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Understanding the role of design thinking methods and tools in innovation process

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Abstract: This paper presents the results of an ongoing qualitative study with employees working with innovation in a Scandinavian company. Using Design Thinking as an approach, the paper analyses how different tools are used to initiate innovation processes. Issues like innovation drivers, team structure, creativity, information flow among teams, usefulness and challenges of using the methods and tools are discussed. The role of different design tools in innovation processes opens the discussion for possible future directions. The results suggest that many methods and tools could generate value in regards with the innovation processes, while there are many challenges that need to be considered. The findings could be beneficial primarily for companies that facilitate DT methods, designers, developers, managers and other involved members in innovation activities could gain insights on how to implement DT methods and tools.

Keywords: Design thinking; Design thinking methods; Design thinking tools; Innovation.

1 Introduction

Innovation in companies often has different and complex paths from the idea development until the final product or service, while companies use different types of design methods and tools for innovation. Due to increasing demands of the markets, companies need to react faster in these demands and to innovate in response to the competition. Therefore, the role of innovation becomes a central part of the daily action in companies. Design methods and tools should be assistive for various companies’ processes, such as from the idea generation phase to the final product/service development phase, and should facilitate the development of innovations. Also, problems with information and activity silos seem to be the norm. This research problem has received little attention from researchers and practitioners. Our focus is to investigate the existing situation of the aforementioned problems with innovation in large companies,

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using the Design Thinking (DT) approach (Brown, 2009) as a methodology to understand how different design tools are used.

Our paper contributes with an empirical study where the main contribution of the paper lies into the analysis of how innovation processes are supported by different design tools, and how those tools are related to the different phases in DT when used in the company in the context of reported innovations. Moreover, the study suggests how DT methods and tools could be used most effectively within company's processes.

The paper is organised as follows:

2 Related work

The process of innovation and the way it is managed constitutes a key strategic issue for companies. For this purpose, a large number of design methods and tools are available to facilitate the DT process and innovations (Curedale, 2013). DT has emerged as a multidisciplinary, human-centered innovation approach inspired by the ways designers think and work (Brown, 2009; Kimbell, 2011). The core idea in DT is that any discipline can take inspiration and learn from the way designers think and work, and apply this to their operations not only in innovation efforts but also in strategy, innovation or organizational renewal (e.g. Brown and Katz, 2011; Brown, 2009). In addition, the stages of DT, namely empathy and insight, definition, ideation, prototyping and testing (Brown, 2009), provide a structured step-process for implementation of DT. Innovation is developed when all three perspectives of DT - business, technology and user's perspective- are addressed. Additionally, often innovative ideas do not manage to be realized by the company. The flow of information for innovation seems to stop during internal processes (Hippel, 1994), and it is questionable how methods and tools will ensure that the elaborating forces of innovation will be more fluid inside the company. The implementation of DT methods and the integration of DT in a company's context have received little attention. Existing knowledge focus on the adoption of DT methods (West et al., 2003), as a mean of strategic governance of innovation, letting out some of the holistic needs inbound in the real DT approach. More studies in organizational settings that provide insights for an optimal implementation and successful use of DT for innovation are needed. A framework to address creativity is also needed to understand better how the design thinking tools can function optimally, and the use of the concept of divergent and convergent thinking is interesting. In fact, both types of thinking are required if creativity shall be obtainable (Crompton, 2006).

Group dynamics is also relevant as companies often use different design tools that gather people to work with each other. Although workshops and like produce several outputs, there are several issues needed to be addressed. For example, social loafing in creatives groups can be problematic (Runco, 2010). In fact one of the possible and undesired outcomes can be the unwillingness of sharing risky and creative ideas as they can be misunderstood (Runco, 2010).

This paper aims to describe the existing status regarding innovation processes in companies and how DT methods and tools facilitate innovation processes. Also, the study aims to explore if the use of the design methods and tools for innovation can be helpful for the information flow and communication among departments or groups.

3 Methodology

We organize a case study with Scandinavian companies in order to understand the internal company processes that lead to innovations and change, and the implementation of DT methods and tools. Interviews were selected as a data gathering method, because they reveal rich information and details. The ongoing case study includes interviews with a variety of companies, where at least three employees who work have been involved in innovation related projects are interviewed. This allows us to explore at least three perspectives of innovation processes: one design, one technical and one managerial perspective. In this paper, we report on the pilot study with a Scandinavian company in service sector. The company was selected as a representative case because of its long experience with innovation projects, its capacity to absorb innovation practices and its size.

