From team collaboration to product success: the domino effect of design thinking

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Abstract

Design thinking (DT) offers a potent way to create breakthrough products due to its ability to find unarticulated needs and solve problems. For a long time, design thinking was considered the creative activity whose aim was to determine aesthetic features of objects, however; many authors suggest that design thinking can provide significant value to product development and management. However, a critical issue of adopting design thinking in business organisations is that it is difficult to explain the contribution made by DT in the new product development (NPD) process. In practical terms, there is little guidance on how to correlate relevant product development dimensions (such as cost and time) to DT-related activities. This effort is complex because design thinking is only one of several factors that contribute to new product success. To uncover that gap, we aim to develop a framework that identifies the benefits of using design thinking for team collaboration regarding relevant product development process dimensions. Towards our aim, we conducted ten in-depth interviews with design thinking professionals from the Stanford University School of Design Thinking (D.School - Stanford) in the USA in order to identify dimensions that could be used to understand where design thinking adds value to the NPD process. We propose that understanding how design thinking contributes to the NPD process could offer managers the opportunity to uncover gaps in the strategy implemented. Additionally, the framework presented in this study could be used to compare different performance results when developing new products. Our contribution consists of offering the first conceptual model to map out the impact of using design thinking to promote team collaboration on relevant product performance dimensions. This research extends our knowledge of how to analyse the impact of team collaboration on firm's performance. Our findings shed new light on the complexity of adopting design thinking as an innovation strategy in business organisations. This study can lead to valuable insights into how having a design thinking strategy can support competitive advantage in organisations.

Keywords: Design thinking, team collaboration, new product development, innovation

1 Introduction

It is widely accepted that design can play a major role in the new product development (NPD) process. In particular, prior research has demonstrated that design thinking (DT) offers a potent way to create breakthrough products due to its ability to find unarticulated needs and solve problems (Liedtka, 2011). Design thinking is a creative process that uses mechanisms to identify problems and generate innovative solutions (Lockwood, 2009). It is lauded to present an alternative to typical approaches to organisational problem-solving, which consists of several steps that include defining the problem, generating and testing solutions (Brown, 2009). Moreover, it has been suggested that design thinking (DT) can support a more smoothly product development process because of its ability to promote team collaboration.

However, there is little published data on the impact of using design thinking on the NPD process. In practical terms, there is little guidance on how to correlate relevant product development dimensions (such as cost and time) to DT-related activities. In order to enhance the product development process, it is fundamental to understand the actual use of design thinking in companies and the potential benefits of implementing DT and its effects on organisations.

To uncover that gap, we aim to develop a framework that identifies the benefits of using design thinking for team collaboration regarding the product development process dimensions. This study adopts good practices and procedures (Charmaz, 2014) to allow a deeper understanding of the current theoretical and practical scenario of design thinking implementation. First, through an objective, systematic and comprehensive synthesis of the literature on team collaboration and its effect on the product development process, a draft framework was created. Then, to validate our framework, ten interviews were conducted with design thinking professionals from the Stanford University School of Design Thinking (D.School - Stanford) in the USA. The interviewees were academics who have experience in implementing DT in companies. Our contribution consists of offering the first conceptual model to map out the impact of using design thinking to promote team collaboration on relevant product performance dimensions. This research extends our knowledge of how to analyse the impact of team collaboration on firm's performance. This study can lead to valuable insights into how having a design thinking strategy can support competitive advantage in organisations.

