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Using Dynamic Capabilities in an actionable tool as a vehicle to initiate design-driven innovation

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In order to become more innovative, corporations are increasingly turning to design-driven innovation capabilities. These capabilities are dynamic: they influence the way companies run their business and how companies create, capture and deliver value. Building design capabilities has proven difficult, given the tacit nature of design practice and the conflicting reasoning style of abduction that allows for the creative leap. However, if these enterprises don't improve, they are in danger of losing their ability to add value to the market. This may result in loss of market-share, which may lead to job destruction and the loss of valuable knowledge as communities of practice fall apart. This paper describes an iterative design process in which a tool was developed to determine which design-driven innovation capabilities a company is lacking. The tool started as a theoretical framework and was subsequently developed by prototyping with innovation managers from several large corporates. This paper contributes a new 'dynamic capabilities view' on design and innovation and a practical approach to implementing design in large firms.

Dynamic Capabilities; tool development; Design; Innovation

Introduction

It is increasingly difficult for firms to stay relevant. In fact, according to an article in Forbes "Half a century ago, the life expectancy of a firm in the Fortune 500 was around 75 years. Now it's less than 15 years and declining even further" (Denning, 2011). Some argue that large companies are simply not fit to survive, because they lose their ability to explore new opportunities as they mature and focus on exploiting their current products. In other words, they have trouble, "continuously reconfiguring their structures and processes, sustain stability through replication and optimization, ensure steady performances, and, at the same time, generate innovations in order to meet or create future demands" (Martini, Laugen, Gastaldi, & Corso, 2013, p. 2). Other authors even argue that



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‘creative destruction’ is needed, where old companies are replaced by new ones as the economic, political and/or technical landscape changes (Schlesinger & Doyle, 2014).

To sustain profitability, enterprises will need to innovate (Chesbrough, 2013; Eisdorfer and Hsu, 2011). Not only do they need to innovate, they need to innovate efficiently and effectively as our world becomes more digital and more globalized (Carlsson, 2006). This leads to product/service development cycles that are becoming increasingly demanding upon organizations as customers get used to frequent product/service launches to market.

The Value of Design for Innovation

One approach to kick-start innovation in large companies that is increasingly popular is using design (Kolko, 2015). Design has been associated with, amongst others, using empathy (or deep customer insights), visual communication, brainstorming (or divergent thinking), abductive thinking and iterative and cross-departmental problem solving (e.g. using prototypes). It has been described amongst others as a way of reasoning, a method, a way-of-working and a mindset.

The greater value of design however, lies not only in how it aids to develop better products, but in how it can reshape companies (Yee, Jefferies, & Michlewski, 2017). Design can influence the way a company performs its day-to-day business by inquiring into the organization (Junginger & Sangiorgi, 2009). Dynamic capabilities are those capabilities that change how a company operates (Helfat et al., 2009). This paper thus proposes that design can be considered a dynamic capability. However, before a company can implement design, a transformation needs to take place (Deserti & Rizzo, 2014).

This transformation touches many facets of the company: the organizational culture (Brown, 2009; Deserti & Rizzo, 2014), the mindset of how innovation should be managed (Martin, 2009) and the systems that support innovation and business operation in general (Tushman, Smith, Wood, Westerman, & O’Reilly, 2010). For example, according to designers, innovations should stem from observations and customers (latent) needs, rather than traditional marketing research (Martin, 2007; Yee et al., 2017).

Literature on Design-driven Innovation

The body of literature associated with ‘design-driven’, ‘design-led’ or ‘design-intensive’ organizations and –innovation is growing¹. Some of this research focusses on determining where a company is on a scale from the absence of design to high engagement in design. Examples of this are the Design Capacity model (Storvang, Jensen, & Christensen, 2015), the Design Value Index (Rae, 2016), the Danish Design Ladder (Ramlau, 2004) and the Australian extension of this model (Doherty, Wrigley, Matthews, & Bucolo, 2014). Other studies focus on determining what a design intensive organization is or what characterizes a ‘designerly’ company. Many portray success stories of companies that have realized a competitive advantage due to this transformation (Yoo & Kim, 2015).

