

Adoption of Design Thinking by a novice multidisciplinary team in industry

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Abstract

Despite the limited amount of empirical evidence, the adoption of the Design Thinking approach is frequently presented as a solution to many of the problems that large organizations face when executing radical innovation projects. In this master thesis, a longitudinal study was conducted which revealed the difficulties of implementing such approach with a novice multidisciplinary team in a large corporation. Along the document, the causes for such barriers at the individual, team and organizational levels are analyzed by a combination of empirical evidence and extensive literature review. As a result, a framework is presented which highlights the importance of carefully setting up the project prior to its execution, emphasizing a broad variety of interdependent enablers. In particular, a highly adaptive team structure is proposed, and guidance is offered on how to set up such team for success and ensure the adequate organizational support structures.

Keywords: Design Thinking; Corporate venturing; Corporate entrepreneurship; Intrapreneurship; Radical innovation; Breakthrough innovation; Disruptive innovation; Major innovation; Creative facilitation; Multidisciplinary team management; Multi-level theory in innovation management; Systems theory in innovation management

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1. Introduction

Procter & Gamble (hereafter P&G) was established in 1837 (P&G, n.d.-b) and today is one of the largest Fast Moving Consumer Goods (hereafter FMCG) companies in the world, with over 100,000 employees (Forbes, 2016). Its portfolio includes around 20 billion-dollar brands –e.g.: Pampers, Gillette, Oral-B, Braun, Ariel, H&S, Pantene and Olay– and around 15 half-billion-dollar brands, e.g.: Mr. Clean, Vicks, Swiffer and Tampax. These products are sold to billions of customers in over 180 countries (P&G, n.d.-c).

The company considers innovation through consumer understanding and deep technical knowledge a critical element within its business model (P&G, n.d.-a). Consequently, the Research and Development (hereafter R&D) function has a significant annual budget of over \$2 billion dollars and is composed of over 8,000 professionals across the different business units (Dyer & Gregersen, 2012). However, and due to the business size, the organization perceives that it is becoming increasingly difficult for some of its largest business units (hereafter BU) to do innovation beyond incremental.

This project was set up to explore the challenges in the use of alternative approaches for tackling radical innovation (see e.g.: McDermott & O'Connor, 2002) within one of such large BUs, the Baby Care organization. Given that Design Thinking has been proposed as a particularly well suited approach for such purposes (see e.g.: Luchs, 2016), the research described in this thesis focused on trialing the application and implementation of such approach within the existing framework of the Baby Care BU. Given the generalizability limitations linked to a single case study, the learnings from this thesis rely heavily on previous literature findings.

This master thesis aims at offering guidance to novice corporate adopters on the implementation of Design Thinking as an approach for radical innovation. These learnings are drawn from a combination of empirical evidence and theoretical research. Based on the challenges that I faced while using Design Thinking with a novice multidisciplinary team, I propose a framework of the conditions required for successfully executing Design Thinking projects in large industrial organizations. This framework integrates my practical experience together with the literature on previously identified barriers and enablers for the use of Design Thinking in large organizations, but also with that of radical innovation.

The thesis starts by offering a short introduction to the concept of Design Thinking (see Chapter 2) and is followed by an extensive literature review on barriers and enablers previously identified for radical innovation and Design Thinking in large organizations (see Chapter 3). In chapter 4, I introduce my research question and approach. This is followed by an assessment of the organizational context in which this research takes place (see Chapter 5). In chapter 6, I explain

the project barriers that were faced by the team and their causes. After explaining the limitations of the research (see Chapter 7), I present my proposed framework of Design Thinking enablers (see Chapter 8). Along this chapter, I explain the variety of identified dimensions, showing their interdependency together with their theoretical justification and empirical evidence from my project that supports their necessity. Finally, in Chapter 9, I offer some final conclusions, outlining the limitations and implications of the current research and proposing further research directions.

2. What is Design Thinking?

Design Thinking (hereafter DT), as the term indicates, can be seen as an approach to tackle challenges “as a designer would” (Luchs, 2016, p. 2). In this chapter I offer an overview of the existing meanings of DT and how they relate to the use of the concept in the current project.

2.1.A concept in development with multiple meanings

The first instances of DT in literature go back to the late 60's as a way of describing the way in which designers think (N Cross, 1982; Bryan Lawson, 1980; McKim, 1973; Simon, 1969). Several authors helped in shaping the term during the 70's and 80's, using it to describe a cooperative design approach (Papanek & Fuller, 1972) consisting of a set of methods for tackling complex and ambiguous problems labeled as *Wicked Problems* (Buchanan, 1992; Rittel & Webber, 1973). In the 90's, fostered by the work of design consultancies like IDEO and education institutions like Stanford, the term DT got its current most accepted meaning “as a systematic and collaborative approach for identifying and creatively solving problems” (Luchs, 2016, p. 23) within the context of New Product Development (hereafter NPD).

In the 2000's, practitioners like David Kelley and Tim Brown (IDEO) together with academics like Roger L. Martin (Rotman School of Management) started promoting a management discourse of DT. According to this discourse, “design has become too important to be left to designers” (T. Brown & Katz, 2011, p. 8), and so “design thinking can be viewed as the application of design methods by multidisciplinary teams to a broad range of innovation challenges” (Seidel & Fixson, 2013, p. 19). This discourse showcases the need in the business literature for articulating the value of non-analytical problem-solving approaches (Dunne & Martin, 2006). Despite the interest that the management discourse of DT has attracted, several academics have raised their concerns regarding the lack of empirical evidence to support its validity (Badke-Schaub, Roozenburg, & Cardoso, 2010; Hassi & Laakso, 2011; Johansson-Sköldberg, Woodilla, & Çetinkaya, 2013).

There is therefore a co-existence of a design discourse and a management discourse for the term DT (Hassi & Laakso, 2011). This makes it a rather loose term, ranging from its original use as a way of describing the working process of designers in NPD, to an approach for tackling challenges beyond NPD that can be learnt by non-designers. Accordingly, DT varies in the ways it is depicted in literature and used in practice, including: processes with different step-by-step phases (Liedtka, 2015), sets of principles, mindsets and practices, or toolboxes of methods (Carlgren, Rauth, & Elmquist, 2016).

2.2.DT in the context of this master thesis

Given the ambiguity of the term, it is important to explain what DT means in the current work. I use DT to refer to a systematic and collaborative human-centered approach for radical innovation. In my case, DT is used in the setting of a large corporate organization for NPD.

By *radical innovation* (hereafter RI), I distinguish it from *incremental innovation* (Norman & Verganti, 2014). While DT can be used for *incremental innovation* too (Norman & Verganti, 2014), it is particularly well suited to tackle *wicked problems* (Rittel & Webber, 1973) leading to the generation of products and services that are really new to the firm and to the market (Sandberg & Aarikka-Stenroos, 2014), instead of incrementally improving existing ones. DT is usually described as a process for dealing with innovation projects in which even the problem to be solved requires extensive research to be framed before being able to generate solutions (see e.g.: Luchs, 2016). This is because DT borrows the divergence-converge diamond from the theory of Creative Problem Solving (Osborn, 1993) and is usually depicted as a double diamond model with a *problem finding* phase and a *solution finding* phase (Council, 2007). In this sense, this is a *systematic* approach with two phases -*problem finding* and *solution finding* (Council, 2007) - and five sub phases –*empathize, define, ideate, prototype* and *test* (Plattner, 2010)–, which are iterative and non-linear (Liedtka, 2015). How these phases come together can be seen in Figure 1 (Liu, 2016). In addition, the approach is *systematic* in the sense that there is a wide set of methods available that can be applied in the different phases of the process (Seidel & Fixson, 2016) and which are described in methodology guides such as the *Delft Design Guide* (van Boeijen, Daalhuizen, Zijlstra, & van der Schoor, 2014) or *101 Design methods* (Kumar, 2012). These provide a toolbox for *identifying* and *framing* problems, as well as *generating, prototyping* and *testing* solutions, covering the five sub phases of DT (Plattner, 2010).

Also, DT is a *human-centered* approach since the process is driven by the intention of understanding the consumer needs (T. Brown, 2008) and what the *job to be done* is (Johnson, Christensen, & Kagermann, 2008) instead of pushing particular technologies looking for a reason to be. Technology is seen as an enabler rather than the starting point of the innovation process (Norman & Verganti, 2014). This consumer centeredness is ensured by a combination of ethnographic research methods, co-creation with the users and iterative testing of prototypes with them (Carlgren, Rauth, et al., 2016).

Finally, the approach is *collaborative* not only in the sense that it involves users along the process (T. Brown, 2008), but also because it integrates professionals from different disciplines, like marketing and R&D, in an attempt to create a team with a breadth of knowledge and skills (Papanek & Fuller, 1972).

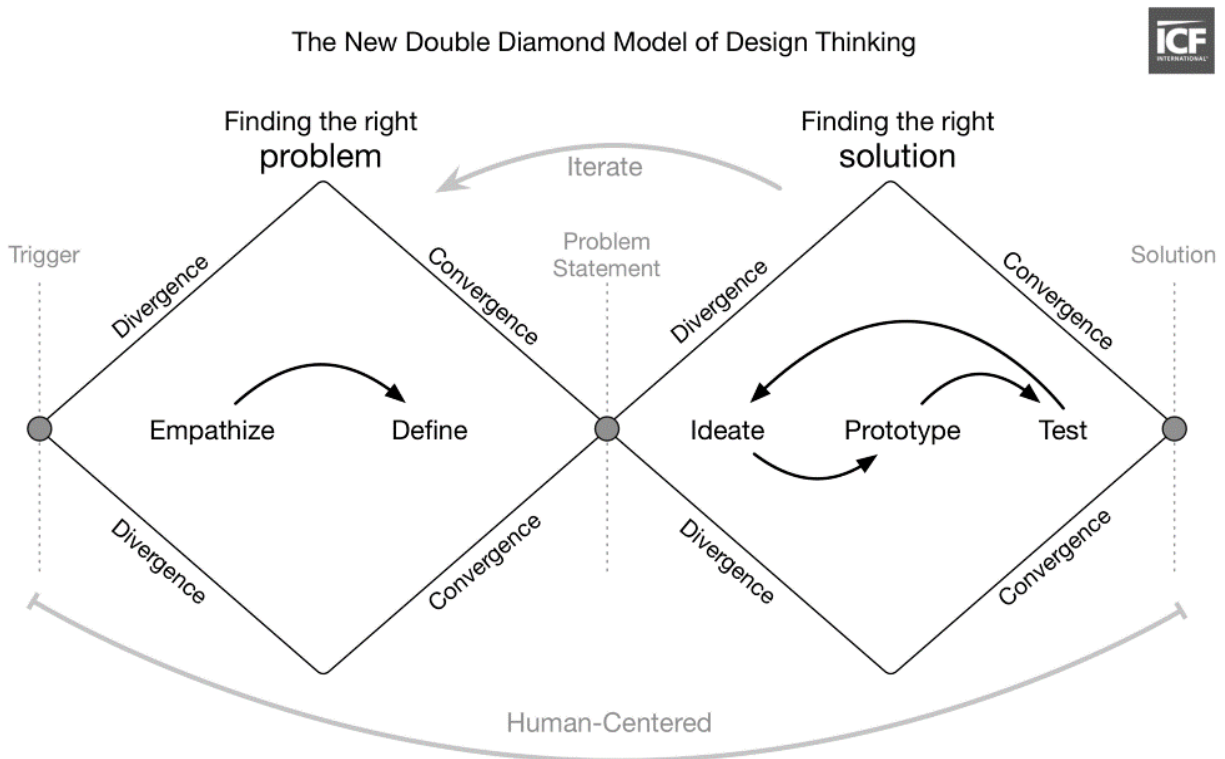


Figure 1- DT model developed by designer Trish Willard from ICF (Liu, 2016)

Given the context in which I will apply DT, radical product innovation performed by a multidisciplinary novice team –without former experience in the use of DT– in a large industrial organization, the use of the DT term falls within the management discourse (see Section 2.1) but remains in the realm of NPD challenges.

3. Challenges in the adoption of DT in industry

Despite the interest that DT has generated in recent years, being promoted and considered by some business managers as “a solution to all their woes” (Kolko, 2015, p. 7), the implementation and use of DT in large industrial organizations seems to come with many challenges which have been largely overlooked in DT research (Carlgren, Elmquist, & Rauth, 2016). In this section we explore previously identified barriers for the use of DT in large organizations, as well as the enabling factors.

3.1. The innovation barriers perspective

Corporate teams using DT as an approach to tackle RI in large organizations face many of the challenges previously identified in RI literature. However, very limited research has attempted to link DT barriers to RI barriers and analyzed those that are specific to DT (Carlgren, Elmquist, et al., 2016). Besides the recency of the DT management discourse (see Section 2.1) and the limited empirical research in its use (Carlgren, Elmquist, et al., 2016), several reasons can be identified for this lack of integration.

First, most of the RI body of literature has mainly focused on success factors, drivers and enablers, overlooking the inhibitors or barriers (Assink, 2006). Looking at innovation barriers instead, understood as “an issue that prevents or hampers innovative activities in the firm” (Sandberg & Aarikka-Stenroos, 2014, p. 1294), can allow us to identify and act upon specific bottlenecks “among the myriad of factors potentially affecting innovation” (Hölzl & Janger, 2012, p. 1).

