS AND TOOLS

In this section, we present six DT methods, combined with a software tool. The selection criteria for the methods

described below were their strong applicability to DT perspectives, their ability to enhance the communication within multidisciplinary teams and their visualization techniques.

Personas

The persona method can help identify the user's needs and desires. A persona is “a user representation intending to simplify communication and project decision making by selecting project rules that suit the real propositions” [10]. Personas represent a “character” with which client and design teams can engage and which they can use efficiently in the design process. The concept of understanding customer segments with coherent identity was developed in 1994 [16]; since then, the method is used for the development of marketing products, for communication and service design purposes, to reflect the human perspective of DT [20]. Personas can be used during the empathizing or defining phases of DT.

One example of software tools for creating personas is Smaply, a web service that hosts and presents personas and other methods, like stakeholder maps and customer journey maps. Smaply provides numerous options for describing personas, such as ready-made avatars, quotes, options for collaboration and engaging visualizations.

Rapid prototyping

Rapid Prototype (RP) is a quick formation of visual and experiential manifestations of concepts [14]. RP can assist in determining which solutions are technologically possible. Prototypes can be created and quickly tested using the RP method. RP systems emerged in the 1980s and established effective and fast communication as an economical and accessible tool for designers, to materialize and support their ideas [14]. RP can thus support communication in multidisciplinary teams in collaborative settings, such as workshops, by facilitating conversations and feedback regarding solutions for a particular product or service. RP reflects more than the technical perspective of DT, and supports the DT prototype phase, which should be robust and fast.

An example of RP software tools is Axure RP, which provides wireframing, prototyping and specification tools needed for RP. It has a graphical user interface for creating mockups of websites and applications. Axure RP can help users generate fast ideas to immediately improve the design and obtain direct feedback.

Business model innovation

Companies and organizations need to relate their decisions not only to users and technology, but also to the revenue perspective. Business Model (BM) innovation is about exploring market opportunities; the challenge is to define what BM actually entails. The term BM first appeared in 1957, and different reflections on the term have sprung up in different fields [15]. The Business Model Canvas (BMC)

is a visual way of handling a BM and related economic, operational and managerial decisions. Generally, a BMC describes the business logic of an idea, product, or service, in a simple and visual representation. BMC mostly reflects the business perspective of DT and can be effectively used in the ideation phase.

Strategyzer is a software tool for creating BMC, a web-based BMC creator. It includes the nine building blocks of a BMC with simple post-it notes that can be placed on the blocks. It also supports economy analysis, conversations between users and an engaging interface.

Stakeholder map

A stakeholder map is a visual or physical representation of the various groups involved in a particular product or service, such as customers, users, partners, organizations, companies and other stakeholders [20]. A stakeholder approach to strategy emerged in the mid-1980s [7] and documents the people who are involved in the provision and consumption of products and services and their relationships, reflecting the human and business perspective of DT. The interplay and connection between these various stakeholders can be charted and analyzed for various purposes. Curedale [5] argues that it is important to identify key stakeholders and their relationship as part of the defining process in DT. He also claimed that stakeholder maps assist with discovering positive stakeholders to involve in the design process, and ways to influence other stakeholders as well as risks [5].

One example of a software tool that can be used to create stakeholder maps is Stakeholder Circle. The tool was designed to put stakeholders on the ‘management radar’, facilitating regular updating of the assessment as the stakeholder community changes to reflect the dynamic nature of the project and its relationships.

Customer journey map

A Customer Journey Map (CJM), which originated from the technique of Service Blueprinting [18], describes a collection of touchpoints from the beginning to the end of the service delivery, as seen from the customer’s point of view. A touchpoint is defined as “an instance or a potential point of communication or interaction between a customer and a service provider” [8]. CJM helps us identify chances for service innovation and problem areas for service improvement [12]. It is a common perspective shared by design/consultancy firms and experiential service providers [22], categorizing the method in the human and technical sides of DT. It can be used during the empathy phase.