However, not much of the reported research has resulted in actionable tools for managers, consultants or other (design) practitioners. Now that our knowledge of ‘what design is’ has progressed, it is time to focus on the question of how managers can implement design practices. What is required is a method to determine whether a company is ready to innovate in a designerly manner. More importantly, there is a need to determine how (not if) to make a company more design-driven and guide the transformation toward becoming more so. When the inhibiting factors to design-driven innovation within an organization are understood, then the steps to determine a transformation toward design can be planned.

¹ The aim of this paper is not to set-apart the differences between these approaches and will thus refer to the generic classification of ‘design-driven’ organizations.

Research Goal

This paper aims to develop a tool for an innovation management consultant (which is described in the section 'context'). This tool can be used to determine a client company's current state in the context of transformation toward design. Following the use of this tool, the consultant can more effectively help the client formulate a strategy to innovate in a more design-driven manner.

To develop the tool, first a theoretical framework based on the dynamic capabilities view is introduced. Subsequently the design of a tool to make this framework actionable is considered. The process of developing this tool is in turn expected to improve the understanding of the concept of 'design-driven' organizations. Hence, the research questions are:

1. What are design-driven innovation capabilities of a company?
2. How can we best identify and leverage these capabilities?

Context

As mentioned, this research was performed in the context of an assignment by Innovation Booster (IB). IB aims to make companies more innovative by introducing a design methodology and a supporting corporate structure. This chapter briefly describes this consultant and its methodology to understand how this tool is employed and how it helps to implement design.

Large corporates who want to either increase their revenue through innovative product introductions or decrease their costs through innovative operations improvement can hire IB. These companies have often experienced growth through becoming experts at exploiting their operations. However, they've gradually unlearned how to explore and uncover new business opportunities. Consequently, more importantly than receiving insights for new products or processes, the clients of IB want to learn how to become innovative again.

The process by which this is done is visualized in figure 1. In short, IB's employees facilitate a client's own employees to tackle projects with the use of design. This is done in an iterative manner, starting with a small project and only a few employees (working part-time on the project). Once this project is finished and the client is satisfied, a follow-up project will often try to tackle more challenges. More employees will be engaged, the same methodology will be used, but a more robust and elaborate structure will be introduced. Ideally, a succession of these projects would end in a fully functional design-led internal incubator.

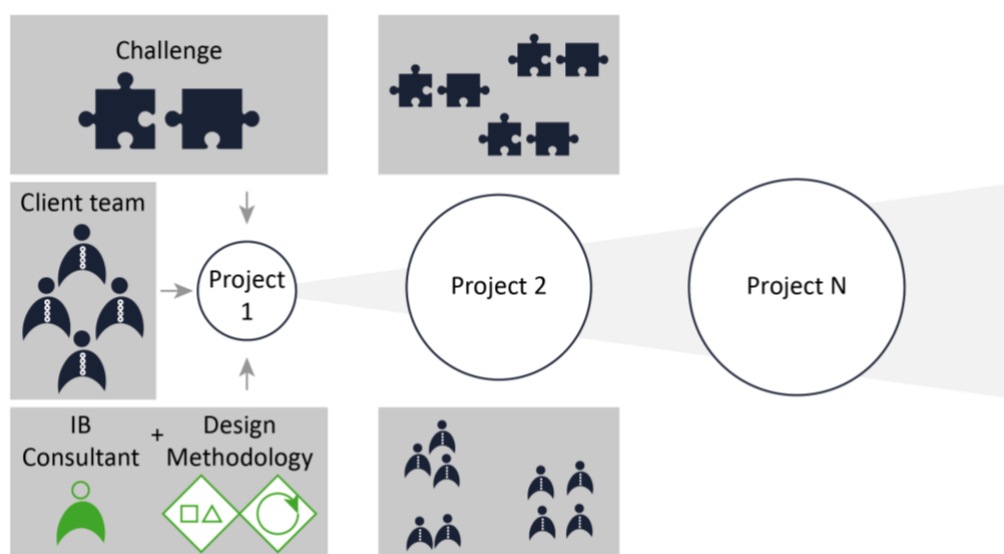


Figure 1: The Innovation Booster process starts by solving a small project with the use of design and expands with more teams and challenges

The challenge that led IB to instigate this research is that they were struggling to tailor their approach to their clients. The use of a generic approach leads to inefficiencies and a lower client satisfaction. The reason a tailored approach wasn't possible, is that IB had no standard approach of measuring the 'baseline' of a client's design aptitude. IB was therefore looking for a tool to measure design-driven innovation capabilities.