Second, the literature around RI barriers seems to be scattered due the multiple uses of the term, which also have ambiguous meanings (Sandberg & Aarikka-Stenroos, 2014): *discontinuous innovation*, *disruptive innovation*, *really new products*, *major innovation* or *breakthrough innovation*, just to mention some of them. In addition, RI in the context of large organizations has also been referred to as *corporate entrepreneurship*, *intrapreneurship* or *corporate venturing* (P. Sharma & Chrisman, 2007), with its own literature streams of barriers and enablers.

And third, there appear to be significant differences in the experienced RI barriers depending on the context of application: large firms vs small and medium enterprises, business to business vs business to consumer, R&D vs commercial activities, etc. (Sandberg & Aarikka-Stenroos, 2014), which hampers the development of generic frameworks.

Nonetheless, we can find several literature reviews offering an overview on RI barriers in large industrial organizations, together with some studies identifying those that are specific to DT. Since our goal is to explore the challenges in the adoption of DT by corporate teams and provide

actionable recommendations, we will focus on the internal barriers, those within the control of the firm, rather than the external ones (see Piatier, 1984).

3.1.1. Barriers for Radical Innovation

Compared to the activities needed to support incremental innovation, for which most large industrial firms are organized (Christensen, 1997), RI requires different ways of working –skills and practices– and thinking –mindsets and attitudes– at the individual and team levels (Bessant, Öberg, & Trifilova, 2014). But it also requires different supporting structures –processes, resources, metrics and culture– at the organizational level (Roussel, Saad, & Erickson, 1991). As a result, most of the identified barriers for RI have to do with a clash or mismatch between the old and the new ways at these three levels of analysis: individual, team and organization.

Assink (2006) identified five distinctive clusters of barriers for RI through his literature review (Table 1) and built a simplified high-level causal model for these RI capability inhibitors, showing how these barriers are hierarchically interdependent.

Table 1- Assink's five clusters of barriers for RI

CLUSTER	BARRIERS
ADOPTION BARRIER	Success and familiarity trap (Ahuja & Lampert, 2001; Christensen, Raynor, & Anthony, 2003; Paap & Katz, 2004; Tushman, 1997); Lacking organizational dualism (Cosier & Hughes, 2001; Moorman & Miner, 1997; Paap & Katz, 2004; A. Sharma, 1999); Excessive bureaucracy (Quinn, 1985); Status quo stifling (A. Sharma, 1999; Thomond & Lettice, 2002)
MINDSET BARRIER	Lack of distinctive competencies (Leonard - Barton, 1992); Lack of awareness of need for new knowledge (Vanhaverbeke, Berends, Kirschbaum, & De Brabander, 2003); Obsolete mental models and theory-in-use (J. S. Brown & Duguid, 2002); Inability to unlearn (Baker & Sinkula, 2002)
RISK BARRIER	Learning trap (Ahuja & Lampert, 2001); Inadequate financial metrics (Harper & Becker, 2004); Lack of resources (Christensen et al., 2003); High risk and uncertainty (Sandberg, 2002); Risk averse climate (Rice, O'Connor, Leifer, McDormott, & Standish-Kuon, 2000); Unwillingness to cannibalize (Cravens, Piercy, & Low, 2002)
NASCENT BARRIER	Lack of creativity (Ahuja & Lampert, 2001); Lack of market sensing and foresight (Trott, 2001); Senior management turnover (Rice et al., 2000); Innovation process mismanagement (command-and-control mental model) (Ashmos & Nathan, 2002); Lack of team chemistry (Levine, 1994)
INFRASTRUCTURAL BARRIER	Lack of mandatory infrastructure (Walsh & Linton, 2000); Lack of adequate follow-through (J. S. Brown & Duguid, 2002)

While Assink's analysis takes an organizational perspective on the management of RI, the identified barriers implicitly cover the three levels of analysis –individual, team and organization–.

Other authors have focused their research on the individual, making explicit how the lack of particular competences hamper the development of RI activities. These competences materialize

both in skills and mindsets. On the skills side, a significant barrier is the lack of appropriate practices or knowledge for the *discovery* and *incubation* of new business opportunities, as well as the *commercialization* of such proposals (Sandberg & Aarikka-Stenroos, 2014). From a mindsets point of view, cognitive flaws –projection bias, egocentric empathy gap, focusing illusion, hypothesis confirmation bias, endowment effect or availability bias– (Liedtka, 2015), as well as cognitive traps –familiarity trap, maturity trap and propinquity trap– (Ahuja & Lampert, 2001) have been linked to the inability to create good RI ideas. In line with the cognitive flaws, the *restrictive mindset*, as a fear and resistance to change and failure, has also been identified as a core barrier (Sandberg & Aarikka-Stenroos, 2014).

3.1.2. Barriers for Design Thinking

Although the use of DT methodologies in itself has been postulated as a solution to some of the barriers encountered in RI, particularly to those associated to the lack of adequate skills and mindsets (Liedtka, 2015), its adoption seems to come with many difficulties (Carlgren, Elmquist, et al., 2016). Some of these have been previously identified in generic RI literature, but others seem to be specific to DT.

Barriers to the adoption of DT just as a methodology for RI

At the individual level, some of the challenges associated to the adoption –learning– of DT can be linked to well-known barriers regarding the adoption of new competences (see “mindset barrier” cluster in Table 1). In addition, DT skills seem to take extensive time and experience to be successfully adopted (N Cross, 2011; Dym, Agogino, Eris, Frey, & Leifer, 2005; B Lawson & Dorst, 2013), which is not always available in corporate environments. The time intense methods of DT are seen as difficult to prioritize and the methodology “tends to get killed by daily business” (Carlgren, Elmquist, et al., 2016, p. 349).

At the organizational level, a lot of barriers are associated to the management of change and risk. It has been identified how new methodologies can be perceived as questioning the established functions (Kanter, 2006) and received with resistance by the rest of the organization, particularly by those who feel their job security and expertise threatened, or feel alienated (Wolfe, Wright, & Smart, 2006). Also, Carlgren, Elmquist, et al. (2016) identified how the difficulties to prove the value of DT upfront can lead skeptical managers to ask for early proof of success, putting the team under pressure to deliver quick tangible results, contrary to the exploratory nature of DT. This, combined with the perception of some costs like user research or prototyping as unnecessary (Carlgren, Elmquist, et al., 2016), together with the uncertainty associated to RI projects, makes it difficult to obtain resources and organizational support on the long-term (Christensen et al., 2003; Sandberg, 2002). These can be seen as just a few of the consequences of applying inadequate

metrics for evaluating and managing RI projects, a well-known pitfall described by innovation researchers (see e.g.: Kanter, 2006; McDermott & O'Connor, 2002). In addition, the excessive bureaucracy associated to large organizations regarding rules and procedures has also been linked to the lack of creativity of the individuals (Quinn, 1985). All this organizational pressure can severely hamper the adoption and use of DT in large organizations, particularly by novice adopters who may not even be fully convinced of the value of DT themselves.

Barriers to the adoption of DT due to its core themes and nature

DT has certain particularities as a methodology for RI that bring additional barriers to RI or amplify existing ones (Carlgren, Elmquist, et al., 2016). These can be linked to the five core themes of DT: *user focus* –human-centered through empathy built in the interaction with users–, *problem framing* –challenging and reframing the initial problem statement–, *experimentation* –iterative learning through divergence-convergence cycles and idea testing–, *diversity* –radical integrative collaboration with diverse multidisciplinary teams and external players– and *visualization* –sharing visual models of insights and building prototypes– (Carlgren, Rauth, et al., 2016). These barriers have been summarized in Table 2.

Table 2- Barriers associated to DT core themes -adapted from Carlgren, Elmquist, et al. (2016)

DT THEME	ASSOCIATED BARRIERS
USER FOCUS	<ul style="list-style-type: none"> - Conducting and processing ethnographic research demands significant resources which are hard to acquire - Subjective user insights are not enough to convince evidence-driven managers - Interaction with users may be explicitly prohibited due to fear of leakage of sensitive information
PROBLEM FRAMING	<ul style="list-style-type: none"> - Iterative process clashes with predominant linear problem solving approaches
EXPERIMENTATION	<ul style="list-style-type: none"> - Deviation from initial plan or failing are negatively perceived - Need to plan and define goals in advance are contrary to the explorative DT, leading to incremental innovation - Knowing when to stop iterating is not easy - Tight times reduce opportunities for testing and failing so ideas are less innovative
DIVERSITY	<ul style="list-style-type: none"> - Flat hierarchies with democratic ways of working clash with more hierarchical structures - New ways of working influence power dynamics in organizations since decision power is moved to the team - Fun (e.g.: icebreakers) is perceived as neither serious, nor productive - Some terms (e.g.: <i>iteration</i> or <i>prototype</i>) have different meanings for different people.
VISUALIZATION	<ul style="list-style-type: none"> - Visualization and prototyping skills are difficult to master - Communication style is found to be inappropriate as compared to Power Point presentations - Showing rough, ugly mock-ups internally and to users is against norms

In line with the difficulties to learn critical skills for DT –e.g.: prototyping, drawing, interviewing...–, it has been identified how learning such skills through workshops is sometimes received with resistance to change and skepticism by those who are used to working in a different

fashion –e.g.: very planned and structured work vs. explorative work– and that it can take a long time for them to buy-in (Wilner, 2015).

Also, something that appears to be particularly challenging for novice adopters is understanding that the DT process is not linear as usually presented (Figure 1), but iterative instead and requiring the adaptation of the process and the tools depending on the circumstances (Beckman & Barry, 2007; Seidel & Fixson, 2016). The process of debating such adaptation and the generated ideas is called team reflexivity and is associated with better team performance (Schipper, West, & Dawson, 2015). However, deciding whether to iterate or move forward instead can also lead to conflicts in the team (De Dreu & West, 2001; Seidel & Fixson, 2013).

The broad variety of barriers associated to RI in general, and DT in particular, seems to indicate that the implementation of DT may require to balance the integration of many different and interconnected elements. In the following section I explore some of the enablers that have been previously identified in literature to mitigate some of these barriers.

3.2. The innovation enablers perspective

In parallel to the barriers perspective, most of the RI literature has focused on describing the success factors or enablers (Assink, 2006; Sandberg & Aarikka-Stenroos, 2014). These enablers are dimensions associated to the successful adoption and execution of RI and DT projects in large organizations.

3.2.1. Enablers for Radical Innovation

The literature of innovation enablers seems to be more extensive and better organized than the one for innovation barriers (Sandberg & Aarikka-Stenroos, 2014). Multidimensional integrational models of analysis –e.g.: the previously used three levels of analysis: individual, team and organization– are more clearly established in this stream of literature (see e.g.: Anderson, De Dreu, & Nijstad, 2004; Crossan & Apaydin, 2010). Anderson *et al.* (2004) offer us a comprehensive overview of the dimensions that have been identified as facilitators of innovation at these three levels of analysis (Table 3). Their impact on the innovation process has been quantitatively assessed in cross-functional studies, but not necessarily in the context of RI.

This review helps in understanding the breadth of dimensions that need to be accounted for in order to study a phenomenon as complex as adoption of innovation practices, especially at the individual and team levels of analysis. However, it fails to do the same at the organizational level, particularly in the context of RI.

Table 3- Facilitators of innovation at three levels of analysis -adapted from Anderson et al. (2004)

LEVEL	CHARACTERISTIC	DIMENSIONS
INDIVIDUAL	PERSONALITY	Tolerance of ambiguity (Barron & Harrington, 1981); Self-confidence (Barron & Harrington, 1981); Openness to experience (George & Zhou, 2001; West, 1987; West, Patterson, & Dawson, 1999); Unconventionality (Frese, Teng, & Wijnen, 1999; West & Wallace, 1991); Originality (West & Wallace, 1991); Rule governed (<i>negative relation</i>) (Frese et al., 1999; Simonton, 1991); Authoritarianism (<i>negative relation</i>) (Simonton, 1991); Independence (West, 1987); Proactivity (Seibert, Kraimer, & Liden., 2001)
	MOTIVATION	Intrinsic (<i>vs extrinsic</i>) (Frese et al., 1999; West, 1987); Determination to succeed (Amabile, 1983); Personal initiative (Frese & Zapf, 1994)
	COGNITIVE ABILITY	Above average general intellect ('g') (Barron & Harrington, 1981); Task-specific knowledge (Taggar, 2002; West, 1987; West & Wallace, 1991); Divergent thinking style (Kirtton, 1976); Ideational fluency (Barron & Harrington, 1981)
	JOB CHARACTERISTICS	Autonomy (Axtell et al., 2000); Span of control (Axtell et al., 2000); Job demands (Janssen, 2000); Previous job dissatisfaction (Zhou & George, 2001); Support for innovation (Axtell et al., 2000); Mentor guidance (Csikszentmihalyi, 1996; Simonton, 1991; Walberg, Rasher, & Parkerson, 1980; Zhou & George, 2001); Appropriate training (Basadur, Graen, & Scandura, 1986)
	MOOD STATES	Negative moods (George & Zhou, 2002)
TEAM	STRUCTURE	Minority influence (De Dreu & West, 2001; Nemeth & Wachtler, 1983); Cohesiveness (Payne, 1990); Longevity (Katz, 1982; West & Anderson, 1992)
	CLIMATE	Participation (De Dreu & West, 2001; West & Anderson, 1992); Vision (De Dreu & West, 2001; West & Anderson, 1992); Norms for innovation (De Dreu & West, 2001; West & Anderson, 1992); Conflict (De Dreu & De Vries, 1997); Constructive controversy (Tjosvold, 1998)
	MEMBERSHIP	Heterogeneity (Nemeth, 1986; Paulus, 2000); Education level (Wallach, 1985)
	PROCESSES	Reflexivity (West et al., 1999); Minority dissent (De Dreu & West, 2001; Taggar, 2002); Integration skills (Stevens & Campion, 1994; Taggar, 2002); Decision-making style (King, Anderson, & West, 1992)
	LEADERSHIP STYLE	Democratic style (Tierney, Farmer, & Graen, 1999); Participative style (Manz, Bastien, Hostager, & Shapiro, 1989; Nyström, 1979; Tierney et al., 1999); Openness to idea proposals (Nyström, 1979); Leader-member exchange (Tierney et al., 1999); Expected evaluation (Shalley & Perry-Smith, 2001)
ORGANIZATION	STRUCTURE	Specialization (Damanpour, 1991); Centralization (<i>negative relation</i>) (Damanpour, 1991; Zaltman, Duncan, & Holbeck, 1973); Formalization (<i>negative relation</i>) (Damanpour, 1991; West, Smith, Feng, & Lawthom, 1998); Complexity (Damanpour, 1991; Kimberly, 1981); Stratification (<i>negative relation</i>) (Kanter, 1983)
	STRATEGY	'Prospector' type (Miles & Snow, 1978)
	SIZE	Number of employees (Rogers, 1983); Market share (<i>negative relation</i>) (Rogers, 1983)
	RESOURCES	Annual turnover (Mohr, 1969); Slack resources (Damanpour, 1991; Kanter, 1983)
	CULTURE	Support for experimentation (Damanpour, 1991; Nyström, 1990); Tolerance of idea failure (Madjar, Oldham, & Pratt, 2002); Risk-taking norms (King et al., 1992; West & Anderson, 1992)