The study conducted on January 2016, where three employees were interviewed in semi-structure, recorded interviews. The national data protection official for research authority has approved the interview guide. The participants in the study were working in the same projects but having different work positions and roles, where one reflects the managerial perspective of the projects and two are involved with the design-technical perspective. Designers, managers and other employees involved in the innovation projects reflect their views on internal processes, revealing examples of innovation projects and how they work with innovation across departments and groups. More in detail, the interviews lasted 45min and they were transcribed verbatim. We then developed a coding schema consisting of the following main topics: definitions and drivers for innovation, innovation process and phases, assistive methods and tools, team's structure and roles and other involved parties. More detailed themes coding schema was defined during the analysis. Similarities and differences in responses were found and systematized.

4 Findings

In order to understand the methods and tools that are being used in innovation processes in companies, it is important to draw the context where those methods and tools are applied. Starting from the definition and drivers of innovation, the process of innovation and the team's structure is described, while the methods and tools are analysed according to the phases with the corresponding challenges.

Defining innovation and innovation drivers

According to the participants, innovation is regarded as small steps to change the mindset of a company. It is related with the resources, and company's ability to generate and support innovation activities. The participants explained what innovation means for their company, reflecting their perspectives and roles in innovation projects:

“Innovation doesn't need to be a huge idea, I believe that innovation is something that changes the way you do things basically. And that you are able to make it work.” (Interview 2)

“Innovation for a company [...], is not only the radical innovation, but also working smarter, and incremental innovation. [...] Innovation happens every day, in every corner of the company. [...] So a big part of innovation is just working smarter, find new solutions to old problems.” (Interview 3)

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The drivers for innovation are considered both customers and company employees. Company employees who work as department leaders or in other work positions have been identified as key persons to initiate innovation projects in the company. Customers are also driving the innovations. The dynamic nature of customers' preferences affects the company's demands that try to adapt to those changes, and aligned with the market needs. In addition, examples of other companies that focus on a specific area constitute an innovation driver as well. Accordingly, the focus on a specific part of the value chain is considered the main company's focus, and not in the whole value chain.

“We have found some key persons that really like working with these things and everyone is in different departments” (Interview 1)

“Well, I think [...] that the department is the most dynamic area where the customers basically change preferences each month. So, we have to be ready for those changes and adapt.” (Interview 2)

In line with the DT approach, the design process can look like fuzzy in the start, and accordingly make the innovation process difficult to monitor and administrate.

“For the moment it is about make it work on the practical level before we organize too much” (Interview 3)

Innovation process

The innovation process in the company refers to two types of innovation: sustaining and disruptive innovation. According to the participants, in sustaining innovation the ideas come from the customers. This is a customer-driven approach and the ideas for innovation come from customers' needs and feedback on existing products or services. For example, the company received more than 10000 posts from customers who gave feedback through one application. Additionally, feedback that is collected either from face-to-face meetings or through electronic means is used as a basis for both sustaining and disruptive innovation. The innovation process in sustaining innovation starts with customer feedback and data that generate a corresponding concept development that provides value to the customers in regards with this need. After the concept becomes concrete, the available resources and the company's acceptance need to be ensured. The value proposition and the evaluation criteria, such as attractiveness, are established in this phase. The concept should be in a presentable way that allows feedback from others, like partners and colleagues. The feedback helps the concept to be further developed and starts a pilot where the value propositions are tested together with as many hypotheses as possible. Iterations among phases help the company to confirm more hypotheses and to decide whether to invest resources, such as money and time, for the project or not. According to participants, the duration such projects is 3 months approximately.

“We are dividing in disruptive innovation and sustaining innovation [...]. We are looking all the markets around how things are changing, how we can take a role in everything that's out there. [...] We get a lot of ideas from both customers, internal, sales people, everything they stuck it up and prioritize what they seems to have biggest value and test it to customers to see if they respond the way we think they will respond. [...]” (Interview 1)

In disruptive innovation the ideas come internally from the company. A digital platform that target to gather employees' and other partners' ideas supports this type of innovation. As a market-driven approach, the ideas for innovation come internally from the company,

for example the department leaders, based on the market-driven needs, specify the needs for innovation. The corresponding departments develop concepts that answer the calls and prioritize what will generate the most value for customers. Many iterations in early phases help to establish the main path for innovation and focus on the concept that will generate the most value, both for the company and the customers. The disruptive innovation should be based on small, iterative steps and specific metrics, such as the cost reduction. For example, the duration of such a project is approximately 1 year.

