DESIGNING A VISUAL INQUIRY TOOL FOR IDENTITY COMMUNICATION

Elikan Dina

UNIL | Université de Lausanne

FACULTÉ DES HAUTES ÉTUDES COMMERCIALES

DÉPARTEMENT DES SYSTÈMES D'INFORMATION

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THÈSE DE DOCTORAT

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pour l'obtention du grade de
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par

Dina ELIKAN

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IMPRIMATUR

Sans se prononcer sur les opinions de l'autrice, la Faculté des Hautes Etudes Commerciales de l'Université de Lausanne autorise l'impression de la thèse de Madame Dina ELIKAN, titulaire d'un bachelor en Management et d'un master en Systèmes d'information de l'Université de Lausanne, en vue de l'obtention du grade de docteure ès Sciences en systèmes d'information.

La thèse est intitulée :

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Faculté des Hautes Études Commerciales

Doctorat en systèmes d'information
PhD in Information Systems

Par la présente, je certifie avoir examiné la thèse de doctorat de

Dina ELIKAN

Sa thèse remplit les exigences liées à un travail de doctorat.
Toutes les révisions que les membres du jury et le soussigné ont demandées
durant le colloque de thèse ont été prises en considération
et reçoivent ici mon approbation.

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Rapporteur externe du jury de thèse

To my late grandmother “Oma” and all the people who still cannot access education in the world.

Abstract

In this doctoral dissertation, I relate three studies performed to address the challenge of a visual inquiry tool for identity communication in the context of startups and SMEs. The challenge being: how to develop a visual inquiry tool (a tool on which a team of stakeholders with different backgrounds could try and solve their challenge in a designerly way) especially tailored to help them tackle the issue of communicating a coherent brand identity to all their different stakeholders. These three chapters (or studies) have been developed within a design science paradigm of research, which allows to develop knowledge through both theoretical and in the form of artefacts to tackle a practical problem. The main contributions of this dissertation are: 1) a brand identity ontology based on an extensive literature review, which addresses the semantic issues found in the brand identity literature and gives us the opportunity to explore and redefine the concept in terms of a conceptual model and 2) an identity communication map, this is derived from the ontology but is this time directly aimed at practitioners. It addresses the challenge of creating a coherent and structured identity communication especially in the context of startup and SMEs. And lastly, 3) by analyzing existing visual inquiry tools, we derived a design theory for managing any business challenge in a designerly way. This last contribution aims at supporting future designers and researchers when developing such artefacts. The view proposed in this thesis is highly interdisciplinary, but focuses mainly on design and proposes to adopt a new approach when solving management problems.

Acknowledgements

I would like to thank all the people who have supported me in the past years. First of all, I would like to express my deepest gratitude to my supervisor, Prof. Yves Pigneur. He has been the best mentor, both as a PhD supervisor but also as a human being. I don't think I'll ever meet anybody who is so humble, human, empathetic, nice, positive and smart. Answering emails faster than anybody else, he has always been available. I could not have dreamt of a better PhD supervisor. And when supervised by Yves, you get the bonus of having Isabelle who is also an example of care and kindness. I cannot thank you both enough for everything these past three years.

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Foreword

This thesis is presented as three main chapters, that could also be seen as three "essays" that have been submitted as journal publications (two accepted and one ready to submit). Each essay has actually been the result of different smaller projects that have been presented in conferences and workshops. In this table I present how each project is the result of different conference presentations / posters and workshop papers.

Essay	Journal	Related conference publications
A design theory for visual inquiry tools	JAIS 2019 Journal of the Association of Information Systems	H. Avdiji, D. Elikan, S. Missonier, and Y. Pigneur, (2018) "Designing Tools for Collectively Solving Ill-Structured Problems," *In Proceedings of the 51st Hawaii International Conference on System Sciences* (HICSS).
Brand Identity Ontology	To be submitted	D. Elikan and Y. Pigneur,(2018) "Foundations of a visual tool for brand identity," presented at the European Conference on Information Systems (ECIS), Proceedings, Porthsmouth, UK. D. Elikan, Y. Pigneur,(2017) "Brand modelling and ontology", 11-th International Workshop on Value Modeling and Business Ontologies (VMBO), The Luxembourg Institute of Science and Technology (LIST), March 6th – 7th 2017 D. Elikan, Y. Pigneur, (2018) "Brand Identity Ontology". In 12th International Workshop on Value Modeling and Business Ontologies (VMBO), Vrije Universiteit Amsterdam.
A visual tool for strategizing on identity communication	JSBED 2019 Journal of small businesses and enterprise development	D. Elikan, Y. Pigneur., "Designing the Brand of a Business Model for its stakeholders" *presented at the Business Model Conference* (BMCONF), Ca' Foscari University, Venice 8-19 May, 2017. Elikan, D., & Pigneur, Y. (2019). A Visual Inquiry Tool for Brand Identity. In *Proceedings of the 52nd Hawaii International Conference on System Sciences* (HICSS) 571-580.

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Chapter 1

Introduction

Brand Identity is of paramount importance for organizations today. The reasons being to the advancement of technology, faster innovation, growing competition and more demanding consumers. But a large number of authors have agreed that managing a brand is becoming increasingly complex (Spence and Hamzaoui Essoussi, 2010; Balmer, 2008; Abratt & Kleyn, 2012; Klaus and Maklan, 2007). Identity strategies are the backbone of organizations: they guide brand decisions, guarantee the coherence of a marketing strategy over time and will impact both internal stakeholders, such as employees as well as external stakeholders, such as customers (De Chernatony, 2001; Urde, 2003). Decisions surrounding brand identity will have strong impact on organizations. It will impact for instance, the hiring process and the attractivity of a company for some potential candidates for a specific position as well as the performance of the sales.

Organizations with a sense of purpose achieve greater levels of innovation and sustainability than those who do not (Sisodia, Wolfe, & Sheth, 2003). Brand identity is a key construct that helps companies define this sense of purpose. It helps companies differentiate themselves from competitors (D. Aaker, 1996); Kapferer, 2004). The creation of a well-defined brand identity during a company's infancy helps it to manage its strategic direction and the value it creates for stakeholders. Startups and SMEs need to attract attention from both internal and external stakeholders in order to be successful (Bresciani & Eppler, 2010). They need to communicate their purpose and identity in order to sell to their potential investors and customers, as well as to communicate consistently on social media. However, often SME owner-managers seem to think that branding is out of their reach (Merrilees, 2007).

On another side, the context faced by organizations today is changing, with increasing complexity, rising uncertainty and a fast-changing society. This is due to the current state of the world being: the emergence of new technologies at a fast pace, the environmental issues that we are facing as well as all the social changes that are occurring. Paradoxically the current tools and solutions on which these organizations rely are often static, mechanistic ideas that are somewhat out of touch with the changing realities. In this context, the task for organizations is ongoing and necessitates not only adaption of known solutions but also the discovery of new possibilities. Designerly approaches are helpful to tackle this paradox as

they allow more flexibility in organizations. They allow to align decisions with impact and work together, and with others, across disciplinary boundaries to innovate (Amatullo, 2015). This dissertation investigates how to tackle the problem of brand identity with a designerly approach. We achieve that developing a tool that will tackle the topic of identity communication in SMEs and startups from an uncertain perspective.

This doctoral dissertation is centered around the use of visual inquiry tools which support a designerly approach in organizations. In particular, we look at how to design a visual inquiry tool for supporting entrepreneurs in co-designing their brand identity. These tools allow for teams to gather and discuss strategies and solution around a common frame, a shared understanding of the elements involved and the necessary outcomes to help drive the organization forward.

We can define these tools as tools that allow teams to approach specific problems by framing the elements of that problem and then represents them in a shared visual (usually in the form of a printed poster) problem space where team members will inquiry into the problem. Inquiry is used in the sense of Daalsgard (2017), meaning that teams of practitioners will jointly, iteratively and democratically explore and define the specific problem they face. They will then jointly develop and evaluate prototype of potential ways to solve it.

These tools are aimed at managers and practitioners who would like to face a specific problem in a designerly way, meaning that they could approach specific problems for which there are no straightforward answers. They could iterate and prototype different solutions to the problem they are facing. These tools are however suited for strategy and only allow to strategize and co-design ideas and potential solutions without giving any specific or particular direction on how to proceed to implement this specific solution.

As this doctoral dissertation focuses on visual joint-inquiry tools and the study of the visual has been a relatively recent, yet growing, phenomenon in organization and management research (Warren, 2009), we rely on few empirical performed show that visuals can enable organizational actors to challenge dominant organizational narratives (Bell & Davison, 2013;

Comi and Bresciani, 2017) and support the creation and sharing of strategic knowledge (Kaplan, 2011), and deal with the social and emotional aspects encountered in strategy making (Eppler & Platts, 2009).

Through the research covered in this thesis my aim is both to contribute further evidence to support this approach, as well as provide a basis of prescriptive knowledge that is necessary for scholars and practitioners to design new visual joint inquiry tools and artefacts. To move from pure analysis to solution design there is the need of a change in the method and the way of thinking. The "passive" perspective of the observer is no longer enough but there is the need to adopt an "active" role to create the solution. According to (Aken, 2004), most research in management and organization has remained purely descriptive, which translated in a lack of practical and relevance. Koskela (2017) has even argued further that research in management has become irrelevant in the last fifty years partly because of its distance from reality, the unhelpful ontological assumptions due to the focus on quantitative methods and the failure to embrace the topic conceptually.

On the contrary several scholars have argued that the Information Systems (IS) discipline and in particular design science research (DSR) is particularly tailored to help practitioners solve complex problems for which knowledge is still descriptive (i.e: ., Gregor & Hevner, 2013; Peffers, Tuunanen, Rothenberger, & Chatterjee, 2007;Mandviwalla, 2015;Winter, 2008). One of the goal of DSR in IS is to address practical problems that are being faced by practitioners by developing different types of artefacts (in the forms of constructs, models, methods, tools and softwares) that could support practitioners in addressing their problems (Hevner, March, Park, & Ram, 2004). This makes DSR a research paradigm being different from the traditional paradigms in the social sciences. The design-science paradigm has its roots in engineering and the sciences of the artificial (Simon, 1996) and is essentially a problem-solving paradigm (Hevner et al., 2004).

The difference between this paradigm from other social sciences approaches is that it is not only concerned with describing and understanding a phenomena or theories that explain or predict human or organizational behaviors but it is also concerned with developing

knowledge – in the forms of artefacts—on how to address these phenomena. This reflects the objectives of my research project, which presents the need to provide more actionable guidance on how to deal with the development of tools that can support designerly approaches in organizations and how to develop a visual inquiry tool for the specific problem of identity communication in startups and small organizations.

We achieve this through a theory developed by analyzing three visual inquiry tools (The Business Model Canvas, The Value Proposition Canvas and The Team Alignment Map), which have proven useful and have been popular in the last decade. By analyzing the development of these three tools, we uncovered three main design principles which state that such a tool must (1) be based on a conceptual model developed according to academic justificatory knowledge and should be kept parsimonious; (2) represent the conceptual model as a shared visualization by logically structuring the components into a visual problem space; and (3) define and specify techniques for its use that allow for joint inquiry. In the second part of my work, I apply these principles specifically to the wicked problem of "organizational identity communication" or "brand identity communication". Defining an organization identity and managing its communication has become increasingly complex (Abratt and Kleyn, 2012; Balmer, 2008, 2008; Klaus and Maklan, 2007). In our research we discovered a significant amount of semantic confusion about what organizational identity represents in and of itself, furthering its confusion despite the research showing that organizations with a clear purpose can outperform their competitors (Sisosodia et al. 2003) and that having a clear identity helps companies to differentiate themselves from competitors (Aaker, 1996; Kapferer, 2004). This identity guides brand decisions, guarantees the coherence of a marketing strategy over time, and should be associated with specific and limited core values that complement organizational values and culture (De Chernatony, 2001; Urde, 2003). Research has even shown that companies who manage to better define their identity, values and philosophy are more successful than those who do not (Rode and Vallaster, 2005). The complexity of the identity communication problem in startups and SMEs make it a problem that could easily be solved with a visual inquiry tool. Adding to that, (Inskip, 2004) has argued that in smaller companies the identity is set-up by the team of founders.

Because brand identity is a wicked problem (i.e., it is complex, unique, intangible and difficult to define), there are usually disagreements among stakeholders about how to define the problem (Dorst, 2006). As for the solutions of these types of problems, there is typically no "stopping rule", which means that the process of searching for solutions ends, as and when determined by the judgment and mutual satisfaction of the stakeholders. Further, the solution is usually based on the stakeholders' judgments, as there are no "universal solutions" (Rittel and Webber, 1973). Buchanan (1992), showed that design approaches are better suited for coping with wicked problems, because they allow for collaborative exploration and iteration through prototyping. Co-design or visual inquiry tools could help in solving wicked problems, as they support collaboration and allow for a shared understanding of the problem. Nonetheless, according to our knowledge, it is a real issue and to date, there are few tools available for this.

Integrating theories of marketing, organizational research, modeling, information systems and design, and building on the construct of "design attitude" (a set of unique capabilities, abilities and dispositions that are related to organizational learning and innovation), the dissertation relies on the interpretation and analyses of existing visual inquiry tools and the development of a new visual inquiry tool as well as some preliminary evaluation of the aforementioned tool.

In this dissertation, we answer the call of Osterwalder and Pigneur (2013), who consider IS researchers well-suited for designing strategic tools, given the IS tradition in designing artefacts; in this, we seek to develop an ontology that captures the essence of brand identity, in order to develop a tool that helps entrepreneurs define their organization's identity in a systematic way.

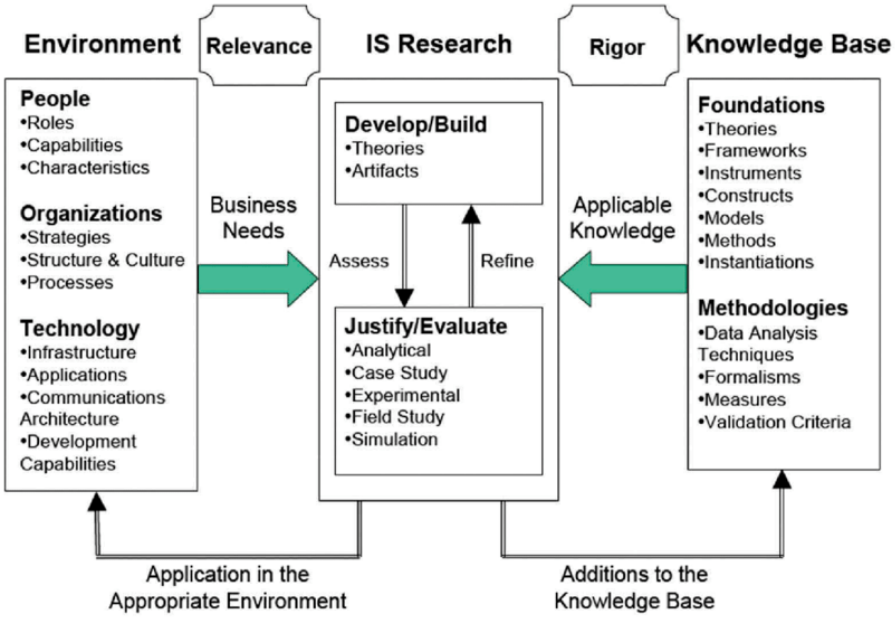
Following Hevner, (2004), this dissertation has three main contributions: A first contribution is the ontology developed in the third chapter. This contribution allows to look at the brand identity concept from a different perspective than what has been done until today. It allows us to propose a new definition of the concept. To be able to come up with this conceptual

model, we have conducted extensive literature reviews, which we believe could also contribute further to researchers.

The second contribution is the identity communication map presented in chapter four. This artefact was iteratively developed following a design science approach and evaluated by different stakeholders in different contexts. This has been the main "build and evaluate" episode of this dissertation.

As a third contribution, in chapter two, we propose a design theory that adds to the knowledge base in the form of a level V "Design and Action" Theory (Gregor, 2006). This theory informs future researchers or practitioners on how to develop a new visual inquiry tool that could be aimed at solving a specific business problem.

Figure 1. Hevner (2004), three cycles process



In the sense of these three main contributions, we pinpoint that this dissertation contributes to both the rigor and the relevance aspects of IS research as conceived by Hevner, 2004. We have made a theoretical contribution to the knowledge base and have developed two artefacts that have proven to be relevant for practitioners.

Hereunder is the outline of the dissertation. Each of the three proposed contribution has been put in the format of a journal paper, two of which have been published in journals this year. One in an pure information systems journal and the second one in a journal that lays in the management discipline. This also showcases the interdisciplinarity of the proposed dissertation. Lastly, the third paper has not been submitted to a journal, but is based on a conference paper and is ready for submission.

Table 1. Outline of the dissertation

Chapter	Title	Content	Corresponding publications
2	A design theory for visual inquiry tools	• Analysis and observations of the development of three existing visual inquiry tool • Presentation of a theory to follow when designing such tools	JAIS 2019
3	Literature review and conceptual model for identity communication	• Systematic literature review on the concepts of brand identity/organizational identity • Conceptual model to decrease semantic confusion	NEW SUBMISSION
4	A visual tool for strategizing on identity communication	• Description of the development of a visual inquiry tool for identity communication • Illustration of the use of the tool • Preliminary evaluations	JSBED 2019
5	Conclusion and perspectives	• Conclusion of the main contributions of the different studies presented • Contributions put in perspective with existing studies regarding design approaches, the use of tools in organizations and research on identity communication for small companies.	

Chapter 2

A Design Theory for Visual Inquiry Tools

This chapter corresponds to the paper: " A design theory for visual inquiry tools" written by Hazbi Avdiji, Dina Elikan, Stephanie Missonier and Yves Pigneur referenced as (Avdiji et al., 2019). This project was born in 2016 and was first published at the Hawaiian International Conference on System Sciences (HICSS) in 2018 referenced as (Avdiji et al., 2018). In this version we related design principles that had been followed for designing the Team Alignment Map and the Business Model Canvas. It was nominated for Best Paper Award. It was then extended in the version presented in this chapter. This paper has been accepted in the Journal of the Association for Information Systems (JAIS) in the special issue on design science research knowledge and accumulation. We included the Value Proposition Canvas as an additional tool, which development we analyzed to allow to improve the design principles. We extended these principles to a design theory following Gregor and Jones, (2007).

ABSTRACT OF CHAPTER 2

The Business Model Canvas opened the way for the development of a new tool type which we call visual inquiry tools. Such tools build on design thinking techniques to allow management practitioners to jointly inquire into specific strategic management problems. As the interest in and the emergence of visual inquiry tools gains momentum, it is important to formalize the design knowledge that future designers can build on for developing such tools. Thus, we propose a design theory for visual inquiry tools based on the design knowledge accumulated within and across three projects: the Business Model Canvas, the Value Proposition Canvas, and the Team Alignment Map. We outline the design principles (among others) that should be followed for developing visual inquiry tools for other strategic management problems. Our study addresses the lack of guidance in the development of visual inquiry tools and the lack of methodological guidance in design science research on how to theorize and formalize knowledge across multiple projects. We provide a methodological process for analyzing multiple-project data by bridging methodological insights from design science research and qualitative methods from the social sciences.

Keywords: strategic management problem, visual inquiry tool, joint inquiry, design theory, design knowledge accumulation, multiple-projects analysis.

1. Introduction

The reality managers face today is increasingly characterized by strategic management problems. Such problems are wicked, unique, intangible, and hard to define and ultimately solve. This is for instance the case in information systems (IS) development (Dorst, 2011; John & Kundisch, 2015), new product development and service design (Dunne & Martin, 2006; Steen, Manschot & De Koning, 2011), and organizational design (Camillus, 2008; Clegg, Carte, Kornberger & Schweitzer, 2011). Since these problems are not governed by stable and linear causal mechanisms (Dunne and Martin, 2006; Farjoun, 2010), scholars and practitioners have begun to address them with iterative approaches such as design thinking and joint inquiry (Détienne, 2005; Martin, 2009; Steen, 2013). Joint inquiry is a process through which a group of diverse individuals who face an uncertain situation jointly *define* and *explore* a problem, and jointly *generate* and *evaluate* different hypotheses about how to solve it. These approaches are becoming more popular for strategic problems than traditional linear approaches, since they allow for iterative and creative processes (Boland, Collpy, Lyytinen & Yoo, 2008).

Practitioners make use of various tools to navigate the complexity of joint inquiry (Dalsgaard, 2017). Work is increasingly mediated by objects and tools used for different purposes and functions (Nicolini, Mengis & Swan 2012). Among these various tools, we have in recent years seen an emergence of what we call *visual inquiry tools*. These tools support the process of exploration and ideation of a strategic management problem. Such tools include the Business Model Canvas (Osterwalder & Pigneur, 2010), the Project Canvas (Habermann & Schmidt, 2014), the Innovation Matrix (Van der Pijl, Solomon & Lokitz 2016), and the Customer Journey Map (Kalbach, 2016). These tools provide a shared and framed design space in which practitioners can jointly inquire into a strategic management problem. Recently, these tools have attracted considerable interest, as shown by the number of tools available and the extensive adoption of tools such as the Business Model Canvas, which has been downloaded more than 6 million times.

Given their importance, a major shortcoming is that it is not clear how rigorously and theoretically sound these tools are designed. There is a lack of systematic or rigorous prescriptive knowledge that could inform future developers for designing such tools. Since this visual approach to joint inquiry may prove useful to address strategic management problems, the development of prescription for their design is increasingly called for. The lack of such knowledge leaves room for potential inconsistent developments that are solely based on the imitation or replication of existing tools, without a clear and rigorous conceptualization on the functions and forms of the intended design. Thus, we seek to answer the following question: *How can we develop tools that guide practitioners in using joint inquiry techniques for specific strategic management problems?*

To answer this question, we propose a design theory based on three independent design science research (DSR) projects, which resulted in the design of three visual inquiry tools: the Business Model Canvas, the Value Proposition Canvas, and the Team Alignment Map. The theory integrates principles and knowledge from these three visual inquiry tools, each of which addresses a different type of strategic management problem. We based the development of our design theory on three extensive and longitudinal datasets spanning across seven to 17 years. Our design theory informs us that such tools have three fundamental pillars: (1) a conceptual model that frames and defines the strategic management problem at hand, (2) shared and visual design spaces in which practitioners can explore and try different solutions, and (3) a set of directions for use that users can follow to solve the strategic management problem.

In answering the research question, we also make a methodological contribution. We outline how design knowledge accumulation and theorization within and across projects can be conducted in DSR. There are currently no clear frameworks on how to theorize design knowledge from multiple projects, since most methodological developments in DSR have either focused on how to conduct a research project (e.g. Hevner, March, Park & Ram, 2007; Peffers, Tuunanen, Rothenberger and Chatterjee, 2007) or how to present and theorize design knowledge from single projects (e.g. Gregor & Jones, 2007; Gregory & Muntermann, 2014). Our methodological approach can inform other design science researchers who wish to develop design theories for multiple artifacts and projects.

Literature Review

Given the importance for organizations to manage strategy's wickedness and thus to be able to formulate, align, and implement their strategies so as to remain competitive, one could expect that many different tools and techniques would have been introduced to support this process (Aldea, Iacob, van Hillegersberg, Quartel & Franken 2018). Tools can be any kind of object, concept, framework, method, or model that helps practitioners to analyze and solve a problem, making decisions, and collaborate with others (Lee & Amjadi, 2014; Nicolini et al., 2012).

The 1980s saw the development of an extensive number of strategic management tools that are still widely used today, such as the Five Forces (Porter, 1979), strategic group maps (McGee & Thomas, 1986) or the BCG growth-share matrix (Henderson, 1979). Such tools were among the first to target specific management activities and help practitioners to analyze a situation and evaluate strategic choices (Jarzabkowski & Kaplan, 2015). These tools were developed based on the assumption that management activities mainly require procedural rationality (Simon, 1978) – the use of rational and causal thought processes to come to a decision or a solution. Thus, they were primarily developed for the purposes of rational analysis and decision-making processes (Cabantous & Gond, 2011; Jarratt & Stiles, 2010). This decision-making process is based on the process of gathering data, narrowing down possibilities, and choosing the best one. This business approach values the refining and polishing of ideas without testing them prior to implementation. However, as uncertainty and complexity increase strategy's wickedness, practitioners increasingly face issues they can no longer resolve by breaking problems down into smaller ones (Camillus, 2008; Teece, Peteraf & Leih, 2016).

Instead of traditional strategic management approaches, joint inquiry through design thinking techniques (an approach that comes from the architectural world) has emerged as a valuable approach in strategy making (Boland, 2006; Steen, 2013). It is a recursive process through which multiple individuals (1) jointly define and explore a problem, and (2) jointly develop and evaluation alternative solutions to it. This process is less linear than traditional rational techniques in strategic management (Buchanan, 1992). This approach to problem-solving has been shown to enhance innovation and, by extension, organizations' value

(Gruber, De Leon, George & Thompson, 2015), especially in environments with great uncertainty (Lietdka, 2018).

Joint inquiry encourages the creation of alternatives and transforms the way management problems are dealt with. Instead of refining their first idea, architects and designers using design thinking generate prototypes. These visual prototypes allow for easier representations of different possible scenarios, testing these different scenarios and (re)presenting the selected solutions to all the stakeholders (Cooper, Junginger & Lockwood 2009). Thus, joint inquiry is particularly tailored to strategizing, since it allows individuals and teams to adjust to unexpected changes (Razzuk & Shute, 2012), as well as handle uncertainty and increase team engagement via the implementation of team processes. For instance, Ben Mahmoud Juini et al., (2016) found that the limitations of project management in innovative solutions could be leveraged by joint inquiry.

A new management tool type, visual inquiry tools, which rely on joint inquiry techniques, has emerged in the past few years. Examples include the Project Canvas (Habermann & Schmidt, 2014), the Innovation Matrix (Patrick van der Pijl et al., 2016), the Operating Model Canvas (Campbell, Gutierrez & Lancelott, 2017), the Customer Journey Map (Kalbach, 2016), and the Market Opportunity Navigator (Gruber & Tal, 2017). These tools build on design thinking techniques to guide practitioners in jointly inquiring into specific strategic management problems. For instance, the Business Model Canvas (Osterwalder & Pigneur, 2010), the first and best-known example, has transformed business modeling by providing a design space framed by nine building blocks that outline all the elements that must be inquired into to develop business models.

Visual inquiry tools have been developed to aid a less linear and more creative and innovative process, relying on both design techniques and visualization for collaboration (Comi & Bresciani, 2017), because they allow a social design process (Dym, Agogino, Eris, Frey & Leifer, 2005). According to Dalsgaard (2017), they allow one to approach and transform uncertain situations in which there are no straightforward answers by helping to better understand a problem, an explore and make sense of it. Also, such tools support the

forming of ideas and hypotheses on how to address a problem and experimenting with these ideas in practice (Horn & Weber, 2007). We compare these tools to the traditional strategic management tools in Table 1.

Table 1. Comparison of Traditional and Visual Inquiry Tools

Tool types	Traditional management tools	Visual inquiry tools
Problem-solving approach	Analytical and rational processes of decision-making, planning, and optimization. Deductive and inductive.	Process of joint inquiry: exploring alternative hypotheses, creative and iterative design. Abductive and inventive. Based on a design thinking techniques.
Types of use	Mainly verbal, use of tables and diagrams. Mainly rational and objective. Lead by organizing and planning.	Mainly visual, use of sketching and prototyping. Intensive observation and wondering, challenging stereotypical perception. Comfortable with ambiguity and uncertainty.
Examples	Porter's Five Forces, BCG growth-share Matrix, Strategic group maps.	Business Model Canvas, Value Proposition Canvas, Team Alignment Map, Project canvas, Innovation Matrix, Operating Model Canvas, Customer Journey Map, Portrait of Design Essence, Market Opportunity Navigator.

Given the increasing number and use of visual inquiry tools, it seems crucial to accumulate knowledge on how to develop and evaluate them. The lack of prescriptive knowledge for designing visual inquiry tools has been problematic, since their development has relied on intuition or imitation of existing popular tools such as the Business Model Canvas. Without a clear and rigorous conceptualization of the form and functions of the intended design. Thus, designers who wish to develop a visual inquiry tool can only rely on the apparent features and properties of other tools (Piirainen & Briggs, 2011). For instance, several design science researchers have admitted replicating the logics behind the Business Model Canvas without prescriptive knowledge for their development (e.g. Campbell et al., 2017; Chandra-Kruse & Nickerson, 2018). This motivates the question that drives our research project: *How*

can we develop visual inquiry tools that guide practitioners in using joint inquiry techniques for specific strategic management problems?

2. Research design

To answer our research question, we theorized the knowledge accumulated within and across three DSR projects, which resulted in the design of visual inquiry tools: the Business Model Canvas, the Value Proposition Canvas, and the Team Alignment Map. Given the lack of frameworks and processes for analyzing and theorizing multiple-project data in DSR, we used a hybrid approach between theorizing in DSR (Gregor & Jones, 2007; Lee, Pries-Heje & Baskerville, 2011; Mandviwalla, 2015; Meth, Mueller & Maedche, 2015) and multiple-case analysis in the social sciences (Fereday & Muir-Cochrane, 2006; Miles & Huberman, 2010). We performed a within-project and cross-project analysis to capture, formalize, and compare the design knowledge that was acquired in the three projects. The design knowledge of interest concerns all the design intuitions, design decisions, principles of form and function, and descriptive knowledge that were used to understand the problems and design the corresponding solutions in each case.

Our analysis has three aims: (1) to outline the process of the development and accumulation of design knowledge within each project, (2) to theorize the design knowledge by analyzing the idiosyncrasies and commonalities across the three projects, and (3) to formalize the theorized design knowledge as a mid-range design theory, which can serve as a foundation for future designers of visual inquiry tools. A design theory is a set of principles and knowledge that describe and guide the design of an artifact in order to attain a specific goal in the material world (Gregor & Jones, 2007).

3.Project selection

The three projects we selected represent three longitudinal DSR initiatives that have been undertaken separately (Table 2). We used the theoretical sampling criteria recommended by Eisenhardt (1989) to ensure comparison between the three projects. That is, we selected the

three projects based on these reasons: (1) they are among the few widely recognized examples of tools that support a joint inquiry approach to solving specific strategic management problems collectively, which is the target of our research question, while at the same time (2) being designed based on theoretically sound and rigorous academic work through a DSR approach.

Table 2. Overview of the Cases

Tool	Business Model Canvas	Value Proposition Canvas	Team Alignment Map
Strategic problem	Business modeling and strategic innovation	Value proposition design	Team alignment and project kickoff
Adoption and use	Adopted by +6 million people worldwide, including startups, SMEs, and large organizations for business modeling, strategic management, and competitor analysis.	Adopted by +1 million people worldwide, including startups, SMEs, and large organizations for designing and testing different value propositions and their fit to potential customer segments.	Adopted by teams in +200 organizations to manage collaboration and project kickoffs in organizations in different sectors.
Secondary data collection	Cycle 1 (1999 to 2004), Design of the Business Model Ontology (BMO): - 2 instantiated case studies - 11 semi-structured interviews of 60 to 90 minutes with managers and consultants - 5 fifteen-week courses with 30 to 60 undergraduate students - References: Gordijn et al. (2005); Osterwalder & Pigneur (2002); Osterwalder (2004); Osterwalder, Pigneur & Tucci (2005).	Cycle 1 (2011 to 2012), Design of the conceptual model: - Literature review of customer development and value proposition design - The jobs-to-be-done framework had already been tested by Ulwick (2005). Cycle 2 (2012 to 2013), Design of the Value Proposition Canvas: - Evaluation of the visual layout with 60	Cycle 1 (2010 to 2014), Design of the COOPilot conceptual framework - 3 longitudinal cases of 3 project teams in different organizations - 3 workshops with project managers - Reference: Mastrogiacomo, Misssonier & Bonazzi (2014). Cycle 2 (2014 to 2015), Design of the COOPilot App

	Cycle 2 (2004 to 2008), Design of the Business Model Canvas: - 32 one-day workshops and seminars with practitioners - 4 fifteen-week courses with 30 to 60 undergraduate students - References: Fritscher & Pigneur (2009); Osterwalder & Pigneur (2010); Osterwalder & Pigneur (2013). Cycle 3 (2008 to 2016), Design of the Business Model Mechanics, the iPad app, and the web app: - 256 two-day workshops and seminars with management practitioners and entrepreneurs - Questionnaire to 1,300 users - Semi-structured interviews with 35 users of 2 hours each - 8 fifteen-week courses with 30 to 60 undergraduate students - References: Fritscher (2014); Fritscher and Pigneur (2014a); Fritscher and Pigneur (2014b).	practitioners and 55 undergraduate students - Design of the layout with a seasoned visual designer Cycle 3 (2013 to 2014), Stabilization of the directions for use: - Evaluation of the Value Proposition Canvas with 100 practitioners - Evaluation of the Value Proposition Design (book) with 60 practitioners - Reference: Osterwalder et al. (2014).	- 4 cases of project teams in different organizations - 8 one-day workshops with project managers - Reference: Avdiji (2018); Missonier et al. (2014). Cycle 3 (2015 to 2017), Design of the Team Alignment Map - 10 cases of project teams in different organizations - 11 one-day workshops with project managers - Semi-structured interviews with 7 users - References:Avdiji, Missonier & Mastrogiacomo (2015) ; Avdiji & Missonier (2018); Avdiji (2018);

Besides their criticality, there were additional rationales for choosing these projects. Some co-authors were directly involved in the projects, which allowed for extensive access to data on the design process and design decisions. Some design knowledge was also formalized in journal and conference publications. Also, the three projects were undertaken following DSR approaches. This illustrates the academic rigor the three research projects were

conducted with, in contrast to most other similar tools that are designed following the mere intuition of the designer or through the imitation of existing tools. Also, the three artifacts were developed in close collaboration between academics and practitioners, and were continuously refined based on evaluations in situated contexts. Finally, the search for specificities allowed us to have some variety, so as to increase our design theory's reliability. The three projects contrast, since they address different strategic problems (business modelling and strategic innovation, value proposition design, and team alignment and project kickoff). Since each strategic management problem has its own set of challenges, this provided variety in our sample regarding the problems and the solutions the design science researchers attended to.

4.Presentation of the three projects

4.1 The Business Model Canvas Project

In a business landscape characterized by complexity and uncertainty, in which business models demand the coordination of an increasing number of stakeholders (Teece, 2010), there needs to be a tool to understand, map, and share a firm's business logic. This was the logic behind the Business Model Canvas when it was designed (Figure 1). The Business Model Canvas defines business models as having nine components, and presents these components via a visual template to facilitate the ideation, elaboration, and evaluation of business model ideas. The Business Model Canvas project spanned from 1999 to 2012.

The tool has attracted tremendous interest in practice, since the designers of the tool state that more than 6 million downloads of the tool were made globally (Strategyzer, 2015). By 2015, the book *Business Model Generation* had sold 1.5 million copies, and more than 400 universities have used the Business Model Canvas for at least one course. In practice, the Business Model Canvas has become the quasi-standard for describing business models. Further, the impact of the Business Model Canvas is not limited to practice, since the book describing the tool has been referenced by more than 6,000 academic studies, according to Google Scholar.