Because of the difference in nature between existing business exploitation and new business exploration, RI requires different organizational support than incremental innovation initiatives (Hornsby, Kuratko, & Zahra, 2002). The difficulties in managing both practices under the same organization is a phenomenon that has been widely explored in RI literature (see Section 3.1.1) and popularized as *The Innovator's Dilemma* (Christensen, 1997). Dealing with both activities at the same time requires the organization and its senior management to become *ambidextrous* (Duncan, 1976). The current most extended best practice is to create separate venture capital units charged with RI (Rice et al., 2000) and having their own processes, structures and culture, but keeping their link to the mainstream business through senior management (O'Reilly & Tushman, 2004).

Therefore, successfully implementing a RI *dynamic capability* (Eisenhardt & Martin, 2000) requires the systemic integration of several elements beyond individual competences (O'Connor, 2008). In her study, O'Connor identified the following elements for a *Major Innovation* (MI = RI) dynamic capability: “(1) an identifiable organization structure; (2) interface mechanisms with the mainstream organization, some of which are tightly coupled and others of which are loose; (3) exploratory processes; (4) requisite skills and talent development, given that entrepreneurial talent is not present in most organizations; (5) governance and decision-making mechanisms at the MI project, MI portfolio, and MI system levels; (6) appropriate performance metrics; and (7) an appropriate culture and leadership context” (O'Connor, 2008). These can be seen as enablers that, if present, prevent a lot of the RI barriers previously identified (see Section 3.1.1).

This way of studying innovation as a complex system of interdependent elements that cannot be fully understood in isolation from the rest follows from systems theory (Capra, 1996; O'Connor, 2008) and seems to be particularly well suited for analyzing the complex dynamics arising from RI in organizational settings (O'Connor, 2008) and the variety of interdependent barriers associated to it (Assink, 2006).

3.2.2. Enablers for Design Thinking

DT practices in themselves are usually described as enablers of RI. For example, Calabretta & Gemser (2015), explain how design practices can solve three key challenges within the *fuzzy front end* of innovation: defining the right problem, managing information and integrating different stakeholders into the process. However, and although the authors also mention the importance of preparing the ground for the interaction between stakeholders from different backgrounds so that long-term trustful relationships can be built, the adoption of DT is rarely postulated as a challenge in itself requiring of enablers (Carlgren, Elmquist, et al., 2016).

Nonetheless, a few authors have paid attention to the implementation of DT by novel users in large organizations and been able to identify certain success factors on the organizational level such as having a separate physical creative space, providing enough autonomy to the DT adopters and managing cultural conflict (Wilner, 2015). Similarly to the independent function advocated for in RI (O'Connor, 2008), some authors have emphasized the importance of having a dedicated infrastructure with their own proprietary creative process and surrounded by a supportive corporate culture fostered by senior leadership mandate (Rosenberg Sr., Chauvet, & Kleinman, 2015).

At the team level, which in DT is multidisciplinary (see Section 2.2), it has been identified how facilitating the differences in *learning styles* (Kolb, 1983) by increasing team reflexivity, not just on the ideas but also on the process and chosen methods, is important for getting a good balance between *thinking* and *doing* in an iterative fashion (Basadur et al., 1986; Beckman & Barry, 2007; Seidel & Fixson, 2016). Also, it has been acknowledged how keeping a stable team in a large organizational setting is not always possible and that, therefore, it is important to properly document the past learnings and use onboarding mechanisms for new members (Seidel & Fixson, 2016).

At an individual level, many mindsets have been identified as being required for successfully using DT, like *being empathic, curious, non-judgmental, playful and humoristic, learning-oriented, comfortable with complexity, open to differences in personality, eager to share, having a democratic spirit*, etc. (Carlgren, Rauth, et al., 2016). These mindsets are not always present among business practitioners (Dunne & Martin, 2006) but activating them is critical before DT practices and methods can be adopted (Wilner, 2015). In order to do so, multiday experiential learning workshops taught outside of a *business as usual* context –also called *boot camps*– have been proposed (Wilner, 2015) and extensively offered by some consulting firms (e.g.: IDEO) and education institutions (e.g.: Stanford d.school).

Overall, and similarly to what happened in the barriers perspective (see Section 3.1.2), the link between RI enablers –as an integrated multilevel system of dimensions– with those of DT seems to be missing in the DT literature, where most authors focus on a limited subsets of elements (e.g.: Luchs, Swan, & Griffin, 2015). This has left some innovation managers with the perception that DT implementation is an easy *plug and play* solution to foster RI by simply training a group of individuals and facilitating their work process, overlooking the organizational and team dynamics happening in a large industrial organization which can hinder the adoption of DT (Carlgren, Elmquist, et al., 2016; Walters, 2011).

4. Research question and approach

The main dogma of the DT management discourse (see Section 2.1) is that design is not reserved to designers anymore but that can and should be adopted by others involved in the innovation process (Badke-Schaub et al., 2010; T. Brown & Katz, 2011; Dunne & Martin, 2006). Most DT literature has used anecdotal success stories to show the value of DT and focused on how to train novice individuals so that they can operate under the DT mindsets and practices, but overlooking the challenges that appear while implementing and using DT for RI in the context of a large industrial organization (Carlgren, Elmquist, et al., 2016). In addition, the existing literature on enablers and barriers for DT seems to be scattered and without a clear link to that of RI (see Chapter 3). This has left new adopters with the perception that DT is an easy *plug and play* solution, which contrasts with the experience of those who have tried implementing it and faced many issues (Carlgren, Elmquist, et al., 2016; Walters, 2011). Also, and although enablers and barriers can be seen as two sides of the same coin –the lack of a certain enabler can lead to a variety of barriers–, there seems to be a lack of explicit and comprehensive integration between both perspectives in the literature for both RI and DT (see Chapter 3).

4.1. The research goal

The goal of this master thesis is to explore the multidimensional barriers that appear while using DT for RI with a novice multidisciplinary team in a large organization. The ultimate purpose is to be able to provide guidance to corporate DT adopters on how to minimize such barriers by the use of the right enablers.

4.2. The research plan

To research this topic, I will use an action research approach preceded by an assessment of the state-of-the-art of the organization, performed mainly through a set of interviews with key stakeholders.

4.2.1. Using action research to explore the adoption challenges in-situ

Some of the few authors that have been exploring the barriers for the adoption of DT in large organizations have done so through post-factum interviews and highlighted the importance of conducting “ethnographic studies of the real-time use of DT in practice” (Carlgren, Elmquist, et al., 2016, p. 15). These longitudinal studies, rather than cross-sectional, follow teams along all the phases of the project (Seidel & Fixson, 2013) in order to understand the *macro-dynamics* happening at the organizational level, but also the *micro-dynamics* at the individual and team levels (Carlgren, Elmquist, et al., 2016; Felin, 2005), identifying relevant bottlenecks or barriers in the process. This is arguably an appropriate method for understanding the interdependency across time and levels of analysis between the elements of a complex system that cannot be dissected and

studied in isolation (Capra, 1996), as is the case of RI practices in an organizational setting (O'Connor, 2008).

Following this explorative and interpretative nature of my research, I choose to adopt an action research approach, a method previously proposed for the research of the design practice (Swann, 2002). Three conditions need to be met: “[1] First, its subject matter normally is situated in a social practice that needs to be changed; [2] second, it is a participatory activity where the researchers work in equitable collaboration; and [3] third, the project proceeds through a spiral of cycles of planning, acting, observing, and reflecting in a systematic and documented study” (Swann, 2002, p. 55). In order to do so, I assemble a novice multidisciplinary team within the company to work on a RI challenge through the DT principles (condition 1). There, I take a dual role as an active member of the team and researcher (condition 2). Throughout the project, the team, including myself, plans based on the best available knowledge among its members and existing constraints, takes certain actions, reflects on the outcomes and adapts the plan accordingly. This iterative process is observed and documented by me (condition 3) to address the research goal (see Section 4.2).

It is important to mention here that, due to the fast day-to-day pace of corporate innovation projects and the breadth of potential barriers (see Section 3.1), the adaptations made when facing particular issues are not conscious methodological choices in order to test previously identified enablers (see Section 3.2), but rather the result of applying the best knowledge available in the team and organization at a given time, including mine, which comes from our combined previous work and educational experiences. This should not be seen as a limitation since the ultimate goal of this thesis is not to flawlessly implement DT from the beginning by leveraging the literature on RI and DT enablers. Instead, the goal is to experience and document the variety of challenges that could appear to other adopters unaware of the myriad of barriers that hinder the adoption of DT for RI due to the aforementioned lack of integration in literature.

4.2.2. Interviewing key stakeholders to assess the organizational context

With the intent of providing the reader with contextual information regarding the setting in which my project takes place, it is important to first conduct an assessment of the existing organization in which the team individuals develop their current incremental innovation activities. In order to do so, a combination of publicly available materials are analyzed together with a set of interviews focused on previous experiences of employees with different responsibilities in the innovation process. The goal of this initial assessment is also to reveal those practices and mindsets that may fit or clash with DT, and using such information to understand the dynamics that I would need to facilitate within the novice multidisciplinary team.

5. Understanding the organizational context

The company –P&G–, and the BU in which this project takes place –Baby Care–, have certain characteristics that are very relevant to my master thesis and derive from the nature of their business, organization size, structure and culture. These are elements that condition the type of dynamics that can be encountered regarding the adoption of DT for RI by a novice multidisciplinary team, and therefore limit the generalization of the results to similar contexts.

In this chapter I will first analyze the nature of the P&G business and its relation to RI, as well as the existing efforts to drive DT within the organization. This will be followed by an in-depth analysis of how innovation is currently done in the particular BU of Baby Care based on a set of interviews. This analysis will put a special focus on identifying those elements that I originally thought could pose challenges for the adoption of DT as described in Section 2.2. Finally, I will offer an overview of the original plan that I put together for the project based on this initial assessment. This chapter should help the reader understand the setting in which this project took place and that originated the learnings on DT enablers explained in the next chapter.

5.1.P&G as a large marketing-driven FMCG industrial organization

P&G is a large multinational company that owns some of the biggest FMCG brands in the world (see Introduction). A simplified version of P&G's business model would be: *take an existing product category, iteratively understand what people are (not) happy about, continuously improve the product performance, brand it very well, optimize manufacturing costs and take the benefits of massive scaling.*

As a large incumbent firm, most of its resources and practices are organized for *exploiting* the existing business, not for *exploring* and developing new ones from scratch (Christensen, 1997). If we would analyze it through a Product Life Cycle (Figure 2), P&G's core business model is not focused on creating new product categories, but rather making existing ones grow to mass adoption and prevent their decline through (1) heavily-advertised products (2) with superior performance. The first element is ensured by the powerful *Marketing* organizations who manage all the brand strategic choices regarding product innovation and commercialization within a given BU. The second element comes from the *R&D* organizations, a community composed of scientists and engineers who focus their efforts on improving the current offering by a combination of consumer research and highly specialized technical work. A more detailed explanation of the company structure and the responsibilities and composition of both functions –Marketing and R&D– can be found in Appendix 1.