“We want to have a quick time to market we do not want to spend resources without knowing what’s out there so we want to try things fast, test it and put money to that as it goes.” (Interview 2)

“In disruptive is more like Hans-Petter and his position that something about the market and changes and we help him developing concepts that answer the needs in the markets.” (Interview 1)

Team structure and external parties

The collaboration across company's departments and teams depends on the projects, where the department that is responsible to develop the concepts leads the team building in most of the cases. Resources such as involved people, costs, and other external, involved parties are defined in order to develop the project. Depending on the projects' topic, people from corresponding departments lead the project after the team building. The collaboration and the involvement of people from other departments in innovation processes is considered a necessary step for sanity check, where the realization of innovation is ensured. Departments have also their internal, smaller teams for innovation with specific needs and innovation segments.

“So I have to find people in each division [...] and then make sure that they are onboard with what we are doing.” (Interview 1)

“We all have to check if any innovation or idea it can be easily [...]. So, we always have to involve people in the process early.” (Interview 2)

Other external partners are involved in innovation processes, such as developers, following the process from the early phases until the launch of the product or service. The external partners become part of the decision team, where the project team as a whole decides on the solutions and delegates the tasks among project members.

Design thinking methods and tools

We described the innovation processes in the company, according to participants' views. Many methods and tools were mentioned that are actively utilized in the company, and some of those methods or tools are used for research, design, management or presentation purposes. In order to understand how the DT methods and tools are used in various phases, we mapped them according to the DT phases: empathize, define, ideate, prototype and test.

Empathize and insight

Empathy is a central phase in the human-centered design approach. The empathy step refers to understand the users and their needs within the context of a design challenge. The participants replied that methods for understanding the users include observations

that are utilized mainly during other phases, such as to get user insights and test prototypes.

“We use observations each year [...] first we get user insights, that people say "were you able to do what you came to our website to do" and then we ask 5-10 people in our lab when they do the tasks and we observe.” (Interview 1)

Other methods to understand the users include the personas method, to understand the target user, either in the beginning or in later phases, for example in ideation phase. According to participants, three main sources are used to collect customer data, through online survey tool (Questback), direct feedback with customers, and focus groups. As mentioned in the introduction, insight and how the information flows inside the company can make innovation difficult to happen. Information can be “sticky” (Hippel, 1994) in one department, making more expensive and difficult to enact innovation. In the first phase of the creativity, divergent thinking needs to gather as much insight as possible. The participant mentioned different ways they worked with this topic, whilst several alternative possibility of improvement was requested.

“There should be a system where you can collect and where people could place [...] like the e-lab or discuss with me [...] or an open innovation platform.” (Interview 3)

Define

The phase of problem definition refers to the focus on specifying the problem, while a problem addresses the need for a change. For the company, the need for a change is generated from two main sources, as it was discussed above, the customers (sustaining innovation) and the company (disruptive innovation). The participants replied that methods in use for this phase include brainstorming, surveys, co-creation with customers, interviews, workshops, customer journey map, prototyping, design scenarios, and focus groups. One example is customer journey maps that are used in early phase to define a problem and find the pain points of a product or a service. Other examples are interviews and workshops.

(Participant talks about the co-creation with customers) “[...] Well, we have used it to define and get user insights, and in the project where I am the project leader they will create and test the prototypes with the customers.” (Interview 2)

Digital tools are used for gathering ideas from any source. A digital platform is used internally for company’s employees to submit and/ or discuss ideas, while other digital tools– such as Trello and Slack– have been utilized as a digital space for managing and prioritizing ideas, but also to generate discussions for a topic.