2 Literature review

2.1 Design thinking

Multiple interpretations of the role of design thinking have been proffered by scholars over the years. Rowe (1987) provides one of the earliest discussions of the concept of design thinking, which he describes as the "Interior situational logic and the decision making processes of designers in action, as well as the theoretical dimensions that both account for and inform this kind of understanding". Research based on design thinking has varied between studying how designers think (Rowe, 1987), how they address problems (Buchanan, 1992) and how they create meaning (Brown, 2008). In tracing the roots of design thinking, Kimbell (2011) proposes a typology and characterises DT in terms of a cognitive style, a general theory of design and as an organisational resource. Even though this study was based on the theory of design thinking as an organisational resource, we give a broad explanation of the perspectives of the other theories existing in the literature and explain in detail the theory of design thinking as an organisational resource, in particular, design thinking's contribution to the NPD process.
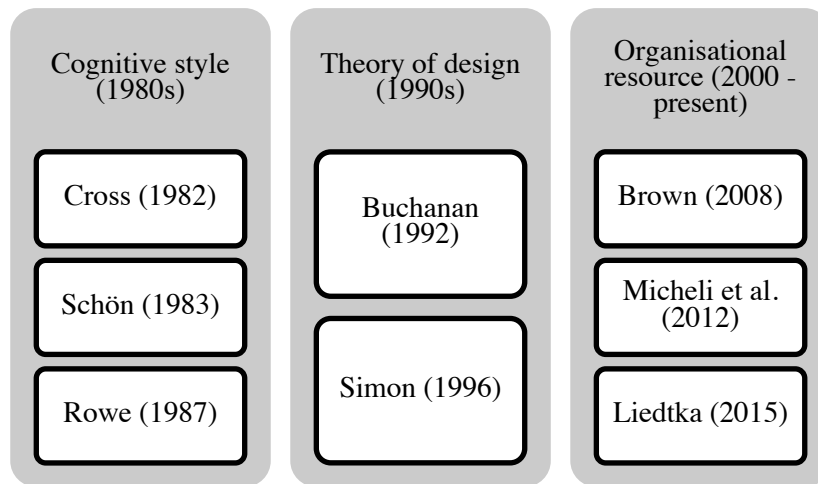
Figure 1. The evolution of the role of design thinking .

By the early 1980s, cognitive research emphasised the role of the designer and the importance of the study of design thinking (Cross, 1982; Rowe, 1987; Schön, 1983). Overall, researchers who follow this perspective and consider design thinking in terms of a cognitive style primarily explore the individual designer and how design experts make decisions. For example, Rowe (1987, p. 2) provides one of the earliest discussions of the concept of design thinking. He describes design thinking as the "*interior situational logic and the decision-making processes of designers in action, as well as the theoretical dimensions that both account for and inform this kind of understanding*". Authors who adopt this theoretical lens attempt to understand the cognitive processes and methods by which successful designers solve problems. These studies examine the neurological basis of DT. They study those who exhibit DT traits in order to increase their "problem-finding" behaviour.

A second theory on design thinking is referred to as a general theory of design. Researchers adopting this perspective claim that the concept of design thinking shifted from aesthetic modelling to wicked problem solving and proposed the notion that all professionals should be able to design (Buchanan, 1992; Simon, 1996). Based on that, scholars have claimed that designers should work closer with other functions. It was suggested that the nature of information flows between functions influenced success or failure of the new product (Hart et al., 1999). In addition to the abundant research challenges, by the mid-to-late 1990s firms were grappling to integrate separated functions in the NPD process in order to facilitate cross-functional information exchange (Griffin and Hauser, 1996; Kahn, 1996). Due to the new challenges, scholars begin to highlight the need for the recruitment of design managers to manage the interaction between departments (Bruce and Vazquez, 1999). In this way, by using design thinking as an interlink between departments, researchers aim to offer a common language that cross-functional teams could use to enhance collaboration.

Considering all this evidence, it seems that the role of design thinking has shifted from a tactic level function to a more elevated strategic position in organisations. In the next section, we discuss the third theory of design thinking, which is design thinking as an organisational resource. In particular, we analyse the contribution of design thinking to the new product development process.

2.2   The contribution of design thinking to the NPD process

Design thinking is "a discipline that uses the designer's sensibility and methods to match people's needs with what is technically feasible and what business strategy can convert into customer value and market opportunities" (Brown, 2008, p. 1). For a long time, design thinking was considered the creative activity whose aim was to determine aesthetic features of objects, however; many authors suggest that design thinking can provide significant value to product development and management (Liedtka, 2015; Carlgren et al., 2014; Micheli et al., 2012, Rosensweig 2011). In recent years, design thinking (DT) has emerged as a powerful contribution to product success (Rosensweig, 2011). In order to encourage innovation and economic growth, researchers are investigating how to use using design thinking as an organisational resource to reinvent the entire new product development process. It has been suggested that design thinking (DT) can support a more smoothly product development process because of its ability to promote team collaboration.