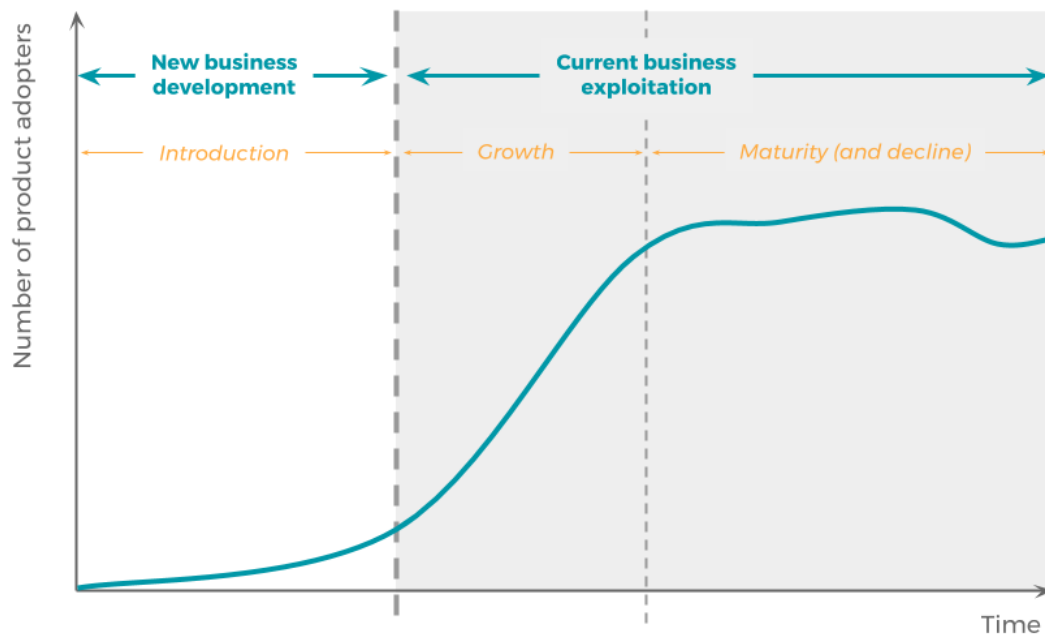


Figure 2- Product Life Cycle: the difference between exploration and exploitation

5.1.1. Ambidexterity in P&G

In addition to sustaining the current business, the organization's leadership is aware of the need to periodically renew its business through RI initiatives (see Chapter 1) to prevent disruption by new entrants (Christensen, 1997). The company can do this in different ways –e.g.: by acquiring *start-ups*–, one of them being corporate entrepreneurship. When the company chooses to do the latter, the practices, mindsets, metrics and organizational structure required for running such new business development initiatives can clash with those of the current business (see Section 3.1.1). To solve this, the organization needs to become ambidextrous (see Section 3.2.1).

P&G has made significant efforts to become an ambidextrous organization in recent years. As a result, there are some remarkable success stories in which the company created complete new product categories like Febreze and Swiffer (B. Brown & Anthony, 2011). The approach in P&G has been to foster the creation of small intrapreneurship teams that can work independently as a venture capital. Sometimes, these innovation teams work under a specific BU umbrella but with a particular setting –like our project–. In other cases, when there is not a strong strategic fit with any of the existing BU models for the new offering, they are run through independent structures –like P&G Ventures or FutureWorks–.

5.2.P&G and its efforts for top-down implementation of DT

In parallel to the development of its ambidextrous capabilities for RI, the company has often been cited as an example of successful implementation of DT in a large industrial organization (e.g.: Rae, 2008; Rosenberg Sr. et al., 2015). The process of implementing DT followed from a senior leadership mandate: in 2001 the former CEO, A. G. Lafley, declared that “we will not win on technology alone, [...] we need to build design into the DNA of P&G” (Rosenberg Sr. et al., 2015, p. 181). To lead this transformation, which aimed at changing the corporate culture together with the mindsets and practices of employees working on innovation, he appointed a VP for Design Innovation and Strategy. In collaboration with leading DT experts – from Stanford d.school, IDEO, Rotman School of Management and Illinois Institute of Technology–, a series of experiential workshops were created for exposing a wide range of people in the organization to the new approach (Kotchka, 2008). In order to further spread awareness for DT and support the BUs in their implementation, two initiatives were set up: (1) a voluntary network of DT facilitators, which focused on organizing workshops to solve wicked problems across the organization, and (2) the Clay Street Project, which focused on team development and capability building through a 12-week program using DT among other approaches. At the time of executing my project, the first initiative has almost disappeared and the second one remains localized in the US.

Carlgren, Rauth, et al. (2016) give us some more perspective on how P&G currently uses DT, not necessarily in a homogeneous fashion across different BUs: “DT is not seen as a prescriptive process, rather the emphasis is on a number of principles: *empathy, from defining to framing, from validation to learning through prototyping, from ideas to stories and from knowing to collective curiosity*. Processes as well as the application of techniques are seen as project dependent. [...] Within the company DT is utilized in three ways. First, as an element in a human-centered approach, which supports teams over many months to improve their innovation capabilities. Second, as a facilitated workshop format aimed at supporting teams in idea generation, team alignment and learning, supported by a volunteer network of facilitators. Third, as in some divisions where continuous prototyping and testing have been integrated into everyday practice. All three approaches have been applied in numerous areas including strategy, business models, products, services, processes and organizational structure. The company’s objective is to make DT daily practice among employees” (Carlgren, Rauth, et al., 2016, p. 45).

This objective shows how DT has been dissected into its different components (see Section 2.2) and appropriated for a wider range of applications than just RI, or even incremental product development. As a result, the term DT is loaded with different meanings inside the organization, a phenomenon that mimics the academic use of the term (see Section 2.1).

5.3. Assessment of innovation practices at the Baby Care BU

Prior to starting my team project, and given that the P&G organization as a whole was not new to RI and DT, I wanted to deepen my understanding of the specific Baby Care BU context. In particular, I wanted to evaluate the state of the art regarding ambidexterity within the Baby Care BU, as well the perception and use of the DT approach among those charged with innovation. To do so, I decided to interview some key stakeholders about their past experiences and perceptions.

The goal of the interviews was double. First, for me as a DT facilitator to assess the kind of training and coaching that would be needed for the novice team on DT methodologies. And second, to get a first impression on the type of organizational challenges that could appear ahead and the changes that would be required for better supporting DT for RI.

5.3.1. Research topics for the interviews

An interview guide (see Appendix 2) was generated around four key topics:

1. Organizational support for RI: the type of innovation projects and their origins.
2. The methods and mindsets for tackling innovation and their relation to DT –and RI.
3. The type of cross-functional interactions between Marketing and R&D functions.
4. The perception of DT.

5.3.2. Participants in the interviews

Eleven Baby Care employees working on innovation, specifically in *front end innovation* (hereafter FEI; see Appendix 1), were interviewed (average duration of the interview = 40 minutes; max=60'; min=30').

The selection was done through my project sponsors' network and intended to achieve a good representation of the perspectives from different FEI stakeholders that could potentially be involved in the radical innovation project. This included a mix between various levels of managers (n=5) as well as non-managers (n=6). Also, the participants belonged to a wide range of departments involved in Baby Care FEI: *product technologists* (n=5), *product researchers* (n=3), *open innovation manager* (n=1), *designer* (n=1) and *marketer* (n=1). They were mainly from the R&D function (n=10) since Marketing (n=1) is not usually involved in upstream FEI projects. Their practical experience with the company ranged between 3 and 20 years, with an average of 12 years. Regarding educational backgrounds, all the R&D employees came from technical degrees –chemical engineering (n=4), electronical engineering (n=2), mechanical engineering (n=1), civil engineering (n=1), industrial design engineering (n=1), physics (n=1)–, while the Marketing interviewee had a business management background. A list of the participants can be found in Appendix 4.

5.3.3. Interview research method

Given that the goal was learning about the past experiences and perceptions of individuals, a qualitative semi-structured interview method was used (see also: Carlgren, Elmquist, et al., 2016). This explorative method is particularly well suited for creating portraits of complicated processes –like innovation practices in a large organization– by combining accounts from different standpoints (Rubin & Rubin, 2005). The variety of participants (see Section 5.3.2) helped in reducing the bias associated to partial views between respondents (Seidman, 2006).

The interview guide (see Appendix 2), which was thematically structured around the different research topics (see Section 5.3.1), used questions that grounded the interviewees' responses into concrete recent experiences and personal reflections, rather than into abstract generalizations (Patton, 2002; Robson, 2011). This semi-structured open guide provided a tool for probing and redirecting the conversation into specific subtopics (Robson, 2011), and it also helped in keeping consistency between the interviewees' responses for later comparison and analysis (Rubin & Rubin, 2005).

The questions of the guide were single and open-ended (Robson, 2011) and reviewed by the master thesis supervisors to ensure the neutrality (Patton, 2002) and clarity in the flow and wording of the questions (Robson, 2011). After the corresponding adaptations, a pilot was conducted with the first participant, helping me in understanding which questions were either not fully intelligible, disrupted the flow or brought redundancies in the responses. After a second iteration of adaptations, the remaining interviews were conducted by me, tape-recorded and transcribed no later than a week after execution.

The transcripts were analyzed through thematic coding, a method characterized for its flexibility and efficiency as compared to other analysis methods like grounded theory (Braun & Clarke, 2006). The initial manual transcription of all the interviews helped me in getting familiarized with the data. Then, I conducted a first round of coding to identify and label those excerpts that were relevant to the original research topics. This was followed by a more focused coding based on the emerging themes that were either consistent or incongruous across interviews. This resulted in a set of themes and subthemes along which these coded excerpts were iteratively clustered using specific color codes for each of the interviewees. Finally, the different themes and excerpts were organized into a structured narrative, which I present in the next section.

It is important to mention that, although the analysis was performed individually by myself, the results of the analysis were reviewed by the company sponsors in an intent to reduce the subjective bias that could have been introduced in the analysis process.

5.3.4. Learnings from the interviews

In this section, I present the results from the analysis, including interviewees' verbatims. These learnings are, necessarily, an interpretation of reality based on a limited amount of conversations (see Section 5.3.2). Because of that, the reader should restrain from generalizing these views to all employees within the Baby Care organization of P&G.

Topic 1: the drivers of innovation projects and the organizational support for RI

Learning 1: The current innovation practice is organized around technologies rather than consumer needs, which seems to have led to incremental innovation with limited added value

There seemed to be an agreement on the fact that most of the projects in the last years have been very technology-driven due to the current structure of the FEI department around *technology platforms* –e.g.: material properties like absorbency for hygiene products–. It was related how: “in the current organization, there are a lot of technical possibilities looking for a reason to be” since the FEI community had a tendency to “fall in love with their technology and forget about the consumer”. This, in turn, has led to “projects that were labeled internally as disruptive since they were disrupting our business model and our diaper form, but none of which the consumer cares about” since they weren’t addressing “a specific consumer tension”. Because of this, some of these projects have not even seen the light of day because “we don’t move forward unless the benefits of doing so are clear and proven with the consumer: if he [the consumer] doesn’t feel a difference, then we don’t move forward”.

Learning 2: Being technology-driven, looking for solutions without extensive problem research, can be the right approach for RI when the need is well known. However, this is unusual.

This being said, it was also very interesting to come to the realization that there are some projects in which being technology-driven was the right approach: “the consumer need has existed for a long time and we were aware of it, but at some point someone decided to solve this because we thought the technology was ready”. “It was so compelling from consumer side, so the main focus was *how we do it*”. However, as he continues, “most of our projects are not that way”.

Learning 3: The economic recession has shifted focus to incremental short-term innovation.

On top of the technology centeredness, there was a clear short-term focus that “has led our long-term FEI pipeline to be dry”. This was due to the economic recession which made “our former president focus on milking the cow and cost-reduction”. The focus “on things that don’t work and need fixing in markets like China”, has left little room for more upstream innovation. “R&D programs get defined by upper management”, which makes “the business model not to be out for discussion”.

Learning 4: The reward system transfers the risk of RI projects to employee's careers, decreasing the attractiveness of pursuing such opportunities.

The reward system for promotion also disincentives employees from pursuing more transformational projects due to the “high degree of uncertainty on how those will develop”. Therefore, “people prefer focusing on making a nice market number on safe bets like the incremental innovation”. This leaves transformational innovation at the expense of passionate employees: “we kept it alive when people wanted to kill it just for our own passion. On top of it, we had to deliver on other ends. There was not a corporate commitment for this project”. This translated in very long development cycles “we have been working on this for years, we couldn't get the pool! It was not a priority for Baby Care. But sometimes timing is everything”.

Learning 5: Opportunity scouting for RI and its exploitation is somehow unsystematic, mainly technology-driven and left to the personal passion of the individuals

One senior R&D technologist who has recently been recently working on RI explains how opportunity scouting is left mainly to the passion of individuals: “I keep up with new technological opportunities by spending a lot of time in universities in the West Coast but also by staying connected to leaders in my field of work, and reading books that come down the path. I try to expose myself to situations where things are unconnected to see if I can draw a connection. However, this is not common in P&G”.

These concerns regarding the lack of system at the organizational level are shared by a FEI senior manager: “the way in which we find opportunities worries me a lot. Right now it comes from a lot of external connections –a community called Connect and Develop, C&D– but there is no system”. The C&D manager, in turn, confirms these suspicions: “we don't have best practices for that I think. I get exposed to a lot of technologies in fairs and conference which I bring back and share with BUs and *technology platforms*. People don not really jump into it a lot: they look at it, distribute it, but people do not act upon it”. Similarly, a cross-BU technology manager explains a similar kind of activity: “once a month, lead R&D *technologists* from different BUs come together and we feed them with different technologies so they get inspired. We find those technologies by market trend analysis, it is not super standardized procedure, and going to conferences and fairs (like CES)”. Both approaches, can be linked back to the *technology-driven* focus we previously described.