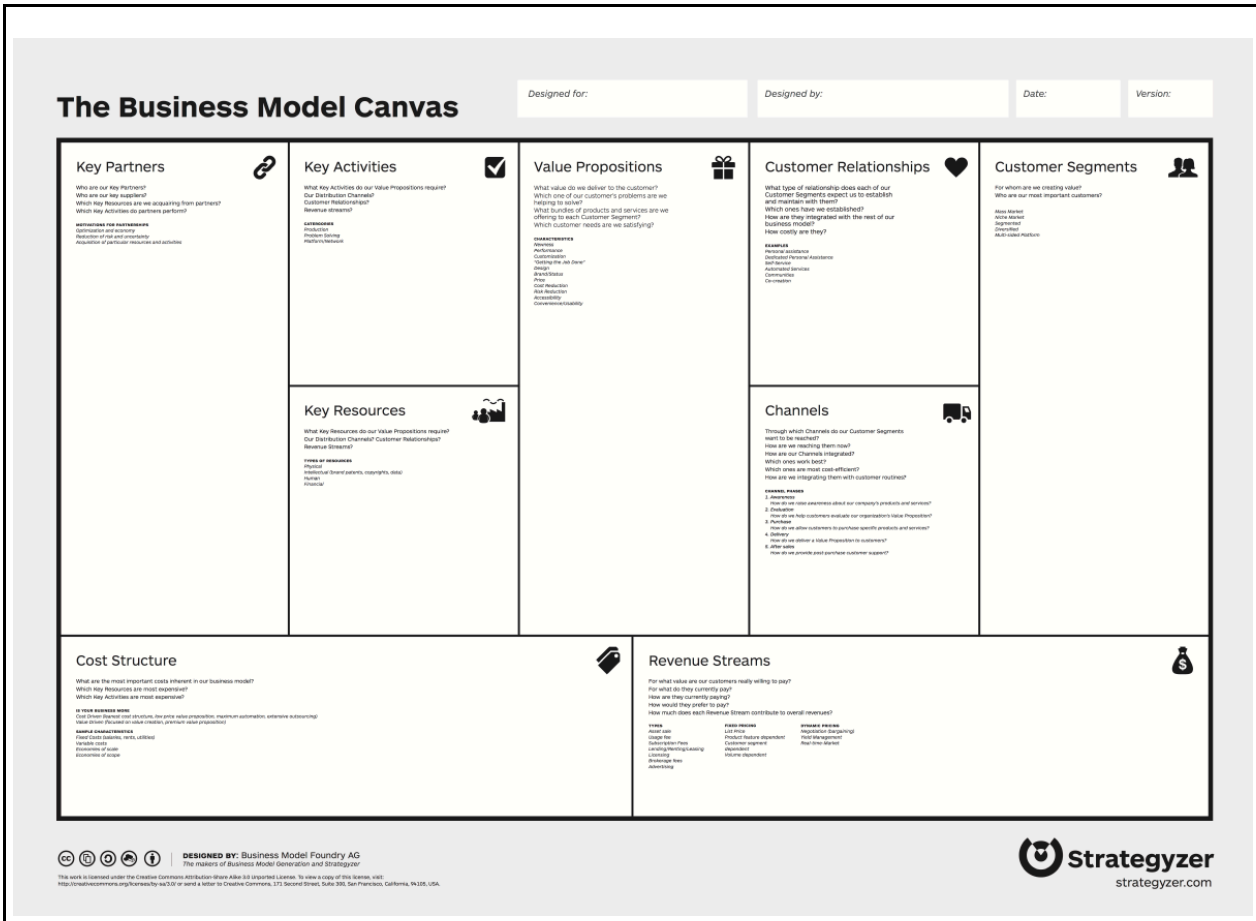


Figure 1. The Business Model Canvas

4.2 The Value Proposition Canvas Project

Creating value for customers is a major challenge for organizations. One major reason why a large majority of newly funded companies fail is because of a poor product market fit (Feinleib, 2011). Finding the right value proposition is challenging, since it requires the testing of all hypotheses and being able to have strong empathy with customers. This was the logic behind the Value Proposition Canvas when it was designed (Figure 2). The Value Proposition Canvas allows users to define the value proposition and to frame it from the perspective of the relevant customer segments. It has two sides, made up of three blocks. These are presented on a visual template to facilitate the ideation, elaboration, and evaluation of a value proposition and its fit with its customer segment. The Value Proposition Canvas project spanned from 2011 to 2014. By early 2018, the Value Proposition Canvas had been downloaded more than a million times. Also, the requests for training and workshops underlines the extensive interest from practitioners.

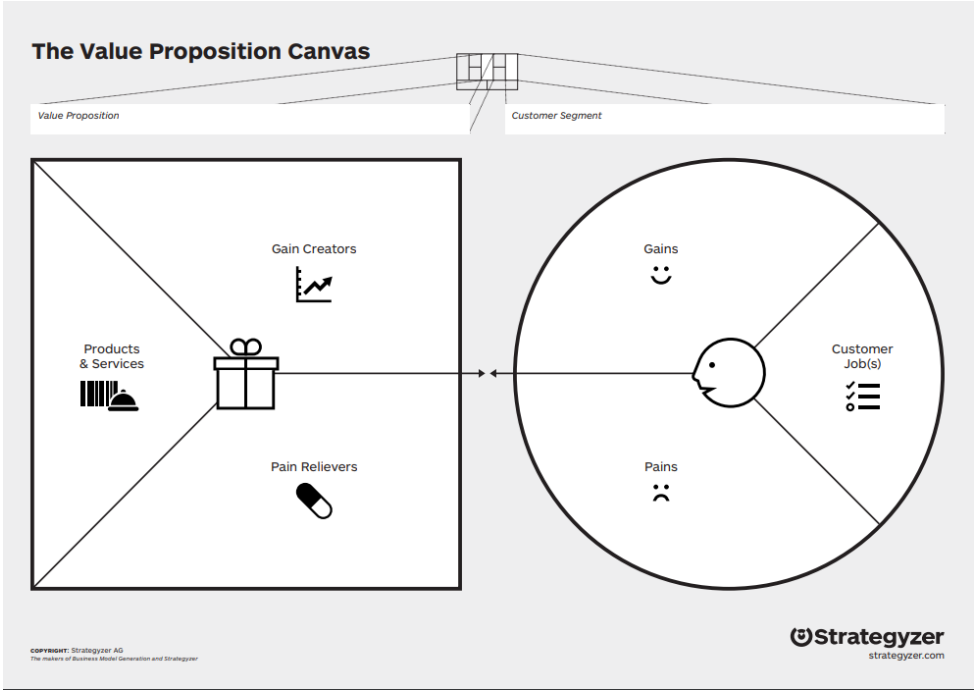


Figure 2. The Value Proposition Canvas

4.3 The Team Alignment Map Project

In a complex and unpredictable environment, project team members also need to be regularly coordinated together (Espinosa, Cummings, Pearce & Wilson, 2002). In this regard, traditional coordination mechanisms have proven incomplete or often ineffective (Okhuysen & Bechky, 2009; Mintzberg, 1979; Sosa, Eppinger & Rowes, 2004). Insights from the literature and requests from practitioners who shared their need for a simple tool to collectively help them to define team coordination led to the Team Alignment Map being designed (Figure 3). It is a collaborative tool used by teams during meetings to coordinate effectively. It reverses the logic of coordination: it allows team members to design their collaboration in a highly iterative way and requires the participation and ownership of all participating team members. The Team Alignment Map project spanned from 2010 to 2017.

The Team Alignment Map has been presented at conference proceedings and in journal articles, but has also been used extensively in project-based teams in various industries and

sectors, such as manufacturing, health, IS, and innovation. The Team Alignment Map has also attracted interest from a wide array of organizations as the design team has received more than 200 requests for training and is extensively used by management consultants.

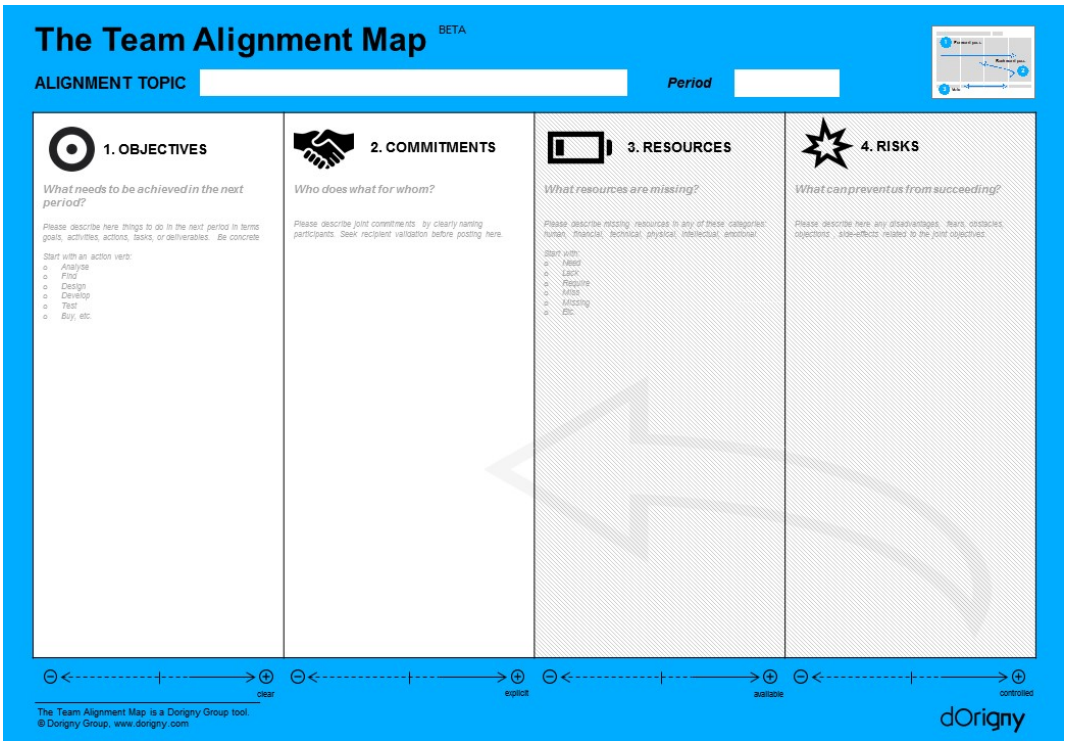


Figure 3. The Team Alignment Map

4.4 Data collection

To collect the data for our analysis, we followed common recommendations for qualitative research based on case studies (Eisenhardt, 1989; Miles & Huberman, 2010; Siggelkow, 2007), and relied on an extensive set of data that includes multiple sources (see Table 2). In the three DSR projects, we had first-hand knowledge through our strong involvement and participation in these projects (some co-authors were members of the DSR team of one of the three tools). Semi-structured interviews with a member of the DSR project were sources of primary data, providing insights into how the project was conducted, how the artifacts were designed over iterations, and the different problems and solutions they sought to address. The other main source of information was data collected from workshops run by the design teams. During these workshops with management practitioners, the design teams

gathered data from observations, interviews, and questionnaires (see Table 2) so as to evaluate, refine, and transform the artifacts. For triangulation purposes, we also relied on the design knowledge explicitly formalized in 21 academic publications by all the design team members (in which artifacts were evaluated and some design knowledge explicitly formulated, thus ruling out the academic publications in which there was no analysis of either the problem space or the solution space), two books, eight sets of course materials, 16 workshop presentations, four documents for practitioners, and four news articles by the design teams.

4.5 Data analysis

Our analysis consisted of within-project and cross-project analyses. Since the literature on DSR provides little insight into the methodological approaches to theorize design knowledge across multiple cases, we addressed this gap by bridging the frameworks and processes for knowledge formalization in DSR (Gregor & Jones, 2007; Lee et al., 2011; Mandviwalla, 2015; Meth et al., 2015) with multiple case analysis methodologies in the social sciences (Fereday & Muir-Cochrane, 2006; Miles & Huberman, 2010). Specifically, we performed within-case and cross-project analyses around two primary activities (Figure 4): (1) analyzing the knowledge accumulation and evolution of design knowledge within each project, (2) theorizing the design knowledge across all projects and formalizing it as a design theory. These two activities allowed us to analyze the commonalities of and differences between the three projects in order to develop a mid-range theory (Offermann, Blob & Bub, 2011). These activities were not conducted in isolation and sequentially, since we constantly balanced between activity 1 and 2 to ensure that the design theory was reflected in each empirical case (Ragin, 1994; Mueller & Urbach, 2013).

To conduct these two main activities, we referred to Lee et al.'s (2011) framework for theorizing design knowledge process (Figure 5) and Meth et al. (2015). The framework by Lee et al. (2011) helped us to define the level of abstraction of the design knowledge we focused our analysis on, and the sequence through which these different levels of abstraction should be analyzed. While they don't specify an entry point for their process, we chose to start with the instance domain, since instance design knowledge was easier to identify. We

then proceeded to the abstract domain. Within each level of abstraction, Meth et al. (2015) provided the analytical frames for the different design knowledge types we needed to identify. They distinguished different design knowledge types that can be captured and formalized (design requirements, design features, and design principles)

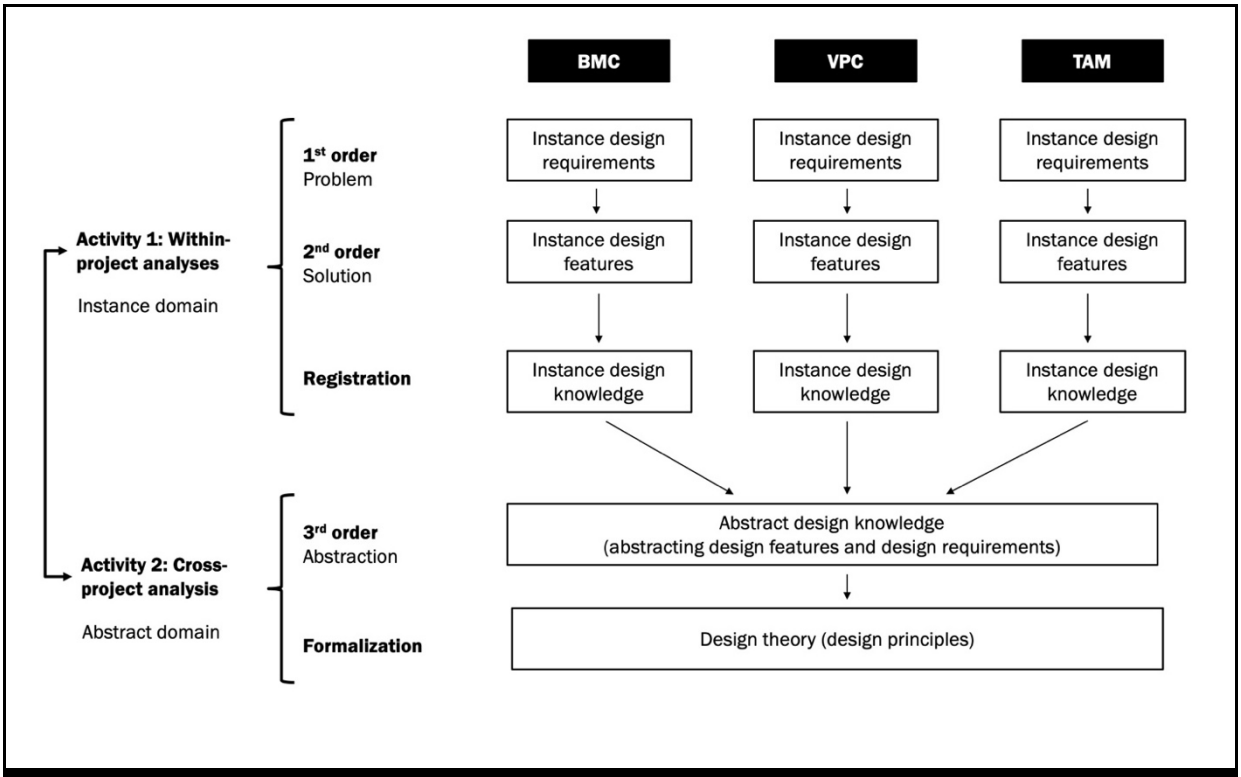


Figure 4. Data Analysis Process

The authors distinguished between the abstract and the instance domain. In the instance domain, a particular solution is designed or registered for a specific instance problem. The abstract domain denotes a generalized (rather than particular) problems class that is addressed by searching for an abstract solution. We will detail how we proceed for each activity of our data analysis, where activity 1 (within-project analyses) refers to the instance domain, and activity 2 (cross-project analyses) refers to the abstract domain (Figure 4).

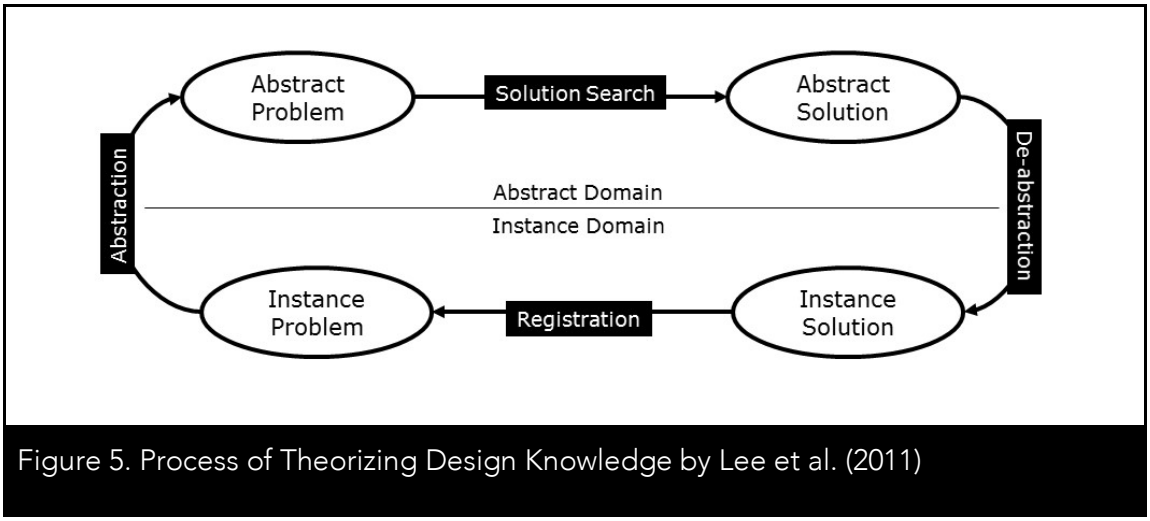


Figure 5. Process of Theorizing Design Knowledge by Lee et al. (2011)

Activity 1: Within-project analysis of design knowledge accumulation and evolution

We first performed within-project analyses of the three DSR projects (Figure 4). Our data analysis started with what Miles and Huberman (2014) term *data condensation*. In this stage, we sought to simplify and abstract the raw data within each project in order to make sense of the amount of data. To do so, we performed a thematic analysis (Boyatzis, 1998) by following both Lee et al.'s (2011) framework and the design knowledge types as differentiated by Meth et al. (2015). That is, we first singled out the instantiated problems addressed for each project. These corresponded to the (instance) design requirements researchers addressed in the three projects. Design requirements outline the generic requirements that should be met by the designed solution (Meth et al., 2015). In that sense, they pertain to the problem domain, since they outline the problems designed solution addresses. This is equivalent to the clustering of the data into first-order themes in the social sciences (Fereday & Muir-Cochrane, 2006).

After our data had been arranged according to these three different design requirements in each project, we identified the main artifacts (instance solutions) that were developed for each requirement. This allowed us to identify three problem-solution cycles within each project. Within these cycles, we identified the (instance) design features of each artifact, which represent the characteristics of the designed solution (Meth et al., 2015). These problem-solution cycles guided our data condensation process (Miles & Huberman, 2014)

and helped us to sort, focus, and organize the considerable amount of data from each project.

To identify and analyze these different problem-solution cycles (i.e. the instantiated design requirements and the related instantiated design features), we proceeded by iterating between the collected secondary data (as shown in Table 2) and the insights of the co-authors involved in the design projects. At first, the design science researchers involved in the project were interviewed by another co-author who was not part of the project. The semi-structured interviews related the history of the project and outlined the instantiated problems and solutions developed throughout the projects. During the interviews, we followed the recommendations by Mandviwalla (2015) to compare the stabilized versions of the visual inquiry tools (e.g. the Business Model Canvas in its current form) with previous prototypes (e.g. the printed Business Model Ontology / BMO used with post-it notes on top of elements rather than the building blocks of the Business Model Canvas). This allowed us to highlight the discarded insights and to investigate why the stabilized design features were more relevant in addressing the design requirements.

The interviews were then transcribed by the interviewer and validated by the interviewees. The interviewer also used and complemented these identified cycles with the analysis of the design knowledge that had already been formalized by the researchers of the project in our secondary data sample (Table 2). That is, the interviewer referred to the publications and training materials developed by the researchers, since some of these specifically mentioned the most important design features and requirements of the artifacts. Then, to ensure the reliability of the analysis, the other two co-authors verified the first-order and second-order thematic analysis of the design knowledge accumulation (i.e. the problem-solution cycles, as displayed in Tables 3, 4, and 5) for each project by ensuring that the analysis corresponded to what was formalized in the secondary data sample (Table 2). This verification was complemented with discussions between all authors to develop an "intersubjective consensus" (Miles & Hubermann, 2010) by paying particular attention to the principles of suspicion and multiple interpretations as defined by Klein and Myers (1999).

Finally, for all the three projects, we performed registration, in the sense of Lee et al. (2011). We identified the design knowledge that had been accumulated in terms of design features for each design requirement, i.e. for each problem-solution cycle (see Figures 7, 8, and 9). Since our main concern in activity 1 was to ensure that the design knowledge identified was exhaustive enough (i.e. that key design features and design requirements were not left out). Our data analysis ended when all the design features documented in the secondary data were covered for each project and when the designers of the visual inquiry tools considered the analysis to be exhaustive. There were iterations and discussions between the designers in each project and the other co-authors, which ensured that the design knowledge was intelligently formalized and that the relationships between design features and design requirements were made explicit.

Activity 2: Cross-project analysis to theorize the design knowledge

In a second stage, we performed a cross-project analysis. All the authors first aggregated the design knowledge that was accumulated within each project (Appendix A), which allowed us to identify differences and regularities. The regularities were used as the main input for the design theory, since their occurrence in the three cases provides solid ground to consider that these would also apply to cases beyond our sample. A design feature was considered for inclusion in the design theory if it appeared in all three projects. The differences allowed us to either rule out some design knowledge that was specific to the projects (e.g. the Team Alignment Map case developed an evaluation solution in the form of a mobile app, while the Business Model Canvas project led to the development of a computer-aided design / CAD solution) or to formulate certain aspects of the design theory with more flexibility (e.g. the problems that were addressed in the cycles of each case were in a different order, which we considered by not deducing a precise development plan). Both regularities and differences were discussed between all authors using investigator triangulation (Patton, 2002). This cross-project comparison resulted in abstract design features that were applicable across the three projects (Appendix A). This is comparable to third-order themes in qualitative research (Fereday & Muir-Cochrane, 2006). We formulated

the abstract features in a way that they did not include any situated specificities of the artifacts.

The last step of our cross-project analysis consisted of the adaptation of the abstract design features to the framework for presenting design theories by Gregor and Jones (2007). In this step, we performed three specific analyses. First, we translated the abstracted design features that were common across all cases into design principles of form and function following the guidelines by Chandra, Seidel & Gregor (2015). Design principles describe a means-ends relationship in the form of prescriptive statements that outline how abstract design features address the design requirements (Meth et al., 2015). Second, we translated the design features that were not common across all cases as principles of mutability for visual inquiry tools. Finally, we identified the meta-requirements of the design theory by analyzing the similarities of the problems (design requirements) for which the three visual inquiry tools were used. By analyzing these characteristics, we defined the purpose and scope of our design theory to apply to strategic management problems as outlined in the literature review.

To ensure the reliability and credibility of our analysis, we used investigator triangulations (Patton, 2002). Each step of our cross-project analysis was achieved by the four co-authors in order to check the consistency of the analysis. Also, our analysis was scrutinized by two independent and external researchers, who are familiar with DSR and had developed visual inquiry tools. The rationale was to identify additional design principles we may have overlooked but that they had implicitly used in their various projects.

Project Analyses

We will now present how the design knowledge for visual inquiry tools was accumulated and evolved across the three projects. We structure the presentation of the findings in a temporal order (Figure 6) and present how knowledge was accumulated and replicated over time. We will first present the development process of the Business Model Canvas and will outline the design knowledge that was accumulated throughout its development. We will then relate how the designers of the Business Model Canvas replicated the design knowledge they had acquired into the design of the Value Proposition Canvas. We will analyze the design

knowledge that was common and different in the two projects. With the knowledge the researchers had acquired with the two developments, they ran a workshop (the Business Design Summit) to share their experience and knowledge in order to help other management thinkers to develop visual inquiry tools for their domains of expertise. The Business Design Summit outlined practitioners and scholars' interest in guidance on how to design such tools. However, since only a few visual inquiry tools were developed after the workshop by some of the attendees, the need to refine and extend the design knowledge to make it more replicable arose. Thus, we relate the development of the Team Alignment Map, which was developed independently from the other two. Analyzing the design knowledge accumulated across the three projects allowed us to formulate the design theory for visual inquiry tools, which we will present at the end of this section.

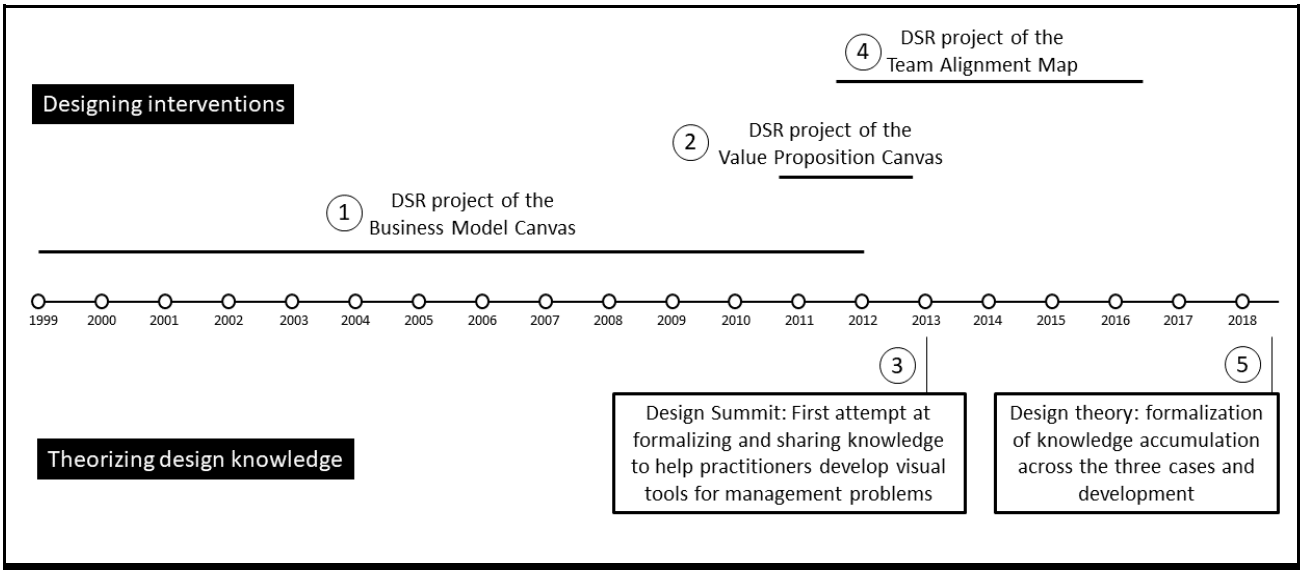


Figure 6. Timeline of the DSR Projects and the Theorization Episodes

The Business Model Canvas: Generating the foundational design knowledge for visual inquiry tools

The Business Model Canvas project had three main cycles, with each addressing a different problem type (design requirement) and research questions relating to business modeling (Table 3). These reflect the particularity and novelty of the Business Model Canvas. Each cycle corresponds to the development of a solution to support practitioners in using inquiry techniques for business modeling. The description will be oriented toward the explanation

of (1) the evolution of the problems faced by practitioners regarding business modeling, (2) the solutions (artifacts) brought by the design science researchers to address these problems, and (3) the design knowledge accumulated for each of the cycles. At the end of this part, we will provide a summary of the design knowledge accumulated throughout the entire project.

Table 3. Summary of the DSR project for the Business Model Canvas

Cycle	1: Defining the management concept	2: Translating the management concept into a tool for joint inquiry	3: Stabilizing directions for joint inquiry and developing methods for evaluation
Period	1999 to 2004	2004 to 2008	2008 to 2016
Problem domain	For an entrepreneur, the business plan is not the best tool to provide a coherent description of their startup	The BMO is helpful to ask the right questions but not intuitive enough for co-designing a business model	Users of the Business Model Canvas have difficulties extracting hypotheses about the business model and evaluating them
Design requirement	How to define a business model?	How does one co-design into a business model?	How does one test and evaluate a business model?
Solution domain (artifacts)	- BMO	- Business Model Canvas - Business Model Generation (book)	- Business Model Mechanics - iPad App
Joint inquiry technique (Steen, 2013)	- Defining	- Ideating - Prototyping	- Testing - Implementing

Cycle 1 (1999 to 2004): Defining the management concept

Problem domain. The DSR project started in the era of the dotcom bubble and the emergence of Internet ventures. In that context, a need to define and describe new business models that were made possible by the Internet arose. Investors and analysts required new means to evaluate the potential value of the increasing number of startups. To do so, startup

founders increasingly made use of concepts such as business plans and business models to describe, compare, and assess the ways their e-business ventures could create value. The two initiators of the project – Alexander Osterwalder and Yves Pigneur – realized, after interacting with and supporting entrepreneurs in the French-speaking part of Switzerland, that these would mostly rely on the business plan concept to describe their venture. This approach proved inefficient for describing the logic of their businesses, since most entrepreneurs would fill in a long document without a coherent and clear depiction of all the aspects of their organization. Further, most of their efforts would go toward forecasting their company's financial potential, with less focus on the customers, the company's infrastructure, and the value they would propose. Thus, the researchers undertook a DSR project to find a solution to the question: *How do we define business models?* In answering this question, they sought to develop a means that would improve the ways entrepreneurs were reflecting on their ventures.

Solution domain. The researchers' intuition for addressing this problem was to define a set of questions that would need to be answered by entrepreneurs. In this cycle of the project, they undertook the design of an ontology of all the domains required for defining an organization's business model and, thus, the questions that entrepreneurs would need to address to describe their venture. They developed the BMO in Osterwalder's (2004) doctoral dissertation (Appendix B).

The BMO was designed after performing an extensive literature review and consolidating the dispersed body of knowledge on business modeling. The researchers identified all the concepts that were used in the business literature to describe business models and then grouped them in categories according to their similarity. For instance, various constructs related to the value that the organization offers to the market were grouped under value proposition, for instance, product/market scope (Hamel, 2000), value stream (Mahadevan, 2000), or product and service offered (Applegate & Collura, 2001). The sorting and categorization of these constructs were based on the four perspectives of the Balanced Scorecards (finance, customers, infrastructure and learning). This resulted in the nine components that were the most recurring in previous studies (Osterwalder, 2004, p. 129). Clear and precise definitions were then provided for each domain. Questions for each of the

constructs of the BMO were defined to guide the reflection of its users, such as 'who are your clients?' for the customer component or 'what value do you propose?' for the value proposition component.

It is important to note that the researchers did not have the Business Model Canvas in mind when developing the BMO. The purpose at that time was to provide the basic common language and set of questions to communicate and reflect on business models between cross-boundary individuals. The researchers ran workshops after the design of the BMO, during which the researchers used various visual depictions of the BMO when introducing it to practitioners. The researchers would describe the business models of existing and well-known organizations by displaying nine boxes (representing the nine elements of the BMO) and filling them with sentences describing the elements of the boxes.

Design knowledge accumulated. The major design knowledge the design science researchers accumulated during the first cycle was the BMO's, and thus the need to define the management concept of interest through a conceptual framework. Given that the nascent literature on business modeling had accumulated into dispersed, it was important to identify the elements, attributes, and relationships characterizing business models. The value and novelty of the BMO lies in the different conceptualization of business modeling that its designers had provided. They put greater emphasis on the strategic level of business modeling compared to other approaches which were mainly concerned with modeling the processes of companies (e.g. Gordijn, Osterwalder & Pigneur, 2000).

In Osterwalder's (2004) dissertation, several design decisions regarding the principles of form and function were made to ensure the quality of the definition of the management problem. First, the identification and definition of the nine components of the BMO was based on academic justificatory knowledge. The BMO was refined twice after evaluating it with practitioners and applying it to concrete case studies. Second, the researchers explicitly decided to keep the level of detail of the BMO parsimonious so that it would provide a common language across practitioners who are not experts in the domain of business modeling. Third, they ensured that the nine elements of the BMO were sufficient to cover all

aspects required for describing an organization, while at the same time having clear and delimited definitions. In that sense, their ontology was not developed with the traditional approach of describing a phenomenon as exhaustively as possible. They made the design decision that their Ontology would remain at a strategic level. It is important to note that one of the goals which motivated them to avoid a prohibitive level of detail was to provide a way of defining an organization that would be more intuitive than business plans.

Cycle 2: Translating the management concept into a strategic tool for joint inquiry

Problem domain. The need to create the Business Model Canvas emerged during the workshops that the researchers ran with practitioners. The researchers noticed the limitations of the BMO when using it during workshops and training. The BMO proved valuable to describe and illustrate existing business models during workshops. However, when practitioners requested that they design the business models of their own organization, the researchers would need to change the sizes of the boxes of the BMO in real time and type in the description of each box. It was impractical for designing potential future business models of organizations in real time, as the BMO had been conceived as a framework merely for describing existing business models. Therefore, the researchers started inquiring into the new research question of their design science project: How to co-design business models?

Solution domain. The answer to this question led the researcher to develop the Business Model Canvas. The researchers' intuition then was to recreate a design space which would reflect the conceptual model of the BMO. Thus, the Business Model Canvas reflects the nine elements of the BMO as empty building blocks. The relationships of the BMO are replaced by the physical proximity of the building blocks. For instance, the value proposition is delivered to customer segments through the organization's relationships with its clients and through its channels. In 2006, the researchers added logos to increase the understanding of the building blocks and visual metaphors to make the masked relationships between the building blocks explicit.

When defining the directions for use of the Business Model Canvas, the researchers turned to the works of Boland (2006) they had just discovered at that time. In his work, Boland describes design thinking techniques that could be applied to management to increase collaboration and innovation within organizations. They focused their efforts on four of the five design thinking techniques that are outlined in Boland's work, namely ideation, visual thinking, prototyping, and storytelling. While visual thinking was addressed by the visual form of the Business Model Canvas, the others were translated into directions for use. To ideate and prototype different business models, the researchers suggested the use of post-it notes in which practitioners would write different potential solutions for the nine building blocks. As these can easily be added, removed, amended, and displaced, it facilitated the emergence of ideas and the creation of prototypes. The designers also added a set of questions for each building block in one of the early versions of the Business Model Canvas to stimulate ideation (Figure 1). For storytelling, the researchers emphasized the role of the relationships between the building blocks of the Business Model Canvas. The story of a business model would have an entry point and would be continued with the elements of the proximal building blocks, until all elements are covered.