Visualization of a service user’s experience can be presented by Touchpoint Dashboard, a web-based system for creating CJM. It uses common visual notations to unite a team and converts the information into an intuitive, data-rich map of a customer journey.

Service blueprint

The service blueprint introduced by Shostack [18] is a template that shows the steps and flows of service delivery that are related to stakeholders’ roles and the process. Service blueprints show the actions between customers and service providers during a service delivery. It is a process-oriented method for the business and technical perspectives of DT, and shows all actions, including technical activities. Such a blueprint may benefit us in the early innovation process, such as the process of defining a phase, by showing the series of actions of both in-front tasks, actions that can be seen by the customer, and back tasks, actions that cannot be seen by customers, such as actions between employees in the back office.

Creately is a web-based tool that helps create blueprint diagrams based on the early version of the service blueprint made by Shostack. Table 1 summarizes the various DT methods and tools, matching them with DT perspectives.

DT method	DT perspective	Software Tool	Website
Personas	Human	Smaply	https://smaply.com/
Stakeholder map	Human & Business	Stakeholder Circle	http://www.stakeholder-management.com/
Customer Journey Map	Human & Technical	Touchpoint Dashboard	http://www.touchpointdashboard.com
Service Blueprint	Business & Technical	Creately	http://goo.gl/gdZHIk
Business Model Canvas	Business	Strategyzer	https://strategyzer.com
Rapid Prototyping	Technical	Axure RP	http://www.axure.com/

Table 1. DT methods and tools.

DISCUSSION

The use of DT methods and tools in multidisciplinary teams is a way of incubating business ideas and creating innovative solutions. We need these DT methods and tools handled by non-designers because multidisciplinary teams consist of experts in various desirably complementary areas. Thinking like a designer might improve the way in which companies and organizations develop their products and services. Using human- and business-oriented methods, such as stakeholder maps, and thus leaving out the feasibility of the technology, can spark innovation. The human-oriented methods, like personas, focus on the user-centered side by analyzing their desires, needs, and expectations, among other things, which is mainly helpful in the first phases. Fostering good ideas can result in solutions to technological issues. In this context, tools can

help with rapid prototyping and effective decision making. Moreover, tools used in the human- and technical-oriented methods do not visualize the economic viability of the changes generated. For instance, using a customer's journey, the economical effect of redesigning touchpoints can only be analyzed long after the ideation process. The result is low effectiveness in the decision making process. All three perspectives of DT are needed for innovation. For example, when the user's perspective is left out of the process, the results can be two fold. It can be positive at the start of a project, since one can gain a good understanding of how a company works. Similarly, relying exclusively on business and technical tools does not help project effective decisions, especially as the user may wish for another path.

The use of collaborative software tools that support DT methods is an insightful way of working with teams. For example, using Smaply to visualize a stakeholder map can be fun and inspiring, simultaneously providing, in addition to creative activity, a visual exercise and analytical tool. Engaging interfaces and visualizations help different people adopt new perspectives on things that might not have earlier. The value of using DT tools in companies is related to the adoption of a broader view of things and an effective communication tool for multidisciplinary teams. The value for teams is in their shared basis for communication, as they can embody their own ideas in real-time, in collaboration with other partners. This procedure could lead to better decisions and to visualizing complex systems problems and their potential solutions.

CONCLUSION

Understanding how multidisciplinary teams make decisions using design methods and tools to innovate is an area of increasing importance. In light of the fact that organizations are being encouraged to adopt DT in areas in which people may not have prior experience with such methods [17], more collaborative methods and engaging tools are needed. The central proposition of DT that may be helpful for different business challenges and that should be pursued by multidisciplinary teams [17] is the need for DT methods and tools from different perspectives. The list of methods and tools that we discussed here is only a starting point for further work in this field. Further research might focus on how multidisciplinary teams use design methods and tools for innovation in each design phase and what the most suitable DT methods and tools are in these phases. Another future research topic is the functional diversity of a team that could maximize innovativeness using these methods and tools. Case studies, field studies or similar studies, from businesses would be enlightening for this research area.