And even when these triggers are more consumer-driven, “the trend analyses provided by R&D, Marketing and Design are overlooked in the system. They are mostly picked up out of personal interest and *seed funds* [an initiative where employees get a small budget and a percentage of their time to experiment with something they are passionate about]”.

Topic 2: the innovation methods and mindsets used for problem finding, idea generation and prototyping

Learning 6: The learning trap (see Section 3.1.1) prevents innovation teams from looking out of the box during problem finding, leading to incremental solutions

One of the well accepted practices among R&D employees was that of “not reinventing the wheel” by leveraging existing knowledge in the organization and outside. While most employees showed an impulse for reframing the original given challenge, there was also an acknowledgement of this reframing being around “what the product already does today” instead of “looking outside of the box into what we could do”. Several employees referred how there was a tendency “to converge too soon” and “jump into specific ideas too quickly”: “we usually have a very specific problem statement, we assemble a group of people and they throw ideas”. It was also very frequently stated that “reframing a problem can lead to big discomfort and frustration, especially when done downstream in the project” because “a very small innovation becomes really big and costly when you are the size of P&G. So at a certain point, you better don’t change your plan and stick to what you have”.

Learning 7: Conducting and analyzing consumer research is reserved to few people in the organization and technologists do not always perceive it as useful for RI

Regarding the consumer research, the organization uses extensive qualitative research methods like in-home visits, interviews, generative research tools or focus groups. However, and as we will further elaborate in the next topic on collaboration, they are reserved to specific functions like *product researchers* and some marketing sub-functions. In fact, it was not uncommon to hear some *technologists* dismissing any consumer research for transformational innovation since “the consumer doesn’t know what he wants, so there is no need of talking to them. Apple thinks in the same way, Steve Jobs knew this”. The employee from the Design function gives us some hint on the reasoning behind this: “for the consumer research, if you are not trained, you usually go to the consumers and ask them directly what they want, but of course they don’t tell you what they want, you need to know when to probe”.

Learning 8: The analysis of the consumer research is done without proper rigor, losing valuable insights in the process

Following the qualitative consumer research, there appears to be a problem in the lack of rigor during the analysis and synthetizing of the learnings based on the description of a PR employee: “after the research, we select the relevant insights individually. It doesn’t feel like there is any methodology behind: you just dive into the recordings and your notes and share what stroke you as interesting with the rest of the team. Since this requires quite a lot of work and time, not a

lot of people are involved. For downstream innovation this is fine, for more upstream innovation, I am not sure”. The Marketing employee shares a thought on the same line: “It would be interesting to have a 2-day workshop to interpret the results of the consumer research”.

Learning 9: Idea generation approaches do not leverage team creativity and associated methodologies, which are sometimes regarded as unnecessary

Regarding ideation during the problem finding phase, most are done on a one-on-one basis. While in some other BUs collective ideation sessions are organized both internally and externally for coming up with new product concepts, in Baby Care R&D “most of these brainstorming sessions in the past relate to cost savings in moments of crisis. Something specific happens, like a crisis on a product launch that didn’t perform as expected, and a meeting is organized to figure out *how can we fix this quickly?*” Despite the fact that there were accounts of frequent breaking of brainstorming rules –e.g.: *postponing judgment, hitchhike on each other’s ideas or quality through quantity* (see e.g.: Ideo, 2011, p. 95)–, the need for a facilitator was sometimes seen as superfluous, and *fun* activities like ice-breakers were considered to be unprofessional. It was a shared belief among most of the interviewees that “creativity techniques like brainstorming are not used to their full potential”.

Learning 10: Prototyping is widely (over)used, but not as much for experimenting with new product concepts due to risk aversion

Finally, regarding prototyping, this seems to be a well-established practice within the Baby Care R&D community, but mainly for scientifically testing hypothesis: “the moment there is risk X, people say *we need to test* instead of talking longer to figure out what is going on and how to tackle it”. However, when it comes to low-fidelity prototyping as a way of experimenting, this doesn’t appear to be a well-established practice: “we try to make the most perfect product, instead of making something that is good enough for the consumer right now”, “prototyping is used for improving features, not for getting out of the box as much as we could as proposed by the *Lean Startup* [(Ries, 2011)]. We don’t use it as a way of finding new needs and opportunities but only for iterating within that box”. Another senior technologist shows his frustration: “We are a very data-driven company and at the same time we are very risk-averse, instead of going out there and getting the data, it is easier for us to hide behind endless meetings. We get caught up in hypothetical discussions: *the consumers will never go for that..., that benefit is not strong enough...* The amount of time we spend in such discussions could be much smaller if we just tried something new, learn and pivot. We say we are risk-takers but we optimize to minimize risk. My big learning from all of that is: *just build it!* Put it in the hand of 5-10 consumers and we can have a much more solid discussion on hunches and hypotheses”. This risk-aversion is patent in the company culture which

is built around success: “people is really weary to make mistakes: fingers get pointed at departments, so everything gets double checked”.

Topic 3: the type of cross-functional interactions between Marketing and R&D functions

Learning 11: Most FEI RI initiatives are kept within reduced R&D teams, without early involvement of Marketing due to their short term focus, which hinders the project scaling

It is not unusual that a RI initiative is originated and kept within a reduced team –one or two people– in R&D. This brings difficulties in creating support within the organization and involving others when the project becomes bigger: “by the time we needed the support of Marketing and other *technologists*, they weren’t up to speed. I have learnt to be much more explicit about my project and share my strategic vision so people can start understanding how this work relates to theirs. But for this I have learnt the importance of crafting communication materials, beyond bullet points slides and spreadsheets that summarize the learnings effectively for newcomers and creates acceptance for all the work that the original team has already done”.

This builds on the idea that “we work too much in silos”. Most R&D people, for instance, never interact with Brand until the products and technology is ready to go-to-market: “it was so upstream that there was no point in involving them so early. They are really focused on short term launch-to-market projects. When the project goes downstream, the best way to involve them is to show them how the technology works through a working prototype in order to create some fuzz and excitement around it. FEI projects are 5 years or so, and if you start creating fuzz too early, they may become too excited for something you can’t deliver. And, on top of that, I would say they don’t want to be involved because there is too much uncertainty still: *come to me when you have something*”.

Learning 12: The lack of early cross-collaboration can lead to costly late adaptations to the new product concepts, so involving Marketing and R&D in FEI is seen as beneficial

Changes to the concept in later stages of development can be very costly (see Learning 6). Due to this, experienced R&D employees explained that “involving other functions like Design or Marketing from early on is really important, it sounds a little bit more overhead but it is better to align them from the beginning”. Another senior R&D concurs: “there is absolutely a benefit of involving Marketing: in the new P&G, Marketing has the money and the final saying. So if I can involve them from early on and get them to learn together in the project, it is easier to create alignment and start thinking of the business model for your product”.

Learning 13: When this integration happens, however, it is not a radical-collaboration for innovation (see Section 2.2), but just for keeping Marketing informed

But even when Marketing wants to get involved, there is not usually a close *radical-collaboration*: “it is not for innovating together, it is just to keep them in the loop”. As one person from Marketing explains: “it is difficult to stay in touch with other functions, you only ask straightforward questions on very specific issues. I think it is something that is missing in the way we work at P&G between Marketing functions and R&D, probably because of lack of physical co-location [the R&D team is located in Germany, while the Marketing one is in Switzerland]”.

Learning 14: The reward system hinders radical-collaboration in favor of functional goals

One of the elements that seems to have a big impact on the this lack of *radical-collaboration* can be found in the tensions introduced by the reward system: “different functions are rewarded for things that are not always 100% compatible: R&D for product performance and innovation, marketing for new product features, manufacturing for reliability, product supply for leveraging supplier partnerships, finance for cost...”. As a consequence, “agendas start appearing and they are all competing when the only agenda should be: what can we do to make the consumer life better?” As one senior R&D manager puts it: “people don’t think of what the best hybrid solution is but what goes best with their department goals”.

Learning 15: the different innovation practices used in the DT process (see Section 2.2), particularly consumer research, are reserved to functional specialists in silos

Another element that makes *radical-collaboration* difficult, besides the reward system, seems to come from the deep specialization within the different functions and a certain level of corporatism. For instance, even within the R&D community, the kind of collaboration needed for DT can be difficult since “consumer research is *an art* reserved to *product researchers*. Not everyone is allowed to have a saying or question the findings”, as acknowledge by a member of this community. So, in the end, the *technologists* within R&D accept this fact and leave any activity within the phases of *Empathize* and *Define* of the DT model (see Section 2.2) to those in *product research*: “it is fine for us [*technologists*] to watch some consumer research, but *product researchers* should conduct it and do the interpretation, otherwise you end up with a push of technology over consumer needs. There are a lot of protocols and procedures that the *product researchers* have put in place for good reasons”, explains a senior *technologist*.

However, this “ownership” of the consumer understanding by the *product researchers* is limited to product related elements. Any sort of consumer research on packaging, communication strategy or market launch are “owned” by Marketing. And although both types of work are being labeled as consumer research, the way Marketing conducts consumer research through agencies is

fundamentally different from the hands-on research performed by R&D *product researchers*. This brings a difference in skill-sets, but also a language barrier due to differences in thought worlds (see Griffin & Hauser, 1996).

Topic 4: the perception of DT

Learning 16: Design is used for product aesthetics, rather than as an innovation approach, and is perceived with resentment by some in the R&D community

In general, the work of the Design function is still seen as aesthetics driven in the Baby Care FEI community. The new intended role of Design as those driving the innovation process (see Section 5.2) has created certain resentment among some in R&D: “everyone [in R&D] thinks they [the designers] are just focused on making flowers for the diaper back sheet, so they feel bad, they want to do more, so now they are trying to claim overall ownership of the innovation process to become more relevant. This has failed. They tried pushing it and we were like: *you haven’t delivered anything, Why are you gonna take over now? Go back and draw your flowers*. To some extent they are not a full member: it’s ok if they are there during the innovation process, but there is no need. Some of them pissed off people in the R&D organization and some people don’t want to work with them anymore”.

This feeling is also present in some other BUs’ R&D. A senior R&D employee explains us why: “Design in P&G was introduced as aesthetics. That was how they chose to bring industrial design into the organization. They built it as a separate discipline. And when they launched it, they denigrated people who were already here. There were some famous events in which the designers made R&D employees wear lab coats and goggles. I was invited and I was like: *no f*** way! F*** you! Is that who you think I am? I am definitely not that and I am not gonna propagate that*. We started in conflict from the beginning. But Design gets underutilized when only used for aesthetics. Also, at some point, people were like *let’s throw everything at Design*: well, no, formulation and advanced physics and chemistry is not going to be in their way of working”.

Learning 17: The meanings of the term DT vary greatly between P&G employees

Regarding *Design Thinking* as a term, there was a whole range of perceptions across the Design Ladder (see Dansk Design Center, 2001). These ranged from several interviewees literally saying that it was a *buzzword* to them, up to one employee who considered it a solution for almost any challenge. Most of the interviewees, however, were either on the aesthetics perception of DT as mentioned before, or seeing it as a lean innovation approach for *fuzzy* challenges. In general, there was no common understanding of what DT was, but rather a collection of elements were mentioned: collaboration, cost-efficiency, consumer thinking, co-creation, art, *what if*...

Learning 18: DT-related trainings and creativity workshops are not always perceived as useful, particularly by those attendants whose work is not in RI

Among the eleven interviewees, only one had attended the corporate DT workshops, in the context of a facilitated creative problem solving session. He refers how: “they were completely useless, because we were all P&G employees that had expertise in that specific area, so everyone converged into the same thought, there was no outside stimulus”.

5.3.5. Implications from the Baby Care context assessment

These conversations helped me in identifying some potential difficulties that could appear during my DT project and their underlying reasons. The following table (Table 4) summarizes these potential risks, organized around key issues, and provides the type of preventive action that was envisioned to minimize them. As explained in Section 4.2.1, the assessment of the potential risks and the generation of these preventive actions was the result of applying the best available knowledge among the company sponsors and myself a few days before starting our team project. This included my previous experience as a designer and creative facilitator at the university, together with some best practices described in DT literature (see e.g.: Luchs et al., 2015), as well as the organizational management knowledge of the company sponsors at that time. Therefore, this list should not be considered the result of extensively applying the learnings from the literature review presented in Chapter 3, but rather a set of facilitation guidelines for myself and the team, as adopters of DT in a corporate setting who were still unaware of many considerations. The project proved that reality was more complex than we first thought, as I will explain in the following chapter, and many of these actions could not even be executed due to the existence of other barriers.