Developing a Theoretical Framework

Two different theory streams were used to create a framework that describes 12 'Design-driven Innovation Capabilities'. First, the theory of innovation strategy (Pisano, 2015) provides a holistic perspective on the different aspects that a company can innovate on. As mentioned before, a dynamic capabilities (Pavlou & Sawy, 2011; Teece, 2007) view was added to emphasize the effect of design as a transformative power.

The Perspective: Innovation Strategy

According to Pisano (2015), an innovation strategy answers three important questions:

1. How will innovations create value for the customer?
2. How will the company capture a share of the value its innovations generate?
3. What types of innovations will allow the company to create and capture value?" Or in other words: how will the company deliver value?

The answer to the first question describes the need of a specific customer segment that is targeted and the proposition that is used to do so. Or as Amit & Zott (2001, p. 513) note, "the strategically important ties are those which would contribute in some way to satisfy the customer's needs". The way in which a company captures value describes the revenue streams, cost structures and potentially the partners that will be included in the model. The last question, how a company delivers value, covers elements such as customer relationships, key activities, channels and resources.

The act of innovation entails finding new answers to these three questions. Innovation might focus on the way a company creates value (i.e. a new need to be serviced). An example of these kind of innovations are Googles steps from a search engine to a mobile phone manufacturer, operating system developer and security camera producer. Other innovations such as business model innovation speak to the way value is captured (Berman, 2012). One of the most obvious ways this is done, is by introducing subscription models into industries that were previously based on one-off purchases (such as headphones, laundry machines and computer games). Last, new answers to the third question are innovations that use for example new technologies to service the same need (such as a new model iPhone that services the same needs, only more effectively).

This theory isn't specifically positioned as a design related theory. However, it stretches the importance of empathy, describes reframing and encourages creative problem solving. It can therefore be seen as a theory that matches a design-driven approach. It is important to note that the desired transformation is not about changing the way a company creates, captures and delivers value once. A transformed company has the capability to make changes within the three elements of the innovation strategy continuously. The question remains: how to develop the three innovation strategy elements?

Making It Actionable: Dynamic Capabilities

A firm needs dynamic capabilities to change its operational capabilities (Winter, 2003). Dynamic capabilities are a collection of routines that are defined by (personal) traits, processes and interactions (Teece, 2007). Through these capabilities, a firm senses market changes, learns how to deal with those, integrates the knowledge that it gathers and coordinates a change in the way it performs its daily business. According to Felin et al. (2012, p. 2) "An explanation of these collective phenomena requires consideration of lower-level entities, such as individuals or processes in

organizations, and their interactions". These lower-level entities are also named micro-foundations. Pavlou and Sawy (2011) propose a framework that has four grouped micro-foundations:

- Sensing, or "the ability to spot, interpret, and pursue opportunities in the environment";
- Learning, or "engage in learning to find new solutions, create new knowledge, and reconfigure existing operational NPD capabilities to develop new products";
- Integrating, or "to combine individual knowledge into the unit's new operational capabilities", and;
- Coordinating, or "to orchestrate and deploy tasks, resources, and activities in the new operational capabilities."

Dynamic capabilities are rarely explicitly mentioned in the same literature as design (thinking), Although Eisenhardt & Martin (2000) do mention "build new thinking" (p.1108) and the brokering of knowledge (which can be done through prototypes and visualizations) as dynamic capabilities. More explicitly, each of the micro-foundations can be linked to the features previously described as 'design'. Sensing is linked to empathy, learning is linked to creative problem solving and integrating is performed through prototyping and visualization. Coordinating is supported by visualization and prototyping but is less inherently a design activity.

The Theoretical Framework

There are three questions that an innovation strategy is concerned with: how a company creates value, how it captures value and how it delivers this value. These three elements consider operational capabilities. There are four capabilities that a company needs to change its operational capabilities. If transformation is about building dynamic capabilities, then that means that a transformed company should have all four capabilities with regards to the three questions of an innovation strategy. This means that a total of 12 'Innovation Capabilities' become apparent. These are all the capabilities that a company can develop to ensure a lasting fit with the marketplace. This theoretical framework is visualized in figure 2.