Ideate

The ideation concerns the generation of ideas and it’s a creative phase among participants. The participants commented about ideation that it could be part of the previous phase– the definition phase– or any of the next phases– such as prototyping and testing. Several methods are used to generate ideas for the company, but not necessarily answering the previously defined problems. Methods for ideation include survey, co-creation with customers, interviews, workshops, observations, focus groups, and personas. Additionally, participants reported that other methods to generate customer-

driven innovation include a forum and an advisory board, where important customers and partners provide input to ideas. A sub-step of this phase is to ask for feedback on ideas. For example using interviews, participants get user insights for concepts or ideas and prioritize them, although it is considered challenging to predict future activities. This happens especially in disruptive innovation. In addition, the need to get user insights varies among company's departments. For instance, participants mentioned that in one department they use a forum and an advisory board as tools to get feedback on ideas. The internal digital platform for gathering ideas is believed that will lead the innovation process in the future, in terms of prioritizing and managing ideas and innovation activities.

Table 1 Overview of the methods and tools in use.

Phases	Methods and tools
Empathize	Observations, Personas
Define	Brainstorming, Surveys, Co-creation with customers, Interviews, Workshops, Customer Journey Map, Prototyping, Design scenarios, Focus groups
Ideate	Surveys, Co-creation with customers, Interviews, Workshops, Observations, Focus groups, Personas
Prototype	Prototyping, Design scenarios, Storyboards, Personas, Co-creation with customers, workshops, Focus groups, Scenarios, Stakeholder Map
Test	Design scenarios, Storyboards, Co-creation with customers, Prototyping, Workshops, Focus groups, Stakeholder Map

“So this platform will be lead most of the innovation in the company hopefully in the next years.” (Interview 1)

In this phase, other tools for gathering ideas in a digital space, such as Trello and Slack, are considered very important project management tools for managing ideas. Either using some kind of tools or discussing ideas face-to-face, the company's culture is believed to be open for ideas

Prototype

This phase refers to the creation of prototypes, by any means that visualize ideas, created in the previous phase. Depending on the project, prototypes could be presented either in paper format or as tangible artefacts. The participants reported that they use methods such as prototyping, design scenarios, storyboards, personas, co-creation with customers, workshops, focus groups, scenarios, and stakeholder map. One prototyping tool for sketching is InVision that was used after a workshop to put ideas in an online space. The prototypes have assigned hypotheses and metrics that will be used in the next phase of the testing. Hypotheses and metrics assume that a prototype will work, for instance:

“We would like to test X by doing this and in order to understand if it will be accepted we measure this and if this metric is above X or Y is accepted.” (Interview 2)

Examples of metrics refer to the value proposition for the company, the customers and/ or the partners. For end users, different prototypes are created, for example when launching new actions in a webpage and there is a need to create a non-fully functional buttons, without any action behind.

Test

Testing is a part of the iterative process, where the purpose is to learn and iterate if it's needed. Prototypes are evaluated according to value propositions that were developed, for example the value proposition for customers, the company, partners, etc. According to the participants and in relation with methods and metrics for prototyping, the testing will provide explanation to what will be developed, what should generate, and how it will be measured. Prototyping testing with end-users of the company requires different approaches, such as experiments and hypotheses testing. The participants reported that methods for prototype testing include design scenarios, storyboards, co-creation with customers, prototyping, workshops, focus groups, and stakeholder map. An additional method for testing is a digital panel with 150 users, registered to test out ideas. Other methods that were used to test the hypotheses include the Lean Startup method, which supports a quick approach to get products into the market.

“So we are working on a method called Lean Startup how we can to get products out in the market, to test before use a lot of money and develop it.” (Interview 1)

The selection among various prototypes could be achieved with methods such as A/B testing, during the first iterations and before the full development of a product or a service. Depending on the cost, multiple prototypes might be developed.

Usefulness and challenges of the methods

The participants discussed the usefulness of the methods in relation with testing in early stages of the product development. Meetings with partners and long discussions might be time consuming, focusing on the wrong direction. For example, the use of methods in early stages might help the fast development of the projects in terms of time, resources and focus on the important things. Furthermore, structured processes are considered appropriate for specific phases, for instance when presenting ideas and in order to convince other people, but not for the idea development where there are various needs depends on the project. For example, workshops was mentioned as a method that is hard to follow due to lack of structure and it does not provide detailed analysis.

“[...]I have hard time to get something valuable with workshops [...] but I don't think that create as much value as others.” (Interview 2)

The Lean Startup method is considered a good example of method that helps participants to get quick results, as well as the hypothesis testing which provides clarity of results and suggests the right direction. Focus groups is considered a method that was used for presentation purposes to other partners, but it depends on what it is tested.