Researchers have highlighted a strong connection between team collaboration and the product's speed to market. Carlgren et al. (2014) mention that collaboration can encourage better team dynamics in terms of increased energy, inspiration and motivation and a significant reduction in the classic divide between functions such as engineering and design. This view is supported by Simons et al. (2011) who claim that having the entire team involved in the decision-making discussion creates more robust ideas, fewer design flaws and a more comprehensive product to support. Thereby, it has been discussed that the level of employees' interaction has the ability to build trust and intimacy. In turn, intimacy promotes frequent conversations, early sharing of ideas (where others can build on the thoughts) and builds trust, which could increase inventiveness and vitality of ideas (Simons et al., 2011).

Furthermore, it has been argued that team collaboration can lead to significant cost savings. Several studies have considered the relationship between team collaboration and development cost. Prior research has suggested that incorporating design thinking into the NPD process can result in cost savings as DT is lauded to reduce redesign work and shorten lead time to development (Carlgren et al., 2014; D'Ippolito, 2014). However, design thinking is a relatively new addition to the management literature (Bloch, 2011), and integrating design practices into new product development is still a challenge (Micheli et al., 2012). This essentially means that design thinking's involvement in new product development is changing and consequently it is imperative to articulate the scope and nature of this transition.

3   Research design

From the analysis of the literature, it is evident that there is clear need to (1) articulate the scope of research based on design thinking and new product development; (2) compare current practices in the industry with theoretical foundations; (3) to ascertain managerial and theoretical implications of these findings. With this in mind, the relevant literature on DT in NPD was reviewed, and a survey was developed in order to understand how professionals from large companies apply design thinking to their innovation process.

3.1   Sampling and data collection

For the final interview guide, ten in-depth interviews were performed with design thinking professionals from the Stanford University School of Design Thinking (D.School - Stanford) in the USA. In this case, a criterion-based purposive sampling approach was used to identify the respondents using a list of recognised professionals on the D.School Stanford website.

Purposeful sampling is a technique widely used in qualitative research for identifying and selecting individuals or groups of individuals that are especially knowledgeable about or experienced with a phenomenon of interest (Creswell and Clark, 2011).

The interview questions (see Appendix A) contained five categories considered to be relevant by the design thinking literature: implementation, collaboration, users involvement, concept development and strategy. The criterion used in this study was: experience with design thinking in academia and industry for a minimum of five years. Interviews typically lasted 30 minutes and were recorded for analysis. The interviewees were academics who have experience in implementing DT in companies. The method, scope, and a number of interviews for this exploratory study are similar to other studies relying upon in-depth interviews (Bohlmann et al., 2013). Additionally, Strauss and Corbin (2008) state that the focus of qualitative research is not on the size of the sample but rather on the quality and depth of the information obtained. Moreover, it is only necessary to continue with interviews until theoretical saturation occurs (Charmaz, 2014). For this study, ten in-depth interviews were conducted with design thinking professionals.

3.2   Data coding and analysis

The purpose of qualitative data analysis is to organise, categorise and elicit meanings from the data collected from the field (Strauss and Corbin, 2008). The interviews were transcribed and the transcripts anonymised with a code stating the body and role of the interviewee and a number for later reference. The transcripts were coded and labelled according to concepts related to design thinking dimensions and NPD metrics. Coding is the first step of data analysis, as it helps to move away from particular statements to more abstract interpretations of the interview data (Charmaz, 2014). For this study, open coding was used with the help of qualitative analysis software NVivo. Finally, emerging patterns were structured into more general categories that helped us refine the dimensions and define key concepts. The results from the interviews were used to develop our framework.

3.3   Validity and reliability

Peer review was employed by the authors to establish the credibility of the study. A peer review is the review of the data and research process by someone who is conversant with the research or the phenomenon being explored (Creswell and Miller, 2000).

Additionally, reliability in this study was ascertained through the triangulation of data sources, which involves the use of different methods of data collection within one study in order to ensure that the data and findings are accurate (Charmaz, 2014; Strauss and Corbin, 2008). In this study, triangulation was used by comparing the data collected from interviews with participants, informal discussions as well as field notes.

4   Conceptual framework

Companies encourage different cultures in terms of design thinking collaboration. In some cases, it is possible to see cross-functional teams collaborating or just intra-department collaboration. Cross-functional indicates that different departments are collaborating, such as engineering and marketing. Intra-department is when members of the same department are collaborating, such as members of the design department. Collaboration could also happen on a cross-project level, which refers to when team members can collaborate with members from other projects. Based on that, our framework aims to identify and synthesise existing research on the impact of design thinking collaboration on relevant new product development dimensions. The benefits of the framework include (I) identification of critical research topics

in the area and (II) alignment of theoretical research and industry practice on the importance of team collaboration to the NPD process.