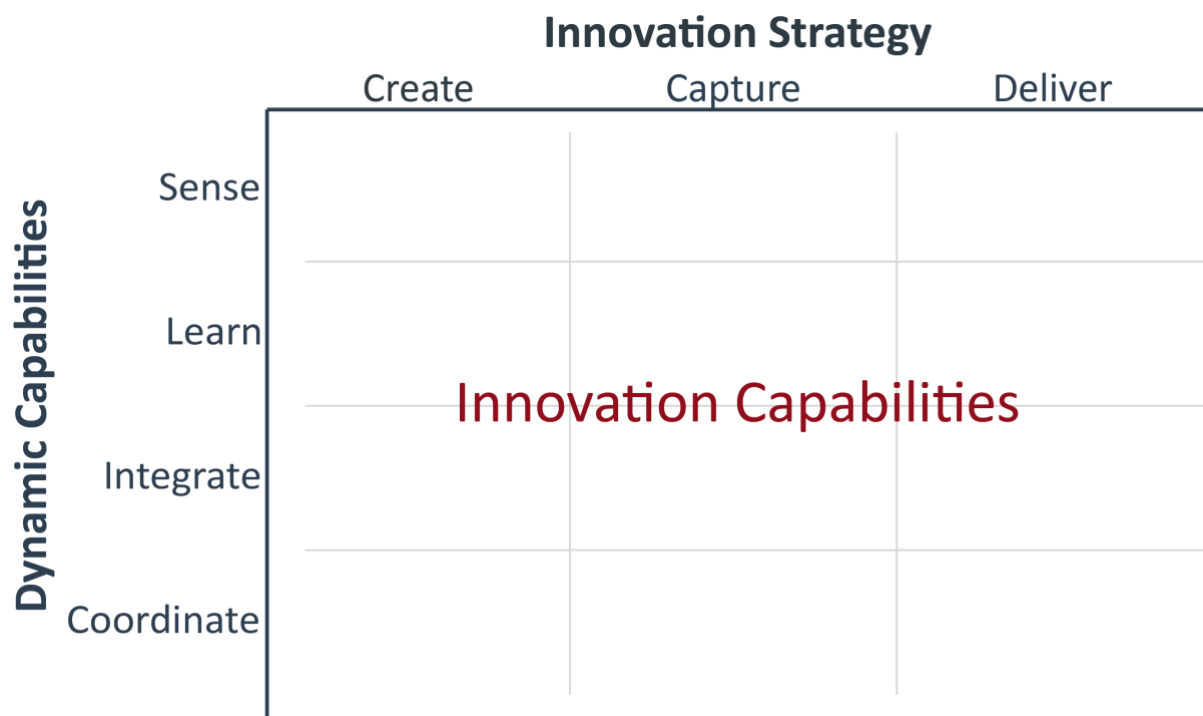


Figure 2: The proposed theoretical framework as a combination of Innovation Strategy and dynamic capabilities

The Development of an Actionable Tool

Now that the framework has been established, a tool can be designed. This tool was designed by testing prototypes with innovation managers. In total 9 innovation managers from 7 different companies and 3 design consultants provided input during 6 design cycles. These companies had a large office (frequently headquarters) in the Netherlands and operated in different industries. All but one of the companies can be considered large companies (>250 employees (Eurostat, 2017)). The functions of the managers and the type of companies are presented in more detail in table 1.

Table 1: The various iterations that led to the final design of the tool

<i># of company</i>	<i>Company Industry</i>	<i>Company Size (# employees in NL)</i>	<i>Functions of Participants</i>
1	Healthcare	~4,000	Manager Innovation Lab
2	Pharmaceuticals	>100,000	Digital Specialist
3	Logistics	~50,000	Division Head, Managing Director, Manager Design
4	Commodities	~700	Innovation Manager
5	Bank	~50,000	Innovation Portfolio Manager
6	Financial Services	~3,500	Innovation Manager
7	Government	~50	Project Manager

The simultaneous development of a product and theory building that was applied during this research is a form of research-through-design (Stappers & Giaccardi, 2017). During the 'experiments', the researcher observed the reactions of innovation managers to the prototype and asked questions regarding its' usefulness and understandability. Following this, each experiment was evaluated and conclusions were drawn regarding the reactions of the innovation managers. Finally, these conclusions were used to improve the prototype and generate knowledge regarding the theoretical framework itself.