According to the participants, there are many challenges related with the alignment of the methods with the company's internal processes to innovate. One challenge is to utilize methods and tools that offer quick and trustworthy results. Especially in early stages of the product development, the company decides on the projects that fulfil certain values

and finding specific methods for this purpose is often a challenge. The participants discussed that the Lean Startup method provides quick results for companies in an innovation process. Second, there is a challenge to find methods that support both qualitative and quantitative data, as both types of data are important for the decision processes with multidisciplinary teams. As it was mentioned, finding methods that support convergent and divergent thinking with multidisciplinary teams is also a challenge. The third challenge can be found in the organizational processes, where the application of the methods should be adapted to the short or long development processes. For example, there is a challenge to utilize methods when bureaucratic processes of a company interfere the application of the methods. Forth, there is a challenge to establish the same methods and tools in the organization's culture. Different departments or teams work with different tools that are a personal choice at some extent. Lastly, it depends on the individual skills how to make the utilization of the methods beneficial for the project or a team. For some projects, the use of methods and tools is considered as a way to convince other people for the value of an idea or a project.

“If you have an idea will most likely get the answer "ok define it" [...] that's the culture in here. But after it is defined, there is more bureaucratic process, so if its cost you have to have it through, an investment committee and those things.” (Interview 2)

Discussion – Conclusions

In this paper, we presented the results from an empirical study with a company and how various methods and tools are being used in their internal innovation processes. The DT approach served as a methodological and analytical tool for mapping the applied methods in various design phases. The results suggest that many methods and tools could generate value in regards with the innovation processes, while there are many challenges that need to be considered.

Innovation processes are characterised by iterative phases, measurable factors, leadership, digital space. Accordingly, we believe that the utilization of DT methods and tools should adapt to these characteristics. The DT methods should allow many iterations, especially when they are applied in early phases. In other words, the methods of the early phases should generate rich data that will be used in later phases, in every direction. Additionally, the DT methods and tools should incorporate some kind of metrics that will help the decision processes. Metrics are important for innovation processes and DT methods should combine qualitative and quantitative results. Various kind of data are useful to different partners, in order to decide on the development process. Furthermore, methods that support convergent and divergent thinking allow the communication of people with different backgrounds. Regarding the leadership of innovation processes, bottom-up and top-down methods should be combined. The bottom-up methods, where the department leaders utilize to support their decisions, and the top-down methods, where everyone in a company could utilize in order to support the ideas/projects, should be jointly affect the innovation processes. Also, DT methods could be applied easier in a company when the methods work in a digital space as well. This allows to share the working space with other partners, but also to have everything online, in one place. Especially in big departments where it is up to individual skills to develop and present his/ her ideas, a digital space gives visibility to everybody's voice. Learning barriers of the digital tools should be limited. For example, simple digital tools for project

management are considered very important for innovation processes and accordingly, DT tools could be more functional if they are online. Lastly, building organizational culture for the use of the DT methods and tools, it will eventually generate value. The company will have access to every innovation activity that is growing and how it is developed.

“We don't know of everything that happens in the company. In many departments, they have their own innovation team [...] As I said we will never get control of everything.”
(Interview 1)

The findings could be beneficial primarily for companies that facilitate DT methods and want to get insights from other companies. In addition, designers, managers and other involved members in innovation activities could gain insights on how to implement DT methods and tools. Finally, designers and developers could benefit and inform the design of these tools and methods or suggest combinations of methods and tools for the DT phases.

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Feedback

The paper has many potential areas for development, regarding (a) the area of contribution, (b) the selection of theoretical background, and (c) future work on the topic. The first area for feedback concerns the general contribution to practitioners. The paper ends up with a list of DT methods and tools based on company's experience. These methods and tools need to be validated with other case studies, in order to make their validity stronger for generalizations. In which areas could be possible contribute the study?

The second area for feedback includes the interpretation of data in relation with the choice of a theoretical background. The study uses the DT approach as a methodological and analytical tool for mapping the applied methods in various design phases. Other approaches or theories might benefit the data analysis. What other theories could provide rich interpretations in this study?

The third area for feedback refers to the future work on the topic. What would be the extension of this empirical study?