Through a comprehensive synthesis of the literature on design thinking and NPD and qualitative surveys with key opinion leaders, we combine concepts from both approaches into a new set of propositions. Figure 2 illustrates how team collaboration might have an impact on the NPD process.
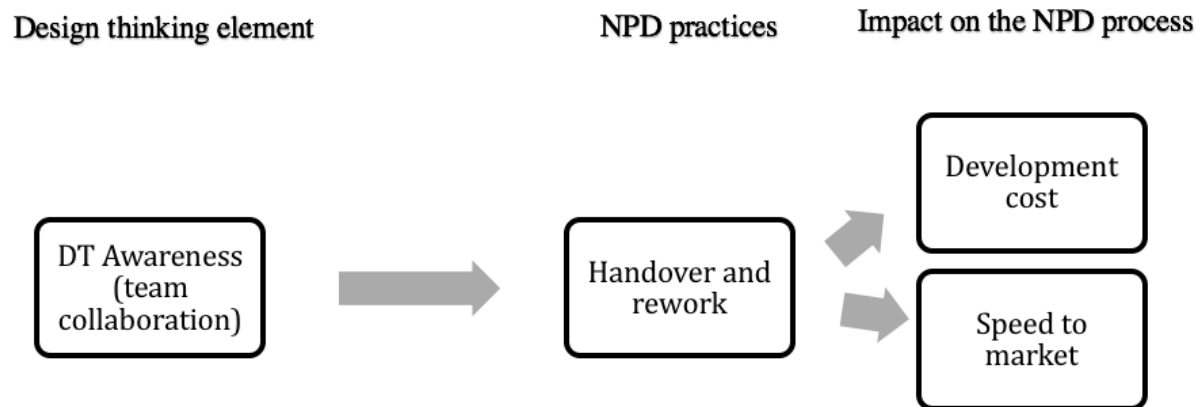

Figure 2. The framework

The element "design thinking awareness" represents how widespread design thinking is in the company in terms of who is doing DT-related activities and how well they collaborate with each other. Ideally, a design thinking team should be composed of people with different backgrounds from different departments in the company. The idea behind combining people who were supposed to work on the product in different stages is to make them familiar with the product concept at the early stages of the development. By doing that, it is possible to avoid unnecessary effort with rework and problems with handover. Additionally, the project moves from an individualistic way of thinking to a culture of shared creation, which has the potential to result in more innovative solutions. Consequently, when teams have fewer problems with handover and rework that can lead to a decrease in the development cost and also the product to reach the market faster. In the next section, we discuss the impact of DT on the NPD in more detail.

4.1 The impact of design thinking collaboration on the NPD development cost

Design thinking can be a driver for innovation, and it can take place at different stages in the company, the front-end phase being the most important. Front-end consists of those activities that are conducted prior to the actual development. The different phases covered during the early stages of the concept development phase: product vision, solution design, opportunity mapping and customer insights (Koen et al., 2001; Seidel and Fixson, 2013). It has been argued that it is vital to pay close attention to this phase as it could lead to saving the most time at the lowest cost later on. According to Markham (2013), the more thoroughly these activities prepare an idea, the better that idea should perform later on in the next phases, and ultimately, in the marketplace. Therefore, it is imperative to understand how design thinking can help enhance the outcome of activities carried out at the earliest stages of conception.

The lack of team collaboration during the fuzzy front-end can cause many problems, such as rework. Managers involved in the redesign effort claimed that rework can be "(…) costly and then affect the firm's performance negatively". Understanding what causes design rework is vital to improving NPD performance. Our findings suggest that by having a well-integrated

design thinking team collaborating could avoid rework and consequently reduce costs during the NPD process. Ideally, companies should start with small teams as one of the interviewees mentioned, "I often work with a team of five people – five to seven people – and I found that when a company is first getting introduced to design thinking that I would rather start with a small team and get a few successes with that team (…), and then we grow it from there".