Because of the relationship between the researcher and IB, the tool was also designed to match the desires of IB. By introducing this element, the researcher constantly needed to balance three elements:

- Technical/theoretical feasibility, which in this case also included: does the tool do what it needs to do?
- Business viability, or: can the client design a business model around the tool?
- Human desirability, or: do users want to use this tool? Is it understandable?

Table 2 describes which factor influenced each decision during the iterations. The balance between those three factors is characteristic of design projects (Brown, 2009; Buckley, Beames, Bucolo, & Wrigley, 2012; Jones & Samalionis, 2008). Through a sequence of iterations, the tool developed from a canvas to a process including the use of a chatbot to perform inquiries. Figure 3 visually summarizes the development of the tool throughout the study.

Table 2: The various iterations that led to the final design of the tool

Iteration	Artefact	Participant (# as referenced in table 1)	# participants	Major Change driver	Key Learning
1	Framework	Fellow Consultants at Design co.	3		- The framework makes sense to this group - Add examples
2	Framework	Small Firm (#7)	1	Desirability	- Framework is overwhelming - General concept provides interesting framework
3	Framework & explanation slides	3 Large firms (#1, 2 & 3)	3	Desirability	- Improved understanding of framework - Difficult to gauge own organization
4	Framework & questions	3 Large firms (#4, 5 & 3)	3	Feasibility & Viability	- More 'objective' scoring - Opportunity spotted: let colleagues score (to increase objectivity & political support)
5	Framework & survey	1 Large firm (#3)	2	Viability	- Need for qualitative sense-making session - Surveys result in low engagement
6	Framework & chatbot	2 Large firms (#3 & #6)	4	Viability, Desirability	- Tool sparks engagement - Chatbot needs to be humanized