When defining these design thinking techniques, the researchers started considering writing the Business Model Generation book to formalize the explanation and directions for use of the Business Model Canvas. In the book, they provided illustrations with case studies to understand the logic of the Business Model Canvas and present existing patterns of similar business models. They described the three different directions for use and their rationale. The book was the first to provide both techniques for design thinking and the tool that would support it. In fact, at that time, most developments would only address either aspect. Therefore, the book brought a unique value proposition at a time when design thinking and business models were gaining momentum in the management practices.

Design knowledge accumulated. The reasons behind the rapid adoption of the Business Model Canvas related to several design decisions related above regarding the form and function. Regarding the form, the Business Model Canvas proved more valuable than the different visualizations of the BMO as it represented the elements of the BMO as empty

design spaces in which teams of practitioners could easily try out different ideas for their business models. The design spaces and the post-it notes provided a material support that allowed practitioners to visually and materially ideate on the business models. Second, the relative simplicity and ease-of-use of the tool was facilitated by, on the one side, the visual metaphors and icons, and on the other side, the parsimonious number of building blocks (number of elements in the BMO by extension).

Regarding the function, the researchers sought some harmony between the form of the Business Model Canvas and the three directions for use, namely the three design thinking techniques of ideation, prototyping, and storytelling. The empty design spaces and the questions for the nine building blocks allowed practitioners to easily ideate. The conjunction of using post-it notes and the empty design spaces facilitated the process of trying out different prototypes. Finally, the physical proximity between the related building blocks along with the visual markers of post-it notes provided a visual and flowing way to present a business model.

Cycle 3: Stabilizing the directions for use and developing methods for evaluation

Problem Domain. In the final cycle of the DSR project, the rapid and extensive adoption of the Business Model Canvas had driven a voluminous demand for workshops and presentations. In this cycle, the researchers moderated 256 workshops with more than 5,000 practitioners. The feedback from the practitioners and their observation of the use cases showed that the directions for use needed to be more explicit. An extensive number of practitioners used the Business Model Canvas as a checklist. They used the nine building blocks as a list of aspects they needed to consider when designing a business model, without necessarily paying attention to the relationships between their solution elements and the building blocks. For instance, practitioners would define a certain stream of revenue without relating them to a client segment. In addition to this inadequate use, the researchers noticed that the Business Model Canvas did not provide any means to evaluate and test the business models that would be designed. This lack needed to be addressed as most design thinking approaches would stress the need to evaluate and test the various solutions that

practitioners would elaborate (e.g. Boland, 2006; Buchanan, 2002). Therefore, the researchers sought to answer the question: How to test and evaluate business models?

Solution domain. The researchers developed the Business Model Mechanics, an instruction book in which they made explicit the dynamics of the building blocks and provided several directions for use to ensure that these relationships were reflected in use. For instance, they suggested using color coding (i.e. post-it notes with the same color) to relate certain building blocks, and the need not to leave any building block with orphan elements (i.e. elements that are not connected to elements in other building blocks). These directions for use reflected the best practices for making the best use of the design thinking techniques when using the Business Model Canvas.

To address the lack of support for testing and evaluating hypotheses about the business models, the designers took inspiration from Blank's (2013) work on customer development and lean startup. They grouped the building blocks according to Blank's four dimensions: feasibility, desirability, viability, and adaptability. This visual metaphor outlined the testing categories that the elements of the building blocks would fall into. For instance, the viability hypothesis would be met if practitioners consider that the elements in the Revenue Streams building block would be greater than those in the Cost Structure. The designers later developed testing cards that would allow need to be used for all the elements in the Business Model Canvas.

The researchers also built on their background in IS to sense the potential of a CAD solution. Tzonis (2006) had already mentioned the potential benefits of applying techniques used in the architecture discipline to management. Therefore, they launched the development of an iPad app and software-as-a-service (SaaS) application, which were downloaded and accessed more than 150,000 times. The SaaS application allows users to design business models and provides guidance on how to test the main hypotheses regarding the elements that users would put in the software (Appendix C). The development of the application also marks the launch of the Stragyzer spin-off, which is the company that now manages the commercialization of the Business Model Canvas and the Value Proposition Canvas.

Design knowledge accumulated. This design cycle along with its evaluation confirmed the Business Model Canvas's efficacy (it supports a process of design thinking for business modeling), effectiveness (the components of the tool are easy to understand), elegance (the tool is visually attractive and easy to use), ethicality (the tool supports a morally correct transformation), and efficiency (the directions for use improve the joint inquiry process). Results from these evaluations confirmed the five propositions. Interestingly, the results also outlined 14 different uses of the Business Model Canvas, some of which had not been identified by the practitioners. This suggested that the tool was flexible in its use in ways that could not be anticipated (e.g. using the Business Model Canvas to understand competition or set numerical objectives).

In addition, the intuition that the directions for use of the Business Model Canvas should also address testing and evaluation was confirmed by the large adoption of the CAD applications. This outlined the need to cover the whole spectrum of the design thinking techniques when designing business models. The limitations of the paper-based Business Model Canvas suggested that the most appropriate means to test and evaluate solutions is through CAD tools, thus another form and artifact.

Summary of the design knowledge accumulated throughout the project

In summary, the design knowledge (DK) that was accumulated across the three design cycles relates to the need to (1) develop an ontology to understand the management problem of interest and outline its main constituents (DK1.1 to 1.5 in Figure 7), (2) representing the BMO into a shared visualization that would allow for joint inquiry with post-it notes (DK2.1 to 2.5; DK3.5), (3) the need to develop directions for use based on design thinking and joint inquiry techniques for effective exploration and prototyping (DK2.6, 3.2, and 3.4), and (4) the use of CAD to improve the evaluation of the business models (DK3.3 and 3.6).

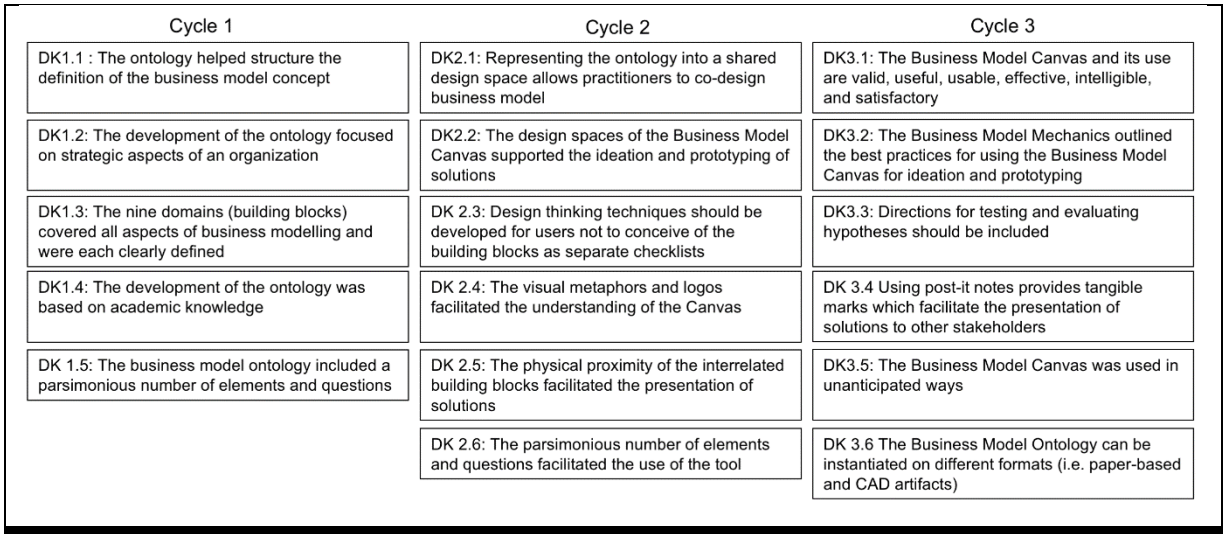


Figure 7. Design Knowledge Accumulation for the Business Model Canvas

The Value Proposition Canvas: Replicating and adapting the design knowledge into a new visual inquiry tool

The designers of the Business Model Canvas undertook to replicate the knowledge they had acquired to the development of the Value Proposition Canvas. To address this need, the researchers undertook a three-cycle DSR project (Table 4). They first developed the conceptual model, which they then instantiated into a visual inquiry tool, and finally developed directions for use. It is worthwhile underlying that the development followed the same process as for the Business Model Canvas, but in a significantly shorter amount of time. As the researchers had already accumulated the knowledge on how to design a visual inquiry tool, they anticipated the design activities they would need to perform.

Cycle 1: Defining the management concept

Problem domain. The need to design a new tool specifically for the value proposition building block became apparent during workshops and training with the Business Model Canvas. In several situations, the designers noticed that participants would spend a lot of effort and time defining what the value proposition is, with lesser focus on the other building blocks of the Business Model Canvas. This highlighted the need for practitioners to have a tool that was specifically dedicated to the co-design of value propositions. Therefore, the first question that was raised was: How to define a value proposition?

Table 4. Summary of the DSR project for the Value Proposition Canvas			
Cycle	1: Defining the management concept	2: Translating the management concept into a tool for joint inquiry	3: Stabilizing directions for joint inquiry
Period	2011 to 2012	2012 to 2013	2013 to 2014
Problem domain	Users of the Business Model Canvas would focus on the Value Proposition building block whenever their offer was not clear. The space was limited and there was guidance for designing value propositions.	The researchers needed to find a shared visualization for the conceptual model.	The researchers needed to define the directions for use that would allow practitioners to inquire into different solutions.
Design requirement	How to define a value proposition?	How does one represent the conceptual framework visually?	How does one use the Value Proposition Canvas effectively?
Solution domain (artifacts)	- Value Proposition conceptual model	- Value Proposition Canvas	- Value Proposition Design (book)
Joint inquiry techniques (Steen, 2013)	- Defining	- Ideating - Prototyping	- Ideating - Prototyping

Solutions domain. In the first cycle, the designers undertook to define the problem of designing value propositions. The designers had already defined the elements of the value proposition building block in Osterwalder (2004). However, they amended the conceptual framework after coming across the concept of "jobs to be done" that was first coined by Ulwick (2005). This work was close to the definition in Osterwalder (2004) but it was more oriented toward the design thinking approach that the researchers sought for the Value Proposition Canvas. As one activity in design thinking involves empathizing with the stakeholder, thinking in terms of jobs to be done, gains, and pains would be more intuitive than the value and price that the product would cost. The designers then developed a

conceptual framework that linked the value proposition and the customer segment building blocks (Appendix D).

Design knowledge accumulated. The researchers confirmed most of the design knowledge they had accumulated for the Business Model Canvas (Figure 7). The main differences were that to frame a problem, they did not need to develop an ontology[1]. A conceptual framework with the main elements of the problems proved sufficient here. However, the conceptual framework included not only aspects that could be designed by its users (i.e. the pain relievers, the grain creators, and the products and services) but also aspects that could only be observed, such as the jobs to be done, the gains, and the pains that characterize a certain customer profile. This was different from the BMO, which contained only elements that could be designed by the organizations (DK1.2 in Figure 7). Overall, the design of the conceptual framework of the Value Proposition confirmed that the problem needed to be framed and defined with academic knowledge that covers all its main constituents with precise definitions, while the number of constituents needed to remain parsimonious.

Cycle 2: Translating the management concept into a tool for joint inquiry

Problem domain. The second activity was to translate the conceptual model into a shared visualization. The idea was to reuse the same format as for the Business Model Canvas, i.e. a shared printed poster. However, as stated above, the main issue was to identify the best visual representation for the building blocks, as some pertained to the value proposition as such, while others to the customer profile. In addition to that, a design question arose regarding the fact that some components of the conceptual framework can be designed by the practitioners (i.e. the product or service, the gain creators, and the pain relievers), while

[1] Here, we make a difference between building an ontology from scratch, by looking at various literature sources – which was the case for the BMC – and just modeling the concepts and relationships from a single theory. To distinguish them, we refer to the latter as a "conceptual framework".

others could only be observed and used as decisional information (i.e. the jobs to be done, the gains, and the pains). The question that the researchers sought answers for in this cycle was: How to represent the conceptual framework visually?

Solution domain. The researchers tried out various prototypes for the visual representation. The researchers collaborated with a visual designer to arrive to the current version (Figure 2). The layout of this version was finalized after evaluations with 55 undergraduate students and feedback from 60 practitioners who had been extensive users of the Business Model Canvas.

The Value Proposition Canvas has two parts. On the right is the customer profile (or customer segment in the Business Model Canvas). On the left side is the value proposition, which is described by the products or services that the organizations offer or can offer for the job that is identified in the customer profile. The emphasis on the Value Proposition Canvas is put on having a match between the elements on sides, in order to have a value proposition that is in line with what the customers expect. The rationale for having both building blocks in the same tool comes from the holistic approach that the researchers had for the Business Model Canvas, i.e. that all parts (building blocks) of business models should be considered as a coherent whole.

Design knowledge accumulated. The designers reused most of the design knowledge and intuitions they had for the Business Model Canvas. That is, the representation into a shared visualization that would allow users to ideate and prototype solutions, place the building blocks in the Business Model Canvas according to their relationship, and the use of visual metaphors to facilitate the understanding of the components.
However, the researchers made a different design decision compared to the Business Model Canvas. They differentiated visually between what the users could design solutions for and what could only be used as decisional information. Thus, the value proposition block was displayed as a square – to reflect the value proposition in the Business Model Canvas – while the customer profile was represented as a circle. This accentuated the difference between

filling in the customer profile with information and filling in the value proposition with potential solutions.

Cycle 3: Stabilizing directions for joint inquiry

Problem domain. The last cycle of the development was dedicated to evaluating whether the same directions for use of the Business Model Canvas could be applied to the Value Proposition Canvas. Therefore, the question that was driving this cycle was: How does use the Value Proposition Canvas effectively?

Solution domain. The researchers used the same rationale for the directions for use. They suggested the use of sticky notes for the visualization, flexibility, and conciseness they provide. The Value Proposition Canvas would also be used during workshops or team meetings for guided ideation. All the directions for use were formalized and illustrated in Osterwalder et al. (2014).

The use of the Value Proposition Canvas differs in several ways. First, the directions for use stipulate that users should start on the right, i.e. the customer profile identified in the Business Model Canvas. Second, color-coding is not as important as for the Business Model Canvas as researchers suggest to focus on one single customer profile, rather than seeking multiple solutions as is the case in the Business Model Canvas. That is because the Value Proposition Canvas serves as a plug-in to the Business Model Canvas to dive deeper into the value propositions and customer profiles identified in the business model. If users want to generate alternative solutions for alternative customer profiles, they are recommended to use multiple canvases. Finally, the directions for use emphasize the need to be as exhaustive in the number of elements that users put for each building block in order to enhance ideation.

Design knowledge accumulated. This design cycle and its evaluation confirmed several design decisions. First, framing and defining the directions for use, as in the Business Model Canvas, proved effective to practitioners. This allowed them to use the ideation and

prototyping design thinking techniques with a visual that frames the content toward which these activities need to be directed. The use of questions to frame the ideation and prototyping activities was also retained for the Value Proposition Canvas, which includes questions for each building block. Second, the use of sticky notes provides tangible, flexible, and concise marks that allow practitioners to easily add, amend, or remove elements when ideating and prototyping solutions to the value proposition. The sticky notes also proved useful to present the solutions to other stakeholders, in a storytelling way.

Some design knowledge that the researchers acquired during the development was not reflected in the Business Model Canvas. On the one hand, prototyping proved more efficient if done through multiple instances of the Value Proposition Canvas, rather than using color-coding to differentiate between the solutions. On the other hand, the Value Proposition Canvas confirmed the designers' intuition that different visual inquiry tools could be used separately yet integrated. In fact, the Value Proposition Canvas zooms into two building blocks of the Business Model Canvas, allowing users to focus on a subset of the elements of business modeling.

Summary of the design knowledge accumulation and evolution

An overview of the design knowledge accumulated is provided in Figure 8. Overall, the development of the Value Proposition Canvas confirmed the need to frame the management problem of interest. While this was done with an ontology for the business model, a conceptual framework proved sufficient for the value proposition. Second, the need to represent the conceptual model into a shared visualization to make it more accessible and appropriate for design thinking was confirmed. However, the Value Proposition Canvas suggested that building blocks could also be used for information purposes only, as is the case with the customer profile. Third, the need to define directions for use was confirmed. These were done through questions for each building block in the tool and in the Value Proposition Design book (see Osterwalder, Pigneur, Bernarda & Smith, 2014). Adding to that, the researchers were influenced by the lean startup approached and developed testing cards that can be used along with the Value Proposition Canvas. The cards allow users to test the hypotheses of the solutions the value proposition they would design and their

potential fit with a specific customer segment. Finally, this project provided some additional design knowledge that the designers did not have when developing the Business Model Canvas. The development of the Value Proposition Canvas suggests that visual inquiry tools can be integrated and combined to address different management problems.

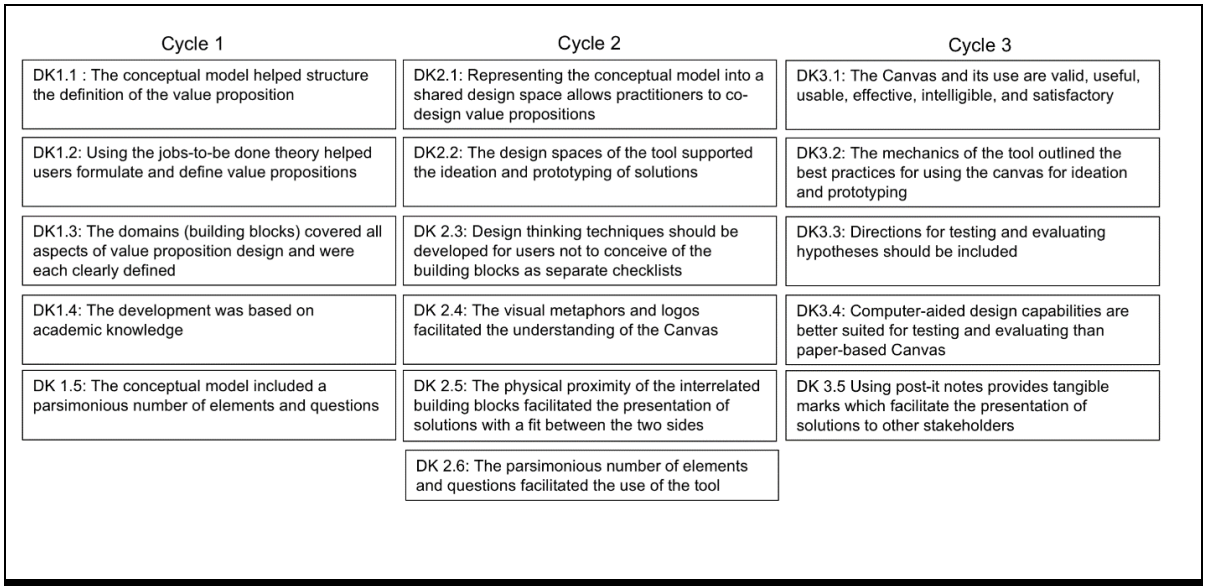


Figure 8. Design Knowledge Accumulation for the Value Proposition Canvas

First episode of Theorizing and Communicating the Design Knowledge

Equipped with the design knowledge they had acquired from the two cases, the designers sought to communicate and share it with practitioners who were experts in specific management problems. The designers had the intuition that any management concept or problem could be translated into a visual tool. Therefore, they undertook to share their knowledge and guide the practitioners in the design of a visual inquiry tool for their strategic problem. These would be tested during a two-day workshop in 2013 called the Business Design Summit. The workshop was attended by 280 practitioners.

The workshop was structured as follows. The designers of the Business Model Canvas shared their expertise and the design knowledge they had gathered with 14 scholars before the summit. The latter managed to design an artifact related to their domain of expertise. During

the summit, these 14 scholars presented their artifacts to the participants and guided them through hands-on activities to use their newly designed tools.

The design knowledge that designers shared contained the contextual background of the two DSR projects and the development process of the two visual inquiry tools. Their design knowledge was not formalized into a development process or principles of form and function that developers should follow. They mainly related the overall main elements, i.e. the need to define the management problem and instantiate it into a shared visualization.

While none of the participants had managed to develop a visual inquiry tool during the two days of the workshop, some developers had carried the development after the workshop. One of the most notable examples is Dave Gray's Culture Map for managing change initiatives (Gray, 2015). Overall, the Business Design Summit underlined the interest of practitioners in a variety of domains in the development of visual tools that can support design thinking techniques for specific management problems. The experience also indicated that the design knowledge needed to be formalized in a clear and practical way that developers of additional visual inquiry tools could build upon.

The Team Alignment Map: An Independent Development of a Visual Inquiry Tool

Hereafter, we present another case that was developed independently from the previous two. Overall, the Team Alignment Map DSR had three main cycles, with each addressing a different kind of problem and research questions relating to team alignment and coordination (Table 5). One major difference with the other two cases is the order in which the development happened for cycles 2 and 3. Instead of first designing the visual inquiry tool and later developing artifacts for evaluation, the designers of the Team Alignment Map followed the reverse order. Hereafter, we relate the problem and solution domains of the three development cycles and outline the design knowledge that is common and different to the previous two cases.

Table 5. Summary of the DSR project for the Team Alignment Map			
Cycle	1: Defining the management concept	2: Developing methods for evaluation	3: Translating the management concept into a tool for joint inquiry and stabilizing directions for use
Period	2010-2014	2014-2015	2015-2017
Problem domain	Need to define what team members should discuss during project meetings to coordinate effectively.	Practitioners required a way to evaluate the potential for coordination (alignment on the four requirements) in real-time during meetings.	Practitioners required a way to co-design the content of the four requirements during team meetings.
Design requirement	How to define team coordination in projects?	How to evaluate the potential for coordination in a project team?	How can team members co-design their project coordination?
Solution domain	- COOPilot conceptual model - COOPilot Cards	- COOPilot App v1 - COOPilot App v2	- Team Alignment Map - Directions for use
Joint inquiry techniques (Steen 2013)	- Defining	- Testing	- Ideating - Prototyping

Cycle 1: Defining the management concept

Problem domain. The first cycle also concerned the understanding of the problem that was faced by practitioners, i.e. how project team members can coordinate their contributions when undertaking uncertain, complex, and innovative projects. While coordination had been the object of extensive research, most studies on team coordination and project management methodologies had failed to provide concrete guidance on the process to follow to coordinate effectively. Most of the perspectives on team coordination had either treated it as a black box (Cannon-Bowers & Salas, 2001) or only attended to it through organizational design (e.g. Malone & Crowston, 1994). Project management methodologies would explicitly state that team coordination is a critical factor but would not provide any

actionable knowledge on how to ensure it. The DSR project had thus started with the question: How to define team coordination in projects?

Solution domain. Given the emphasis on discussion and conversation, the designers turned to the works of Clark (1996) who provides a theory of human coordination through discussion. As Clark's work is inscribed in psycholinguistics, it focuses on the cases where two individuals coordinate for simple tasks. The researchers undertook to adapt Clark's theory for cases where there are multiple individuals and in which the joint activities are complex and lasting over time such as with IS projects. They developed the COOPilot conceptual model, which translated Clark's fundamental requirements for coordination to project management (Mastrogiacomo et al., 2014). The conceptual model outlines the four requirements that teams must discuss during project meetings to coordinate effectively.

The designers instantiated the conceptual model into a set of cards, i.e. the COOPilot Cards (Appendix E). The Cards were used by project managers as visual support to guess the level of common ground of all team members during project meetings, so that they could adjust the discussions according to the domains which required further explanation and agreement.

Design knowledge accumulated. The evaluations of this design cycle showed that frequent and recurrent use of the COOPilot Cards augmented the level of common ground and thus reduced the number of coordination breakdowns (Mastrogiacomo et al., 2014). The evaluations confirmed the usefulness and validity of the conceptual model to frame team coordination during team meetings. This highlighted the relevance of adapting Clark's theory to project teams and the need to frame the problem of interest with a conceptual framework. The evaluations also covered each of the four domains of the conceptual model and concluded that they were all clearly defined and useful. The users also highlighted the relative simplicity of the conceptual model.

Cycle 2: Developing methods for evaluation

Problem domain. Following the promising results of the first study on the COOPilot conceptual model and cards, the researchers decided to extend and refine the mobilization of the concept of common ground in project management. The researchers focused their efforts on improving the way the level of common ground was assessed during project meetings. This decision was motivated by theoretical considerations and feedback from practitioners.

On the practical side, during the workshops with practitioners that the researchers would run on the COOPilot conceptual model and Cards, participants underlined their interest in having an artifact that would allow to ask every project team member what they understand of the four requirements, rather than leaving it to the project manager's perception. On the theoretical side, the researchers sought to find a more accurate way to quantify the level of common ground and, consequently, assess the relevance of the concept of common ground in project management with more precise analyses. In fact, the evaluation of the level of common ground with the COOPilot Cards was based on perceptions of perceptions (i.e. how the project manager perceives their peers understand the project), thus adding considerable bias. Therefore, the researchers undertook a second DSR cycle in which they tried to answer the question: How to measure the level of common ground to *evaluate* the potential for coordination of project teams?

Solution domain. These reasons drove the researchers to instantiate the COOPilot conceptual model into a mobile application, the COOPilot App (Appendix F). The level of common ground (and thus potential for coordination) was represented by the scattering of the votes: the more votes on the right hand side of the continuum, the more common ground and potential for coordination team members had. The developers added a numerical result which would compute the potential for coordination in percentage. This version also included a conversational guide containing questions for each requirement that the team could use to trigger a repair discussion in case their level of common ground was too low.

Design knowledge accumulated. The evaluation of this design cycle outlined three major findings. First, the app provided effective assessments of the level of common ground, which were more accurate than with the paper-based COOPilot Cards. Second, the COOPilot App triggered two types of corrective actions when the level of common ground was low. In some cases, project teams started collective discussions on the domains that required further explanations. In others, when the level of common ground was too low, project teams decided to put an end to the project as they considered it would be too costly or political to repair the misunderstandings. Finally, the evaluations underlined the importance of making use of the dynamic guiding capabilities that digital artifacts can support. This version included a set of questions to trigger remedial conversations, which were followed when the level of common ground was low. This feature avoided providing users only with the evaluation of their potential for coordination and leaving them to decide which strategies to put in place to react to the evaluation.

Cycle 3: Translating the management concept into a joint inquiry tool and stabilizing directions for use

Problem domain. The evaluation in the second cycle suggested that the COOPilot Cards and the COOPilot App did not cover all the supportive guidance that project teams needed for coordinating. The problem that was addressed in this cycle relates to the need for several project team members to define the content of the four domains collectively with their peers during team meetings. With the first two cycles, practitioners were only provided means to understand the requirements for coordination (COOPilot Cards) and evaluate their team's position regarding these requirements (COOPilot App). Feedback from practitioners outlined the need for the development of a visual inquiry tool for team coordination. This led the researchers to inquire into: how can team members co-design their project coordination?

Solution domain. To answer this question, the researchers designed the Team Alignment Map. Similar to the previous two cases, the researchers' intuition was that teams needed a shared design space that they would fill in together during team meetings. Thus, the

researchers displayed the four requirements as four empty design spaces next to each other on a shared and printed canvas-like support. The order of the design spaces reflected Clark's (1996) implicit relationships between the four requirements. For any joint activity, individuals must first identify the joint objectives, after which they can define what part they commit to and finally assess whether they have the ability to do their part (joint resources and no joint risks). The researchers also used the same icons as in the COOPilot Cards and COOPilot App to have some consistency across all formats and provide users visual cues to understand the four requirements more easily.

The researchers defined directions for use to make the most out of the tool. These directions evolved over time as feedback from the observation and evaluation of the tool in use was gathered. One stable function support was that the set of questions for each requirement for project teams to trigger collective discussions and ideation. For instance, to design the joint objectives, users should ask themselves what they intend to do together. The researchers thought that questions were the best way to trigger collective ideation, as the designers of the Business Model Canvas and the Value Proposition Canvas did.

In addition, the researchers developed and refined directions for ideating the content of the four requirements and prototyping solutions. They first suggested that users fill the four design spaces from the left to the right according to the relationships (which they called the forward pass). As they noticed, users would conceive of the four design spaces as separate checklists providing the elements that they should think about and discuss. Therefore, the researchers stressed some rules that should be followed to ensure a coherent and exhaustive solution, such as making sure that there is at least one person committing for each objective.

Design knowledge accumulated. The evaluation of the Team Alignment Map (Avdiji et al., 2018) confirmed that the function of the tool allowed for fast ideation and prototyping of different solutions and arrangements of the four requirements, and improved and changed the way project meetings were held. The tool was also deemed easy to understand and use. The three reasons that explained the ease-of-use were the parsimonious number of elements in the tool, the visual support provided by icons, and the fact that some members

were familiar with the Business Model Canvas and the logic of using post-it notes for ideation.

The evaluation also led to one major amendment of the tool. Initially, the researchers had integrated scales for team members to display their understanding of each domain using the same logic as the sliders of the mobile apps. However, this function was never used and teams resorted to the COOPilot App whenever they wanted to evaluate their level of common ground. The evaluation suggested that it was more effective to separate the two functions of the tools, as they activated different discussions and ways of thinking, which teams did not feel comfortable with.

Summary of the design knowledge accumulation and evolution

Overall, the development of the Team Alignment Map underlines a similar finding as in the previous two cases: the importance of developing a conceptual model which outlines the elements into which team members must jointly inquire into to in order to coordinate effectively. The importance and value of developing a visual inquiry tool for team coordination was confirmed in different settings. Similarly, the mobile application covers the need to evaluate solutions, while the visual inquiry tool supports the ideation and prototyping of solutions. The major differences lie in the way these requirements were met through the specific design features.

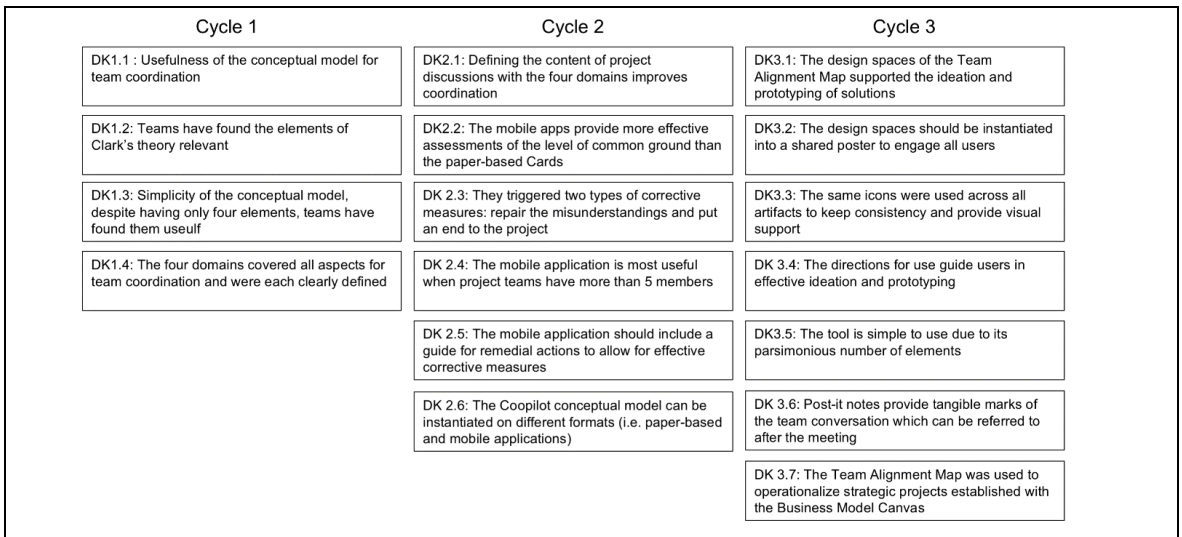


Figure 9. Design Knowledge Accumulation for the Team Alignment Map

5. The Design Theory for Visual Inquiry Tools

The in-depth analysis of the development process of each case allowed us to identify the different problems, solutions, and design knowledge that the researchers activated throughout the project. Our design theory provides prescriptive knowledge for developing what we term visual inquiry tools, i.e. visual tools that guide teams of practitioners to inquire into hypotheses and potential solutions to specific strategic management problems. In other words, the purpose of the design theory is to support researchers and practitioners in developing such tools. In that sense, our design theory is the second episode of the formalization and communication of design knowledge, the first being the Design Summit. The major difference is in the way design knowledge is formalized – here, using Gregor and Jones' (2007) framework – and the number of the DSR projects from which it evolved. A summary of the design theory is provided in Table 3. Thereafter, we explain the design principles and the mutability in greater detail.

Table 6. Components of the Design Theory for Visual Inquiry Tools, based on Gregor & Jones' (2007) Framework.		
Component	Description	Application
1. Purpose and scope	"What the system is for," the set of meta-requirements or goals that specifies the type of artifact to which the theory applies and in conjunction also defines the scope, or boundaries, of the theory.	This design theory is intended for designers who wish to develop visual inquiry tools. The purpose of these tools is to guide cross-boundary teams of practitioners in jointly inquiring on specific strategic management problems. Joint inquiry is the process through which individuals (1) articulate and explore the strategic management problem, and (2) develop and evaluate alternative hypotheses about how to solve the problem. Such problems are typically solved by cross-boundary teams, i.e. those teams with knowledge boundaries (Carlile, 2004; Edmondson & Harvey, 2017).
2. Constructs	Representations of the entities of interest in the theory.	Strategic management problems; Joint inquiry; Conceptual model; Shared visualization; Inquiry techniques; Cross-boundary teams.
3. Principles of form and function	The abstract "blueprint" or architecture that describes an IS artifact, either product or method/intervention.	DP1 – Conceptual model: To structure the strategic management problem, frame it with a conceptual model describing the relevant building blocks (components) of the problem that teams can act on. The conceptual framework should be modeled according to academic justificatory knowledge and be kept parsimonious. DP1.1 – Frame: The conceptual model should identify the components which teams should inquire into to address the problem, and which they can act on. The components of the model should be mutually exclusive (components are well-defined and scoped) and collectively exhaustive (they cover the central dimensions of the strategic management problem). DP1.2 – Rigor & Relevance: The development of the conceptual model should be based on academic justificatory knowledge. Designers should assess the relevance of the conceptual model with practitioners, and if it corresponds to a reality faced by users.

		DP1.3 – Parsimony: The conceptual model should be accessible for cross-boundary team members with different backgrounds and knowledge bases. To avoid information overload and to prevent a prohibitive level of detail, the number of components in the conceptual model should be parsimonious. Designers can merge some components into higher order components. If subcomponents are deemed important, they can be used to develop additional tools. DP2 – Shared visualization: To facilitate communication between users, represent the conceptual model into a shared visualization by structuring the components logically into a visual problem space. DP2.1 – Functionality: The components of the conceptual model should be represented as empty problem spaces to support the directions for use, i.e. they should allow for ideation, prototyping, and presentation. DP2.2 – Arrangement: To increase the affordance of the tool, building blocks should be arranged according to their relationships in the conceptual model. These relationships should be masked to reduce the complexity of the visual. DP2.3 – Facilitation: Appropriate images, metaphors, tags, or visual arrangements should be used to increase the affordance of the tool. These visuals should provide a simple common language understood by all. DP3 – Directions for use: Define and specify techniques that allow for joint inquiry. DP3.1 – Ideation: The directions for use should stimulate and guide the creation and exchange of ideas, insights, and alternatives for the strategic management problem. DP3.2 – Prototyping: The directions for use should support users in developing, transforming, evaluating, and selecting alternative hypotheses on how to solve the problem. DP3.3 – Presentation: The directions for use should create tangible marks (e.g. sticky notes) that users can use to present and critique the design/solution.