Overall, our findings are aligned with Owens and Davies (2000) who suggest that bringing critical perspectives into the process early enough to influence design and prepare for downstream problems can cause early detection of problems, which leads to less rework. Moreover, Valencia et al. (2013) claim that identifying the variety of roles that designers can fulfil in companies is pivotal to support the strategic utilisation of design and to strengthen their product development processes

4.2 The impact of design thinking on the product's speed to market

It has been suggested that spreading design thinking throughout the company creates this idea of teams having a common language. As one interviewee said: "Once you teach everyone design thinking, which is fundamentally focused on the user need, we have a common language to talk about (…), so design thinking overcomes the semantic gap where we do not share common languages". Similarly, Carlgren et al. (2014) mention that collaboration can promote better team dynamics in terms of increased energy, inspiration and motivation and a significant reduction in the classic divide between functions such as engineering and design. A similar approach is suggested by another interviewed who commented, "Organisations that are typically late are teams that are not collaborating well". This view is supported by Simons et al. (2011) who claim that having the entire team involved in decision making and discussion creates more robust ideas, fewer design flaws and a more comprehensive product to support.

Once team members who typically would not collaborate are working together at the early stages of the product development process (i.e. concept development phase), they can share ideas early in the process and then avoid errors and misunderstanding later on in the process. Moreover, when they return to their original department, they have a clear idea of the product concept, which could lead to a significant reduction in the time spent with handover tasks (e.g. time to explain the product concept to the next team).

From the data collected, one of the interviewees said, "(…) team fighting and picking the wrong product are the two major reasons start-ups fail and probably are the major reasons projects in large companies fail too. Additionally, another interviewee said, "(…) when you have a design thinking team all of these stakeholders are involved in the beginning, so they all learn to respect each other's disciplines".

Thereby, it has been demonstrated that the level of employees' interaction has the ability to reduce the time spent fixing errors, and also to promote trust and intimacy. In turn, intimacy promotes frequent conversations, early sharing of ideas (where others can build on the thoughts) and builds trust, which could increase inventiveness and vitality. Overall, our findings suggest that how well design thinking teams are collaborating at the early stages of the NPD process will have an impact on the time the product will take to reach the market.

5 Implications and conclusion

This paper aims at identifying the benefits of using design thinking for team collaboration regarding the product development process dimensions. First, we established theoretically what design thinking element adds value to the NPD process and how they connect to each other. By making this connection, we developed dimensions and integrated them into a framework that synthesises DT's contribution to the NPD process. The dimensions investigated are consistent with relevant existing literature (Brown, 2009; Carlgren et al., 2014; Liedtka, 2015; Rauth et

al., 2014) on the topic. We then conducted ten in-depth interviews with design thinking professionals in order to validate the framework by comparing theoretical research with industry practice. The final framework illustrates a map of how to connect a design thinking element (team collaboration) to specific NPD dimensions (development cost and speed to market). We propose that understanding how design thinking adds value to the NPD process could offer managers the opportunity to uncover gaps in the strategy implemented. Additionally, the framework presented in this study could be used to compare different performance results when developing new products. Implementing the framework in the industry is beyond the scope of this paper, which can be seen as a limitation. In light of this, as future work, we plan to investigate how our framework could be used by large organisations in order to analyse their design thinking strategy.

Our contribution consists of offering the first conceptual model to map out the impact of using design thinking to promote team collaboration on relevant product performance dimensions. This research extends our knowledge of how to analyse the impact of team collaboration on firm's performance. Our findings shed new light on the complexity of adopting design thinking as an innovation strategy in business organisations. This study can lead to valuable insights into how having a design thinking strategy can support competitive advantage in organisations.

Acknowledgement

APPENDIX A. INTERVIEW QUESTIONS

Questions about design thinking implementation
In what stage of the development process is design thinking normally implemented and how?
Questions about the DT collaboration
Do you believe having a cross-functional team would decrease costs with handover (e.g. time to explain the product concept to the next team) and rework (e.g. errors committed due to the lack of team collaboration)? If yes, why? If not, why not?
Questions about users' involvement
How does the concept development team learn about the users? Do the users participate in the process in the company? Does the team learn about the users through other methods such as surveys, observations, and focus groups? How often does the team meet with the users?
Questions about concept development (front-end phase)
What is the role of design thinking to generate and select ideas?
Questions about DT Strategy
What drives your company to use design thinking? If you were asked to develop metrics to prove the usefulness of design thinking in terms of its benefits and cost? What would you do?

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