Table 4- Potential risks and preventive actions from the organizational assessment

#	Potential Risk	Preventive action
1. Lack of organizational supporting structures		
1.1	The existent short-term incremental processes may not fit with the explorative approach required for more fuzzy transformational long-term challenges. Learning(s): 1-15	Get senior management to support the initiative and ring-fence it from the rest of the organization, encouraging employees to take this as an experiment outside of the organization's usual way of working. Source(s): (Rosenberg Sr. et al., 2015; Wilner, 2015) <i>We were partially able to do this because we had some senior management who believed in the need for RI and in the value of DT, and set up an independent organizational structure.</i>
1.2	The uncertainty in the project could lead to limited engagement due to the incentive system. Learning(s): 4	

2. Lack of integration of multiple functions in the team for radical collaboration		
2.1	<p>Lack of integration with Marketing can lead to problems in downstream development and lack of organizational interest. However, Marketing co-workers may not fully engage in the innovation process but simply audit it.</p> <p>Learning(s): 12, 13</p>	<p>Get at least one person from Marketing into the multidisciplinary team and leverage their business expertise through specific tasks such as conducting competitive market analysis. Use them also as ambassadors for later downstream development within the Marketing function.</p> <p><i>We managed to secure at least two Marketing employees who would be involved in the DT project from the beginning.</i></p>
2.2	<p>Employees may become defensive and claim expertise and ownership over specific activities of the DT process, making radical collaboration difficult.</p> <p>Learning(s): 7, 15</p>	<p>Make it very clear that this is a new way of working in which we want to learn together and act together as a team. Leverage functional experts to coach and lead others: as the project advances and different skills are needed –e.g.: consumer research, market research, ideation, prototyping, testing...– organize small workshops led by the different team members.</p> <p>Source(s): (Beckman & Barry, 2007)</p> <p><i>The goal was to create a sort of shared leadership that would be transferred to those with the most expertise at any given step of the DT process. I had a strong feeling, based on previous DT experiences, that the team should stay together throughout the different activities of the DT process in order to ensure common understanding and enable radical collaboration in the team</i></p>
2.3	<p>There could be misalignment in expectations and goals between team members from different functions due to the reward system.</p> <p>Learning(s): 14</p>	<p>Spend some time at the beginning to set a clear strong goal for the team. Engage into a team conversation to define what success is for the team as a whole, as well as the individuals.</p> <p><i>This step was planned as part of the kick-off session (see risk 3.1).</i></p>
2.4	<p>There could be certain amount of membership turnover, but it may be difficult to onboard new members and take them through the past learnings.</p> <p>Learning(s): 11</p>	<p>Use visual thinking and other synthesizing tools like customer journeys or empathy maps, to capture the learnings after the convergence phases.</p> <p>Source(s): (Calabretta & Gemser, 2015; Seidel & Fixson, 2016)</p> <p><i>In order to create a shared understanding among the team members as well as onboarding new ones, I wanted to get the team to get together to summarize the project learnings through visualization techniques.</i></p>
3. Lack of minimum shared understanding for what DT is		
3.1	<p>There could be a misunderstanding of what DT is.</p> <p>Learning(s): 16, 17</p>	<p>Use an initial DT boot camp to set a common ground for what DT is and the kind of tools and collaboration that is used.</p> <p>Source(s): (Ideo, 2011; Wilner, 2015)</p> <p><i>Following DT best practices, I wanted to organize a kick-off multiday workshop to get the team familiarized with each other as well as with the DT approach and mindsets.</i></p>

4. Lack of thorough problem framing		
4.1	There could be a tendency to push the technological opportunity without a compelling user benefit. Learning(s): 1, 2, 7	Make an emphasis on being solution-agnostic at the beginning and instead starting with a thorough exploration of the challenge and the user. Use consumer research methods to build empathy and ground problems statements on specific identified insights. Source(s): (Luchs, 2016)
4.2	Doing ideation straight away without proper problem framing could lead to incremental ideas, particularly by those in the Marketing function due to short-term focus. Learning(s): 6, 7, 8, 11	<i>The company sponsors and I planned to dedicate 3 weeks to consumer research prior to going into solution finding.</i>
4.3	Non <i>product researchers</i> may not be at ease with conducting consumer research or be able to see how that links in the overall DT process. There could even be a dismissal of consumer research since “the consumer doesn’t know what he wants”. Learning(s): 7, 15	Leverage <i>product researchers’</i> expertise to coach and lead others through the consumer research phases (see risk 2.2) so that everyone interacts with consumers to some extent. <i>After the DT boot camp (see risk 3.1), everyone in the team would have experienced the importance of building empathy and probably be open to give it a try in the project. This, in turn, would help in creating a shared understanding (see risk 2.2).</i>
4.4	There could be a tendency to analyze the consumer research in a very shallow and biased way. Learning(s): 8	Use proper tools –e.g.: peer reviewed interview coding– for systematically going through the gathered data and derive insights reducing individual bias. <i>Within the framework of “not business as usual” type of project (see risk 1.1), I was expecting participants to be open to being guided by the team facilitator, myself, through the use of the different methods.</i>
5. Lack of enough divergence and experimentation during solution finding		
5.1	During brainstorming for idea generation, there may appear some destructive attitudes that need to be managed. Learning(s): 9	Have a creative facilitator to manage the sessions so that the team differentiates between convergence and divergence phases, and all participants feel safe to share their own ideas without being judged. Source(s): (Osterwalder, Pigneur, Bernarda, & Smith, 2014; Tassoul, 2009) <i>I was planning on using my experience with creative facilitation in order to manage the idea generation sessions.</i>
5.2	There could be a tendency to endlessly discuss hypothesis due to risk aversion, rather than take further actions. Learning(s): 10	Encourage an experimentation mode through the generation of learning plans when spotting vicious circles in which additional consumer input is needed. Source(s): (Ideo, 2011; Ries, 2011)

5.3	<p>There could be a need to reinforce the idea of building rough low-fidelity prototypes and use visual thinking.</p> <p>Learning(s): 15</p>	<p><i>The kick-off boot camp (see risk 3.1) was intended to create this predisposition to learn through prototyping and testing, which would be complemented with small workshops on visualization and prototyping when the skills would be more needed in the solution finding phase, after the first value propositions would be generated (see risk 5.1).</i></p>
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5.4. Discussion based on the organizational context assessment

In this chapter we described how P&G, despite being a large corporation which could face many of the barriers for RI (see Section 3.1.1), has already taken some steps towards becoming an ambidextrous organization (see Section 5.1.1), one of the key organizational enablers for corporate venturing (see Section 3.2.1). These efforts to change the organizational structure have been accompanied by an intent to drive a change at the individual level as well. This has been done, among other things, through a large scale implementation of DT (see Section 5.2) in order to foster the adoption of mindsets and skills for RI (see Section 3.2.1).

However, this change has not been homogeneous across different BUs. From our contextual assessment (see Section 5.3.4), there appears to have been a very limited amount of RI initiatives happening in the Baby Care BU in recent times, in favor of more short-term technology-driven incremental innovation.

The focus on incremental innovation seems to come hand in hand with the lack of expertise in certain activities central to DT and RI –e.g.: consumer research, problem framing, creativity techniques for idea generation and prototyping. The interviews showed that there is awareness among some employees regarding the lack of individual skillset and mindsets, as well as organizational supporting structures to foster RI.

Besides the lack of expertise at the individual level, the existing cross-functional collaboration dynamics at the team level can also be linked to the mainstream *exploitation* approach that has dominated the FEI efforts in the last years. In favor of efficiency, innovation gets compartmentalized into highly specialized functions in a linear *stage-gate* model (see Lenfle & Loch, 2010). As such, Marketing is only being heavily involved in the NPD process when the product has already been designed and gets transferred to them for deciding the market launch strategy. As part of this linear compartmentalization of the innovation process, there seems to be a certain degree of exclusive *ownership* over specific activities in the innovation process, which are reserved to particular functions. This could pose a problem towards achieving the tight cross-functional collaboration within a multidisciplinary team as advocated for by the some DT experts (see Section 2.2).

This lack of (i) mindsets and skills for RI at the individual level, (ii) tight cross-functional collaboration routines at the team level and (iii) adequate supporting structures at the organizational level, made me suspect that there could be certain challenges in the application of DT with a (i) novice (ii) multidisciplinary team (iii) in a large industrial organization.

5.4.1. Setting up a project plan based on existing DT best practices

To reduce such risks, a set of actions were envisioned (see Section 5.3.5) and organized within the frame of a project plan (see Appendix 3 for a detailed explanation) which mimics similar corporate DT adoption initiatives (see e.g.: Wilner, 2015).

As part of such plan, the company sponsors and I would start by choosing a RI challenge and getting senior leadership to support the initiative and endorse the DT approach so that the necessary resources would be protected for the project.

Then, we would select our team members from different functions, including different departments of R&D and Marketing, based on the innovation topic. In order to build common understanding and achieve a tight hands-on collaboration as advocated for in DT literature (see Section 2.2), everyone in the team would take part in all the phases of the project, including consumer research, idea generation, prototyping, etc. This had a dual purpose of ensuring a multidisciplinary composition that would enrich the project outcome, as well as create project ambassadors in different functions to facilitate the transition to market launch. This approach would require that every team member would secure at least one or two days per week for this initiative.

The project would be kicked-off through a multiday *boot camp* on DT, organized by me, that would announce the end of *business as usual* and help the team members getting familiarized with the new approach, as recommended by existing literature (see e.g.: Ideo, 2011; Wilner, 2015). The kick-off program would also be an attempt to set a common goal, build trust among the team members and ensure consensus for the next steps of the project, all of which are key enablers for RI (see Section 3.2).

After the project basis would have been established, the DT project itself would begin. As advocated by the DT approach (see Section 2.2), a first phase of problem framing, which would include several weeks of consumer research and analysis, would lead the team to identify and select consumer needs. From these, the team would move into a solution finding phase with iterative cycles of idea generation, prototyping and testing.

6. The difficulties in executing the DT project

In the execution of the project plan (see Section 5.4.1), the team in general, and me as a DT facilitator in particular, encountered many critical challenges that I had not foreseen through my initial literature review on DT implementation (see Section 5.3.5) or experienced in DT projects outside of this corporate environment. These forced me and the company sponsors to adapt the plan and team structure drastically and painfully to keep the project alive, challenging some of the assumptions we had made.

In this chapter, I will use the experience from my project to offer an overview of the barriers we encountered, the potential reasons behind them, the way in which we tackled them and the consequences of such actions.

Given the broad variety of interconnected challenges, I start by offering an overview of the project setup, as well as key development milestones. Next, the most important challenges are abstracted and organized into a causal model. Finally, I describe the two elements that I believe are the origin of such challenges, namely: (1) how the team was assembled and trained and (2) how the team autonomy and resources were protected.

6.1. The project setup

In this section, detailed information is provided on how the project team was set up prior to starting the DT project itself.

6.1.1. Project goal

The project goal was to explore the type of value propositions that Pampers could offer in a particular field of baby care (details are left out for confidentiality reasons) leveraging the Internet of Things opportunity. Within the scope of the project, the team needed to identify a broad variety of relevant consumer problems within the given baby care field and generate a set of commercially viable and technically feasible solution concepts to solve them. Ideally, a first round of prototypes for concept validation with consumers would be crafted by the end of the project. A selection of such design concepts would be developed in later stages from a commercial and technology standpoints by the Marketing and R&D functions respectively.

6.1.2. Team composition

As envisioned in the project planning (see Section 5.4.1), a multidisciplinary team including technical and commercial experts (R&D and Marketing) was assembled. Given that the final solutions would probably fall within the realm of wearables and apps, the original intent was to bring together practitioners that would cover expertise in such realm as presented in Table 5.

Table 5- Intended team composition

ROLE	EXPERTISE
1. THE TECHNOLOGIST	Electronic devices; Data analytics; Prototyping
2. THE DESIGNER	Digital/App design; Sketching; User Interfaces (UI)
3. THE CONSUMER RESEARCHER	Qualitative and quantitative consumer research; UX
4. THE BUSINESS STRATEGIST	Market research; Business Models; Go-to-market
5. THE DT FACILITATOR	DT approach; DT methods; Creative facilitation

The final team composition was the result of searching for professionals from the Baby Care BU's network within the constraints of the project: they needed to be available to dedicate one or two days per week for the coming four months. Table 6 offers an overview of the team composition.

Table 6- Initial team composition

Role	Function	Background	Time @PG	Location
Technologist	R&D	Materials expert with passion for Big Data	+10 years	Germany
Technologist	R&D	Electronics expert for smart products	+10 years	Germany
Consumer researcher	R&D	Company sponsor for the IoT initiative	+10 years	Germany
Business strat.	Marketing	Communication strategy for Pampers	+10 years	Switzerland
Business strat.	Marketing	Brand management for e-commerce	+5 years	Switzerland
Business strat.	Marketing	Consumer & Market understanding	+5 years	Switzerland
<i>DT facilitator</i>	<i>R&D</i>	<i>N/A</i>	<i><1 year</i>	<i>Germany</i>

Several singularities need to be highlighted from this team:

- **Lack of designer:** while the Baby Care BU has a Design function, the people with the required expertise were located in the United States without the possibility to move to Europe. The company sponsors and I determined that we would use freelancers when UI design or sketching would be required.
- **Lack of co-location:** the Marketing and R&D functions of the Baby Care BU are in Geneva (Switzerland) and Frankfurt (Germany) respectively. To mitigate this barrier, the team would initially come together in Germany for the training and the first wave of consumer research planning. This *kick-off* would be held at a particular co-creation space assembled for the occasion. Later, the team would conduct the market/consumer research in smaller sub-teams and come physically together every few weeks to share the results and decide the next steps. In addition, a plenary online progress-sharing meeting would be held every week. As a DT facilitator, I would be available to move to Switzerland at given times to aid the Marketing team while using the DT methods.
- **A group of strangers:** some of the R&D practitioners knew each other and had worked together before. And so did some of the Marketing ones. However, and overall, the team members were strangers to each other, without clear collaboration precedents between the R&D and Marketing functions. As a consequence, it was unclear what each member was really experienced with.
- **Multiple business strategists:** due to the lack of co-location and the original intent of conducting the consumer research in pairs, I deemed wise to onboard two Marketing professionals that would work together as a sub-team. A third Marketing professional was pushed into the team by request of senior management. It is important to mention that these professionals did not have experience with new business development and did most of their work through specialized agencies.
- **Part-time dedication:** except for the company sponsor (consumer researcher) and me (DT facilitator), no one was full-time staffed for this project. Rather, for most of the team members this represented a 20% of their workload, which would be equivalent to one day per week. This was not an intended condition, but rather an organizational constrain of resource allocation for the project. To compensate for this, the company sponsor and I would do most of the heavy lifting regarding amount of consumer research and organization of activities.
- **DT facilitator officially staffed by the R&D department as an intern:** since the initiative was the responsibility of R&D, I was staffed by sponsors from the R&D function. As a consequence, I had the endorsement from the R&D function's

management, but not necessarily from the Marketing function. Within that setting, I was officially a master thesis intern within R&D, not an external consultant.