4. Artifact mutability	The changes in state of the artifact anticipated in the theory, that is, what degree of artifact change is encompassed by the theory.	Flexibility of use: Due to the flexible nature of visual inquiry tools, use cases that different from the directions for use can be anticipated. These can even change the nature of the artifact. For instance, the building blocks might also be used to set numerical objectives rather than using post-it notes for ideation and prototyping. Flexibility of evolution: The conceptual frameworks can be represented visually in different ways and on different media. For instance, it can be represented on a paper-based shared poster or it can be instantiated into a CAD. Flexibility of integration: The visual inquiry tools may not and cannot cover all the aspects of the strategic management problem. Integrations or synergies between the visual inquiry tools and tools that cover additional aspects of the specific problems can be anticipated.
5. Testable propositions	Truth statements about the design theory.	The visual inquiry tools that implement the aforementioned principles can be tested by following Checkland (2000). Hereafter, we list the criteria that are suggested to be used in the evaluation of the visual inquiry tools: TP1 – Efficacy: The use of the visual inquiry tool supports and improves the outcomes of a process of joint inquiry into a strategic management problem. TP2 – Effectiveness: The visual inquiry tool can be successfully used by the individuals and group within the context of the particular managerial problem and organizational context for which it was designed. TP3 – Efficiency: The use of the visual inquiry tool does not require an inappropriate amount of time or other resources. TP4 – Elegance (Aesthetics): The shared visualization in the tool is easy to understand and use. TP5 – Ethicality: Participants in the inquiry using the tool are not disadvantaged by the outcomes of the joint inquiry compared to other participants, nor are they injured or stressed in the joint inquiry process

6. Justificatory knowledge	The underlying knowledge /theory from the natural/social /design sciences that gives a basis and explanation for the design (kernel theories).	Our design theory is supported by theoretical developments in ontology development, shared visualization, joint inquiry, and strategic problems in management. The design theory is also supported by the knowledge accumulated through the three DSR cases and their related physical instantiations.
7. Principles of implementation	A description of processes for implementing the theory (either product or method) in specific contexts.	The process of implementation of this theory is highly iterative. All the principles are interrelated and interdependent. Each of the three principles should be applied in iterative phases of design and testing. First, the designers should develop a conceptual framework, evaluate it and refine it until they reach a point of stabilization. Then they should instantiate it into a shared visualization that needs to be tested and refined. This instantiation might indicate some inconsistencies in the conceptual model, which might require a refinement of the conceptual framework. When the visual instantiation reaches a point of closure, designers can consider specifying the directions of use for their tool. Because the directions of use are highly dependent on the visualization, designers might have to refine the visual before reaching a point of stabilization.
8. Expository instantiations	A physical implementation of the artifact that can assist in representing the theory as an expository device and for purposes of testing.	The Business Model Canvas The Value Proposition Canvas The Team Alignment Map

Design Principle 1: Conceptual model

The first principle in the tool's design is to develop a conceptual model that frames and articulates a management concept of interest. This is the first step toward the development of the tool.

DP1.1. Frame. The first subprinciple that designers should treat with care is to develop a conceptual model that appropriately frames the business concept. The frame is critical as it sets the scope and purpose for the joint inquiry and thereby influences how practitioners will address the business concept. Thus, designers should have a clear and explicit understanding of their paradigm or foundational assumptions about the problem. All cases have addressed the business concept with a specific lens, for the Business Model Canvas, the frame was to look at the business model from an internal perspective whereas for the Team Alignment Map, the scope was to address team alignment from a conversation perspective. Further, the building blocks of the conceptual model should simultaneously be mutually exclusive and collectively exhaustive. All the building blocks should be clearly scoped and defined so that there are no overlapping characteristics and attributes with other building blocks. Designers should also ensure that the building blocks cover all of a problem's relevant aspects.

DP1.2. Rigor and relevance. The conceptual model should provide a rigorous and relevant account of a business concept. On the one hand, the development of the conceptual model should be based on academic justificatory knowledge to ground some validity and accuracy. Different strategies for the development of the conceptual model can be used. On the other hand, the model should be relevant in that it accurately represents the reality faced by practitioners. In all three cases, relevance was ensured by extensively testing and refining it in real contexts.

DP1.3. Parsimony. Finally, the conceptual model should be simple to ensure that it is easily understood by the heterogeneous members of cross-boundary teams, and to avoid a prohibitive level of detail that would undermine its affordance. Thus, the number of building blocks should be parsimonious, which was between four and nine in the three cases.

Design Principle 2: Shared visualization

The second design principle is to instantiate the conceptual model into a shared visualization via various techniques. Designers should follow three subprinciples, which were informed by the three projects in order to develop an effective shared visualization. They can also call upon experienced graphic designers, as was done by the designers in all three cases.

DP2.1. Functionality. The shared visualization should support the tool's intended functions. Thus, they should be aligned with the directions for use (DP3) and allow for exploration, hypothesis generation, and presentation. In all three cases, this was achieved by representing the conceptual model's components as empty design spaces or building blocks. In all three cases, practitioners would generate hypotheses by using tangible marks in the form of sticky notes that are added in the building blocks. This allows team members to represent their opinions and assumptions on a strategic management problem.

DP2.2. Arrangement. To facilitate the affordance of the tool, the associations between the building blocks should be masked but implied by the way they are visually arranged. The Team Alignment Map organizes the building blocks from left to right, following the conventional reading direction, to suggest that users should inquire into joint objectives first and should then move on to the joint commitments, and so on. Their arrangement reflects the processual associations between the building blocks. If the associations are important for the users to understand explicitly, designers can incorporate them either in the directions for use or through illustrative use cases as is the case for the Business Model Canvas. The building blocks of the Value Proposition Canvas were arranged according to their relationships, as reflected in the Business Model Canvas.

DP2.3. Facilitation. Finally, designers can make use of various aesthetics to facilitate the affordance of the tool and to provide a shared language that is understood by all users. The designers of all three projects used techniques such as appropriate metaphors, icons, written explanations, or shapes. For instance, every building block of the Business Model Canvas is named and has a corresponding metaphor in the form of an icon. The value proposition is depicted as a gift, suggesting that it is what the company should offer its customers. The Team Alignment Map's designers also used an arrow and a darker shade for missing resources and joint risks, suggesting that users should seek to transfer these into objectives

or commitments to the greatest extent possible. Thus, risks and missing resources represent obstacles that can be overcome if someone does something to mitigate them, hence their translation into objectives and commitments.

Design Principle 3: Directions for use

The last design principle relates to the need for designers to define and specify directions for use that guide the joint inquiry process in management concept. Designers should conceive a visual inquiry tool in a way that it facilitates (1) the exploration of a problem space, (2) the generation of hypotheses on the solutions to a problem, and (3) the presentation and criticizing of the solution.

DP3.1. Ideation. The directions for use should be defined in a way to stimulate the creation and exchange of ideas and insights between team members. A key characteristic of strategy is that there is no single best solution practitioners must be supported in their ideation and creativity processes. All three tools promote a collaborative use in cross-boundary teams in which individuals can tap into their diverse set of knowledge, expertise, and resources so as to generate and share creative ideas (Edmondson & Harvey, 2017; Katzenbach & Smith, 2015). For instance, the use of sticky notes facilitates the process of generating ideas as they force individuals to generate small chunks of information that can be combined and recombined to come up with an extensive number of possibilities (Sibbet, 2011).

DP3.2. Prototyping. The directions for use should also guide the generation, transformation, evaluation and selection of hypotheses on how to solve a management concept strategically. The use of sticky notes facilitates this process, since users can easily and flexibly fill the building blocks with hypotheses. The sticky notes provide great flexibility, since they are easy to add, move, or remove. For the purpose of joint inquiry in workshop settings (as opposed to analysis and specification), using sticky notes in the building blocks seems appropriate.

DP3.3. Presentation. The visual inquiry tools should be designed in a way to create tangible marks of the hypotheses and solutions so that they are easy to present, referred to, or criticized. Sticky notes provide a good means to make tangible and visible hypotheses and elements of the discussion, so that they can be presented and criticized by someone from inside or outside the team. Presenting and keeping tangible marks of a version of a solution

on the tool allows users to plan the activities to attain the future state and assess the progress.

Artifact mutability

Gregor and Jones (2007) underline the importance of capturing the mutability and the inherently dynamic nature of design theories. Design science researchers must account for mutability so as to inform future designers on the changing conditions of the prescriptive statements they develop (Gregor & Livari, 2007). Because the presented artifacts are designed iteratively and in a spirit of continuous improvement, they are in nature mutable. The analysis of the differences between the three cases outlined several principles of flexibility that one can foresee in the development of the tool, without them being the fundamental characteristics of what constitutes a visual inquiry tool.

The cross-project analysis allowed us to identify there are three different forms of this mutability: (1) flexibility of use, (2) flexibility of evolution, (3) flexibility of integration. First, the use of the artifact can deviated from its initial purpose and different uses of the tool can be drawn, which can deviate from the directions for use in the design theory and to some extent transform the nature of the artifact. For instance, the Business Model Canvas was aimed at designing a business model and strategizing about it, but we already noticed fourteen derived uses of the Business Model Canvas, among which people using it as a dashboard to set numerical objectives within each building block (e.g. number of customers to reach with a new value proposition) rather than using post-it notes to ideate the content of the building blocks.

Second, the evolution of the artifact is flexible. Simon (1996) sees this as a possibility for the artifact to be redesigned via feedback loops. Once the designers have developed a rigorous conceptual model, its instantiation can be done in many different ways and on different supports. For instance, the Team Alignment Map was first instantiated in a mobile application, but users expressed willingness to have a paper-based shared visual instead. Our design theory can also be instantiated in CAD tools. Third, it is possible to integrate different instantiations of the design theory. Because the tools seek to address a specific management concept, they do not and cannot cover all the aspects of a specific problem.

The visual inquiry tools can be combined to form a toolbox of inquiry. This was reflected in the Value Proposition Canvas being a plug-in to the Business Model Canvas. Another illustration is of the teams who use the Team Alignment Map to design their coordination for the implementation of the strategy they had defined through the Business Model Canvas.

6. Discussion

As we outlined at the start, the goal of our study was to (1) formalize the design knowledge of three visual inquiry tools into prescriptive guidance, and (2) outline how design knowledge can be accumulated within and across multiple cases. Hereafter, we discuss the findings of our analysis and how these answer these two goals.

The outcome: The design theory

A major concern in DSR has been the means through which design knowledge can be accumulated and formalized to provide effective means for future design science researchers to build on existing cases (e.g. Chandra-Kruse et al., 2016; Gregor & Jones, 2007; Gregor et al., 2013; Gregory & Muntermann, 2014; Kuechler & Vashnavi, 2012; Lee et al., 2011). Our analysis suggests that the formalization of design knowledge in the form of a design theory using Gregor and Jones' (2007) framework provides a valuable and effective medium for communicating and replicating design knowledge. In the Business Design Summit, the design knowledge was shared through the description of the development process and the explanation of the design features of the Business Model Canvas and the Value Proposition Canvas. Thus, the communicated design knowledge focused on the solution domain, in the terms of Meth et al. (2015). In our design theory, we have abstracted the development process and design features to develop design principles that bridge the problem and the solution domains. We therefore concur with Chandra et al. (2015) that design principles provide a valuable means to capture and communicate design knowledge. We framed design principles by outlining the design requirement (problem side) and abstract design features that support the design requirement (solution side).

Another point that calls for further discussion is the tension between developing abstract design principles that can be used for multiple instantiations and the need for these

principles to be actionable and clear enough so that they can provide valuable prescriptions to designers, as noted by Lukyanenko and Parsons (2013). Various scholars have developed prescriptions and evaluation criteria for the quality of design theories and principles (e.g. Aier & Fischer, 2011; Chandra et al., 2015). Designers should simultaneously assess whether their design principles are projectable (i.e. they can be projected into multiple instantiations) and clearly framed. In our case, some level of abstraction was required, since we drew the design principles from three projects (while most developments in DSR focus on single projects) and since we aimed for a design theory that could be used for a variety of artifacts. The particularity of our design theory is that it can be projected onto a large class of problems. As noted by Baxter et al. (2007), design knowledge may be easily re-used for problems that are similar (for which context-specific and rich design knowledge can be developed), but challenges arise when the problems are more generic (for which the design knowledge must be abstract yet actionable enough).

Our experiences underlined the importance of making use of descriptions and examples of the design principles to facilitate understanding and provide illustrations that designers can rely on. In our view, our design theory cannot be used as a standalone artifact, since illustrations of the design principles may be required when design principles are framed at an abstraction level that can encompass multiple artifacts. In such situations, descriptions and illustrations via multiple cases may provide future developers with concrete projections of the design principles. This is reflected in the expository instantiations, as recommended by Gregor and Jones (2007). We also join Chandra et al. (2015) in their suggestion that design principles should be material and action-oriented, i.e. they should "prescribe what an artifact should enable users to do and how it should be built in order to do so." (p. 4043). We followed their recommendation by framing design principles in a way that each presents abstracted design features and the design requirements they addressed.

On another note, our design theory not only provides effective support for designing visual inquiry tools, it also provides a timely contribution to developers and practitioners. Our design theory has attracted interest from developers as Strategyzer, the company involved in the development and the commercialization of the Business Model Canvas and the Value

Proposition Canvas, which has integrated it into workshops to help experts in specific management domains to design visual inquiry tools. Further, the Business Design Summit, which attracted 280 practitioners and scholars, underlined the need for prescriptive knowledge on how to design visual inquiry tools. Also, as the development of visual inquiry tools is growing continuously (e.g. Campbell et al., 2017; Gruber & Tal, 2017; Habermann & Schmidt, 2014; Kalbach, 2016; van der Pijl et al., 2016), we expect our design theory to be useful for some time in the future. Also, one of the co-authors is applying our design theory to brand identity design and management in a DSR project (Elikan & Pigneur, 2019).

Our design theory is also mutable, which provides insights into the potential expansion of our study. Our design theory is flexible in its evolution, since it can be instantiated into different media. Thus, we have laid the foundation of what would be required to develop CAD inquiry tools. The conceptual framework of the visual inquiry tool is a basis for the specification of the data architecture of the CAD inquiry tool. The conceptual framework developed with our design theory can be translated into a formal ontological language, such as the web ontology language (OWL) or the lexical OWL ontology matcher (LOOM). The design theory can also be used to inform the design of the CAD inquiry tool's interface. However, our design theory does not specifically address such tools, which calls for further development tailored to CAD.

Our design theory is also flexible in its integration with other visual inquiry tools and tools that address specific components (building blocks) of the visual inquiry tool. Our theory could stimulate the development of this new generation of tools. It is possible to foresee the development of a toolbox for managers, which would be an inventory of the strategic management problems most practitioners face and for each of which a specific visual inquiry tool is dedicated. Notably, such a toolbox would not lead to the replacement of any existing management tool; rather, the visual inquiry tools would be used in the first step toward addressing a strategic management problem, before using other tools for decision-making, analysis, specification, or implementation purposes.

The process: Design knowledge accumulation, abstraction, and formalization

To develop the design theory, we have analyzed the design knowledge we have accumulated, adapted, extended, and formalized within and across the three DSR projects. The process of developing the design knowledge in the design theory occurred across five primary stages, as outlined in the methodology (Figure 4). Given the lack of guidance and illustration for theorizing (abstracting) knowledge from multiple projects in DSR, our methodological approach offers an example from which other design science researchers can take inspiration. In fact, most studies have either focused on how to conduct (often single-case) DSR (e.g. Hevner et al., 2007; Peffers et al., 2007), theorize from single projects (e.g. Lee et al., 2011; Mandviwalla, 2015), what constitutes theoretical design knowledge contributions (e.g. Baskerville, Kaul & Storey, 2015; Baskerville, Baiyere, Gregor, Hevner & Rossi, 2018; Gregor & Hevner, 2013; Kuechler & Vaishnavi, 2012), or how to present the theorized design knowledge (e.g. Chandra et al., 2015; Gregor & Jones, 2007). The lack of methodological guidance for conducting multiple-project analyses led us to follow some principles been developed outside the DSR stream (e.g. Fereday & Muir-Cochrane, 2006; Miles & Huberman, 2010).

Thus, we have proposed a hybrid approach to theorization that incorporates the conventional activities of multiple-case studies to identify the different levels of design knowledge outlined by Meth and colleagues (2015) and the framework by Lee et al. (2011). We performed an iterative (retroductive) analysis between the design requirements and the design features across the three projects until we could formulate design principles and the other components of a design theory. These different design knowledge levels may be used as input for the thematic analysis of qualitative data when analyzing multiple projects. Our methodological approach allowed us to untangle the layers of form and function from the artifacts so that they can be compared and formalized into a more abstract design theory. Our methodological approach can also be replicated for single-project studies to formulate a design theory.

This paper presents a specific instance of knowledge accumulation in DSR, namely that of theorizing and abstracting knowledge from multiple projects into a design theory. Our goal was to formalize the instance design knowledge into more general and abstract design knowledge that can be projected to a broader (less situated) class of problems (i.e. developing visual inquiry tools for strategic management problems). We have illustrated that, for such theorization and knowledge accumulation, both the design features and design requirements of the three artifacts had to be abstracted. Thus, the design features were the entry points: the decision to conduct this study was based on the apparent similarity between the three visual inquiry tools, so that we believed that design knowledge could be accumulated across the projects. The similarity in design features facilitated the comparison of the projects, the accumulation of design knowledge, and the formalization of this knowledge into a design theory, i.e. the knowledge accumulation through theorization was driven by the solution domain, which corresponds to synthesizing mid-range designs, according to Offermann et al. (2011).

We have also illustrated the importance of identifying the practical problems faced by practitioners and the design requirements that must be fulfilled so as to address these problems. This was reflected in the analysis of the development process of the three projects, for which we identified three primary cycles. In each cycle, the researchers were concerned with a different problem, for which they proposed different solutions, often through the development of new artifacts. The evolution of the problems was in the three projects related to the fundamental shortcomings of the existing artifacts. For instance, the BMO did not allow practitioners to design business models, which drove researchers to develop the Business Model Canvas. Thus, the evolution of the problems did not relate to improvements or situated adaptations of tools; rather, they called for new affordances. Based on our study, we suggest that the analysis of the limitations of a tools' affordances to address certain design requirements may provide entry points for analyzing how design knowledge fundamentally evolves across time, beyond the continuous improvement of solutions. In fact, in the three projects, the evolution of the design requirements called for the instantiation of the conceptual model in different formats, with each allowing for certain specific actions (e.g. the COOPilot App for testing the level of team coordination and the

Team Alignment Map for joint inquiring into the domains for team coordination). Thus, identifying the evolution of the design requirements can allow researchers to analyze how the design decisions and intuitions for the development of solutions evolves.

We also raise a critical point regarding the presentation of multiple-project analyses in DSR. In fact, we encountered the same concerns that have been identified in other disciplines. For descriptive multiple-case studies, Eisenhardt and Graebner (2007) highlighted the tensions researchers must manage between providing a rich story about the cases and staying within the space constraints. Single-case studies (analogous to single DSR projects) are in fact easier to present, because the richness of the qualitative data is in line with a rich description of the case (DSR projects). With multiple cases, the challenge is to manage the tradeoff between a story that is rich and having a well-grounded theoretical development. We chose to manage this tension by providing only the main points that readers must know regarding the cases (motivation for the tool's development, description of the tool, development process, and adoption) and kept the details for the description of the design theory. A key aspect stressed by Eisenhardt and Graebner is to relate the cases in a way that is interesting to the reader, to make them want to read more. We have translated our data analysis' results into a storyline that could illustrate how design knowledge can accumulate, become more mature and reusable over time (Figure 10). Also, this way of structuring the presentation of analysis chronologically by identifying what each case brought to the previous one allowed us to avoid unnecessary repetitions and overly descriptive analyses. We contend that this may seem counterintuitive for the abductive or retroductive nature of DSR (Lee et al., 2011; Mueller & Urbach, 2013), since presenting results in this way could suggest that the theory was developed from deduction. However, this issue is easy to overcome if the abductive nature of methodology is clearly explained and outlined.

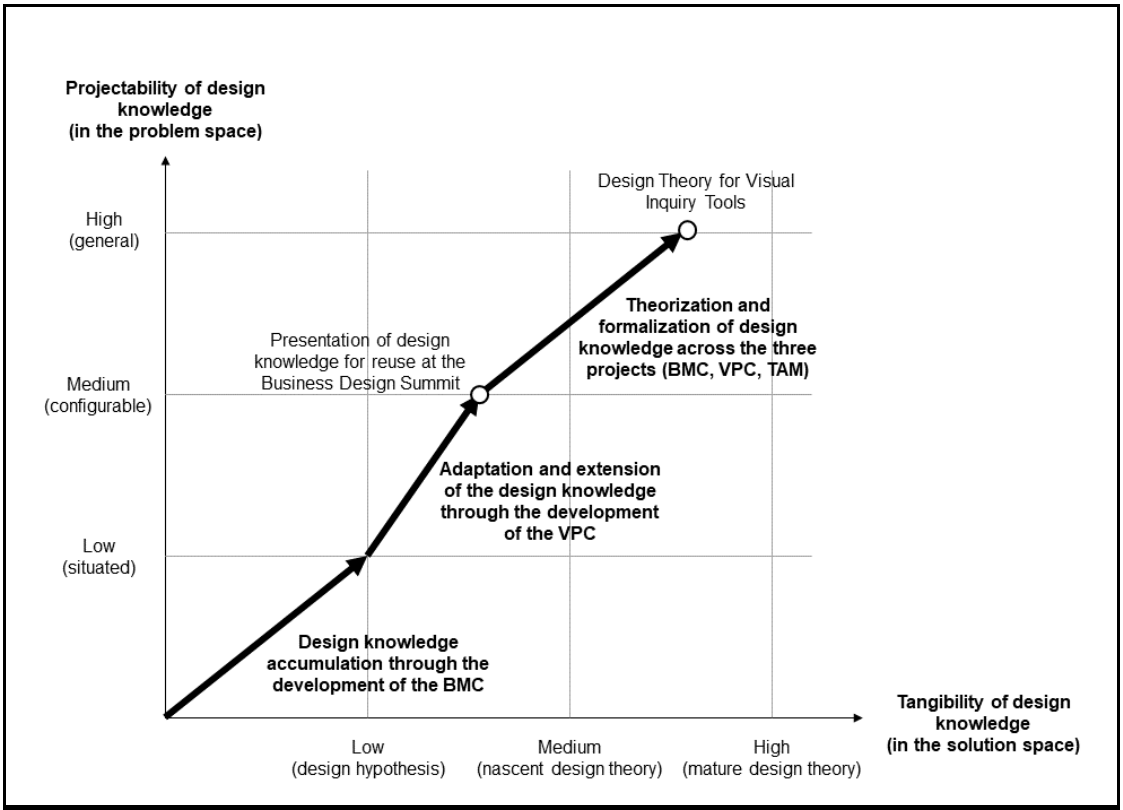


Figure 10. Accumulation of the Design Knowledge across all Cases

6. Limitations

The first limitation we must highlight is the lack of a summative evaluation of the design theory. While we based the development of the design theory on three DSR projects which have been extensively evaluated, we do not propose an evaluation of the design theory itself. Therefore a subsequent study would be required to evaluate the design theory through a lab or field experiment. The experimental task should require management designers to develop visual inquiry tools for a variety of strategic management problems (e.g. strategic alignment, organization vision design, branding management). The hypothesis should be that designers who are provided with the design theory develop tools that score higher on the five testable propositions according to users or external design experts. The evaluation of the usability of the design theory itself should also be considered in order to assess to what extent the design theory is easy to implement and understand. Overall, the evaluation

should consider both the outcome of using the design theory and the process of using the design theory.

Also, we note a limitation regarding the sampling of the DSR projects. We based the current paper on a convenient yet critical sample. The three DSR projects represent critical cases, because they have been used extensively and were the only ones, to our best knowledge, to explicitly follow a DSR approach and relate the design knowledge accumulated in academic outlets. Also, we chose these projects to have access to data through our direct involvement in the projects and ruled out other DSR projects for visual inquiry tools. This allowed us to have access to the design rationales and design decisions regarding the three visual inquiry tools throughout the projects' lifecycles. This may limit the usability of our methodological process (Figure 4), since design science researchers who would like to accumulate design knowledge across multiple projects may have difficulties identifying all the design requirements and design features without being directly involved in the projects. Thus, we need research to validate, extend, or challenge our methodological process when used purely on published data.

Finally and related to the above, we also reflect on our theorization methodology. We followed a hybrid approach, combining both theoretical frameworks and processes in DSR and the qualitative social sciences. Future studies that accumulate knowledge across multiple projects may also build on the qualitative analysis of published DSR papers, since the number of studies that are formalizing design knowledge in conferences and papers is steadily rising (Dolata, Kilic & Schwabe, 2015). This was not possible in our paper as a considerable part of the Business Model Canvas project was undertaken before IS outlets were encouraging and/or accepting DSR studies.

7.Conclusion

We have illustrated how design knowledge can be accumulated within and across DSR projects to develop design theories that can apply to a broad problems class. Our research project was motivated by the need to have prescriptive knowledge for developing visual

inquiry tools that address strategic management problems. Our analysis has allowed us to understand that the accumulation and formalization of design knowledge proved valuable for tools that share similar characteristics such as the design features. Our methodological process can serve as guidance for researchers who wish to develop design theories from multiple DSR projects.

Our design theory outlined 12 design principles along three categories (conceptual model, shared visualization, and directions for use) to guide the design of visual inquiry tools and formulated five testable propositions that designers can rely on for the evaluation. Owing to its projectability on multiple strategic management problems, our design theory is not related to specific instance problems. It can be used for management problems that display the properties of strategic management problems (i.e. hard to define, complex to solve, and no single solution) and that require joint inquiry from cross-boundary teams.

On a general note, we illustrated the opportunities the IS discipline offers for contributing to the management discipline by developing design theories. Van Aken (2004) stressed the need for management research to provide practical and prescription-driven knowledge on top of descriptive theoretical developments. He argued that management research suffers from a lack of relevance and impact in the business world owing to the paucity of academic and prescriptive knowledge on how to solve a class of managerial problems. Thus, he called for more "field-tested and grounded technological rules to be used as design exemplars of managerial problem solving." (p. 221). Osterwalder and Pigneur (2013) suggest that the IS discipline is well-equipped to contribute to the design of management tools as it has a long tradition in DSR. We concur that the IS discipline can build on its strength in the modeling, formalization, and representation of practical problems to design solutions for the realities of management. Our study is an illustration of how the IS discipline can contribute to management research – and still remain true to its own identity – by designing visual inquiry tools for a variety of strategic management problems.

Chapter 3

Brand Identity Ontology

ABSTRACT OF CHAPTER 3

In this chapter, we present a systematic literature review that uncovers the key concepts of brand identity. This systematic literature review is developed in order to lay the foundation for an ontology, that is also presented in this chapter. The systematic literature review was done in two stages: First, we did an extensive literature review on the terms "corporate brand identity". Second: we redid the same process with the terms "brand identity" and "organisational/organizational identity" by doing so we reduced the semantic bias that could have occurred. Then we looked at each definitions found and made an ontology based on these. This ontology was developed following Guizzardi (2005) and the Unified Fundational Ontology.It follows the Unified Fundational Ontology modelling principles and was modelled using OntoUML, which is the formalization developed to support Unified Fundational Ontologies. The modelling aims at being as close to the literature as possible. The objective of this paper is thus, to present the state of the art of the current literature on the topic of "brand identity" and to propose a definition based on that. Adding to that, we propose an ontology based on this literature. This ontology is flexible enough to accommodate all the different fields of research that have been developed around these concepts of "brand identity".

Keywords: systematic literature review, brand identity, organizational identity, organizational identity, ontology, conceptual model

1.Introduction

Brand identity is important for companies as it sets the tone of all its activities; from strategy, to communication, to the development of their products and services. It is associated with different literatures from various disciplines in social sciences (i.e: marketing, strategy, organization studies, social psychology and so on). Many different authors have tried to connect all the literatures in order to add some homogeneity and unite the concept and its definition (e.g. Balmer & Greyser, 2002; ; Hatch & Schultz, 2001; Schultz, Hatch, & Larsen, 2000). Most of these authors when referring to bridging the understandings and different disciplines around this concept, explain that it could strengthen the overall conception that both academicians and practitioners have of the phenomenon of brand identity. Because of the confusion in the terms and concepts of brand identity, authors have been using the same terms and definitions in various domains (Cornelissen, Thøger Christensen, & Kinuthia, 2012) . And according to various authors in the domain (Balmer, 2008; Fetscherin and Usunier, 2012) there is too little consensus about the concept of identity in organizational research, which according to these authors foster confusion in research. There were different proposals in the last decade to develop a coherent, consistent and parsimonious terminology (Brown, Dacin, Pratt, & Whetten, 2006). Despite this comment more than 13 years ago, it does not seem that there has been any advances in this regard in the different disciplines looking at the concept.

The concept of identity in organizations, or what we call brand identity in this chapter, has been increasingly looked at in the last decade. Madhavaram, Badrinarayanan, & McDonald, (2005) as well as Gioia, Schultz, & Corley, (2000) have argued that the reason behind this interest is the increasing complexity and turbulence of the environments in which organizations are currently evolving. These authors explain that the only way for companies to deal with these increasingly complex environment is to change their conception of their identity. For all of these authors this identity should be continuous and fluid to as well as "frequently up for redefinition and revision by organizational members". We truly believe that if this was the case back in 2005, with the increasing social, environmental, technological and economical changes, in 2019 this argument is even more relevant.

To be able to uncover some of the fogginess that lays around the concept, we decided to develop a conceptual model. As Mylopoulos, (1992) explain: conceptual models are usually used for communication between stakeholders. It should represent the aspects of the physical and social world to support communication as well as problem solving between humans. It is an abstraction of a reality according to a certain perspective. It can be used to preserve and communicate a certain view of the world as well as a way to reason problem-solving about this view of the world. In this paper we have looked at how to conceptualize a model of brand identity in order to add a new view of this concept and see if this could maybe help us build a visual tool to help practitioners envision their brand identity differently and solve their brand identity with a new perspective.

We chose to follow Gomez-Perez, Fernández-López, & Corcho, 2006 in developing an ontology following the classical ontology engineering methodologies. In this chapter we tried to follow strict modelling principles, while still being as close to the literature as possible. The objective of this ontology (or conceptual model) is to be flexible enough to accommodate existing theories from various fields of research, whilst still being formal. Many different ontology types exist, inclusive of formal ontology (upper ontology, top-lever ontology or reference ontology), domain ontology and task ontology (Guarino, 1998). We chose to follow Guizzardi, 2005 and use UFO (Unified Foundational Ontology) as our main formalism. Because UFO proposed a large number of semantics, which allows to overcome the situation of ontological deficiencies (Guizzardi, Wagner, Almeida, & Guizzardi, 2015). It has proven useful when trying to model new concepts. To be able to come up with this conceptual model, we conducted a systematic literature review to depict the topic of brand identity and what it consists of. We conducted a systematic literature review for the terms (corporate) brand identity.

The question this chapter seeks to answer is thus: How to develop a conceptual model that uncovers the concepts of brand identity? What sub-concepts are constructing the brand identity concept and what are their relationships?

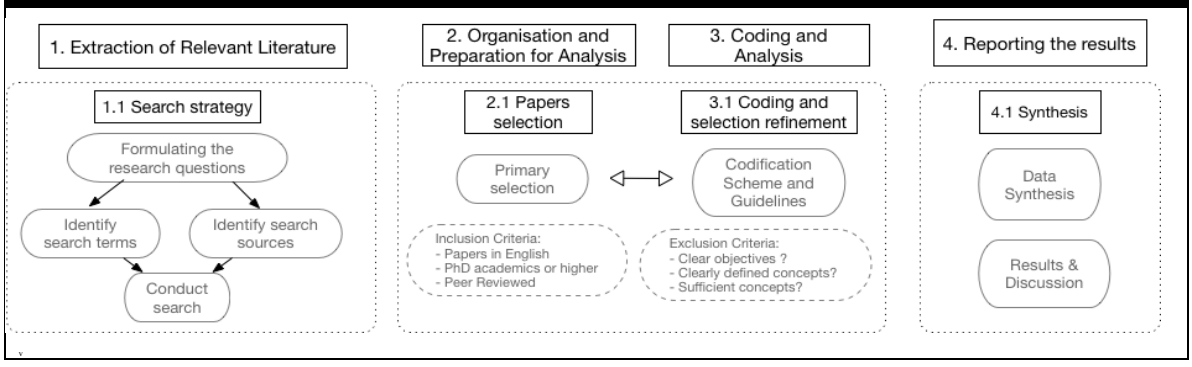
The contributions of this chapter are twofold: first, we present a state of the art of the brand identity literature and second, we present a conceptual model that allows to uncover what a brand identity is, what are its concepts and their relationships. This will allow us to develop a visual inquiry tool for entrepreneurs to develop their brand identity. The remainder of the chapter is organized as follows: we first present the review process and protocol underlying the systematic review. We then present the findings as well as the comparison between the different iterations of the review. After that, we present the ontology developed in On

2.Literature Review

2.1 First iteration

Following the review process (depicted in Figure 1) consists of four phases: 1. Extraction of the relevant literature, 2. Organization preparation for Analysis, 3. Coding and Analysis, and 4. Reporting the results. But before extracting the relevant literature, one must define the research objectives of the review, and formulate research questions that the review aims to answer.

Figure 1. Description of the review method



2.1 Conducting the review

According to Levy & Ellis, (2006), formulating the review questions is a critical activity when conducting a systematic literature review, since these questions are used to derive the entire systematic review methodology (Okoli and Schabram, 2010). We formulate the following

three research questions (RQ) to identify the primary (corporate) brand identity concepts from the literature:

- RQ1: What components are captured in (*corporate) brand identity*?
- RQ2: What components are necessary to build a Startup or SME brand identity?
- RQ3: Can these components be used for developing an ontology as a first step towards a visual co-design tool, to help Startups or SMEs co-design their brand identity strategy?

•

2.1.1 Search Strategy

The search terms are: corporate had to appear along with brand and identity. These terms could appear anywhere in the paper but had to be the exact expression: "corporate brand identity". For the search sources, we decided to gather multiple sources to ensure not missing any papers. The sources are different databases, and because corporate brand identity has been studied in different disciplines (from an organizational focus, a customer one, a marketing one and so on), we looked at it from a multisource perspective.

2.1.2 Organization and preparation

The selection process (shown in Figure 2), has two iterative stages: the keyword search followed by backward and forward searches, as depicted by Levy and Ellis (2006) and Bandara et al., (2015). In the backward reference search, we added the references that did not appear in the keyword search but looked essential to the review and in the forward search we have added the appropriate papers that had cited the ones we found fundamental for explaining corporate brand identity (Vom Brocke et al., 2015).