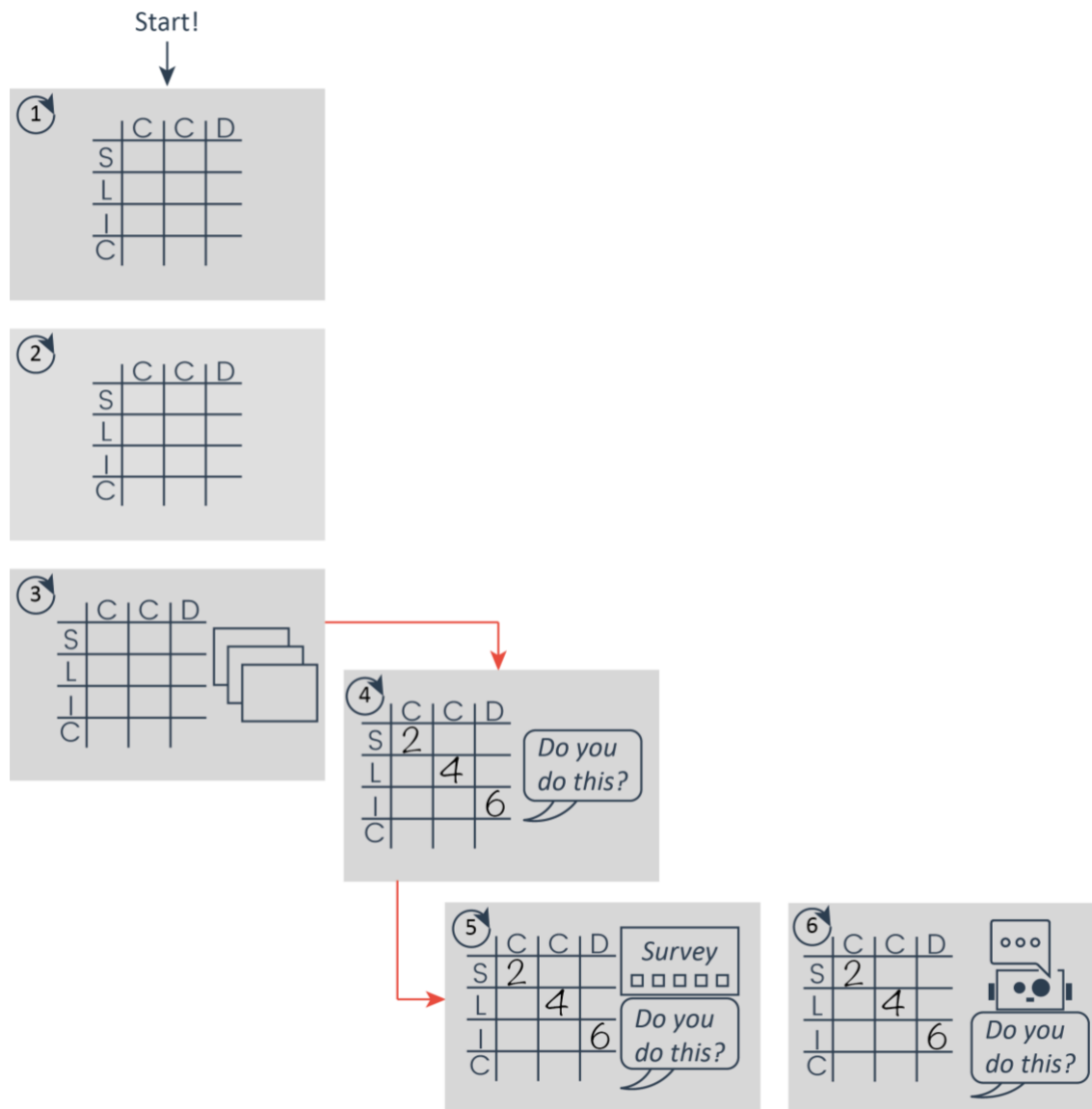


Figure 3: The development of the tool with two major pivotal moments

Evaluation

As the final form of the tool itself is not the focus of this paper, it will not be elaborated upon here. However, it is insightful to elaborate on two specific pivotal moments in this development process. This portrays the sort of data that was gathered during the iteration cycles and how these led to certain decisions. The first pivotal moment appears during the third cycle. During this experiment, participants noted that they understood the framework. However, they found it challenging to reflect upon their own organization and projects with the use of this framework. For example, the participant from company #1 noted: "I understand what you just explained...however, I'm having trouble coupling it to what I see happening"². It was therefore clear that the tool needed an improvement in desirability. During the evaluation of this cycle, the researcher realized that instead of explaining the framework before-hand, it might be more useful to use questions to guide the participants through the framework. The result was that in iteration 4, only the titles of the different capabilities were mentioned and participants were asked to reflect on specific sensitizing questions. Afterwards, the answers to these questions were used to clarify the framework. This resulted in a much more fluent interaction.

² Quotations are translated from Dutch by the first and third author

A second interesting pivot appeared during the fourth cycle. Participants in this cycle independently from each-other mentioned that they doubted whether their vision accurately represented the reality of the entire organization. For example, the participant from company 4 mentioned;

I am obviously colored in my judgement. I'm always busy with the future because I'm tasked with innovation while 99% of the company isn't thinking about that. Should I try to think like the average employee?

This indicated that participants, rightfully so, doubted whether the tool would lead to the valid insights that were being targeted. The judgement from one innovation manager is probably not generalizable for the rest of the organization. This insight, combined with a previous insight that innovation managers had a need for a tool that provided them with support during internal politics, led to an important pivot. The interview-style question guide (as portrayed in figure 4) was replaced with a survey that could be distributed to many participants within the same organization.

To illustrate, in order to gauge how clients interacted with their customers (and were thus able to 'sense' new opportunities to create value for them), staff were asked to rate their company on the following statements:

- *We get in contact with customers to uncover their needs and wishes*
- *We use qualitative insights from customers to develop concepts*
- *Whenever possible, quantitative data from customers is used to inform decisions*
- *Our mindset can be characterized as customer-centric*

This change would not only increase the validity of the information and thus improve the feasibility of the tool. Also, the information that was gathered from other stakeholders throughout the company was valuable to the innovation managers. Indeed, they expressed that they would be willing to pay for this information (and thus, viability was improved).

4. Klantgericht innoveren

De capaciteit om: een concept verder te kunnen ontwikkelen met de benodigde ondersteuning

Hulpvragen

- Is er een platform (fysiek of digitaal) voor de ontwikkeling van nieuwe concepten?
- Is er een innovatie-club? Is er een corporate accelerator?
- Is er een fysieke plek waar productontwikkeling plaats vindt?
- Kan er tijd worden vrijgemaakt voor het ontwikkelen van nieuwe concepten?
- Heeft iedereen de mogelijkheid om tijd te investeren in de ontwikkeling van nieuwe concepten?

Voorbeeld

Score

Why?