6.1.3. Team building and DT training

In order to get the team members to know each other as well as getting familiarized with the DT approach, I organized a DT *boot camp* as proposed by some authors (Ideo, 2011; Wilner, 2015). This *boot camp* was preceded by an evening of team bonding activities.

Team bonding

The team bonding evening was intended for participants to get to know each other in a non-business context while doing something *different*. For the occasion, I chose an escape room, where a team needs to work collaboratively to escape a locked room in less than an hour by solving riddles. Later, the team went for dinner together.

It was interesting to see that, while most participants embraced the experience positively, at least one of the participants felt pushed out of his/her comfort zone too much, up to the point of feeling dissatisfaction with the activities and questioning their necessity. Also, one of the team members could not join due to other pressing matters and came directly to the DT *boot camp* the day after.

DT boot camp

DT *boot camps* are learning experiences in which novice DT adopters develop a feeling for the DT approach and basic principles by solving a particular design challenge using DT methods (Wilner, 2015). My objective was therefore not for the team members to become skillful in design methods, but for them to understand what the process looked like from end-to-end (minimizing risk 3.1 in Table 4). Ideally, this should help them being open towards exploring the consumer problems prior to jumping into solution generation (minimizing risks 4.1, 4.2 and 4.4 in Table 4), and doing so in a collaborative fashion (minimizing risk 2.2 in Table 4). It was also intended as a way of getting participants comfortable with rough prototype building (minimizing risks 5.2 and 5.3 in Table 4) for hypotheses testing.

While previous projects suggest that several days are needed to really activate the learning mode (see e.g.: Wilner, 2015), it was determined together with the company sponsors that a training taking longer than one full day would be seen as excessive and create too many tensions in the organization. The *boot camp* was consequently developed by adapting existing *boot camps* (see e.g.: IDEO & Acumen, 2016; Wilner, 2015) within a one-day program.

The day started by a short endorsement provided by a senior R&D manager (to minimize risks 1.1 and 1.2 in Table 4) and was followed by a short introduction to the DT approach. The

team was introduced to the challenge (improving the experience at the office canteen) and guided through the process. During the morning, the team was introduced to ethnographic research and given the chance to experience it by conducting field research with consumers (minimizing risk 4.3 in Table 4). In order to mimic what would happen in the DT project, this exercise was done in pairs. Later, the three pairs came together to make sense of their learnings. From this point, the whole team moved into problem framing, followed by ideation, selection of ideas and further development. A very detailed explanation of the boot camp, including the session program, can be found in Appendix 5.

Despite the regular challenges of facilitating a creative session (see Appendix 5), the day run smoothly and most of the participants seemed to engage in the activities with the adequate guidance, collaborating with each other. However, a critical barrier for the DT project appeared: the Marketing participants manifested their discomfort of working through a facilitated approach during the DT project, and their interest in determining what process to follow.

Accordingly, the company sponsor and I decided to take a more democratic leadership style that would keep the team engaged, something less prescriptive than the original approach (see Appendix 3). Consequently, I as a DT facilitator moved to a background position in which I would counsel the R&D company sponsor and influence the project direction through her, making the facilitation less explicit. Nonetheless, I would still be an active team member, coaching the team in planning and executing design methods once the direction had been established through consensus.

6.2. The development of the project

The first thing to mention is that, while with significant adaptations to the original plan, we managed to go through the DT process (see Section 2.2) up to the point of generating a variety of design concepts grounded in consumer research, as intended (see Section 6.1.1). However, the project developed significantly more slowly than planned and with an evolving team structure.

Before the team had even conducted the field research to generate its first *problem statements* (see Appendix 3), it disintegrated from the seven original members into just a core team of two: the company sponsor and myself. A set of causes, including *the lack of trust for the DT approach*, *the lack of time*, *the lack of team management mechanisms* or *the lack of co-location* led to a dysfunctional team with unmanageable tensions in less than a month. To allow the project to move forward, we decided to centralize the project ownership, so that we could execute the consumer research for problem finding. Once a broad range of problems were framed by the new reduced team, we started a phase of solution finding through consecutive ideation sessions in which we involved different participants.

It is important to mention, however, that as a consequence of such barriers and adaptations, we failed to execute important steps of the original plan (see Appendix 3), such as *qualitative research within the geographical target market*, *quantitative validation*, *prototyping* or *business model generation*. These, in turn, affected the quality and maturity of the generated outcomes.

6.2.1. Phase 1: Trying to get the original team to move forward together

For the first working session, I had originally planned that the team would organize the consumer research based on the state-of-the-art research that I had asked them to do prior to the *boot camp*. This would be a full day for defining the research topics, deciding the research methods and preparing the research materials (e.g.: interview guides).

Shortly after starting the working session, it became apparent that some team members had a strong bias towards jumping into ideation, considering consumer research as an unnecessary and expensive step (see risk 4.1 and 4.2 in Table 4). This was in part motivated by the fact that there was pre-existing research in a similar field within the organization, but also by the fact that for the Marketing employees, used to working with external agencies, a round of consumer research implied a significant expense, which was not necessarily the case.

In addition, it became clear that there were political struggles over who was the *owner*, and therefore the approver, of the consumer research (see risk 2.2 in Table 4). In the P&G structure, different functions are in charge of the consumer understanding and individuals are rewarded for the outcome of a particular task they *own*, making radical collaboration difficult due to the mixed accountability.

Due to the new democratic approach adopted after the *boot camp*, a compromise was reached in which we would not jump into ideation yet, nor into field research, but postpone the decision until a more thorough literature review would be performed on existing materials. Different responsibilities were assigned for the coming weeks.

Along the following weeks, the online meetings showed that the progress was very slow and the quality of the deliverables was not good. The main reason behind this was the lack of time for the demanding activities: two team members went on holidays for over a week, others got caught up in other more pressing matters and one got re-assigned to different projects.

All these elements, combined with the difficulties in keeping the team cohesion without being co-located, made the company sponsor question the effectiveness of the original approach. In order to move forward, the company sponsor and I decided to regain ownership over the project approach. Within the new setting, and given that the pre-existing research was very limited, the company sponsor and I would conduct the consumer research as intended, without involving the rest of the team. Both the technologists and the business strategists would be potentially involved

in the later solution finding phase, once the problem would have been framed by us, in order to generate technically feasible and commercially viable concepts.

6.2.2. Phase 2: Conducting the problem finding in a reduced team

After re-structuring the team, we believed we had the freedom to move forward as intended, with full-time involvement. However, a new barrier that prevented us from executing the consumer research with target consumers appeared. After a presentation of our progress to senior R&D management, we were told that we had enough problem understanding based on the literature review that we presented, and that we did not require to investigate further before moving into ideation. This did not match our perception.

Consequently, without being able to spend any budget, we were limited to conduct the research among fellow colleagues similar to our target consumer. A set of interviews, transcription, coding and clustering followed, from which a broad range of problem statements, together with associated persona profiles, were generated and evaluated. This was a very time demanding set of activities for the reduced team of two, which limited our ability to move fast or apply other design research methods in parallel.

Despite being very time-demanding, the thorough analysis of the collected data led to a much richer problem framing than the one we had before, something that was appreciated by the company sponsor once the results became apparent. This being said, it was also true that the inability to conduct the research with the target users, nor to validate the insights through quantitative research, led to a potentially limited set of unconfirmed problem statements.

6.2.3. Phase 3: Involving others for solution finding

The final phase of the project was to generate a set of design concepts based on the identified problem statements. In order to do so, different ideation sessions were envisioned: two internal sessions with P&G employees (see Appendix 6) and an external *hackathon* with design students (see Appendix 7).

Despite having the same starting point and similar working process, the internal ideation sessions, generally speaking, led to very technical ideas without a strong value proposition. Behind this, we identified the lack of abilities for creating and visualizing concepts, something that design students are much more experienced with.

In both cases, and although the problem statements were accompanied by synthesizing materials (e.g.: personas and storyboards), onboarding new team members to the previous research proved to be a challenge. Both P&G employees and students took a significant time to understand what had been done before and build empathy for the user. A big part of the problem understanding,

to an extent, remained as tacit knowledge within the team minds. This would advocate for a strong multidisciplinary core-team that stays together throughout the whole DT process, minimizing the need to onboard new members.

Finally, it is important to mention that some of the generated concepts, we later discovered, already existed in the market. In this sense, the lack of a business strategist role (see Table 5-Intended team composition) who would have worked on composing a competitive market overview in parallel with the consumer research, was missed. To compensate for that, however, we commissioned such work to an external market research agency.

Overall, we managed to get to an outcome that pleased the organization. However, many challenges made this a difficult journey with consequences for the quality of the end result.

6.3.A variety of interconnected multi-causal challenges

Most of the challenges I faced were multi-causal and, in turn, the origin of new challenges later in the project. For instance, the *low quality of deliverables* from certain team members can be easily linked to (i) the *lack of skills*, (ii) the *lack of accountability mechanisms* or (iii) the *lack of time due to competing priorities*. And each of these has its own chain of causes. For instance, *the lack of skills* can be linked to (a) the *lack of time for DT training*, (b) the *inability to unlearn* (Baker & Sinkula, 2002) or (c) the *lack of awareness for the need of new knowledge* (Vanhaverbeke et al., 2003), just to mention some of them. As a consequence of the *low quality of deliverables*, new barriers appeared, like (1) *negative team climate* or (2) the *need to re-do the work*, each of them with their own stream of consequences.

The following table (Table 7) captures an overview of such challenges, which span across the three frequently used levels of analysis: organization, team and individual, and derive from the fact that DT is used in a large organization with a multidisciplinary team composed of novice adopters. Most of the challenges in the table are not exclusive to DT, but rather well known problems of executing RI projects in large organizations (see Table 1 in Section 3.1.1). It is important to mention that, while frequently overlooked in the DT literature (see Chapters 3 and 4), these challenges were so critical that they even prevented the deployment of the DT methodology with the original team in the first place.

Table 7- Challenges faced during my project at three levels of analysis

LEVEL OF ANALYSIS	CHALLENGES
Organization	Lack of internal expertise; Inability to hire externally; Lack of co-location between Marketing and R&D; Lack of adequate co-creation spaces; Reluctance to dedicate more than 1 day for DT training; External senior leadership micro-management; Lack of

LEVEL OF ANALYSIS	CHALLENGES
	protection of team integrity; Lack of adequate career reward system; Excess of bureaucracy to conduct DT activities like consumer research or co-creation
Team	Lack of cohesion; Lack of co-location; Difficulties in communication; Negative team climate; Overprotection of functional responsibilities and political battles over activities and results ownership; Inadequate leadership style; Lack of decision making mechanisms; Lack of accountability and evaluation systems; Team turnover; High transactional costs of involving new members; Unsolved tensions due to differences in learning styles; Differences in thought worlds and vocabulary
Individual	Lack of adequate mindsets and skills for DT; Lack of consumer-centeredness; Unwillingness to learn and be guided; Lack of trust for the facilitator; Lack of trust for the DT approach; Unawareness of the need to learn; Low quality of delivered work; Discomfort with non-linearity; Discomfort with fun activities; Lack of commitment; Lack of interest for the challenge; Lack of time due to competing priorities; Fear of project failure

This intricate and complex nature of the challenges appearing during the adoption of DT makes it difficult to study and understand each element in isolation. Instead, and following previous authors (see Section 3.2.1), I believe that using a systems theory approach (Capra, 1996; O'Connor, 2008) is more effective for the ultimate goal of this master thesis, which is providing guidance on how to minimize potential barriers by the use of adequate enablers (see Section 4.1).

6.4.A simplified causal model for corporate adopters of DT

With the goal of offering actionable advice to future adopters of DT on how to execute their projects, it is important to identify the set of elements that had the greatest impact in my project. Upon reflecting on the experience together with the company sponsors, I was able to isolate the elements that we believe were critical. A causal model is presented in Figure 3.

Behind most of the faced difficulties in the deployment of the original plan with the original team (see Table 7), there seem to be five main barriers: (1) the lack of trust for the DT approach, (2) the lack of time, (3) the lack of team management mechanisms, (4) the lack of co-location and (5) the lack of team autonomy.

As described in Section 6.2, these barriers led to several undesirable outcomes, such as: a lower quality of intermediate deliverables, the lack of team cohesion, a slow project development, or the lack of integration between commercial, technical and consumer perspectives for the final concepts.