2.1.3 Papers selection and coding and analysis

Searching Google Scholar, Emerald Fulltext, JSTOR, ISI Web of Knowledge and Springer Link, a total of 1,592 papers were found, using these specific search terms. The search period has not been defined, which means that these papers are all the papers referenced from 2017 and before, including duplicates. Once the duplicates were deleted, we had 1216 papers to look at. Then the following criteria were applied by first screening all the papers:

Inclusion criteria: We included only papers in English that related to at least one of the research questions. To be included, the papers had to have been peer reviewed and written by graduate students or higher.

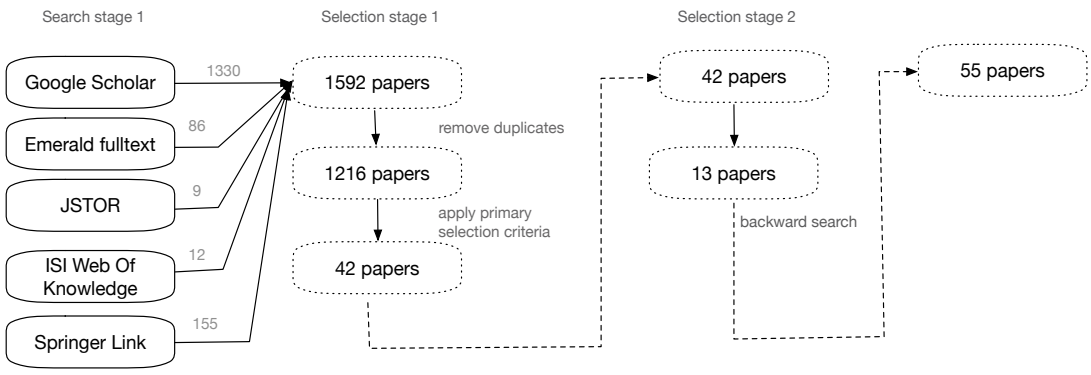
Exclusion criteria: If a paper had several versions, we included only the most complete one. We evaluated the quality along three questions, eliminating any papers with less than two points. As explained by (Okoli and Schabram, 2010), one of the exclusion criteria was quality appraisal. To do so, we relied on the following questions:

1) Are the paper's objectives clearly justified and in line with our goal of explaining brand identity?

2) Are the proposed concepts clearly defined?

3) Does the paper propose sufficient concepts to explain corporate brand identity?

Figure 2. Description of the review method, in particular the paper selection process for "corporate brand identity"



2.2 Second iteration

To ensure the validity of the results found in the first iteration, we decided to re-do a systematic literature review but this time adding more terms. After looking in the literature we found out that the terms "brand identity" and "corporate brand identity" were often intertwined or mixed. The goal of this second iteration was to confirm that the found concepts are the ones that should be used when looking at "brand identity". We were hoping that the found concepts would remain the same or that some concepts might be added through this second review.

In this second iteration we still followed, Levy and Ellis (2006) and kept the same questions as in the first iteration. This second iteration allowed us to also include the papers that have been published between 2017 and 2019.

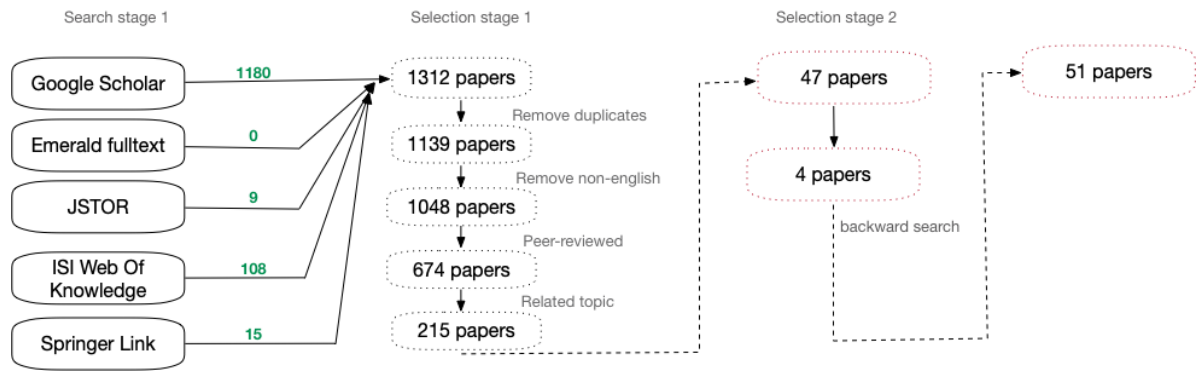
2.2.1 Search Strategy

The search terms are: brand had to appear in the title of the papers along with identity. Because we are aiming at defining the concept we focused on the papers that were entitled with these exact terms. It would be the exact expression "brand identity". For the search sources, we decided to gather multiple sources to ensure not missing any papers. Because this concept has been studied in different disciplines (from an organizational focus, a customer one, a marketing one and so on), we looked at it from a multisource perspective.

2.2.2 Organization and preparation

We followed the same selection process than in the first iteration as illustrated in figure 3.

Figure 3. Description of the review method, in particular the paper selection process for "brand identity"



2.2.3 Papers selection and coding and analysis

Searching Google Scholar, Emerald Fulltext, JSTOR, ISI Web of Knowledge and Springer Link, a total of 1312 papers were found, using "brand identity" in the title of the papers from

the different sources aggregated. The search period has not been defined, which means that these papers are all the papers referenced from 2019 and before, including duplicates. Once the duplicates were deleted, we had 1139 papers to look at. Then the following criteria were applied by first screening all the papers:

Inclusion criteria: We included only papers in English that related to at least one of the research questions. To be included, the papers had to have been peer reviewed and written by graduate students or higher: once these two criteria were applied we found 674 papers.

Exclusion criteria: If a paper had several versions, we included only the most complete one. We evaluated the quality along three questions, eliminating any papers with less than two points. As explained by (Okoli and Schabram, 2010), one of the exclusion criteria was quality appraisal. To do so, we relied on the following questions:

1) Are the paper's objectives clearly justified and in line with our goal of explaining brand/organisational/organizational identity?
2) Are the proposed concepts clearly defined?
3) Does the paper propose sufficient concepts to explain them?

The last stage of the literature review consists of summarizing the results, with two primary activities: 1) Data synthesis and 2) results and discussion. In the next section, we will show how data were synthesized to answer the research questions. We will also compare the results found in the different iterations and see the main changes that occurred by adding a second iteration.

3.Review results

This section presents and discusses the review findings. During the first iterations, we found 55 papers, during the second iteration we found 51 papers, which gives us the total of 106 papers that we looked at.

To answer RQ1: "What components are captured in (corporate) brand identity?", we analysed the content of the first 55 selected papers and then added the content of the 51

papers found during the second iteration. By looking into these, we tried to map what concepts the authors were including in their definitions of (*corporate) brand identity,* and summarized the found concepts in Table 1.

To answer RQ2 we looked at these concepts through the lens of the main differences between large corporations and smaller organizations (ie: Startups and SMEs) to see which of these concepts could be applied.

And to answer RQ3, we looked at all found elements through two lenses: the first one is the "communication theory" by Shannon (1992) and through Hatch & Schultz's view on how to strategize an organization's brand identity. The reason we chose both these lenses are the following: We aim at building a conceptual model that will then be derived to develop a visual inquiry tool that aims at supporting entrepreneurs co-design their brand identity. This endeavor means that they are trying to communicate their identity to some stakeholders. Because of this "communication" aspect, we decided to apply the lens of a communication theory, to ensure that no matter what we find in the literature review, the scope of the tool would help an organization get their message across. The second lens is used because we are looking at brand identity from a strategical perspective. This tool that we are planning to propose to startups and SMEs should allow them to solve their brand identity question from an "abstract" perspective. The discussion they would have along with the tool should help them and give them guidance throughout strategizing about brand identity. It won't help them actually put it in place, but should help them frame their discussion about how to do it better.

3. 1. Comparison of the results of the iterations:

The second iteration of the search allowed us to confirm a majority of the concepts we had found during the first iteration. However, one concept had to be removed: the concept "Leadership" only one author (Ruediger et al., 2013) had found this concept to be relevant in the context of brand identity. We found two more concepts to add to concept of brand identity: People (also called stakeholders) and Perception. People or stakeholders are particularly important when looking at brand identity in terms of communication. Indeed, the

brand identity in this case should be aimed at somebody. It was evident to add this element. Adding to that, we had already uncovered the "employees" and "customer" concepts, it thus, made sense to add a more general category of stakeholders. As for the perception, we had been aware from the previous literature review that there was a duality between desired image and actual image but had no manner to explain it conceptually without this "perception" element. It allowed us to truly make a different between two key aspects of the "image" concept.

RQ1. What components are captured in corporate brand identity?

The review has identified 55 papers in the first iteration and 51 papers in the second iteration, which results in 106 papers with different definitions of (corporate) brand identity. This concept has been looked at from a wide range of disciplines (marketing, organizational behaviour, strategy and communication), which explains the multiple definitions of this concept. This literature review shows that the corporate brand identity concept includes a set of components that determine a brand's way of being, thinking and behaving. It defines the purpose and meaning of a brand and the directions it should follow. For marketing scholars, one of the main concepts of corporate branding is identification. For instance, Aaker (2004) and Melewar et al., (2012) have defined corporate brand identity as the communication of the unique features of a product or service to customers, which in turn differentiates the brand from its competitors. From a strategic perspective, corporate branding is seen as a key activity that requires to be managed, which is constructed by different activities. In organizational behaviour, scholars tend to look at corporate brand identity to understand the relations between the internal and external stakeholders with the organization.

There are elements that were clearly stood out from a majority of papers. For instance the fact that there are internal versus external stakeholders. A majority of authors seem to agree that the brand shouldn't focus only on one type of stakeholders but should ensure that all types of stakeholders are taken into account.

Another element that came across a majority of papers is that there is a duality between the concepts of brand identity and brand image. The identity, which comes from the company

is usually perceived in a certain way by the stakeholders or recipients of the brand communications (Joachmisthaler and Aaker, 1996, Nandan, 2005).

RQ2. What elements are necessary to build a Startup or SME brand identity?
According to Spence and Hamzaoui Essoussi (2010), the main differences between corporate brand identity for a large organization and corporate brand identity for smaller organizations such as SMEs and Startups are the following: in large organizations there is a visionary management, whereas in smaller organizations it is usually an individual who has a vision (usually the entrepreneur); and in a large organisation the process is extensively systematic, based on widespread market research, whereas in smaller organizations, the process is more intuitive and based on the entrepreneur's values, personality and perceptions.

The main elements thare are needed to build a brand identity are the vision, which comprises the essence, the mission and the aims and goals of the organization. This will give the organization its main direction on the long term and will help construct a message that is aligned with this direction and the long term vision. Adding to that, there is the culture, which is a more internal element but will include the structure of the company as well as its main values (Kapferer, 2012; Harris and DeChernatony, 2011) and its personality. Just like a human being a company need these to shape its behavior and its strategy.

Last but not least, the organization will need to decide on a desired image. This is extremely important. It will influence the overall image of the company and will have a strong influence on the communication. All these elements need to be aligned in order to allow the organization to send a coherent message and to shape it.

These three elements form the "internal" part of the identity, they form what the organization will have to work on. Once these elements are clear, the organization can think of all the different means/channels/media it will use to communicate about its identity.

RQ3. Can these components be used for developing an ontology as a first step towards a visual co-design tool to help Startup or SMEs co-design their brand identity strategy?

Yes, in software engineering, conceptual models are usually used for communication between stakeholders. It should represent the aspects of the physical and social world to support communication as well as problem solving between humans (Mylopoulos, 1992), we believe that the found elements can be used in order to do that.

And because ontologies have purposes (Fernández-López, Gómez-Pérez, & Juristo, 1997), the purpose of this one being to give a foundation to a strategic tool, we need to look at the components that will support the goal of the tool. This is why we chose to look at the components that were in line with the theory of communication as presented by Shannon (1992). We will show in the further section how we managed to derive an ontology from the 25 components found in the systematic literature review. These elements can be used with the formalism we chose, naming UFO (Guizzardi, 2005), because UFO allows to represent all entities of different ontological natures. In his formalism of UFO, Guizzardi (2005) also allows to both represent entities as object (what he calls "endurants") as well as "event-like" entities (Guizzardi et al., 2016).

In the table below, we have summarized the findings of the literature reviews in terms of which authors has used which elements to define the concept of brand identity. In bold are the authors found throughout the second iteration of the review.

Table 2. Summary and Mapping of the components found in the review

Components	Authors
Aim and goals	(Aaker, 2004); (Anisimova, 2014); (Leitch and Richardson, 2003); (Balmer, 2001); (Minkiewicz et al., 2007); **(Diefenbach, 1987)**; **(Wheeler, Richey, Tokkman, & Sablynski, 2006)**
Brand heritage	(Burmann and Zeplin, 2005); **(Burmann, Jost-Benz, & Riley, 2009); (Urde, Greyser, & Balmer, 2007); (Aaker, 2004)**
Communication/ Expression	(Abratt and Kleyn, 2012); (Balmer and Gray, 2003); (Balmer, 2005); (Dowling, 1986); (Srivastava, 2011); (Stuart, 1999); (Witt & Rode, 2005); (Urde, 2013);(Gioia, 1998), **(Madhavaram et al., 2005); (Le Roux & Du Plessis, 2014); (Ingenhoff & Fuhrer, 2010) ; (de Bedoya, Morillas, & López, 2015)**
(Corporate) behaviours	(Melewar and Wooldridge, 2001); (Witt & Rode, 2005) ; **(Lievens, Van Hoye, & Anseel, 2007) ; (Van Knippenberg, Van Knippenberg, Monden, & de Lima, 2002)**

Culture	(Aaker 2004); (Balmer and Grey 2003); (Blombäck and Ramírez-Pasillas, 2012); (Percy and Elliot, 2007); (De Chernatony, 1999); (Barros et al., 2015); (Da Silveira, Lages, & Simões, 2013); (Dowling, 1986, 1993); (Harris and de Chernatony, 2001); (Hatch et al., 1997) ; (Kapferer, 1997, 2002, 2008); (Leitch and Richardson 2003); (Mottram et al., 1998); (Ruediger Kaufmann et al., 2012); (Schultz, 2015); (Stuart, 2012); (Urde, 2013) ; (Witt and Rode 2005); **(Hasam et al., 2003); (Nandan, 2005); (LeRoux and DuPlessis, 2014); (Roy & Banerjee, 2008); (Diefenbach, 1987); (Hutton, 1997)** ; (Wheeler et al., 2006); (Ind, 1997); (Kim & Lim, 2003.) ; Bedoya et al., 2015
Customer reflection/ Reflection of consumer self-image	(Balmer and Grey 2003); (Harris and De Chernatony 2001); (Barros et al. 2015); Da Silveira et al., 2013; (Elliot and Percy 2007) (Kapferer 2002); (Leitch and Richardson 2003); (Balmer and Grey 2003); (Barros et al. 2014); (Da Silveira et al., 2013); (Elliot and Percy 2007); (Harris and De Chernatony 2001); (Kapferer 1997, 2002, 2008); (Leitch and Richardson 2003); **(Underwood, 2003); (Lam, Ahearne, Hu, & Schillewaert, 2010) ; (Roy and Benerjee, 2014)**
Employees	(Bravo et al., 2017) ; **(Halliday & Kuenzel, 2008);** (**Lievens et al., 2007)**
Environmental influences	**(Balmer, 2014)**; (Balmer and Gray 2003); (Kennedy, 1977); (Markwick & Fill, 1997)
Essence	(Roll, 2006); (Harris and De Chernatony 2001)**; (Ghodeswar, 2008); (Albert and Whetten, 1985), (Gioia, 1998); (Van Knipperger et al., 2002); (Hasam et al., 2003); (Janonis et al., 2007);** (**Hutton, 1997);**
Identity	(McCormack, Cagan, & Vogel, 2004); (Amujo & Laninhun, 2013) Amujo, and Laninhum, 2013; (Blombäck and Ramírez-Pasillas, 2012); Balmer (2001 ; 2003; 20055; 2008); (Van Riel & Balmer, 1997); (Bick et al., 2003); (Melewar & Karaosmanoglou, 2006); (Bendixen & Abratt, 2007) ; Cornelissen et al (2007); (He & Balmer, 2007); (Van Riel & Fombrun ,2007); (Otubanjo et al, 2010); (Robichaud, Richelieu, & Kozak, 2012); (Dehdashti, Kenari, & Bakhshizadeh, 2012); (Knape & Lundell, 2011)
Image	(Coleman, 2011); (Einwiller and Will, 2002); (Esch et al., 2006); **(Halliday and Kuenzel, 2008);** (**Kamark, 2010); (Kapferer, 2008); (Ruediger et al., 2012); (Schultz, 2015); (Lievens et al., 2007); (Craig et al., 2008); (Janonis et al., 2007); (Roy and Benerjee, 2014); (Kim and Lim, 2003); (Knape and Lundel, 2011)**
Mission	(Aaker 2004); (Balmer et al., Fill, 1997); **Chang, 2008**; (De Chernatony 1999); (Harris and de Chernatony, 2001); (Glanfield et al., 2017); (Minkiewicz, et al. 2007); (**McCornack et al., 2004); (Cole and Bruch 2006); (Wheeler, 2009); (Janonis et al., 2007); (Petek et al., 2013); (Ingenhoff and Fuhrer, 2010); (Ind, 1997); (Kim and Lim, 2003);**
People/ Stakeholders	(Blombäck and Ramírez-Pasillas, 2012); (D. Brown, 2017); **(Petty, 2012)**
Perception	(Mindrut and Manolica 2015); (Nandan, 2005); (Wheeler et al., 2011)
Personality	(D. A. Aaker, 1996); (Abratt and Kleyn 2012); (**Amujo, and Laninhum, 2013); (Balmer, 2014);** (Balmer and Grey 2003); (Burmann and Zeplin 2005);

	(Blombäck and Ramírez-Pasillas, 2012); (Barros et al. 2014); (Chang, 2008); (Da Silveira et al., 2013); (Elliot and Percy 2007); (Esche et al, 2006); (De Chernatony 1999); (Harris and De Chernatony 2001, 2002, 2008); (Leitch and Richardson 2003); (Marwick and Fill 1997); (Mindrut, Manolica, & Roman, 2015); (Minkiewicz, et al, 2007); (Mottram 1998); (Roll 2006); (Razeghi, Roosta, Alemtabriz, & Gharache, 2014); (Shee & Abratt, 1989);(Srivastava 2011); (Stuart 1999); (Urde 2013); (Nandan, 2005); (Burmann et al., 2008); (Petek et al., 2013); (Roy and Benerjee, 2014); (Coop, 2004); (Bolshoof et al., 2006); (Hutton, 1997); (Ingenhoff and Fuhrer, 2010);
Positioning	(Blombäck and Ramírez-Pasillas, 2012); (Campbell, 1999) ; (Chang, 2008) ; (Da Silveira et al., 2013) ; (De Chernatony 1999); (Harris and De Chernatony 2001); (Jean-Noël Kapferer, 1991); (Mindrut and Manolica 2015); (Minkiewicz, et al, 2007); (Roll 2006); (Urde, 2013) ; (Nandan, 2005); (Craig et al., 2008); (Wheeler,2009); (Wheeler et al., 2011); (Ingenhoff and Fuhrer, 2010); (Robicheaud et al., 2012); (Upshaw, 1997)
Presentation	(Harris and De Chernatony 2001); (Kapferer 1991, 1997); (de Chernatony 1999);
Relationships	(Aaker 1996); (Abratt and Kleyn 2012); (Balmer and Grey 2003); (Barros et al. 2014); Da Silveira et al., 2013; (De Chernatony 1999); (Elliot and Percy 2007); Dowling (1986); (Harris and De Chernatony 2001); (Iglesias et al. 2013); (Kapferer 1992,1997, 2008); (Kapferer 2002, 2008); (Kennedy 1997); (Leitch and Richardson 2003); (Mäläskä, Tähtinen, & Saraniemi, 2010); (Mindrut and Manolica 2015); (Muzellec and Lambkin 2009); (Stuart 1998); (Urde 2013); (Nandan, 2005); (Underwood, 2003); (Sääksjärvi & Samiee, 2011); (Roy and Benerjee, 2014); (Coop, 2004); (Bolshoof et al., 2006)
Reputation	(Balmer and Gray 2000); (De Chernatony 1999); (Marwick and Fill 1997); (Stuart 1999); (Coop, 2004); (Bolshoof et al., 2006); (Bedoya et al., 2015)
Strategy	(Amujo, and Laninhum, 2013) ; (Balmer 2001) ; (Vella and Melewar, 2008); (Ghodeswhar, 2008); (Madhanavar et al., 2005); (Alvesson and Robertson, 2006); (Gioia et al., 2000); (LeRoux and DuPlessis, 2014); (Bolshoof et al., 2006); (Wheeler et al., 2006); (Kim and Lim, 2003); (Upshaw, 1997);
Structure	(Rashid, 2012); (LeRoux and DuPlessis, 2014); (Wheeler et al., 2006);
Value proposition	(Balmer, 2014); ; (Campbell, 1999); (Melewar and Wooldridge 2001); (Urde 2013); (Underwood, 2003); (Wheeler,2009); (Petek et al., 2013); (Petty, 2012); (Wheeler et al., 2006);
Values	(Aaker 2004); (Balmer 2001); (Burmann and Zeplin 2005); (Coleman 2011); (Dall'Olmo Riley & De Chernatony, 2000); (Mäläskä et al. 2010); (Minkiewicz, et al, 2007); (Muzellec and Lambkin 2009); (Stuart 2012); (Urde 2013); Burmann et al., 2008; Janonis et al. (2007); (Petek et al., 2013); (Diefenbach, 1987); (Wheeler et al., 2011); (Ind, 1997); (Robicheaud et al., 2012)

Vision	(Blombäck and Ramírez-Pasillas, 2012) ; (Burmann and Zeplin 2005); (Chang, 2008); (Da Silveira et al., 2013); (Einwiller and Ingenhoff 2008); (Glanfield et al,. 2017); (Harris and De Chernatony 2001); (Kamark, 2010); (Mindrut and Manolica 2015); (Mottram et al., 1998); (Roll 2006); (Ruediger et al,. 2012); (Schultz 2005); (Urde, 2016); (Nandan, 2005); (Burmann et al., 2008); (Wheeler,2009; Petek et al., 2013); (Diefenbach, 1987); (Ingenhoff and Fuhrer, 2010); (Kim and Lim, 2003; Bedoya et al., 2015)
Visual components / Design / Physical	(Abratt 1989); (Abratt and Kleyn 2012); (Balmer, 2014); (Balmer and Grey 2003); (Barros et al. 2014); (Blombäck and Ramírez-Pasillas, 2012); Chang, 2008; Da Silveira et al., 2013; (Glanfield et al,. 2017); (Harris and De Chernatony 2001); (Kapferer 2002, 2008); (Leitch and Richardson 2003); (Witt and Rode 2005); Underwood, 2003; McCornack et al., 2004; Roy and Benerjee, 2014; Hutton (1997); (Balmer, 1995); (Baker & Balme, 1997); (Alessandri, Yang, & Kinsey, 2006) ; (Melewar & Jenkins, 2002); (Balmer and Greyser, 2003); (Melewar, 2003); (Suvatjis and De Chernatony, 2005); Melewar & Karaosmanoglu (2006); (Pett, 2012); (Kongprasert et al., 2008); (Campbell, 1999); (Dehdashti et al., 2012); (Bedoya et al., 2015)

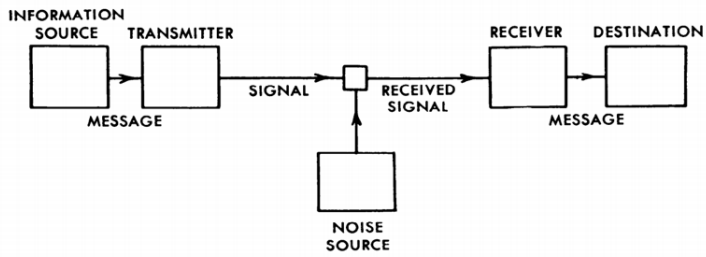
4.Conceptual Model

In the following section, we show how we organized the 25 elements found in the literature review to construct the conceptual model. We made two main choices when it comes to the conceptual model: 1. We chose to look at brand identity through a "communication theory" lens. 2. We chose to look at identity as the alignment of vision, culture and image (Hatch and Schultz, 2001, 2003).

4.1. Communication theory: We used the scope of Shannon (1998) and looked at the communication of the brand identity through the lenses of this author's theory of communication. In this theory, the author explain that the information source (here an organization) selects a desired message out of a set of possible messages (a communication strategy). It can be of any form: spoken words, music, an ad and so on. The transmitter will change this message into a signal sent through the communication channel (any channel or media). The receiver will then receive this message and change it into his or her own perspective. In the case of brand identity, the information source and transmitter are usually

the organization and the receiver and destination are usually all the stakeholders to whom the organization tries to communicate. In this process, there are some elements that can be added to the signal that were maybe not intended by the information source. These unwanted and uncalled elements can distort the message. Shannon calls these "noise". This helps us with unwanted elements suchs as *environmental influence*. These are external and cannot be controlled by the company and are important. One must be aware of the *noises* or *influences*, because they may influence the future strategy.

Figure 4. Shannon Communication Model



In this regard, we have constructed the conceptual model in three parts: In red the part of the "Identity", in the case of the brand identity ontology, it is the organization. Then in blue on the model, we have put all the elements that fit with what Shannon calls the "signal", that we call "Communication" and lastly in green, we have all the elements that belong in the "Stakeholders" part. The receiver represent all the stakeholders that receive the company's message and will then form an image out of the mix of all the received messaged. We have added "noise" into the message section as it can distort the message that the sender tries to get across to the receiver.

4. 2. Hatch and Schultz's alignment model (2001, 2003)

Hatch and Schultz (2001, 2003) have come up with an approach that permits to simultaneous focus on both external and internal views of the identity, by aligning the culture (internal facet) to the identity (link between internal and external) and image (external facet). They are the first authors to look at identity as a mirror of the internal and external facets, thus allowing the integration of both. They state that a company needs to align its vision, culture, and

image in order to have a consistent brand identity. According to these authors, once these elements are aligned and only then, an organizations can tell the complete story of its brand identity and implement it in order to develop its image, especially online. To allow for a first analysis towards what could be in the brand identity ontology for developing a strategic visual tool that allows teams to co-design their brand identity, we analyzed the different components through the three pillars proposed by Hatch and Schultz (2001, 2003). According to this hypothesis, we selected the components that would fit in this model. Table 3 contains the chosen components that can be seen as sub-constructs of Hatch and Schultz's alignment model. We have developed the definitions for each construct by relying on the literature cited in table 2.

Table 3. Overview of some components pre-classified for the ontology

Elements	Sub-constructs	Definitions
Vision	Mission	Reason of existence, vision and philosophy of the organization and its long term purpose. It describes the starting point from where all activities of the organization are initiated.
	Essence	What makes the brand unique and competitive. It is an element that stakeholders can easily understand.
	Aims and Goals	All the goals that the organization aims to achieve in the long term. They are what the organization aims to achieve in business as well as the expected results in terms of performance, as expressed in the vision.
Culture	Values	The values of an organization are the moral beliefs and principles that will be integrated in its culture.
	Personality	Refers to the mix of ideologies present within the organization, including organizational beliefs, ideas and values.
	Structure	According to Balmer (2002) it is a core aspect that defines an identity. It relates to all the element around how an organization is structured. This has a big influence on its culture.
Image	Positioning	The brand positioning incorporates the values, culture, strength and future directions, as differentiators from competitors.

	Presentation	The way the organization seeks to present itself, with different style. How the identity can be presented to appeal stakeholder's characteristics.
	Desired image versus Perceived image	Desired image is internal, whereas perceived image is external. Image can thus, be seen as both the way the organization wants to be seen as well as, the way stakeholders look at it.

We have found nine elements from our literature review that fitted with the assumption that "Vision, Image and Culture" are the main elements that need to be aligned and that can be further developed in sub-constructs. We believe that these nine elements could be looked at by entrepreneurs to build and manage their brand identity. As stated by previous scholars, brand identity should be looked at from both an internal and an external perspective. The nine elements presented here comply with that. Additionally, we have tested the validity of these components with a Fintech Startup based in Switzerland and Mexico and a SME in the domain of Energy, based in Switzerland and they both told us that these elements make sense according to what they have seen while strategizing with marketing consulting companies on their brand identity. The elements found seem to encapsulate the concept according to the existing literature. We believe that these elements could be further used to construct a *brand identity ontology*.

4.3 Ontology Formalization

The conceptual model was formalized using UF-O (Unified Foundational Ontology). UFO is part of the "upper ontologies" family, also called "top-level ontologies", these types of ontologies allow to define basic entities and general categories that constitute the universe and provide a common framework and vocabulary. These types of ontologies are a good starting point when constructing a new ontology from scratch. They provide a good reference point that allows comparisons among different ontological approaches. Upper ontologies like UFO are conceptualizations that contain specification of domain independent concepts and relations based on formal principle derived from different sources (Mika et al., 2004). Because this chapter aims at proposing an ontology based on

new concepts, we adopted this approach. This allows us to ground the new found concepts in general categories, as the model will show.

UFO was created by Guizzardi (2005), and was developed to provide foundations for conceptual modeling based on philosophical principles as well as capturing the distinctions between human cognition and common sense. It is well adapted to the brand identity concepts because these concepts are drawn from different domains of research and different sources of literature, which all have their own definition of what it is. UFO has proven useful for defining real-world semantics for their underlying concepts and providing guidelines for their coherent use (Guizzardi and Guizzardi, 2010).

Along with UFO, Guizzardi (2005) developed OntoUML, which is a pattern-based and ontologically well-founded version of the Unified Modeling Language (UML) (Benevides and Guizzardi, 2009). OntoUML was developed in compliance with the ontological distinctions of UFO. OntoUML allows to produce an ontology that can be easily shared through the web while still having a good level of expressivity. The ontology presented in hereafter was thus formalized using OLED , a lightweight editor for developing , evaluating and implementing domain ontologies using OntoUML. The specifics of OntoUML and UFO and their effect on this model are described next.

Here we explain the different classes we use in our conceptual model. OntoUML characterizes differently Types and Individuals. Types, which are used in our conceptual model, are what we call abstract things. When instantiated, these can become particular things: individuals. In OntoUML just like in UML, every class must have a name and a stereotype as we can see on the figure below. For instance “Identity” is a “Category”. Hereunder are all the class stereotypes we present in the ontology and their explanation as derived from Guizzardi, 2005.

Table 4. Class stereotypes derived from Guizzardi, (2005)		
Category	A Category is a rigid mixin, that does not require any specific dependencies. It is used to aggregate essential properties (objects that have different identity properties).	RigidNonSortal Multiple Identities
Kinds	"Kind" is used to represent rigid concepts that provide an identity principle to their instances. They a whole that has parts contributing in different ways for its functionality.	RigidSortal Simple identity
Subkinds	A «Subkind» is a construct used to represent rigid specializations of identity providers such as «Kind», «Collective», «Relator» and «Mode».	RigidSortal Simple identity
Relator	The «Relator» construct is used to represent **truth-makers** of material relations, i.e., the "things" that must exist in order for two or more individuals to be connected by material relations. Because of this nature, relators are always dependent on other individuals to exist.	RigidSortal Simple Identity
Mode	A «Mode» is a particular type of intrinsic property that has no structured value.	RigidSortal Simple identity
Collective	The «Collective» construct is used to represent rigid concepts that provide an identity principle for their instances. The main characteristic of a «Collective» is that it has an homogenous internal structure, i.e., all parts are perceived in the same way by the whole.	RigidSortal Simple Identity

The different entities we present relate thanks to "Relations". Every relation has a certain amount of "relata" as argument, which are connected or related by it. In ontoUML there are two broad categories of relations: Formal and Material. Formal relations hold between two or more entities directly (no intervention from any further individual). However, material relations are mediated by what we call "relators". Herunder are all the types of relationships that can be found in the proposed conceptual model.

Table 5. Relationships stereotypes		
Generalization	Generalizations are a type of specialization. OntoUML only supports specialization of types. The relation between the type and its subtype is a specialization. (class no object diagram)	
Material	"Material" relations have material structure on their own. The **relata** of a material relation are mediated by individuals that are called relators. Material relations are derived from relators and the mediation relation that connect them to the corresponding relata.	Source 1 - * End 1 - *
Characterization	«Characterization» is a relation between a *bearer type* and its *feature*. Feature is intrinsic (inherent) moment of its bearer type, and thus *existentially dependent* on the bearer. Feature may be stereotyped as «Quality» or «Mode». Feature *characterizes* a bearer type iff every instance of bearer exemplifies the feature.	Source 1 – 1 End 1 - *
Mediation	We define a relation of «Mediation» between a «Relator» and the entities it connects. Mediation is a type of existential dependence relation. It can be derived from the relation between the **relata** and the *qua individiuals* that compose the relator and that inhere in the relata.	Source 1 - * End 1 - *
Member of	«MemberOf» is a parenthood relation between a **functional complex** or a «Collective» (as a part) and a «Collective» (as a whole).	Source 1 - * End 1 - *

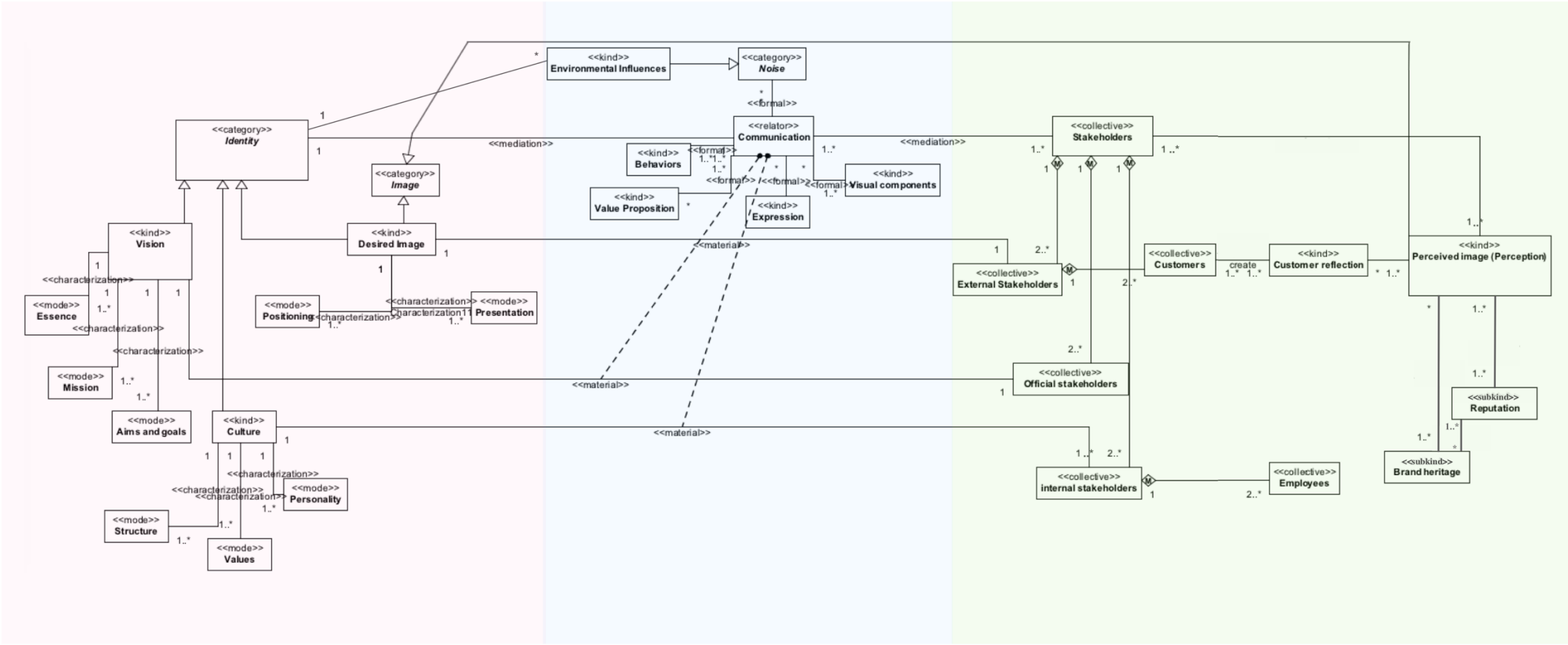
Now that these classes and relationships have been better defined, we propose the conceptual model that we have developed on OLED that software developed to use OntoUML for representing UFO's ontologies. We will further explain each and every concept of this model and how they relate to one another in the following sections.