	Desireability	Viability	Feasibility
Product/service development	4/7	2	5
Information from outside the organization	3/9	2	5
Product/service development	6,5	5	5
Information from outside the organization	5	5	5

7. Kruisbestuiving waarde-modellen

De capaciteit om: intern nieuwe waarde-modellen te bespreken en testen

Hulpvragen

- Is de financiële afdeling in staat om alternatieve inkomstenstromen te schatten?
- Worden er experimenten uitgevoerd om nieuwe verdienmodellen te testen?
- Kunnen besparingen door innovaties op waarde geschat worden?

Voorbeeld

Score

Why?

Figure 4: The sensitizing questions used in experiment cycle 4 and the resulting framework scores.

A last interesting finding, which substantiated the need for this tool, is that all but one of the innovation managers didn't have an innovation strategy. Some of them had an 'innovation agenda', describing for example which technologies they wanted to experiment with. Additionally, some companies did have a process in place which described their innovation process. However, as these agendas only focus on technologies, they tend to focus only on 'how value is delivered' and process descriptions focus on how new product initiatives are judged for example. As mentioned before, these documents lack direction on what value is created and how a company can monetize this value. The innovation managers explained the lack of an innovation strategy by indicating that they had too little time and knowledge to craft such a strategy.

As stated, through progressive insight, the tool developed into a process or proposition. This proposition is visualized in figure 5. In short, the 'tool' developed into a process where:

1. Employees of a company are inquired by a chatbot to provide data concerning design-driven innovation capabilities;
2. This data is analyzed and visualized using the theoretical framework;
3. This visualization is then discussed in a session with a consultant from IB and its' client. The goal of this session is to make sense of the data that is uncovered and to provide an opportunity for qualitative feedback, and finally;
4. The results of the data analysis and the qualitative feedback are combined in a report. This report includes an advice on how to improve certain capabilities.

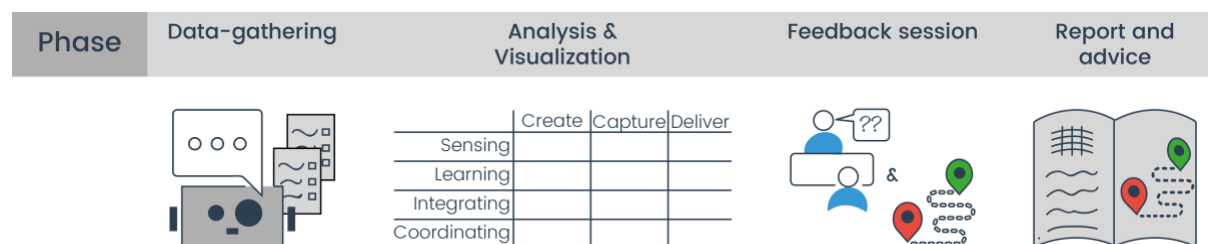


Figure 5: The final proposition includes a chatbot, a data-analysis phase, a qualitative feedback session and a formulated advice.

The qualitative feedback session was added to have an opportunity to explore why certain scores resulted from the chatbot. This session is explained in more detail in the end of the concluding chapter. It is important to note that this proposition, even though it is the 'final proposition' of this project, has not been finalized. Multiple iterations will still need to be performed by the client of this project to make the proposition market-ready.

Conclusion

This research set out to answer two questions: (1) what are design-driven innovation capabilities of a company? And (2) how can we best identify and leverage these capabilities? This research resulted in a definition of capabilities by combining the theory of innovation strategy and dynamic capabilities. Additionally, this research showed that almost without exception, companies do not currently operate with an innovation strategy.

During this project, a (and specifically not 'the') proposition to measure design-driven innovation capabilities is developed to answer the second research question. The development of this proposition was heavily influenced by context factors and is therefore not presented here as a scientific conclusion. However, during this practice, two observations were made that are believed to be fundamental to measuring innovation capabilities and are therefore described in more detail.

What are Design-driven Innovation Capabilities?

Design-driven innovation capabilities are needed to answer three strategic questions related to innovation as championed by Pisano (2015). It is important for a company to consider all of these three questions to “promote alignment among diverse groups within an organization, clarify objectives and priorities, and help focus efforts around them” (Pisano, 2015, p. 4).