REFERENCES

1. Baregheh, A., Rowley, J. and Sambrook, S. Towards a multidisciplinary definition of innovation. *Management Decision* 47, 8 (2009), 1323–1339.
2. Brown, T. *Change by design: how design thinking transforms organizations and inspires innovation*. Harper Business, New York, USA, 2009.
3. Buchanan, R. Wicked problems in design thinking. *Design Issues* 8, 2 (1992), 5–21.
4. Cross, N. From a design science to a design discipline: understanding designerly ways of knowing and thinking. In *Design Research Now*, R. Michel, Ed. Birkhäuser, Basel, Switzerland, 2007, pp. 41–54.
5. Curedale, R. *Design thinking: process and methods manual*. Design Community College Incorporated, Topanga, CA, USA, 2013.
6. Fay, D., Borrill, C., Amir, Z., Haward, R. and West, M. A. Getting the most out of multidisciplinary teams: a multi-sample study of team innovation in health care. *Journal of Occupational and Organizational Psychology* 79, (2006), 553–567.
7. Freeman, R. E. E. and McVea, J. (2001). A stakeholder approach to strategic management. (M. A. Hitt, R. E. Freeman, & J. S. Harrison, Eds.) *SSRN Electronic Journal* (2001). Pitman.
8. Halvorsrud, R., Lee, E., Haugstveit, I. M. and Følstad, A. Components of a visual language for service design. In *Proc. ServDes 2014*, Serv. Des., 291–300.
9. Harhoff, D., Henkel, J. and Von Hippel, E. Profiting from voluntary information spillovers: how users benefit by freely revealing their innovations. *Research Policy* 32, 10 (2003), 1753–1769.
10. Junior, P. T. A. and Filgueiras, L. V. L. User modeling with personas. In *Proc. CLIHC 2005*, Latin American conference on human computer interaction (2005), 277–282.
11. Kolko, J. *Wicked problems: problems worth solving : a handbook and call to action*. Ac4d, Austin Center for Design, Texas, USA, 2012.
12. Krippendorff, K. *The semantic turn: a new foundation for design*. Taylor and Francis, Boca Raton, FL, USA, 2006.
13. Lee, E. and Karahasanović, A. Can business management benefit from service journey modeling language? In *Proc. ICSEA 2013*, Eighth International Conference on Software Engineering Advances (2013), 579–582.
14. Liedtka, J. and Ogilvie, T. *Designing for growth: a design thinking tool kit for managers*. Columbia University Press, NY, USA, 2011.
15. Osterwalder, A. and Pigneur, Y. *Business model generation*. Wiley, Hoboken, NJ, USA, 2010.
16. Plattner, H., Meinel, C. and Leifer, L. *Design thinking research. Studying co-creation in practice. Profiles of drug substances, excipients, and related methodology* (Vol. 36). Springer, Berlin, 2012.
17. Seidel, V. P. and Fixson, S. K. Adopting design thinking in novice multidisciplinary teams: the application and limits of design methods and reflexive practices. *Journal of Product Innovation Management*, 30, 1 (2013), 19–33.
18. Shostack, G. L. Designing services that deliver. *Harvard Business Review*, 62, 1 (1984), 133–9.
19. Stempfle, J. and Badke-Schaub, P. Thinking in design teams: an analysis of team communication. *Design Studies*, 23, 5 (2002), 473–496.
20. Stickdorn, M. and Schneider, J. *This is service design thinking; basics, tools, cases*. BIS Publishers, Amsterdam, Nederland, 2010.
21. Spencer, E. *The principles of psychology*. Williams and Norgate, London, UK, 1881.
22. Voss, C. *Innovation in experiential services: an empirical view*. Diss. London Business School, 2007.
23. West, M. A., Borrill, C. S., Dawson, J. F., Brodbeck, F., Shapiro, D. A. and Haward, B. Leadership clarity and team innovation in health care. *Leadership Quarterly*, 14, 4-5 (2003), 393-410.