5.Brand identity ontology

IDENTITY

COMMUNICATION

STAKEHOLDERS



In this section we explain the ontology as it is presented in section 5. We present it in different parts. We start with the "organizational part" meaning we will first present the "Identity" concept of the ontology. We will then present the "stakeholders" and will finish this section by presenting the "communication" part. Identity defines "what" we communicate to the stakeholders. The "Communication" refers to the "how" the organization communicates that "what" and "Stakeholders" refer to the "whom".

5.1 Identity

As explained earlier, we decided to look at the identity concept through the lense of Hatch and Schultz, 2001 and 2003. They explain that identity is the alignment of Vision, Image and Culture. We thus look at identity as the mix of these elements. These elements are internal and external, tangible and intangible and gives organizations their disctinctiveness (Abratt, 1989; Balmer, 1998). The identity is shaped by the actions of the founders and leaders, by tradition and can be influenced by the environment.

First we present the « **Vision** » element along with its sub-constructs. Vision is composed of Essence, Mission and Aims and Goals. These form all the aspirations, goals and long term plans of the company in terms of what the organization wants to achieve. It gives the organization a direction. Vision is mainly targeted at the official shareholders as they have for instance a word to say on the "goals" (i.e: performance of the organization)

Name of B-I Element	Vision
Definition	Vision is an internal element of an organization. It is the organization's long-term purpose, reason for existence, vision and philosophy. It describes the starting point from which all the organization's activities are initiated. It also generates a certain culture. (Internal element.)
Part of	"Identity"
Relationships	aims and goals characterizes vision - Each aims and goals characterizes one vision

	- Each vision is related to at least one aims and goals mission characterizes vision - Each mission characterizes one vision - Each vision is related to at least one mission essence characterizes vision - Each essence characterizes one vision - Each vision is related to at least one essence official stakeholders materializes vision - Each official stakeholders materializes one vision - Each vision is related to one official stakeholders
Concept type	Object type

Vision has three main sub-constructs: Its essence, it's mission and its aims and goals. These are different but all needed to form the overall long term vision. The organization's vision represent goals which the organization wants to achieve in the long term. These long term goals are explained in terms of what the organization aims to achieve concretely in its operations, which constitutes the mission, as well as the results expected from that performance (aims and goals), as expressed in the stated vision.

Name of B-I Element	Essence
Definition	The concept of brand essence relates to the most important and distinctive properties that make a brand unique and give it its competitive edge. The essence of the brand is a value which consumers can easily understand and appreciate. It represents what makes it distinctive in the market (Van Rekom et al 2006; Kapferer 2008).
Part of	"Identity", "Vision"
Relationships	Essence characterizes vision

	- Each essence characterizes one vision - Each vision is related to at least one essence
Concept type	Object type

Vision and mission are somehow intertwined, however, in this conceptualization we see the vision encompassing the mission. Vision being a more abstract concept and mission being closer to the operations, we think that mission is at the same level than "aim and goals".

Name of B-I Element	Mission
Definition	The mission is vital to the brand identity, in explaining why the corporation exists and what engages and motivates it, beyond the aim of making money (Collin and Porras, 1998). A company's vision extends the mission by formalising its view of where it is heading and what inspires it to move forward (de Chernatony, 2010). When defining brand identity, mission and vision are sources of commitment (Senge, 1990) and willingness to support (Greyser, 2009) from the organization itself and beyond (Alvesson and Berg, 1992).
Part of	"Identity", "Vision"
Relationships	mission characterizes vision - Each mission characterizes one vision Necessity: - Each vision is related to at least one mission
Concept type	Object type

Aims and goals are related to the vision, it is a less abstract way to formulate the vision, the aim and goals should support the vision but express more activable and doable actions.

Name of B-I Element	Aims and Goals
Definition	All the goals that the organization aims to achieve in the long term. They are what the organization aims to achieve in business as well as the expected results in terms of performance, as expressed in the vision.
Part of	"Identity", "Vision"
Relationships	aims and goals characterizes vision (is-property-of fact type)

	- Each aims and goals characterizes one vision (1) - Each vision is related to at least one aims and goals (1-n)
Concept type	Object type

The second element of the identity is "**Culture**". Culture is mainly related to the internal part of the organization. Namely the internal stakeholders. Culture is a collective way of thinking. It is a collective feeling among internal stakeholders. This feeling as presented below is the result of values, beliefs, the structure and personality of the organization. Because culture is mainly an internal part, it is mainly aimed at the internal stakeholders. The employees will have to agree with the culture. For instance, the employees will be the first targets of a change in the structure of the company.

Values are an internal element of the model. It is an extremely important element as it will shape the culture highly. A company that has "teamwork" as core values for instance, will have a different company culture because its culture will try to enhance collaboration, even the company structure might try to lead to that collaborative culture by trying to cut the silos.

Name of B-I Element	Values
Definition	Values are the organization's ethical beliefs and principles. These values, mixed with all the beliefs and the ideologies present in an organization, form its personality. These values also impact on the stakeholders' relationships with the organization. They strongly influence the vision and culture. (Internal element.)
Part of	"Identity", "Culture"
Relationships	values characterize culture - Each value characterizes one culture - Each culture is related to at least one values
Concept type	Object type

Personality is another sub-construct of culture. It should usually be aligned with the values. Just like a human would have a personality, an organization has some personality: beliefs and ideology that are believed and shared in the organization.

Name of B-I Element	Personality
Definition	Can be seen as the different beliefs and ideologies present within the organisation, including organisational beliefs, ideas and values. Personality is derived from the core values, among other things, and represents all the emotional features (Harris & De Chernatony 2001; De Chernatony 2006). There is a close relationship brand personality and the image of a consumer because consumers identify themselves with particular brand features that reinforce their self-image. Moreover, personality can be seen as the personality traits that characterize a brand.
Part of	"Identity", "Culture"
Relationships	personality characterizes culture - Each personality characterizes one culture - Each culture is related to at least one personality
Concept type	Object type

The structure of the company will affect the culture highly. This is increasingly the case in startups, which try to be more "horizontal" than companies used to be previously. Media has been talking about the "startup culture". Obviously, startups have a different organizational structure than larger organizations, this has a big impact on their culture.

Name of B-I Element	Structure
Definition	According to Balmer (2002), the structure of an organization is a core aspect that determines an organization's identity. It relates to all the element around how an organization is structured. The structure and organization of the organization will affect its culture a lot. Adding to that the relationships between the parent organization and its subsidiaries or business units also influence an organization's identity
Part of	"Identity", "Culture"

Relationships	structure characterizes culture - Each structure characterizes one culture - Each culture is related to at least one structure
Concept type	Object type

Lastly, Identity is made of the third element: "**Image**".

Image is both internal and external to an organization. Some researchers see it as how an organization would like outsiders to see it, while others see it as the ways different stakeholders see it. Combining these two views, we state that image is a holistic view held by (internal or external) stakeholders of an organization and is the result of sensemaking by these stakeholders. It is also the organization's communication of a projected picture. It is influenced by daily interactions between organizational members and external audiences. (External element.) Image despite its duality and despite being the element that is targeted at all stakeholders, is an important element particularly for the external stakeholders.

Name of B-I Element	Desired Image
Definition	All the perceptions, beliefs and impressions that an organization wants to create in the minds of its stakeholders and publics by means of tangible identity elements (Topalian 2003).
Part of	"Identity"; "Image"
Relationships	Desired Image; General Concept: Image, Identity presentation characterizes desired image - Each presentation characterizes one desired image - Each desired image is related to at least one presentation positioning characterizes desired image - Each positioning characterizes one desired image - Each desired image is related to at least one positioning

	desired image is aimed at external stakeholders - Each desired image is aimed
Concept type	Fundamental concept

We will be looking at the perceived image, later in the "Stakeholders" part of this chapter.

When deciding on the image to project, an organization shall look at two different elements: how they position themselves and how they present themselves.

Name of B-I Element	Positioning
Definition	The brand positioning incorporates the values, culture, strength and future directions, as differentiators from competitors. This should be how the organization wants to position themselves in the minds of all their stakeholders especially in relation to their competitors in the market.
Part of	"Identity"; "Image"
Relationships	positioning characterizes desired image - Each positioning characterizes one desired image - Each desired image is related to at least one positioning
Concept type	Object type

Name of B-I Element	Presentation
Definition	The way the organization seeks to present itself, with different style. How the identity can be presented to appeal stakeholder's characteristics. Different presentation styles are developed to present the brand identity (Nandan, 2004). It should be presented to appeal the stakeholders and their aspired characteristics. It is important to take all stakeholder groups into account.
Part of	"Identity"; "Image"

Relationships	presentation characterizes desired image - Each presentation characterizes one desired image - Each desired image is related to at least one presentation
Concept type	Object type

5.2 Stakeholders

In this part we will look at all the different stakeholders to whom the organization communicates. There are many different stakeholders that are around an organization. Here we have divided them in three categories: internal, external and official. Each of these stakeholders have their specificities, mainly these specifities are described through the association between some classes and the stakeholders. For instance, external stakeholders are more touched by the "desired image" of the identity part, whereas official stakeholders by the "vision" part and obviously the internal stakeholders (mainly employees) will be mostly touched by the "culture" section of the identity. These are not explicited in the following concepts but are stated with the relationships on the ontology. These relationships show a trend but are not rigid. The image will also touch other stakeholders on top of the external ones.

Name of B-I Element	Stakeholder
Definition	Stakeholders are different actors that all have interests in an organization (including customers, suppliers, partners, and so on). The main stakeholders are the customers who provide value to the company; the employees are the most important internal stakeholders, since they create the value that will be delivered; the other stakeholders differ for each organization – for startups in early stages, venture capitalists may be important, whereas in SMEs, some suppliers may be key to the daily operations.
Part of	"Stakeholders"
Relationships	communication mediates stakeholders - Each communication mediates at least one stakeholder

	- Each stakeholder is related to at least one communication Official stakeholders Official stakeholders is member of stakeholders - Each official stakeholder is member of one stakeholder - Each stakeholder is related to at least 2 official stakeholders official stakeholders materializes vision - Each official stakeholders materializes one vision - Each vision is related to one official stakeholders Stakeholders form perceived image (perception) External Stakeholders external stakeholders is member of stakeholders - Each external stakeholders is member of one stakeholders - Each stakeholders is related to at least 2 external stakeholders customers is member of external stakeholders - Each customers is member of one external stakeholders - Each external stakeholders is related to at least 2 customers desired image is aimed at external stakeholders - Each desired image is aimed at at least one external stakeholders - Each external stakeholders is related to one desired image Internal stakeholders internal stakeholders is member of stakeholders - Each internal stakeholders is member of one stakeholders - Each stakeholders form one perceived image (perception) - Each perceived image (perception) is related to one stakeholders
Concept type	Fundamental concept

In the external stakeholders, we have named a specific type of stakeholder that is particularly important for the organization: the customers.

Name of B-I Element	Customers
Definition	Communication refers to all the media used for communicating with all stakeholder types, which will transform these different communications, which combine to form an image. All the media include the products and service. (Internal element with an external impact.) The ways an organization communicates with its different stakeholders. It may be official, internal or external. It can be interpreted as "what we say we are".
Part of	"Stakeholders"; "External Stakeholders"
Relationships	customers is member of external stakeholders - Each customers is member of one external stakeholders - Each external stakeholders is related to at least 2 customers customers create customer reflection: - Each customers create at least one customer reflection - Each customer reflection is related to at least one customers
Concept type	partitive fact type

When reflecting on their idea of the company, customer develop a so-called customer reflection.

Name of B-I Element	Customer reflection/ Reflection of consumer self-image
Definition	According to Leitch & Richardson, 2003 and Balmer, 2010, brands create meaning rather than just messages. These meanings can be used by consumers in order to convey their own desired-self. Because the communication is usually aimed at a specific group on consumers for whom the products or services (value proposition) of the organization are intended, Kapferer (2003), explain that these consumers will use their perception of the organization to create a particular self-image that will satisfy some of their emotional needs.

	Therefore, the brand should reflect the self-image of the consumer. This element is important because it can predict consumer behavior towards purchases (a consumer purchases products that reinforce his/her self-image)
Part of	"Stakeholders"; "External Stakeholders"; "Customers"
Relationships	customers create customer reflection - Each customers create one customer reflection - Each customer reflection is related to one customers Customer reflection is associated perceived image (perception) - Each customer reflection associates at least one perceived image (perception)

Employees on the other hand are a specific type of the internal stakeholders. They play a particularly important role in brand identity as they play a proxy between the company and some of the other stakeholders.

Name of B-I Element	Employees
Definition	Employees contribute significantly to transmitting the brand's values in the corporate branding process (Balmer 2001a, b). The translation of the corporate brand internally to employees must be supported by the mission, values, and culture of the organization. It is important for employees to buy into organizational values and programs.
Part of	"Stakeholders"; "Internal Stakeholders"
Relationships	Employees is member of internal stakeholders - Each employees is member of one internal stakeholders - Each internal stakeholders is related to at least 2 employees
Concept type	role

All of these stakeholders end up creating a perception of the company that they have built overtime. This is the perceived image. It is the dual concept that comes to complete the "Desired image" to create the "Image concept".

Name of B-I Element	Perceived Image
Definition	All the perceptions which stakeholders form about a brand according to the unique functional and emotional attributes associated with the brand (Aaker, 2011) and which results from the interactions of all stakeholders 'impressions, experiences, feelings and knowledge (Kuusela, 2003), based on the organization's products and services, its management style, and how these are established in stakeholders 'minds through planned or unplanned communication activities (Nandan, 2005). How external stakeholders 'perception of the brand, its products and services and the extent to which these meet their functional and symbolic needs is constructed by means of corporate brand identity elements (Nandan, 2005).
Part of	"Image"; "Stakeholders"
Relationships	Perceived Image; General Concept: Image, Identity Stakeholders form perceived image (perception) - Each stakeholder form one perceived image (perception) - Each perceived image (perception) is related to at least one stakeholder Perceived image form brand heritage - Each perceived image (perception) form at least one brand heritage Customer reflection is associated to perceived image (perception) - Each customer reflection is associated to at least one perceived image (perception)
Concept type	Fundamental concept

From the perceived image, two sub-constructs are derived: the brand heritage and the reputation. The reputation is built overtime through different perceived image of stakeholders. The brand heritage is the perception of the brand in time as well, it is how the identity wil be perceived in people's memories.

Name of B-I Element	Brand heritage
Definition	According to Urde et al., (2007) brand heritage is a dimension of a brand's identity found in its track record, longevity, core values, use of symbols and particularly in an organizational belief that its history is important. It is drawn from the past. According to Keller, (1993) it can be seen as the perceptions about a brand as held in people's memory.
Part of	"Stakholders"
Relationships	Perceived image forms brand heritage (associative fact type) - Each perceived image (perception) forms at least one brand heritage (1-n) - Each brand heritage is related to at least one perceived image (1-n)
Concept type	Object type

Name of B-I Element	Reputation
Definition	Balmer (2002) says that the reputation of a corporate brand can be used as a control mechanism to enable organizations to benchmark decisions, actions, communications and behavior, and to evaluate the effect of these elements on the organization internally and externally. The reputation is built overtime by all the stakeholder's perceptions of the brand.
Part of	"Stakeholders"
Relationships	Perceived image forms Reputation (associative fact type) - Each perceived image (perception) forms at least one Reputation (1-n) - Each brand heritage is related to at least one Reputation (1-n)
Concept type	Object type

5.3 Communication

Communication in this model is crucial. It plays the role of "relator" between the Identity and the Stakeholders. Communication refers to all the media used for communicating with all stakeholder types, which will transform these different communications, which combine to form an image. All the media include the products and service. (Internal element with an external impact.) The ways an organization communicates with its different stakeholders. It may be official, internal or external. It can be interpreted as "what we say we are". We take into account carefully media such as word-of mouth and competitor commentary but

acknowledge them in "noise" instead of controlled communication as prescribed in communication theories (Shannon, 1992). In this conceptualization, communication is made of the behavior, the value proposition and some visual components. Adding to that, we use the environmental influences as an element, which is included in the "noise" concept of this model.

Visual components are one of the main forms that will take place in the communication. It is one of the most important touchpoints for many stakeholders at many points in time.

Name of B-I Element	Visual components
Definition	These include all visual aspects, such as the name, symbol, logos design of the website and everything that can be seen. All the visual components that can be observed in their physical appearance. The physical appearance of the brand is closely connected with a brand original or prototype and depicts the quality and benefits a brand offers to consumers (Verma 2010). The brand's positioning will be affected by artefacts which provide consumers with a set of visual or tangible signs and signals about the brand's unique performance characteristics.
Part of	"Communication"
Relationships	visual components forms communication - Each communication is related to at least one visual components
Concept type	fundamental type

The value proposition related to all products and services with which the customers and other stakeholders will be in contact with, it is thus an important mean of communication.

Name of B-I Element	Value Proposition
Definition	The corporate brand represents a direct promise between the organization and its stakeholders. This promise as revealed through its value proposition is communicated by means of various channels, and customers experience this through the organization's services, products and employees. (Balmer & Gray 2003). It is one of the ways in

	which a brand interacts with some of its stakeholders. It represents the brand to a large extent.
Part of	"Communication"
Relationships	Value proposition forms communication - Each Value proposition forms at least one communication
Concept type	Object type

The last concept Is the behavior of the organization.

Name of B-I Element	(Corporate) Behavior
Definition	According to Melewar and Jenkins (2002), corporate behavior refers to all activities and behavior of the organizations. These include strategic conducts and actions that are aligned with corporate culture as well as actions that take place spontaneously from different perspectives of the organizations.
Part of	"Communication"
Relationships	Behavior forms communication - Each behavior forms at least one communication - Each communication is related to at least one behavior
Concept type	object type

We consider elements that are not directly communicated by the organization because they will certainly affect the perception of the brand by all the stakeholders.

Name of B-I Element	Environment Influences
Definition	External environmental influences are an element that includes all factors of the external environment that infleunce on the organization and over which the organization does not have direct control. Since the external environment in which the organization functions are a constantly changing setting, it is included as a category that may influence the communication and mainly acts as "noise" an element which is not controllable by the organization.
Part of	"Communication"
Relationships	Environmental influenced is related to noise
Concept type	General concept

Now that we are done defining all the concepts and relationships of the ontology, we will seek to define the concept of brand identity as a whole. To come up with a more homogeneous definition of the concept brand identity, we looked at all the components found in the ontology as well as at some definitions that seem to have quite similarities throughout time and that could be used in combination with all the found elements. These five different definitions all take a more cross-discipline perspective and even though there are some discrepancies in the elements that are defined, there is an idea that remains the same in all five definitions: brand identity should help the organization achieve its goal of being different, of being able to be perceived the way it wants to be in the mind of both external and internal stakeholders and that can only be achieved by a good strategy.

Table 6. Some definitions found in the SLR

Author(s)	Year	Definition
Blombäck	2005	The tangible and intangible features that **differentiate** the organization, its products and services based on the functional and **symbolic value** of a product or service which is established in consumers 'minds through planned **strategic communication** and **behavior** in order to **position** the brand favorably in the marketplace
Aaker	2004	All associations transmitted to **internal** and external **stakeholders** through a combination of **strategy**, **structure**, **communication** and behavior in order to position the organization, its products and services favorably in the marketplace.
Balmer	2003	An organization 's identity is a **summation** of those **tangible** and **intangible** elements which make any corporate entity **distinct**. It is shaped not only by the **actions** of corporate founders and leaders, by tradition and the **environment**, but also by the mix of **employee values** and affinities to corporate, professional national and other identities. It is **multidisciplinary** in scope and is a melding of **strategy**, **structure, communication** and **culture**.
Brown	2017	Corporate brand identity refers to the **tangible**, **realizable** value of a product or service created in consumers 'minds by using a network of tangible and intangible associations through planned strategic communication and behavior in order to position the brand favorably in the marketplace.
Van Riel	1995	Corporate identity is the **strategically** planned and **operationally** applied **internal** and **external** self-**presentation** and **behavior** of a

		company. It is based on an agreed company philosophy, long-term company goals, and a particular desired image, combined with the will to utilize all instruments of the company as one unit, both internally and externally.

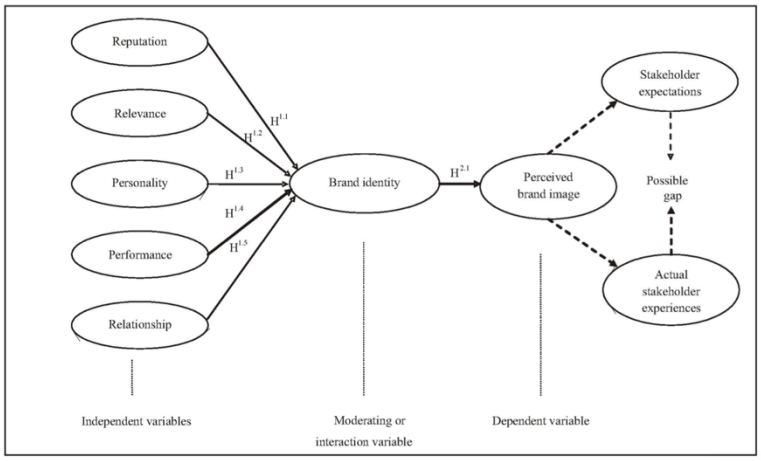
Combining all the elements found in the literature review we propose the following definition of Brand identity:

A mix of all the tangible and intangible, visible an invisible element used by an organization to reflect its unique characteristics to its various stakeholder groups. The organization will define and use these elements and communicate them through different media. This will create an image in the mind of all these stakeholders and represent these audience's perspectives and expectation about the brand.

6.Discussion

In this chapter, we sought to better define the concept of brand identity. We did that by conducting a systematic literature review and developing a conceptual model. This conceptual model allows to better understand which concept means what and what it is used for. To our knowledge, it is the first time that any brand identity concepts have been put together in this way. Bosch et al., (2006) have done a somewhat similar theoretical model in the sense that they have looked at brand identity through the lens of a communication theory as well. They found the following model. Their main idea was to identify a "brand gap" between what the organization wants to convey and what the stakeholders actually perceive.

Figure 5. Bosch et al., 2006's conceptual model



We believe that our model allows to do so as well, while still adding more complexity than existing models in the literature. The model proposed in this chapter could serve as a basis for further modelling of the concept of brand identity.

The proposed ontology does not completely take out all the fogginess of the concept of brand identity as it lays on some strong hypothesis: 1. Identity should be communicated and thus looked at through a communication theory and 2. Vision, culture and image are the main elements of identity and these three elements have to be aligned (Hatch and Schultz, 2001, 2003). We believe that these choices, even though they serve the purpose of the specific work proposed in this dissertation, might be too strong of choices to provide for a neutral model of the concept.

7.Conclusion

With a good brand identity strategy, smaller organizations can improve their identity and value communication to their consumers and stakeholders (Gehani, 2016). It allows them to differentiate themselves from competitors (Aaker 1996). It can also help them increase employee motivation, apart from attracting qualified candidates and greater investments (Arendt & Brettel, 2010). These are crucial for Startups and SMEs that might not have the resources to attract adequate qualified human capital. Adding to that, having a consistent

brand identity can support them in planning a coherent social media strategy as well as keeping a coherent online image.

However, the strategizing of a brand identity is a wicked problem; it implies an in-depth knowledge of the problem and of the factors that may influence it. Da Silveira et al., (2013) suggest that brand identity management is a dynamic process and that managers should therefore reshape brand identity over time, according to contextual changes. This is typically feasible with the help of a co-design tool that would allow teams to inquire about brand identity before implementing their strategy. As stated by Avdiji et al., (2018), for developing such a tool, there are three design principles: 1. Frame the ill-structured problem by developing an ontology in which the main components and their relationships are modelled, 2. Represent this ontology into a shared visualization 3. Instantiate the visualization into a shared support, in order to use it as a problem space on which solutions can be prototyped. The systematic literature review presented in this paper is a starting point in the development of a *brand identity ontology* that will allow the development of a visual inquiry tool for Startups and SMEs to collaboratively inquire about their brand identity. As stated by (Osterwalder and Pigneur, 2013) , because of their tradition in design, IS scholars have a role in designing strategic tools.

The contribution of the proposed ontology is twofold. First, it would be the basis of a visual inquiry for entrepreneurs to co-design their brand identity. The conceptual model would, as proposed by Avdiji et al., (2018), be instantiated into a visual tool using visualization principle. This tool would allow practitioners to have a shared visual and shared understanding of their brand identity strategy. It would support and guide them towards explorations and discussions about potential brand identity strategies. This visual instantiation would be an *Identity Communication Map* that would complement the Business Model Canvas (Osterwalder and Pigneur 2011) and the Value Proposition Canvas (Osterwalder et al. 2014). It would thus, contribute to the practical domain by giving practitioners a strategic tool that can be used to co-design the building and management of their brand identity. Second, if the ontology is well implemented in a formal of language, it can serve as a basis for

supporting small organizations in the development of a software to implement their brand identity strategy.

We have started this chapter wondering whether it is possible to give a good state of the art of the current literature on the brand identity concept. And if it was possible then to draw a conceptual model from that literature, explaining the concept brand identity through its sub-concepts and their relationships. We managed to draw a conceptual model, from which in the next chapter we will develop a visual inquiry tool to help entrepreneurs co-design their brand identity.

Chapter 4

A visual tool for strategizing on identity communication

ABSTRACT OF CHAPTER 4

Being able to communicate a clear identity to different stakeholders is crucial for SMEs and startups in today's world, which is characterized by accelerated innovation, growing competition and increasingly connected consumers. However, this can be a complex task for small organizations. This chapter proposes a visual tool that supports entrepreneurs in SMEs and Startups to collaboratively develop their identity communication strategy. The paper follows a design science research approach. We propose the design of a tool as well as some preliminary qualitative evaluations. We conducted three iterations between design and evaluation, where the results of the evaluations are implemented in the design. We demonstrate how to design strategic tools for allowing teams to co-design their identity communication strategy and present the tool. We also evaluate its use and find out through the preliminary evaluations that it could be easy to use and useful for practitioners. The originality of this paper lays in the novelty of the tool and its development. Such a tool addressing identity communication strategy has not been developed with a scientific approach until now.[2]

[2] Some elements of this chapter are redundant with the findings in chapter 3, as this chapter builds on these findings. To avoid redundancy, the reader can jump onto section 5.

1. Introduction

Being able to communicate a clear identity to different stakeholders is crucial for SMEs and startups in today's world, which is characterised by accelerated innovation, growing competition and increasingly connected consumers. Defining an organisation's identity and managing its communication has become increasingly complex (Abratt and Kleyn, 2012; Avdiji et al., 2018; Balmer, 2008; Klaus and Maklan, 2007). Despite its complexity, identity communication is key for companies to define their purpose and how they communicate it to their various stakeholders. According to Sisosodia et al. (2003), organisations with a clear purpose can outperform their competitors. Having a clear identity helps companies to differentiate themselves from competitors (Aaker, 1996; Kapferer, 2004). It is by developing and communicating a unique identity that an organisation makes its brand unique and conveys its distinctness (Srivastava and Shocker, 1991); used strategically, this guides brand decisions, guarantees the coherence of a marketing strategy over time, and should be associated with specific and limited core values that complement organisational values and culture (De Chernatony, 2001; Urde, 2003).

Startups and SMEs must attract attention from both internal and external stakeholders if they are to become and remain successful (Bresciani and Eppler, 2010). They need to communicate their purpose and identity in order to sell to their potential investors and customers and must communicate consistently on social and other media. Rode and Vallaster (2005) even state that startups that successfully develop an identity that aligns with their business concepts, values and philosophy are more successful than startups that do not. When a startup successfully communicates its identity to its stakeholders and employees, it can develop a clear, distinct image (Muhonen et al., 2017), which leads to better communication, less incoherency and is better when seeking to convince investors and customers. It is hard to achieve a coherent brand identity strategy, since the branding concept may seem misty to entrepreneurs who cannot afford to have their branding strategy done externally. Merrilees (2007) stated that SME owners often think that creating and managing their brand is out of their reach. Because the topic concerns the organisation as a whole, it involves different people, is dynamic and evolves during an organisation's lifetime

(Da Silveira et al., 2013). Practitioners without a marketing/communication/branding background may find the brand identity concept hard to grasp, they likely have different perspectives on and definitions of the topic. Nonetheless, brand identity should form an integral part of an organisation's strategy (Madhavaram et al., 2005), which should be the result of discussions and reflection between SME and startup founders and managers. Despite all these results, it has been demonstrated that startups and SMEs have placed little emphasis on defining their identity (Inskip, 2004; Gabrielsson, 2005; Ojasalo et al., 2008). This may be due to the fact that their employees are focused on their daily operations and on the value-creating operations. It is usually more difficult for employees to become motivated to get involved in an activity that does not produce revenue. Following Merrilees (2007), a simpler process to define an organisation's identity would be helpful for startups and SMEs.

This is the case of fintech startup 'Kiwi', which is based both in Mexico and Switzerland. It has had issues defining their identity and, more importantly, communicating it to internal stakeholders. Kiwi offers a payment system that enables micro-merchants in Mexico to accept credit card payments for a lower fee than the big providers. Having access to the sales of these micro-merchants allows Kiwi to take an informed decision about what micro-credits they can provide them. It was founded with the goal to help micro-merchants gain more independence, but when the founder hired a team of salespeople to sell the solution to micro-merchants, he noticed that they focused on selling the product as a payment solution, ignoring the company's social aspect as well as the original intended purpose and vision for the product. Thus, he decided to hire an agency to help him put together a document that would explain the organisation's identity to all employees. Every new employee now sees the document when they start to work there.

Communicating an organisation's identity is a wicked problem, i.e. there is no one 'right' solution, different stakeholders will have different opinions on the problem, it is unique for each company and is hard to define. To solve these types of problems, we make use of visual inquiry tools. These tools typically support collaboration through structuring and allowing the shared visualisation of a problem, thus resulting with a better shared understanding of the problem by different team members. These tools support idea generation and the

exploration of a specific problem, allowing team members to prototype and explore different potential solutions to it (Avdiji et al., 2018). Thus, they are appropriate to the aforementioned situation, in which cross-disciplinary teams gather to strategize around a given wicked problem (Dalsgaard, 2017). Further, Bork et al. (2017) showed how design approaches such as the use of these tools are well suited to address such problems. Nonetheless, according to persons at the startups and SMEs we interviewed, who are active in different fields and who sought to strategize around their brand identity, doing so without the right knowledge is a challenge and, to date, very few tools support this endeavour.

We present the first steps of the development of a collaborative tool that seeks to help teams address their brand identity strategy. We seek to answer this generative question: *How can we develop a visual inquiry tool that helps startups and SMEs design their identity communication?*

We make three primary contributions: First, we present the current state of identity research. Second, we present a visual inquiry tool for entrepreneurs to co-design their identity communication. Third, we demonstrate the process of developing a visual inquiry tool. The remainder of the paper is organised as follows: In section 2, we present a literature review on the current state of research of the identity concept and on visual inquiry tools. In section 3, we explain our method. And in sections 4 and 5, we present the evolutions of the artefacts and their evaluations. In section 6, we illustrate its use with an example, we finally close discussing the overall project and its implications.

2.Literature review

2.1 The identity concept

We look at the identity concept in the context of organisations. According to Kapferer (2002), organisational identity, when *projected*, is also defined as *brand identity*. Kapferer (2002) defined *projected identity* as "the elements an organization uses, in more or less controlled ways, to present itself to specific audiences". This is exactly what we seek to do in this project:

to understand how to define a projected identity to different stakeholders. The brand identity concept has been looked at from many disciplines (marketing, organisational behaviours, communication, strategy, etc.) (Balmer, 2001), which could explain why it lacks a clear definition. Several authors agree that brand identity is hard to define (i.e. De Chernatony, 2009; Stern, 2006; Wood, 2000; Balmer, 2001). From a strategy perspective, brand identity is seen as a key activity that must be managed, and that is constructed by different activities. In organisational behaviour, scholars tend to look at brand identity to understand the relationships between the internal and external stakeholders with the organisation.

Nonetheless, some definitions recur in these disciplines. One approach is to define an organisation's identity as constituted by its components (De Chernatony and Dall'Olmo Riley, 1998), but this leads to new problems in the choice of these components. For instance, Aaker (1996) as well as Harris and DeChernatony (2001) defined brand identity as the desired way an organisation wants to be perceived by its target audience. These authors all claim that an organisation's brand identity is central to a brand's strategic vision and that it supports the purpose and meaning of an organisation's brand. According to Harris and DeChernatony (2001), it has six components: vision and culture, which drive the brand's desired positioning, personality and subsequent relationships, all of which are then presented to reflect stakeholders' current and aspirational self-images. Kapferer (2002) showed that brand identity has six characteristics: physical, personality, culture, relationships, customer reflections, and customer self-images. According to Fetscherin and Usunier (2012), a research gap underlies the fog in brand identity concept terminologies.

This could be explained by the fact that this concept has not yet been articulated in conceptual models, i.e. ontologies. Despite this conceptual fog, at a more abstract level, there is consensus between researchers in different fields – most authors agree that brand identity is the dynamic process of constructing and cultivating a positive image for an organisation (Einwiller and Will, 2002; Van Riel and Van Bruggen, 2002; Da Silveira et al., 2013).

2.2 Startups and SMEs

While the literature on this topic has mainly focused on large organisations, it is clear that the brand identity concept is especially important for startups and SMEs (Rode and Vallaster, 2005), because among others it will allow them to recruit employees whose values aligned to the organisation, which is more critical for startups and SMEs than for large corporations. Yet, communication activities can be seen as too costly for startups and SMEs and could therefore become a lower priority for them (Petkova et al., 2008). According to Spence and Hamzaoui (2010), the main differences between large organisations and SMEs and startups are that, in large organisations, there is a visionary management, while in smaller organisations, it is usually one individual with a vision (usually the entrepreneur); in a large organisation, the process is systematic, based on widespread market research, while, in a smaller organisation, the process is more intuitive and is based on an entrepreneur's values, personality and perceptions.