What became apparent in experiment 2 and 3, is that each company seems to have trouble with specific elements of the innovation strategy. For example, one company indicated that they had no problem developing the way in which they delivered value. However, they were having trouble finding new ways to create value. On the other hand, another participant indicated that they had more trouble finding new ways to deliver value. To formulate answers to these three questions, dynamic capabilities need to be developed. These capabilities change the way a firm operates and is organized. If a company aims to realize design-driven innovation, it will need to foster these ‘second-order’ (Winter, 2003) capabilities regarding the before-mentioned innovation strategy subjects.

How to Identify and Leverage Innovation Capabilities?

The Innovation Managers that participated in this research often did not have a (complete) articulated innovation strategy. A uniform external method to identify these capabilities as proposed thus seems useful. Due to a perceived barrier regarding the use of surveys, a novel way of inquiring into capabilities was explored, which was positively evaluated. Most importantly, what became apparent during this research is that an assessment of these capabilities should include a qualitative session.

The definition of innovation capabilities in this article is based on the theory of dynamic capabilities and innovation strategy. These theories describe processes, systems and sometimes even mindsets. To make it more complicated, there are interdependencies between elements such as processes and mindsets. It is therefore almost impossible to ‘decompose’ these capabilities into elements which can be tested without losing all validity.

To resolve this problem, a qualitative feedback session was added to the tool. During this session, sensemaking takes place regarding the data that is produced by the chatbot. This session adds depth to the data and offers an opportunity for strategy making. This session is performed by the innovation manager (who is experienced in the organization) and an experienced design consultant (who has experience with different innovation challenges). During this session, both parties discuss the results of the chatbot and explore why certain scores are given. The session results in agreed-upon statements that are grounded in the data from the chatbot but are also sufficiently high-level to be actionable. In the current iteration, no dominant format for this session was developed yet. A last interesting finding in this research is that a chatbot can be an effective way to gather input from employees on innovation capabilities. Using a chatbot has numerous advantages over using traditional surveys such as the possibility to provide contextual information and a more engaging experience for the respondent.

Further Research

The framework and the tool that were developed during this framework are a way of operationalizing dynamic capabilities, which has been pointed out to be one of the challenging facets of this theory (Barreto, 2010; Easterby-Smith & Prieto, 2008; Pavlou & Sawy, 2011). It is a novel way of combining theories that needs refinement and is empirically untested. As per the goal of this research, the results primarily indicate that the framework can indeed be used to inquire into a company. This study also indicates that the results can be used as a vantage point wherefrom a strategy regarding innovation can be made.

However, the framework itself is in its infancy and has not been validated. This research did not aim to test whether the defined capabilities accurately reflect the innovative capability of a company. Also, no longitudinal study has yet been performed to determine whether improvement on the

scores of this grid result in better company performance. Follow-up research on the framework that was created is therefore needed. An initially interesting research would be to use the tool prior and after an intervention by a design consultant, alongside other validated measurements of innovativeness and financial parameters. Eventually, a quantitative study could be performed to see whether interventions lead to higher scores on the capabilities framework and whether this in turn results in better company performance.

This research also introduced the use of a chatbot to gather data. It is currently unknown what the effect of using a chatbot on the gathered data is. As alternatives to surveys are growing in popularity (especially in the realm of design research), research into the effect of using these methods on results and on the way that it can be used as (scientific) data gathering tool would be interesting.

In addition, it is interesting to uncover how the tool and framework that was developed can be leveraged in a variety of contexts. Even though it was originally intended as a conversation starter to determine an innovation strategy based on insights. One of the respondents also mentioned that it could be used to analyze how innovation projects progress or how teams within companies perform.

Besides research on the framework and the tool itself, it might be interesting to analyze the data that is produced from the assessment. First, it will be interesting to see which 'hurdles' Innovation Managers mention during the qualitative feedback session. One could imagine that these hurdles describe absent micro-foundations. Gathering and analyzing the hurdles that are mentioned frequently and comparing them with the capabilities that they are linked to might create a holistic framework of micro-foundations that underlie design-driven innovation capabilities.

A second interesting research would be to determine whether typologies can be recognized in the results of the chatbot. For example, after analyzing the answers of many different respondents across different companies, certain 'profiles' may become apparent. Perhaps companies typically have problems with only one of the innovation strategy elements (the columns) or with one of the dynamic capability elements (the rows). The definition of these typologies might help consultants and managers to determine best practices of solving innovation problems within certain typologies.

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