2.3 Strategizing about identity communication

Creating and maintaining a strong organisational identity requires an organisation to align three independent elements: vision, culture and image (Hatch and Schultz, 2001). Since each element is driven by different consistencies, it is hard but crucial to align them. Vision is the aspirations for the company; culture encapsulates the organisation's values, behaviours and attitudes (employees' feelings about company); and image is the outside world's overall impression of the company. Because brand identity strategy encompasses so many aspects, different people in the company should be involved (Da Silveira et al., 2013). A brand identity communication strategy should be the result of discussions, thoughts and iterations on potential strategies that could be put in place with all the key stakeholders, such as managers and founders of startups and SMEs. But because the process of strategizing on their identity is complex (Merrillees, 2007), tools using design thinking approaches could make the process more intuitive and could allow practitioners to internally build their identity. To do so, they would need a collaborative tool that allows sharing of information, structuring and a shared understanding of the problem. This would increase inquiry and idea generation, guiding and aligning team members' work, and would motivate team members into participating and cooperating (Nicolini et al., 2012; Okhuysen and Bechky, 2009).

2.4 Visual inquiry tools

In recent years, we have seen an emergence of *visual inquiry tools* to support the process of exploration, ideation and prototyping solutions for a given wicked or poorly structured problems. Examples include the Business Model Canvas (Osterwalder and Pigneur, 2010), the Project Canvas (Habermann and Schmidt, 2014), the Innovation Matrix (Van Der Pijl et al., 2016) and the Customer Journey Map (Kalbach, 2016). Such tools often take the form of shared and visual problem spaces in which teams can collectively explore and evaluate different hypotheses and potential solutions to a specific wicked problem. These tools also allow practitioners to get a better perspective on a topic and to consider other members' perspectives, which according to Boland and Tenkasi (Boland and Tenkasi, 1995) improves the possibilities of achieving innovation in an organisation. The visual practices that support the tools have been referred to as *socio-material* or *visual practices* (Whyte et al., 2007), (Nicolini, 2007), and consist of jointly and iteratively visualising facts, analyses, insights and experiences, improving the collaboration quality (Eppler and Bresciani, 2013).

A *visual inquiry tool* is defined by Avdiji (2018) as a tool that frames the elements of a wicked problem and represents them in a shared visual problem space that team members can use to inquire into the problem. As noted by Daalsgard (2017), joint inquiry means that a practitioner team jointly, iteratively and democratically explores and defines the problem they face and jointly develops and evaluates prototypes of potential ways to solve it. In the case of brand/organizational identity strategy, visual identity tools are adopted, because it is complex and involves the whole company, requiring discussion among different people with different backgrounds. Thus, we address *how to develop a tool that helps teams of practitioners design their organisational identity communication.*

3. Research design

We followed a design science research (DSR) approach. Various scholars have argued that DSR is particularly tailored to help practitioners to solve problems that are complex and for

which knowledge is still too descriptive (e.g. Gregor and Hevner, 2013; Mandviwalla, 2015; Peffers et al., 2007; Winter, 2008). A goal of DSR is to address problems faced by practitioners by developing different artefact types (i.e. constructs, models, methods and tools) that will help practitioners to address these problems (Hevner et al., 2004; March and Smith, 1995). This makes DSR a research paradigm that differs from the traditional social sciences paradigms (positivist or interpretivist descriptive research). Boland et al. (2008) noted that design is a well-suited approach to organizational problems, since both are recursive; they state that managers should adopt a design attitude that always allows space to improve the design. Holmström et al. (2009) noted that, when solving a management problem, DSR was a good methodology, since it allows one to bridge theory and practice. We followed Hevner et al. (2004), who consider design as an iterative search process made up of the generation of design alternatives that are tested against certain requirements or constraints. Figure 1 illustrates this process. We generated three design alternatives before reaching the current visual tool, as part of two design cycles (as shown in Figure 1).

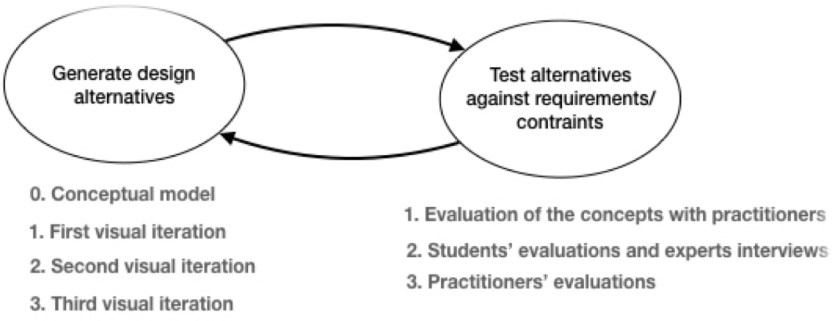


Figure 1: The design and evaluation cycles (adapted from Hevner et al., 2004)

We follow the principles developed by Adviji et al., (2018) who came up with precise guidelines on how to design a visual inquiry tool. On Table 1, we illustrate how we have applied the proposed principles to the project presented in this paper. Their method proposes three iterative design principles: the first one is to have a conceptual model relying on academic knowledge in order to frame the problem that we are looking at. The second states that this model should be translated in a visual representation. The third principle states that this representation should come along with some explanations on how to use the tool.

Table 1: The design principles (drawn from Avdiji et al., 2018)		
DP1	**Conceptual model:** To structure a wicked management problem, frame it in a conceptual model that describes the relevant building blocks (components) of the problem that teams can act on. This framework should be modelled according to academic justificatory knowledge and should be kept parsimonious.	Systematic literature review of the topic. From this review, we took the fundamental concepts to draw a conceptual model that we tested with a preliminary evaluation.
DP2	**Shared visualisation:** To facilitate communication between users, represent the conceptual model as a shared visualisation by logically structuring the components into a visual problem space.	We drew three different visualisations from the conceptual model found while following DP1. The second and third visualisations also made use of visual cues to guide users.
DP3	**Directions for use:** Define and specify techniques that allow for joint inquiry.	This section contains directions on how to use the tool.

To come up with the tool's current version, we went through two design and development cycles. Table 2 shows which evaluation was conducted at each step. We performed ex-post evaluations (Pries-Heje et al., 2008) and mainly evaluated the tool along two criteria: perceived usefulness and ease-of-use (Davis, 1989). We also conducted expert interviews with experts from the strategic design and startup domains. We did evaluations with different stakeholders to allow for triangulation of the data sources (Yin, 2013). We conducted in-depth interviews and evaluations with practitioners, since they are the most critical source of information for this tool. To allow for a better visualisation, we also interviewed students and compared the tool to an existing tool, to ensure our tool's relative ease-of-use. We also sought out experts who could give us advice on the concepts and the visual parts of the tool; either consultants in startup environments or in strategic design firms.

Table 2: Evaluation methods		
Artefact (design)	Evaluation (methodology)	Respondents
Iteration 1	Preliminary evaluation of the visual tool. Interviews with four companies in the form of workshops. We asked the interviewees to work on their identity communication without the tool and then introduced the tool, comparing the results. We used close-ended questionnaires for feedback on the tool.	4 companies
Iteration 2	Close-ended questionnaires with 25 graduate students in a business modelling/entrepreneurship class. We distributed two visual tools: ours and one that addresses the same topic. They used both tools with their startup project developed during the class. They then completed two questionnaires to compare the tools: their perceived usefulness and ease-of-use.	25 students
Iteration 3	Expert interviews and then spread online to more than 300 potential users, who downloaded it and completed an online form (close-ended questions).	4 experts and online publications

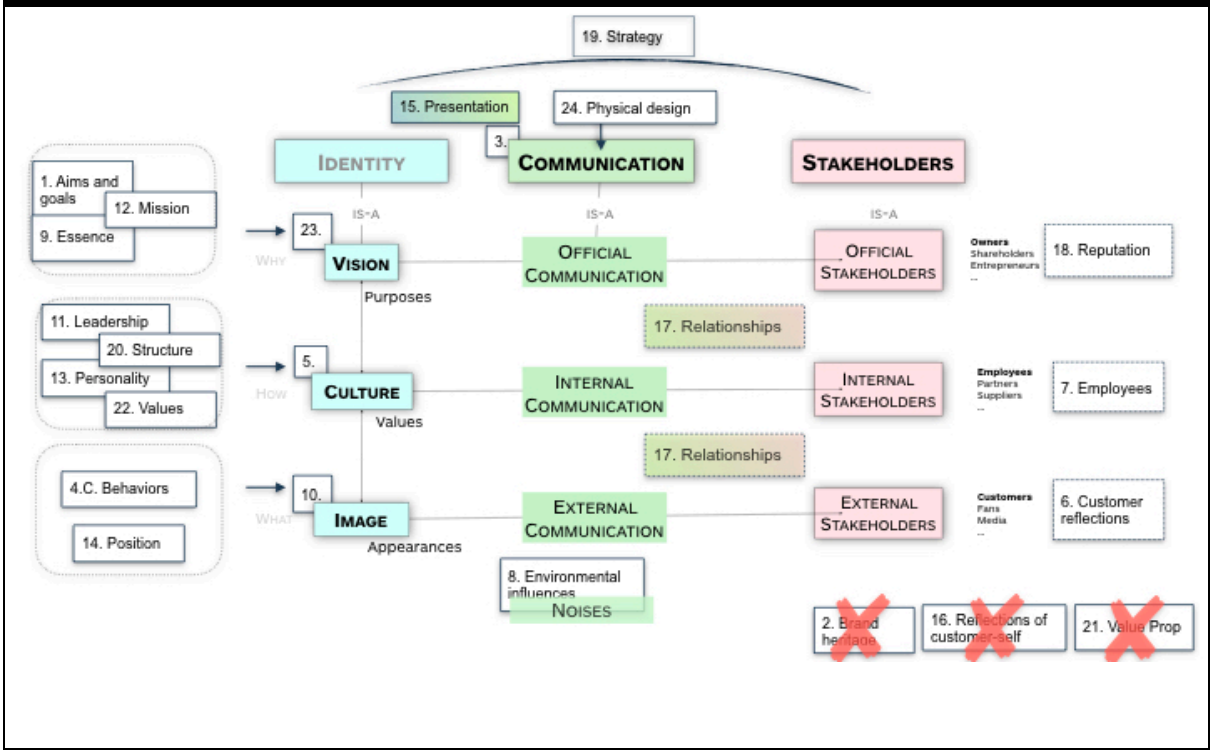
4. Conceptual model

We ran three design cycles. Each contributed to the tool's current version, as used by practitioners. We developed the tool following Avdiji et al. (2018), as shown in Table 1. We first did a systematic literature review (Elikan and Pigneur, 2018a), which we then translated into a conceptual model (Elikan and Pigneur, 2018b). We then transformed this conceptual model into a visual tool by transforming the chosen elements into empty spaces into which the tool's users could ideate, prototype and test different options for each space. We did a systematic literature review to find the components and relationships of the underlying brand identity concepts in order to develop a brand identity ontology.

From the previous step in the project to this simplified ontology, we removed some of the concepts found in the SLR. The SLR was built to better define the concept of brand identity, but considering the need for a co-design tool for practitioners, we considered some concepts as not usable in the tool. Because the tool seeks to help practitioners to develop

and maintain a strong brand identity, we looked at the found elements through the lens of Hatch and Schultz's alignment theory (2002). Thus, the most central elements are vision, culture and image, because it is by aligning them that an organization can achieve a strong brand identity. We arranged all the found concepts around these three key elements and sorted all the concepts. We also only kept the concepts that were mutually exclusive and allowed the ontology to be exhaustive with the least number of concepts in order to keep it parsimonious.

Figure 2: The conceptual model from the SLR



In Figure 2, we show how we organised the 25 elements found in the literature review to construct the conceptual model. To keep the ontology parsimonious, we looked at how some concepts were collectively exhaustive and mutually exclusive. Concepts that were too close in their definitions (i.e. aims and goals with missions) were combined into one concept. We eliminated the concepts of brand heritage, reflections of customer-self and value proposition. In the context of startup, the first doesn't apply and will be reflected in vision and culture in the context of SMEs. The second doesn't apply in the strategizing for an organisational identity – it is more linked to consumer behaviours. As we envision the use of

this tool along with the Value Proposition Canvas (Osterwalder et al., 2014), we decided to not include the value proposition in the model per se but it is reflected in the vision of the organisation indirectly. This tool has a strategic intention, so we did not explicitly add the concept of strategy, because it is implied. We joined the concepts of communication and physical design; since our tool does not focus on the physical aspects per se, we consider them a part of the communication strategy. We provide further definitions of the concepts we retained:

Vision is an internal element of an organisation. It is the organisation's long-term purpose, reason for existence, vision and philosophy. It describes the starting point from which all the organisation's activities are initiated. It also generates a certain culture. (Internal element.)

Culture is a collective way of thinking, a collective feeling among internal stakeholders that results from values, culture strength and future directions, for instance, differentiators from competitors. It also sets some norms that affect the employees' work routines and habits. (Internal element.)

Values are the organisation's ethical beliefs and principles. These values, mixed with all beliefs and ideologies present in an organisation, form its personality. They also impact the stakeholders' relationships with the organisation. They strongly influence the vision and culture. (Internal element.)

Image is both internal and external to an organisation. Some researchers see it as how an organisation would like outsiders to see it, while others see it as the ways different stakeholders see it. Combining these two views, we state that image is a holistic view held by (internal or external) stakeholders of an organisation and is the result of sensemaking by these stakeholders. It is also the organisation's communication of a projected picture. It is influenced by daily interactions between organisational members and external audiences. (External element.)

Communication refers to all the media used for communicating with all stakeholder types, which will transform these different communications, which combine to form an image. (Internal element with an external impact.) The ways an organisation communicates with its different stakeholders. It may be official, internal or external.

Stakeholders are different actors that all have interests in an organisation (including customers, suppliers, partners, and so on). The main stakeholders are the customers who provide value to the company; the employees who are the most important internal stakeholders, since they create the value that will be delivered; the other stakeholders differ for each organisation – for startups in early stages, venture capitalists may be important, whereas in SMEs, some suppliers may be key to the daily operations.

Noise is an overarching concept drawn from the communication literature (Shannon, 1948). First, we did not want to include the environmental influences into the strategic model, because they are external and cannot be controlled by the company, but in the first preliminary evaluation, practitioners stated that this element was missing and said that, even if it cannot be controlled, one must be aware of the noises or influences, because they may influence the future strategy.

5. Shared visualization: Three iterations

Once we found the elements of the conceptual model, we followed the second principle as stated in table 1 and represented this model in a shared visualization. To come up with the current used visual representation we went through three different iterations as illustrated on table 3. Each iteration and its evaluation will be described here-after.

Table 3. Iterations of the tool

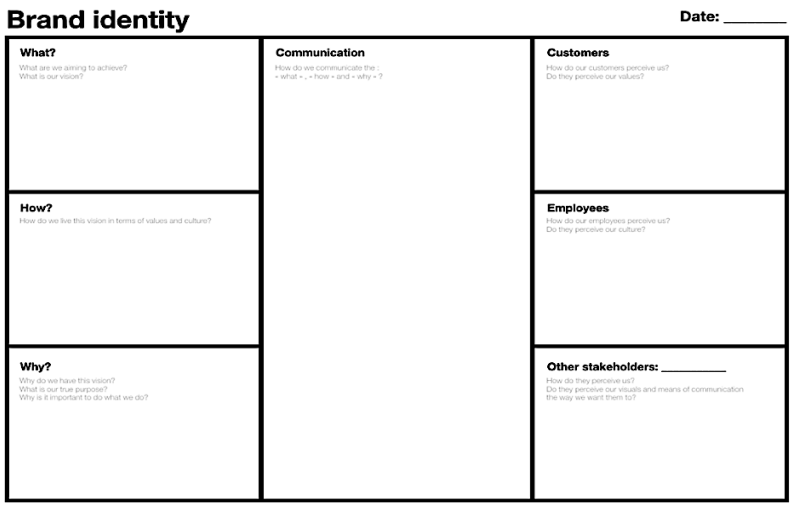
Iteration	Changes
Iteration 1	We derived the visual from the conceptual by transforming the concepts into empty spaces. We arranged the elements according to the relationships in the conceptual model.
Iteration 2	We did this iteration because in the first case study, some elements were missing, such as *noise* and differentiation in the communication and less silos for the destination. The ease-of-use also appeared to be low. Thus, we decided to change the shape to allow us to better direct users in the tool's use and segmented each block differently.
Iteration 3	Because the experts considered «measure» to be a key part of the tool, to be able to test whether the current strategy is working and to be able to improve, we added the «measure» part on the right of the tool, which allowed us to test whether the elements were understood by the different stakeholders.

5.1 Iteration 1

We sought to facilitate inter-user communication when talking about their organisation's identity, thus we decided to represent the ontology as a shared visualisation by logically structuring the components into a visual problem space. To do so, we had to place these components into a space in a logical order, following and respecting the different (inter)relationships found in the ontology. Further, we had to simplify the tool to ensure visual impact and clarity (Bresciani et al., 2008). We then represented the ontology's components as empty problem spaces that could support exploration, solution generation and presentation. To increase the tool's affordance, we added some elements, such as guiding questions in each block, to help practitioners use and understand the tool. Figure 3 presents the first iteration of the visual instantiation. Since broad concepts such as vision, image,

culture and values may be hard to grasp and to define for stakeholders with different backgrounds, we decided the change the elements' semantics so as to simplify them. The building block *what* refers to the vision of the organisation, and the *how* refers the daily operation of this vision through the organisation's values and culture. The *why* is a further derivation of the founders' vision and values, i.e. where they define their true purpose. *Communication* refers to how they communicate all these elements (i.e. which channels they use to reach their stakeholders), and the three building blocks allow them to state what image they want to project to their different stakeholders.

Figure 3: The first brand identity map



Evaluation 1

To evaluate the tool, we conducted ex post evaluations in real settings; these were *user opinion studies* (Pries-Heje et al., 2008). We interviewed persons from two SMEs in the food industry in Switzerland and two startups, one in digital and innovative audio-visual content creation and the other in software engineering. In each evaluation, we used the tool as a boundary object (Carlile, 2002) to allow all team members to jointly explore a problem and discuss potential solutions.

Table 4. Overview of the data sample				
	Organisation 1	Organisation 2	Organisation 3	Organisation 4
Sector	Audio-visual	Food	Food	Software
Year funded	2013	2014	2009	2017
Employees	11, 3 founders	18 full-time, some part-time, 2 founders	>50 full time, 1 founder	3

We kept the settings similar, gathering together persons involved in strategy (founders, CEO, partners or persons in similar positions). The workshop had two steps: The first was for the team to discuss their organizational identity without any tool. Thus, teams would discuss what they thought their identity was and sought to define and explain it to the facilitator. In step 2, when they felt that step 1 was complete, we introduced the BIT on the wall and distributed pens and sticky notes to the practitioner teams. They would inquire, as a team, about their brand identity, this time guided and supported by the tool. We wanted to first evaluate our tool's potential efficacy and ease-of-use as well as our ontology's completeness. After they had completed step 2, we interviewed the practitioners to test the tool's perceived benefits and ease-of-use. Because the ontology is hard to present to practitioners and difficult for them to understand, including its usefulness, we decided to evaluate the ontology's completeness at the same time as evaluating the visual tool, by introducing the two-step workshops, which allowed us to compare a team's conversations with and without the tool, noticing if more topics were covered without the tool, which would prove the ontology's incompleteness.

The results of the four interviews are summarized in Table 5. These were found thanks to interviews (qualitative) with the four organizations. Further, we asked them to fill out a form with 14 questions to assess four dimensions: perceived usefulness, perceived ease-of-use, task outcome and task reflection.

Table 5: Summary of the evaluation's results				
Org	Perceived usefulness	Improvement areas	Managed to use it	Further use
1	Good overview. Brings a structure in one single page that helps one to strategize about brand identity.	A more flexible way to present all the customers, should allow more freedom to add some.	Yes	Yes
2	Having a given structure helps one to find the relevant points to discuss.	The structure lacks clarity on where to start and in which order to go.	With explanation	Yes
3	Useful for small teams, but could be difficult to use for big teams, since the workshop may become messy. Will use it again.	There may be elements in the communication you cannot manage, they aren't grasped here.	Yes	Yes
4	Unfamiliar with some of the vocabulary. Some elements should be clearer. Not sure in what context the tool would actually be used.	Need some sematic clarification: why, how, what. Unclear what to put there.	With explanations	Probably

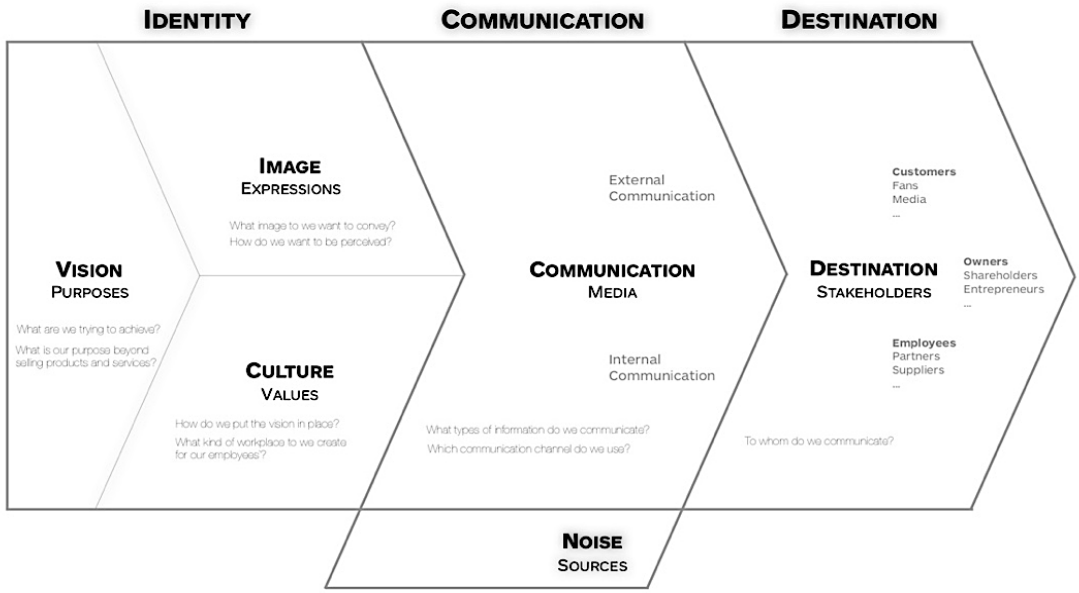
All the practitioners said they found the discussion more interesting and focused when using the tool, which validated the tool's perceived usefulness. In all four cases, the practitioners managed to use the tool to describe and demonstrate their identity strategy and said it was understandable, but that there was much discussion about the semantics (what, how and why). They considered the naming of these elements to be unclear. Further, they complained about the list of stakeholders, and said that a more flexible structure would be an improvement.

5.2 Iteration 2

In the preliminary evaluations, users told us that if some of the elements they had in the what, how and why building blocks were not coherent, they could not visualize them. They also said that the fact that these needed to be aligned was not clear. Thus, we will improve the visual instantiation, to allow practitioners to better see the need to align these elements.

Figure 4 illustrates how the tool evolved. We took off the "what , how, why" and replaced them with the actual names of the concepts. We place the three fundamental elements at the left of the tool and together in a triangle form to show that they are connected and should be linked. Then these elements lead to the communication elements (both internal and external) and all of these are aimed at a specific stakeholder.

Figure 4: Identity communication 1



Further, the first user interviews revealed a missing element: the noise. We added this element looking at the theory of communication (Shannon, 1948), using the ontological elements of *environmental influences*, which are elements that influence a perceived identity without any direct will of the organization. Following the evaluation results, we removed the separation in the stakeholders section and gave users more flexibility in this area. We also added more guidance in both the use of the tool and how to populate it. For instance, we separated internal and external communications according to the conceptual model illustrated in Figure 2.

Evaluation 2

The subjects were two rounds of first-year Information Systems Master's students in Switzerland in the 2018 fall semester. Students had voluntarily signed up to a class on business model design and innovation, in which they are asked to come up with a startup idea and to design the underlying business model following a lean approach. The experimental task formed part of a group assignment and was mandatory. Thus, sampling was mainly driven by external factors. The total number of participants was 25, with an average age of 25.39, and with 32.7% being female.

Experimental design: The students were given a class where their assignment was to design their startup projects's brand identity. First, they had a slight explanation of the concept, then they had to come up with some elements about their organization's brand identity. Then we distributed two different visual inquiry tools for brand identity or identity strategy: the one presented on figure 4 and the brand strategy canvas (Malmö Ventures, 2014).

Table 6 Summary of the elements being evaluated

Dimension	Item (on a seven-point Likert scale)
Perceived usefulness	Using the map to design a brand identity would enable me to accomplish the task more quickly. Using the identity map would improve my performance in designing a brand identity. Using the map would make it easier to design an identity strategy. I would find the map useful to design identity strategies.
Perceived ease-of-use	Learning to operate the map to design identity strategies would be easy for me. I would find it easy to do what I need to do with the map. It would be easy for me to become skillful at using the map to design identity strategies.
Task outcome	I feel satisfied with the designed identity map. I feel satisfied with the process used to design the identity map. With more time, I could substantially improve the designed identity map. I had enough time to complete the task.

Task reflection	The map helps me to generate new ideas. The map helps me to rethink my business' identity. The map helps me try out innovative ideas.
Overall	This is the sum of all these items.

Results: We gave them the same amount of time to populate the two visual tools, and then they had time to complete an empty page with two columns, freely comparing the tools. The results of this open-ended comparison appear in Table 7. Further, they received a questionnaire for each tool, as presented in Table 6 (on a six-point Likert scale). We attributed points from -3 to +3 for every answer (totally unlikely = -3; totally likely = +3), and we added these points for each dimension. The result appears in Table 7. There was an option to answer *I don't know* (0). Because of the negative points and the possibility to answer 0, the result was sometime even, leading us to add a third column in Table 7. For instance perceived usefulness is the sum of the 4 questions leading to that point. And the overall score is an addition of the scores of each of the four elements (perceived usefulness, perceived ease of use, task outcome and task reflection). The score is not a sum of each question but of the total.

Table 7. The students' evaluations of the tool

Dimension	Identity map	Brand strategy	None / Both
Perceived usefulness	12	12	1
Perceived ease-of-use	13	8	4
Task outcome	13	8	0
Task reflection	7	11	7
Overall (total score)	15	9	1

Overall, the students found our tool we more suitable for strategizing about their startup project identity. The perceived ease-of-use and the task outcome seemed to convince them the most. They also had time and a given sheet to qualitatively compare the two tools; the main results appear in Table 8.

Table 8. A qualitative comparison of the tools	
Negative elements	Positive elements
Less elements than the other tool	Easier to use than the other tool
A more focused view of the concept	More useful to generate new ideas
	Elements clearer thanks to the guidance on the tool
	Does not focus only on customers

5.3 Iteration 3

After talking with some experts in the field (two persons working in startup accelerators/incubators and three strategic designers from different countries), as shown on Table 9, a key aspect that emerged was the fact that the tool contained no measure. They said that the tool could be used to co-design a startup or an SME's organisational identity and its communication strategy, but that that there was no way to then measure whether the different stakeholders had understood the communication or the company's value, image and vision. We went back to the practitioners we had interviewed to get confirmation about the need for this added feature; they stated that it would be useful for them.

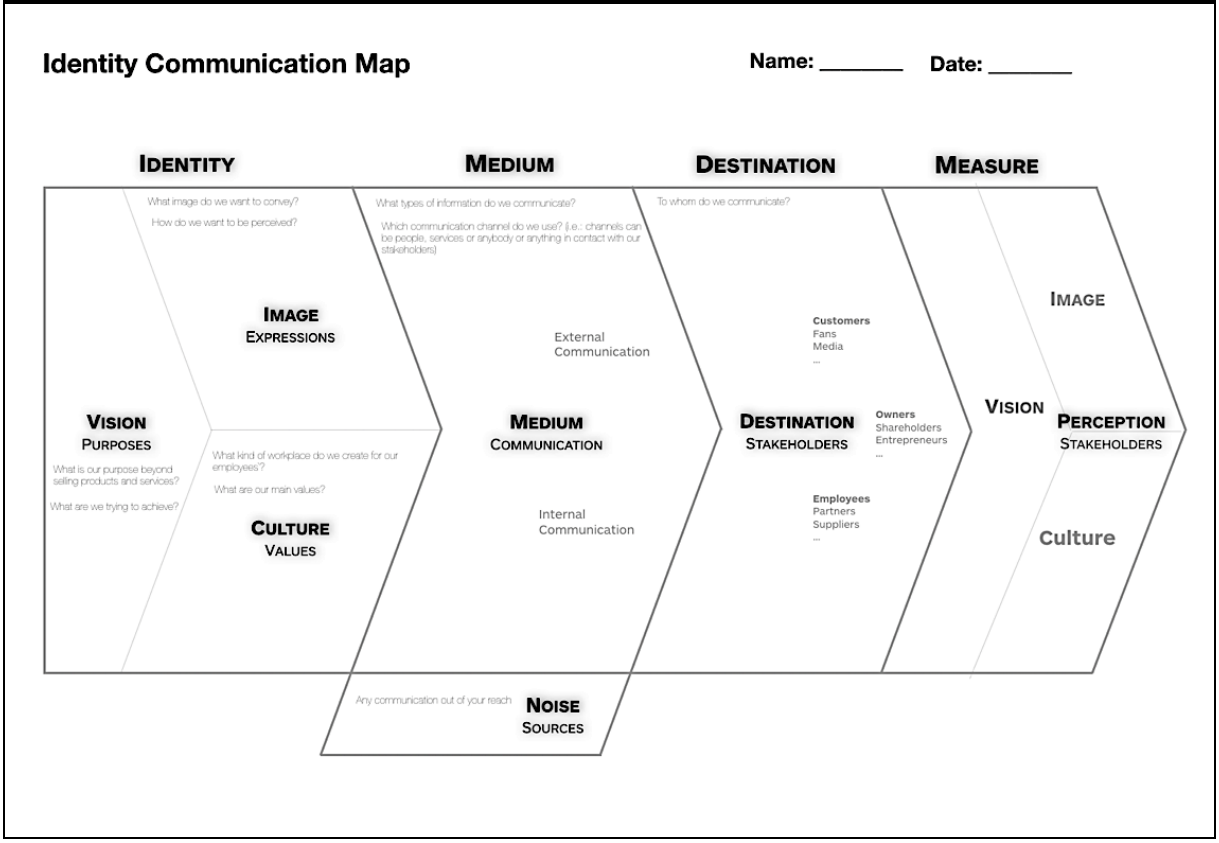
Table 9. Summary of the evaluation's results				
	Expert 1	Expert 2	Expert 3	Expert 4
Sector	Startup acceleration	Startup incubator	Design strategy	Design strategy
Where	Switzerland (Lausanne)	UK (London) – Imperial School accelerator	France (Paris)	Switzerland (Prilly)

This reasoning led to the tool's current version. In this version, we prescribe in the directions for use the testing cards developed by Osterwalder et al. (2014) (see Appendix I), to measure, with all the stakeholders, through all the mediums of communication, whether or not they understood the different elements of the organizational identity. This is also in line with the elements found in the SLR and the conceptual model, which were showed a duality between the desired image and the perceived image for instance. Adding to that, it is also compliant

with Shannon's (1948) theory of communication which states that the signal sent from the source is not the same as the one perceived by the destination. By adding a measure element, it allows the organization to ensure that the message sent is understood the way they would like to. And if it is not the case, they can modify their message accordingly.

We propose that this is done as presented on Appendix I and that each element can be tested (i.e: image, vision and culture) on the appropriate stakeholders in a priority order that the practitioners decide.

Figure 5. Identity communication map 2



Evaluation 3

To evaluate this last iteration of the tool, we went back to the experts we had interviewed, asking them for feedback on the changes. The four of them were satisfied with the changes, saying that they would prescribe the use of the tools to their customers or the startups they were working with. As a last evaluation, we made the tool public online on different platforms (Twitter, Medium and LinkedIn) to share it with potential users and we wrote an article describing the tool and the directions for use, attaching a Google form (see Appendix B)

that could be filled out by whoever downloaded and used it. There has been much interest and positive answers on the Google form, which we designed exactly as presented in Figure 6. As shown on table 10, we have been told through online platforms that the tool had been or was going to be used in different companies and even a school. We consider this as a good preliminary result for the adoption of the tool, though we recognize we could do a more thorough evaluation over a longer period of time.

Table 10. Online results		
Platform	LinkedIn	Twitter
Likes	54 (21 with the founder's title)	12
Comments	6	2
Private message	2	1
Re-share	4	5
Google form filled out	7	
Others (to our knowledge)	The tool was used in workshops at Fujitsu (Paris), in three workshops with French companies and two with Swiss companies as well as a hospitality school.	

6. Directions for use

We developed this tool for use as a boundary object (Carlile, 2002), with some *directions for use*. These are techniques considered for joint inquiry (Avdiji et al., 2018 ; Bresciani et al., 2008), including: 1) exploration, 2) hypothesis generation and 3) presentation. 1) Exploration: The tool and its use should stimulate practitioners and should guide them into inquiring, creating and exchanging ideas, insights and alternatives for solving a wicked problem. This is usually done by using the tool as a shared visual on which users use sticky notes, with each sticky note containing one idea. 2) Once all these ideas are on the tool, users can develop, transform and evaluate these different ideas in order to select an alternative to further discuss solutions to a wicked problem. 3) In this process, there are some tangible elements (i.e. the sticky notes) that allow users to present and criticise techniques when discussing solutions.

We will now present the case of the aforementioned fintech startup Kiwi. Kiwi is a swiss-based startup that has is main operations in Mexico and supports micro-merchants being able to accept credit-cards; then based on their sales data, it allows them to access micro-credits that they can reimburse as fees on their future sales. Kiwi's employees had focussed only on selling the product, and did not always grasp the organisation's social aspect. Thus, the CEO hired an agency to come up with a 10-page document that would be distributed to every new employee. While he was happy with the result, it was pricy and he is convinced that the same work could have been made inside the company, with less effort. After accessing this document and talking to stakeholders in the company, we demonstrated the use of our tool on this case.

Step 1. Print the map on a large surface. Then fill out the left part of the map: the identity (i.e. the vision, image and culture). If these elements are not known to the company, there are some techniques to make them appear – such as the game in which employees must describe the company as if they were aliens who just arrived on a new planet (Huotari and Hamari, 2011). Kiwi's primary vision is to deliver financial inclusion to Mexican micro-merchants and to help them to sustainably grow their businesses.

Step 2. Destination: All stakeholders with whom the organisation seeks to communicate, even the less obvious ones. In this case, customers, investors and all employees and partners.

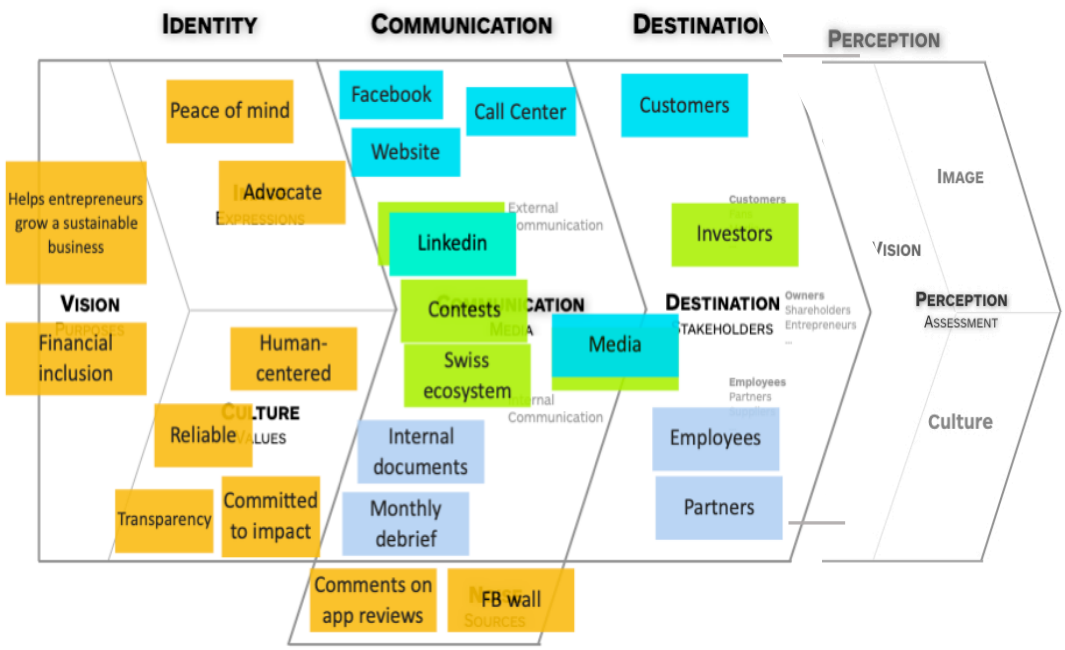
Step 3. Once you know who you are communicating with, analyze every medium of contact you have with them. For Kiwi, these can be obvious – social media channels, but also less obvious ones such as the call centre, which communicates directly with customers and will strongly impact on their perceptions. Kiwi noticed that even the startup contests it participates in strongly impact on how it is perceived.

Step 4. Noise: Elements that will have an impact on the organisation but they cannot fully control. In the case of Kiwi their client acquisition is mainly done through Facebook and the users have to download an application. In such context, reviews impact the image of new customers a lot.

Step 5. Measure: This step is iterative, using the testing card – it was not done in the case of Kiwi but in the future, it would help assessing whether its customers, employees and partners

see its social aspect. With these test results, it can adapt its communication to convey a homogeneous identity to all its stakeholders.

Figure 6. Kiwi's identity communication map



7. Discussion

Developing and maintaining a strong identity is essential for startups and SMEs (Merrilees, 2007; Muhonen et al., 2017). With a proper brand identity strategy, smaller organizations can improve their identity and the ways they communicate the value they create for their users and other stakeholders (Gehani, 2016). This would allow them to differentiate themselves from competitors (Aaker, 1996; Kapferer, 2012). It would also increase employee motivation as well as qualified candidates and bigger investments (Arendt & Brettel, 2010). These are vital for startups and SMEs, which may not have the resources to attract adequate qualified human capital. Further, having a consistent brand identity can help them to plan a coherent social media strategy and to have a coherent online image.

However, strategizing an organization's identity implies in-depth knowledge of the topic and of the factors that may influence it. Da Silveira and al. (2013) suggested that this is a dynamic process, and that the practitioners in charge should reshape brand identity over time, according to how the organization's environment changes. This is feasible with the help of a visual tool that allows teams to inquire about brand identity before implementing their strategy. This tool should allow practitioners to have a shared visual overview and a shared understanding of their identity strategy. For startups and SMEs that would like to use design tools to solve their problems, this would complement tools such as the Business Model Canvas (Osterwalder & Pigneur, 2010), the Value Proposition Canvas (Osterwalder et al., 2014b) and the Team Alignment Map (Mastrogiacomo, Missonier, & Bonazzi, 2014). These new generations of tools have proved useful, for different reasons, such as solving a given problem and for presenting a strategy. As Kernbach et al. (2015) noted, visualization is more efficient than text when presenting a new business strategy. Thus, one could imagine presenting a brand identity strategy to a board or to employees with the visual support of this tool, instead of simply presenting a written text document.

8.Limits and concluding remarks

We began by asking: How can we create a tool that helps startups and SMEs to co-design their brand identity? We addressed this question by demonstrating how we developed the Identity Communication Map. As Avdiji et al. (2018) noted, there are three design principles for developing such a tool (see Table 2). We have sought to demonstrate how we applied these principles to develop our artefact; our preliminary evaluations indicate satisfactory results. We have demonstrated that, from a 10-page document, we could populate the whole tool. We tested the tool with the company, which told us that if they had used the tool, they could have avoided paying an external company to prepare this document for them. In our view, creating an identity, in-house, with different stakeholders in the company, has more than just a financial advantage.

One of the main limits of this paper is the number of evaluations. We will conduct more evaluations with the version of the tool we presented here. Evaluating a visual inquiry tool such as our proposed tool is a longitudinal work, since one of the evaluation criteria is its adoption among stakeholders; we need to see whether, in the next months and years, an increasing number of practitioners are interested in the tool as well as how we can improve it for them. And, as Thomas Edison said, *There is a way to do it better; find it!* The presented tool is still in an iterative phase, and we aim at further improving it in the future.

Chapter 5

Conclusion

1. Synthesis of the dissertation

The notion of identity and how to communicate it, seems to still be problematic both in theory and practice. In the existing literature the concept has been well-researched but never really agreed upon. And in practice many startups and SMEs seem to think that developing and managing their identity communication is out of their reach (Merrilees, 2007). In the last decades, we have seen big changes in how organizations define themselves and address questions such as "Who are we?" and "What do we want to be?" In a world that is being influenced by fast-paced changes because of globalization, deregulation, environmental changes, technological disruptions and other events, organizations will have to keep working on their self-definition constantly. It is thus not surprising that interest in organizational identity has been rekindled in research and has seen large interest in practice in recent years.

But when we look around us, we see an increasing amount of communication channels, we are overwhelmed by information, so it is increasingly important for organizations to be able to get their message across in all this mess. Adding to that, with all the environmental and societal changes, stakeholders are now more than ever careful about what they buy, what they invest in and a large majority of people in Europe and the USA will now look at the origin of the products and services they buy. Having a real purpose for an organization is also more important than ever. But how to ensure that this purpose is right, and well communicated both internally and externally to the organization and all the stakeholders?

We think that providing simple, easily-understandable tools to startups and SMEs can truly have an impact on their perspective on a problem like their identity communication. Instead of being an unsolvable challenge, this will become a problem that they can solve with the right tool. We thus, answered the main question of this dissertation which was, can we develop a tool to support entrepreneurs and managers co-design their identity communication? And In general, is it possible to come up with principles or a theory to follow when developing such tools.

In this dissertation, in particular chapter 3 and 4, we have shown how to develop a visual tool for identity communication and more generally visual inquiry tools for any management problems through the proposed theory in chapter 2. When presenting the development of the identity communication tool, we also show how we evaluated it.

1.1. Chapter 2.

In this chapter, we show how we can derive a design theory, accumulate and theorize from different design science projects in order to propose a design theory for developing new visual inquiry tools. The Business Model Canvas has opened the door to many new development of these visual inquiry tools These tools sometimes were developed without a clear rigor. This study contributes not only in the form of this design theory that can be further used by researchers and designer who would want to develop new tools. But, we have contributed by providing a methodological process for analyzing multiple project data by bridging insights from design science research and qualitative methods from social sciences.

1.2. Chapter 3.

In this chapter we contribute to the question of brand identity by developing a conceptual model to showcase this concept in a new light. This allows us to have a new perspective on this topic and serves as a theoretical basis for the development of the visual tool aimed at practitioners. In this chapter we make a theoretical contribution through the extensive literature review conducted. We also show how methods and techniques used in information systems can be applied in another field.

1.3. Chapter 4.

In this chapter the main contribution is the identity communication map that was developed iteratively throughout the past three years. We have showcased how we could follow the theory presented in chapter 2. We have also shown how we could apply designerly approaches to tackle existing business challenges such as identity communication in startups and SMEs. This perspective that we took on startups and SMEs is also novel, because the majority of the literature on the topic, focuses on larger organizations.

To evaluate the tool proposed in chapter 4, we relied on a form that was addressing 14 specific points divided in four categories: the perceived usefulness, the perceived ease of use, the task outcome and the task reflection. In the design theory we have proposed 5 "testable propositions", which are elements that can be tested when developing visual inquiry tools. These were Checkland (2000)'s "5 Es". 1) Efficacy can be compared to the task outcome. As what we test here is whether the tool allows to come up with a solution to the problem that the team is trying to address. 2)Effectiveness can be compared to the elements we tested in perceived usefulness as it allows to test whether the tool can be successfully used by the teams for the reason it was designed. 3)Efficiency and 4)Elegance can be summarized in the elements we tested in perceived ease-of-use. In these, we tested whether the users could use the map with the least possible amount of external help and if it was understandable and easy to use. As for the 5) Ethicality: we tested the task reflection and believe that if the outcome had cause any disadvantage or stress to some users, they would have expressed that point. Overall the 14 points evaluated cover the five elements that are prescribed in chapter 2, as being testable propositions to evaluate a visual inquiry tool.

Overall, in this dissertation, we show that designerly approaches, which can be used for soling tackling wicked problems (Buchanan, 1992; Rittel & Webber, 1973), are useful to support some existing business problems. We have also shown that it is possible to develop tools based on these approaches. These tools are useful because they allow for innovation and collaboration as well as divergent modes of intervention that might be better suited to the current need of organizations than existing solutions.

2. Limitations

The first limitations to outline is regarding the evaluations. In this regard I see three main limitations. The first one is the amount of evaluations conducted. More evaluations would have been preferred in order to confirm some of the aspects that have been validated in chapter 4. But this thesis has been mainly exploratory in regard to Eisenhardt and Graebner (2007). A second limitation in that regard is methodological. The evaluations have been done

in a qualitative manner. We have also used students as a mean to evaluate the developed artefact. And even though, it is a widely spread practice, we know that this can cause some bias in the evaluation. Some strategies can be used to limit such biases. We chose to let them compare two tools (the one we developed and a tool developed by a consulting firm) and did not tell the students which was which. Adding to that, they were not aware of the reason behind the assignment they had received.

Another limitation is the choice of the projects in chapter 2. We chose there three projects because some co-authors were directly involved in these projects, which gave us an extensive access to insights that were useful to better understand the design rationale and design decisions. However, this brings a bias of selection. We only selected cases that are part of the same "school of thought". The three tools have been developed in the same university and there might be influences in their development since the designers have been communicating and sharing on their development. They also have the same way of addressing the problem. It could have been interesting to challenge this theory by looking at tools, which have been developed in another philosophy.

Lastly, one of the main limitation that can be seen in this dissertation is the lack of evaluation of the conceptual model. We decided that evaluating the conceptual model with practitioners would be too complex and thus, made the decision to validate the model through the validation of the derived visual tool. This can pose problems, but this solution was easier to adopt when evaluating with practitioners who are unfamiliar with modelling languages. However, OLED provides an automatic syntax verification. We used this feature, which allows us to at least ensure the syntaxial soundness of our model.

3. Perspectives

One of the proposition that can be made after all the work conducted in this dissertation is that, designerly approaches could be applied to any business problems. In fact, we believe that design is a key activity for business problem solving as it allows to change an existing

situation into a preferred one. In this way, it is key for business problem solving. According to Boland and Collopy, 2004, designing should become a key managerial activity. And future work could allow us to go into that direction. We imagine a "toolbox" that could encompass different types of tools for some of the encountered management problems. Entrepreneurs and practitioners would then be able to pick the tool that they need to tackle the current challenge in a designerly way instead of looking at it in a linear manner.

There are however still questions surrounded the evaluations of such tools. These types of tools are difficult to evaluate as they have many potential points on which they could be evaluated (usefulness, ease of use, effectiveness and so on). It is also difficult to know when the design of the tool can be stabilized as it has reached a level where it does the goal that the designers had in mind. A future research could try to uncover which characteristics of visual inquiry tools shall be evaluated and maybe propose a set of specific techniques and methods in order to do so. There could be some benchmarks or accepted stabilization points that would have to be reached for the designers to stop evaluating their tool.

Another perspective that can be added and that has already been discussed somehow, is to see if there could be an improved way in which Information Systems could be seen and used as a discipline that supports other disciplines in developing new artefacts, not only visual inquiry tools but other artefacts based on a literature from another discipline. To our knowledge there is no more formal way to do that than just using other theories as kernel theories for the artefact.

An additional perspective that can be discussed is regarding the accumulation and theorizing when looking at multiple design science projects. While trying to accumulate knowledge from three different design science projects, we noticed that there is no existing way to do so. However, for the sake of the discipline, it would be important to be able to accumulate knowledge both from a single DSR project but also across different projects. We believe that there is still a lack of process and knowledge regarding this accumulation. We have shown in chapter 2, one way to do this accumulation but believe that this should be tested and compared to maybe other processes in order to propose an improved version.

A last perspective to add is that this dissertation proposed a visual inquiry tool for identity communication in startup and SMEs. This tool has been developed in order to add a new tool to an existing family of visual inquiry tools. We could imagine a toolbox for managers and practitioners where every problem would have its corresponding visual inquiry tool. In this sense, the Business Model Canvas (Osterwlder and Pigneur, 2010) addresses how to create value for companies. The Value Proposition Canvas (Osterwalder and Pigneur, 2014) addresses how to create value for a specific customer segment. And even though, the identity communication map is tightly linked with the value proposition, since the value proposition is part of the elements that communicate the vision and the image to the different stakeholders, the identity communication map also encompasses the value created for other stakeholders that are not customers. Both are needed, because the value proposition needs to be aligned with the vision, culture and image of the company and because it is part of the elements communicated by the organization but despite that the identity communication map has a different conceptual level than the value proposition canvas and these tools could be seen as complementary.

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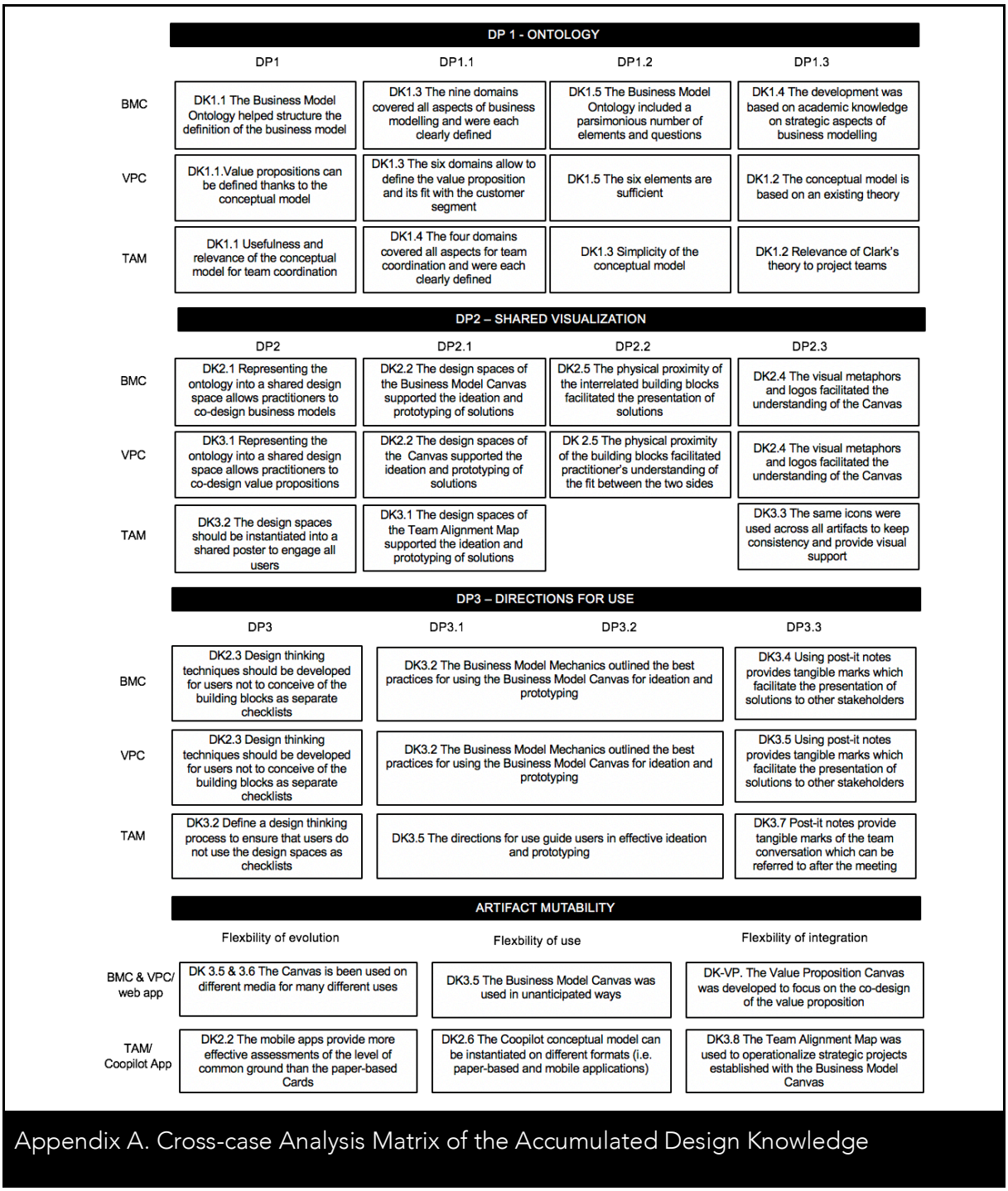
Appendices



DP 1 - ONTOLOGY

	DP1	DP1.1	DP1.2	DP1.3
BMC	DK1.1 The Business Model Ontology helped structure the definition of the business model	DK1.3 The nine domains covered all aspects of business modelling and were each clearly defined	DK1.5 The Business Model Ontology included a parsimonious number of elements and questions	DK1.4 The development was based on academic knowledge on strategic aspects of business modelling
VPC	DK1.1.Value propositions can be defined thanks to the conceptual model	DK1.3 The six domains allow to define the value proposition and its fit with the customer segment	DK1.5 The six elements are sufficient	DK1.2 The conceptual model is based on an existing theory
TAM	DK1.1 Usefulness and relevance of the conceptual model for team coordination	DK1.4 The four domains covered all aspects for team coordination and were each clearly defined	DK1.3 Simplicity of the conceptual model	DK1.2 Relevance of Clark's theory to project teams

DP2 – SHARED VISUALIZATION

	DP2	DP2.1	DP2.2	DP2.3
BMC	DK2.1 Representing the ontology into a shared design space allows practitioners to co-design business models	DK2.2 The design spaces of the Business Model Canvas supported the ideation and prototyping of solutions	DK2.5 The physical proximity of the interrelated building blocks facilitated the presentation of solutions	DK2.4 The visual metaphors and logos facilitated the understanding of the Canvas
VPC	DK3.1 Representing the ontology into a shared design space allows practitioners to co-design value propositions	DK2.2 The design spaces of the Canvas supported the ideation and prototyping of solutions	DK 2.5 The physical proximity of the building blocks facilitated practitioner's understanding of the fit between the two sides	DK2.4 The visual metaphors and logos facilitated the understanding of the Canvas
TAM	DK3.2 The design spaces should be instantiated into a shared poster to engage all users	DK3.1 The design spaces of the Team Alignment Map supported the ideation and prototyping of solutions		DK3.3 The same icons were used across all artifacts to keep consistency and provide visual support

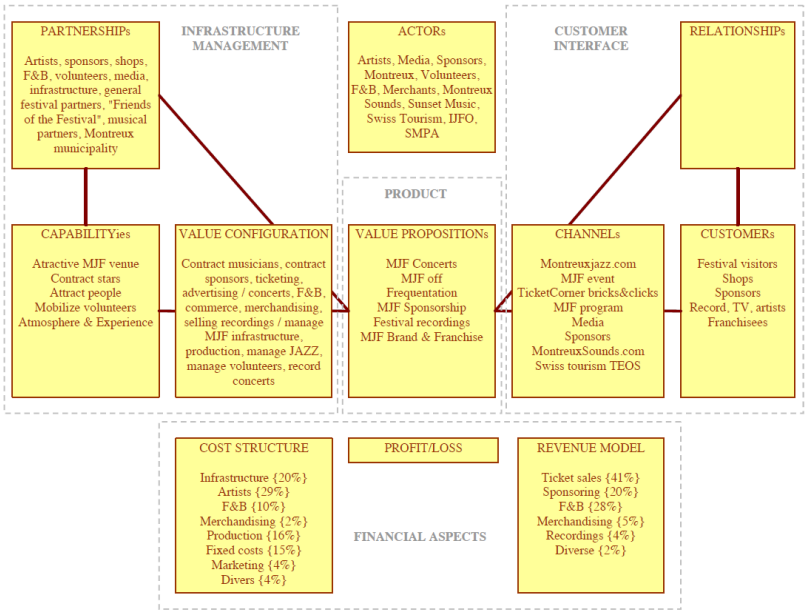
DP3 – DIRECTIONS FOR USE

	DP3	DP3.1	DP3.2	DP3.3
BMC	DK2.3 Design thinking techniques should be developed for users not to conceive of the building blocks as separate checklists	DK3.2 The Business Model Mechanics outlined the best practices for using the Business Model Canvas for ideation and prototyping		DK3.4 Using post-it notes provides tangible marks which facilitate the presentation of solutions to other stakeholders
VPC	DK2.3 Design thinking techniques should be developed for users not to conceive of the building blocks as separate checklists	DK3.2 The Business Model Mechanics outlined the best practices for using the Business Model Canvas for ideation and prototyping		DK3.5 Using post-it notes provides tangible marks which facilitate the presentation of solutions to other stakeholders
TAM	DK3.2 Define a design thinking process to ensure that users do not use the design spaces as checklists	DK3.5 The directions for use guide users in effective ideation and prototyping		DK3.7 Post-it notes provide tangible marks of the team conversation which can be referred to after the meeting

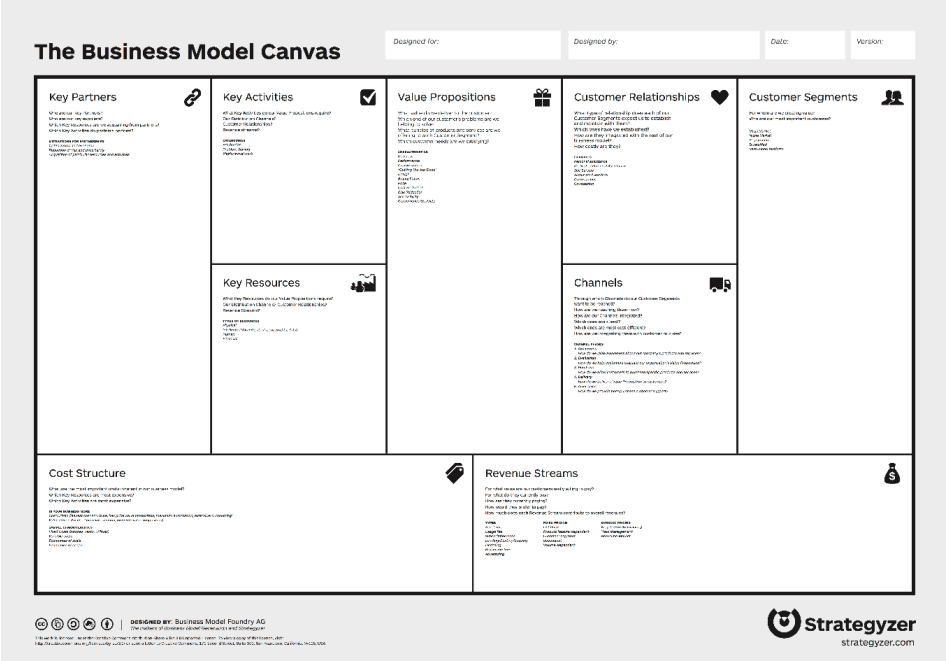
ARTIFACT MUTABILITY

	Flexbility of evolution	Flexbility of use	Flexbility of integration
BMC & VPC/ web app	DK 3.5 & 3.6 The Canvas is been used on different media for many different uses	DK3.5 The Business Model Canvas was used in unanticipated ways	DK-VP. The Value Proposition Canvas was developed to focus on the co-design of the value proposition
TAM/ Coopilot App	DK2.2 The mobile apps provide more effective assessments of the level of common ground than the paper-based Cards	DK2.6 The Coopilot conceptual model can be instantiated on different formats (i.e. paper-based and mobile applications)	DK3.8 The Team Alignment Map was used to operationalize strategic projects established with the Business Model Canvas

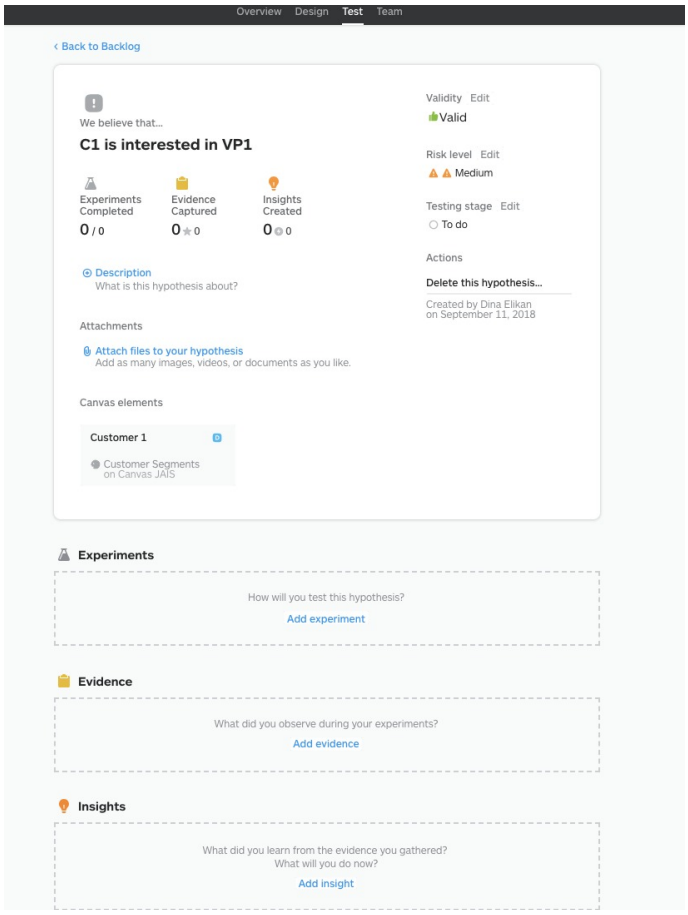
Appendix A. Cross-case Analysis Matrix of the Accumulated Design Knowledge



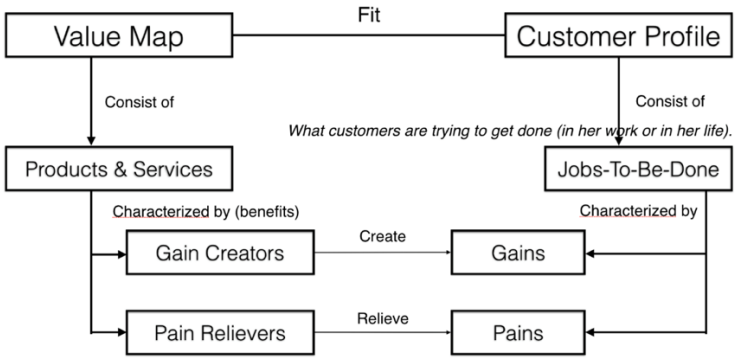
Appendix B. The Business Model Ontology of the Montreux Jazz Festival



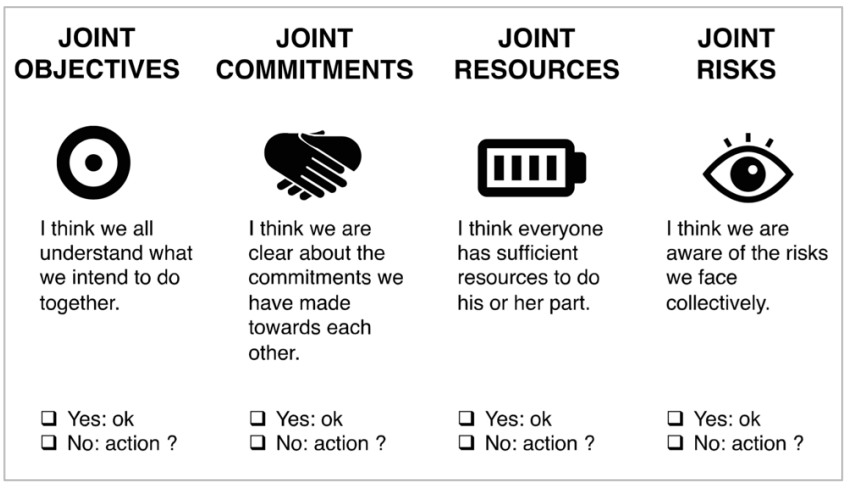
Appendix C. The Business Model Canvas with Questions for each Building Block



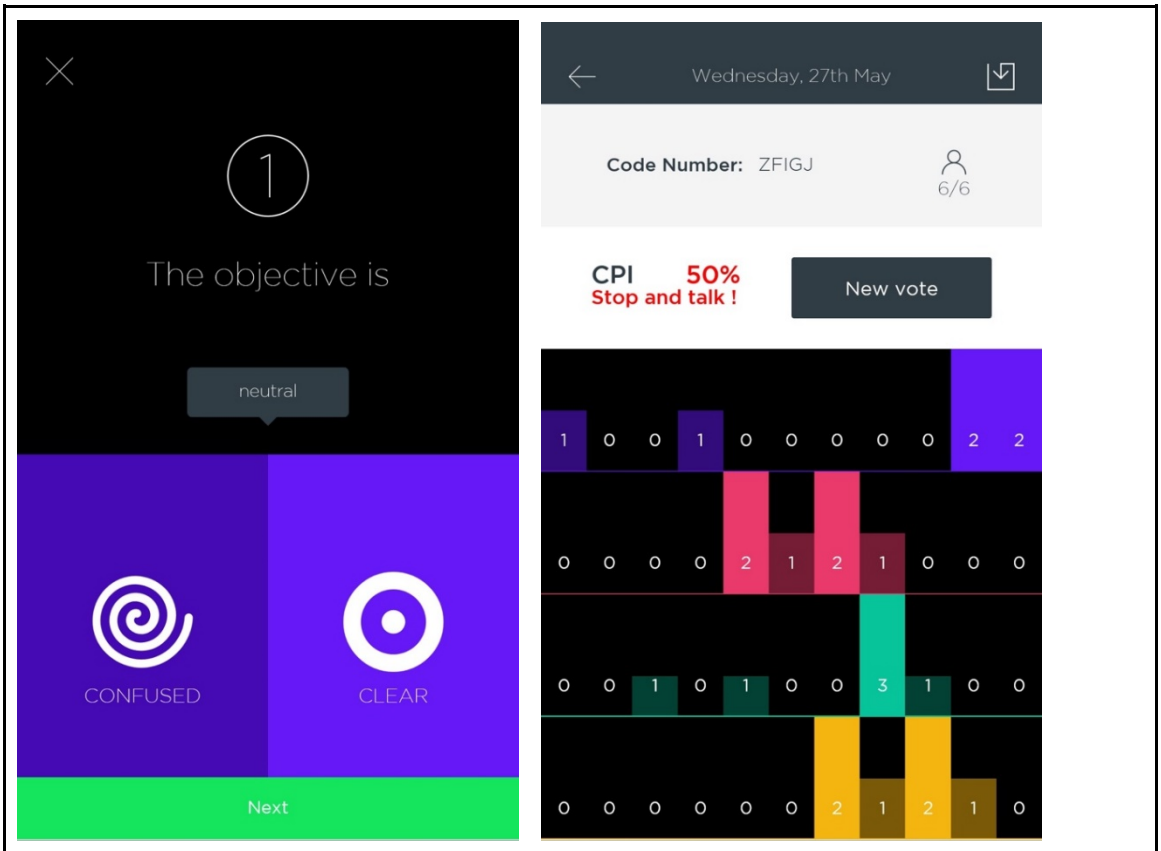
Appendix D. Hypothesis Testing in the SaaS Application



Appendix E. The Value Proposition Conceptual Framework

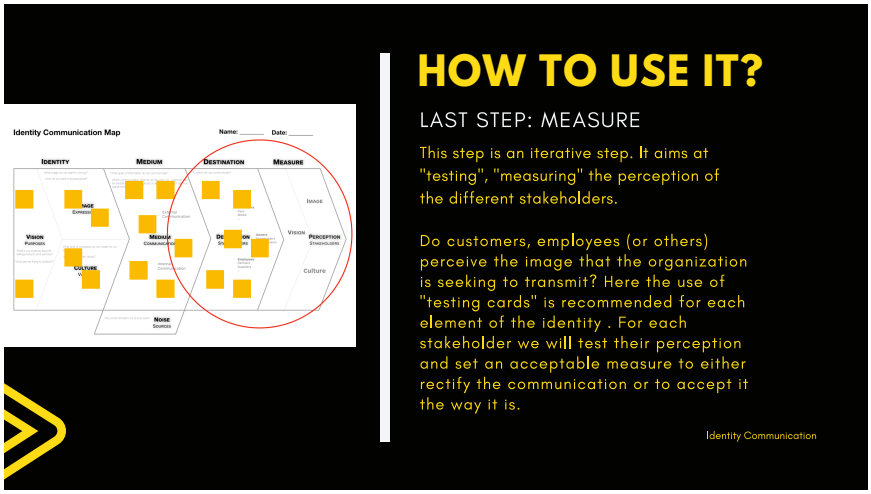


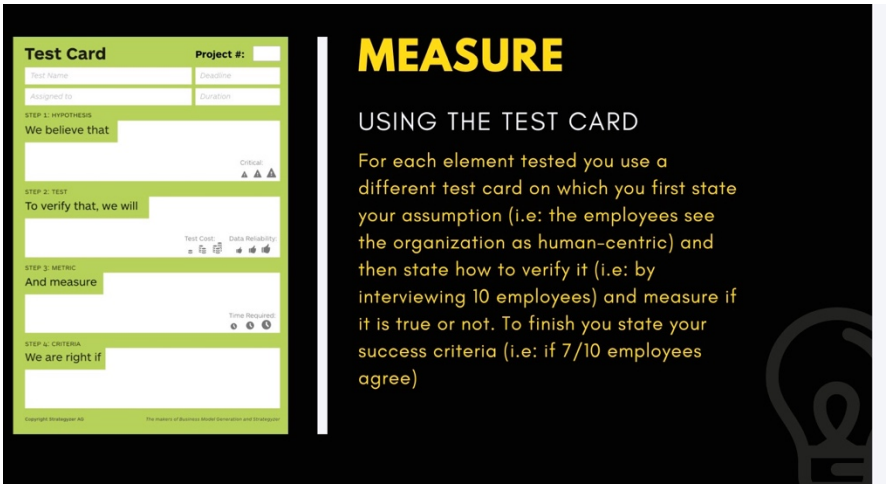
Appendix F. The Coopilot Cards



Appendix G. The Coopilot App

Appendix H. First iteration of the visual tool





Appendix I. Snapshot of the guide that was given to participants for the Map