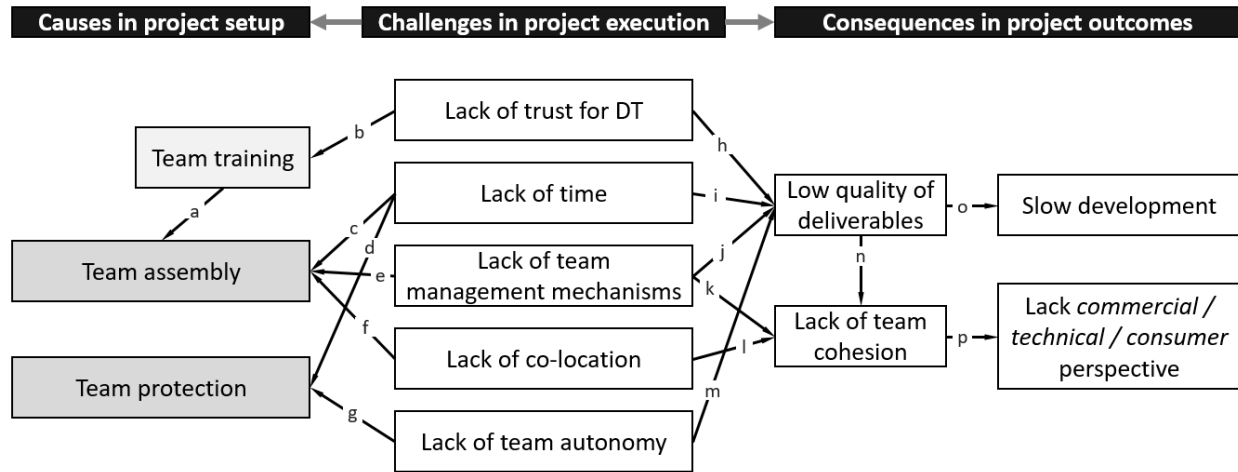


Figure 3- A simplified causal model of barriers in the adoption of DT

6.4.1. Lack of trust for the DT approach

The first element refers to the predisposition to learn and be guided through the DT approach. The different methods of design (e.g.: interviewing, brainstorming, visualization, prototyping...) can be trained and mastered with varying degrees of proficiency (see e.g.: Cross, 2011; Kelley, 2001). When working with novice adopters, by definition, these skills are not usually present and the role of the facilitator should be to help the team members becoming acquainted with them.

However, a pre-requisite for being open towards learning is realizing that there is the need for doing so. Not everyone in the team was convinced of the need to acquire new skills or knowledge to tackle the RI challenge, a well-known barrier for RI (see e.g.: J. S. Brown & Duguid, 2002; Leonard - Barton, 1992; Vanhaverbeke et al., 2003).

In this regard, there were significant differences in predisposition to learn between team members. The company sponsor, who was open towards trusting the DT approach and the facilitator, had tried tackling a similar RI project in the past on her own without a structured approach like the one provided by DT, arriving at very incremental ideas. In her own words: “I knew there must be a better way of doing things than the one I use in my day to day work for non-incremental innovation”. In addition, prior to the project, she had supervised the work of design students on RI over a period of five months, something that helped her getting acquainted with the process and its benefits: “it felt comforting to understand that there is the equivalent of the scientific method for innovation. What the scientific method is to technology, DT is to innovation.

It has been so frustrating for me all these years to think that this is some sort of skill that people were born with: *how do they know what to do next? How do they figure that out?*”.

This was not the case for the rest, who, generally speaking, had not worked directly on really new product design. Some of these team members had a neutral attitude towards the DT approach and were willing to try it despite not feeling comfortable with it (e.g.: the technologists who had manifested their disinterest for conducting consumer research). Some others were directly opposed towards being guided or doing consumer research (see Section 6.2.1).

With the boot camp (see Section 6.1.3) I had tried to get the other team members familiarized with the DT approach so that they would understand its benefits, and consequently, being open towards following the approach. However, a one-day boot camp was not enough to activate the design mindsets with a lasting effect, something that has already been expressed by other authors (see e.g.: Wilner, 2015).

One element that may have aggravated this was the fact that I, the facilitator, was staffed by the R&D function, not the Marketing one, in the position of an intern. This could have diminished the trust of some participants for the approach and the facilitator.

This lack of trust for the DT approach was one of the elements that led to low quality of intermediate results (connection ‘h’ in Figure 3), consequently slowing down the project (connection ‘o’ in Figure 3), due to the need to re-do some work, which led to team tensions (connection ‘n’ in Figure 3).

6.4.2. Lack of time

The fact that learning DT method takes time, and that its activities are time intense and difficult to prioritize in the daily business, are not a new finding (see e.g.: Carlgren, Elmquist, et al., 2016, as described in Section 3.1.2). In the words of the company sponsor: “the methods we have been using for analyzing the consumer research are way much more time consuming than the ones we use in other projects”.

Participants may not be willing or able to invest such time, particularly when there is a lack of trust for the DT approach (see Section 6.4.1), and the benefit of doing so is unclear. This gets reinforced by the fact that some time may be required before clear results become apparent (see Section 6.2.2, also described by Carlgren, Elmquist, et al., 2016). As the company sponsor explains: “I am convinced this is the right way to do it, but I can imagine that this can be difficult for people who are maximizers and get frustrated if they don’t see rapid progress”.

Many of the team members were only able to dedicate one day per week to the project (see Section 6.1.2). However, exploratory processes require slack time, an identified enabler for RI (see

e.g.: Damanpour, 1991; Kanter, 1983). This point is particularly critical due to the iterative nature of the DT approach, in which deviations from the plan can be expected (see Section 2.2). As a consequence of this lack of time, participants take shortcuts that affect the quality of the work. A senior R&D manager confirms this fact: “in our R&D organization people have too many things to do. So, it is very easy for people to rely on their intuitive *Fast Thinking System* [(Kahneman, 2011)] instead of taking the time to build their knowledge through the *Slow Thinking System*”.

A particularly element to mention here is that, in an environment where time is a scarce resource, employees tend to prioritize the work that has the highest impact on their performance evaluation. RI projects, per definition, have a higher risk of failure. As I learnt during the company assessment, this risk gets transferred to the employee’s careers (Learning 4 in Section 5.3.4). Consequently, RI projects tend to be tackled as a lower priority.

In my project, the combination of novel highly time-demanding activities with overloaded agendas of competing priorities led participants to deliver low quality deliverables, without enough depth (connection ‘i’ in Figure 3).

The lack of time, nonetheless, was considered to be a secondary factor by the company sponsors: “it’s not so much about time availability: they find time if they really want to work on something, even if they have to do so in their free time”.

6.4.3. Lack of team management mechanisms

In any team, conflicts due to differences in opinions are likely to appear. When well-managed, this minority dissent can lead to improved innovation outcomes (De Dreu & West, 2001). This is only true, however, when these conflicts are not interpersonal conflicts, but rather minor differences in views on the process and ideas (De Dreu & West, 2001).

Because of this, it has been identified how diversity managed through an appropriate leadership style (Goleman, 2000) that is participative, rather than commanding, is beneficial for innovation projects (Ashmos & Nathan, 2002; Manz et al., 1989; Nemeth, 1986; Nyström, 1979; Paulus, 2000; Tierney et al., 1999). This point is aligned with the kind of radical multidisciplinary collaboration advocated for by the DT approach (see Section 2.2).

However, being open to differences in views does not remove the need to establish clear decision-making mechanisms upfront that will allow the team to settle their differences (O’Connor, 2008). The lack of such decision-making mechanisms became patent in our project when we could not get the whole team to execute the consumer research (see Section 6.2.1). This, in turn, led to a negative team climate (connection ‘k’ in Figure 3). Some DT authors have referred how some of these tensions can be resolved organically, without addressing them directly, in the course of the

activities (see Wilner, 2015). This may only be true, however, when the project coaches or facilitators have the power to establish the course of action.

When working with multidisciplinary teams, like I did, a potential source of conflict is the differences in learning styles. These can be linked to factors like personality type, educational specialization or professional career (Basadur et al., 1986; Beckman & Barry, 2007; Kolb, 1983). Professionals that are more action-oriented are good for getting things done, but may experience some difficulties in more explorative and reflective tasks (diverging and analyzing). In contrast, professionals that are more reflexive may spend too much time diverging and theorizing, rather than converging and moving into action. Well performing innovation teams need to balance both type of behaviors in order to create concepts that have a strong value proposition (Beckman & Barry, 2007). In order to do so, it is required an experienced leader or facilitator that is aware of the mix of learning styles in the team and has the decision-making mechanisms to help the team deciding when to keep diverging and iterating, or rather move to the next phases of the DT process (Beckman & Barry, 2007). This was not the case in my project.

Besides decision-making mechanisms, it is also important for the team to have accountability and reward mechanisms. Particularly when working with novice adopters, who may not be fully aware of what is expected from them in terms of deliverables quality, it is important to set the standards upfront through examples (Shalley & Perry-Smith, 2001). While examples were provided with the tasks as part of the facilitation, we did not agree on how to evaluate the performance of the team members, something that may have contributed to a lower quality of deliverables (connection 'j' in Figure 3).

These internal accountability mechanisms would have been particularly critical in my project since, as explained in Section 6.2.1, the existing corporate evaluation system does not fit the radical collaboration nature of DT. This learning is consistent with previous research (see e.g.: O'Connor, 2008), and gets confirmed by a senior R&D manager: "in P&G I get promoted for how I do against people in my department, not about how the project goes, so we are set into this competitive dynamic, which is not good for a startup mentality". The company sponsor reflects on this point as well: "in DT, accountability gets mixed. We would need to change the assessment process. In these teams, the company's assessment should be measuring the overall team's achievements and combine that with a cross-assessment between team members".

Both accountability and decision-making mechanisms, however, we could have not imposed unto the team members, but rather would have needed to come from senior management as part of the project setting.

6.4.4. Lack of co-location

It is often referred in DT literature the importance of having a physical space where the team can work together: “a project room whose walls can be used to lay out the data from interviews, ethnographic observations, drawings, storyboards, and findings” (Seidel & Fixson, 2016, p. 169). In addition to the practical use, which allows the team to document and share the generated materials, a physical space also serves a second, more psychological, purpose: “having a separate physical space that can both signal the end of work as usual and provide a safe environment in which to be vulnerable while learning and experimenting is vital. The space should be conducive to creativity, with no corporate boardroom or classroom-style meeting rooms, comfortable and adaptive furniture, and ample materials for expression” (Wilner, 2015, p. 184).

This advice is consistent with the way in which successful RI teams work in P&G, assembling *garages* outside of the corporate offices in which the new team can work together.

In my project, I assembled such space, which proved very useful for the boot camp and the internal ideation sessions. However, the fact that the team was geographically de-centralized (see Section 6.1.2) prevented it from being the usual working space. Within the original plan (see last figure in Appendix 3), the team would come together to such space at particular times of the project to be trained, make sense of what had already been done separately and decide on the next steps.

As I learnt during my project, however, when the people in the team are new to each other and to the DT approach, one needs to invest heavily at the beginning in making sure that the team can come together and keep the momentum generated by the boot camp. This is especially important for projects as adaptive as the ones using DT, where the next actions are rapidly decided in the light of the new findings. This lack of co-location led to lack of team cohesion (connection ‘1’ in Figure 3).

Although I believe this is an important barrier, I also think that it played a secondary role in my project. Being co-located would not have solved the previous barriers (lack of trust for DT, lack of time and lack of team management mechanisms), but the lack of co-location aggravated them.

6.4.5. Lack of team autonomy

Last, but not least, the DT projects require resources (human, time, monetary and space) for its activities (Christensen et al., 2003). Provided that the team is working on a design challenge that fits the company’s goals and has the right mastery to do so, which is not always the case (Leonard - Barton, 1992), it needs to be able to manage them with a certain degree of independence (Ashmos & Nathan, 2002; Quinn, 1985).

P&G's executive management is aware of this need in order to become an ambidextrous organization (see Section 5.1.1). Within its RI capability, P&G Ventures, teams are provided with such autonomy and resource protection. In our case, however, we experienced how team members were removed from our project (see Section 6.2.1) or how we were prevented from pursuing further consumer research by senior management (see Section 6.2.2). This, in turn, affected the quality of the deliverables (connection 'm' in Figure 3).

Autonomy, nonetheless, needs to come accompanied by adequate governance and evaluation mechanisms with clear performance metrics (O'Connor, 2008). Again, in P&G Ventures the teams are assigned an advisory board to monitor their progress and provide advice, something that was not established in our project.

In addition to adequate project governance, there are other bureaucratic elements that can affect the creative process (Quinn, 1985). For instance, one of the key aspects of iterative learning approaches like DT or the Lean Startup is to be able to rapidly interact with the consumer, learn and incorporate such learnings into your project (see Section 2.2). In P&G, consumer tests, even for interviewing fellow colleagues (see Section 6.2.2), require approvals. These approvals may take several weeks or months to be obtained. Because of this, teams are forced to do one big test rather than several small successive studies. As the R&D manager acknowledges: "it destroys the flow of the learnings. Spacing apart the sequence of planning research and executing can really affect the team dynamics. Other projects come in the way, people get engaged in other things... People have so many projects to be part of that you need to keep yours with high energy". This was something I did not account for in my original project planning (see Appendix 3).

6.4.6. A project setup with many assumptions

This experience shows that, as expressed by other authors (see e.g.: Carlgren, Elmquist, et al., 2016; Walters, 2011), DT is not an easy *plug and play* solution, but one that comes with its own challenges, particularly when used in large organizations with novice multidisciplinary teams. Along this chapter, I have shown the breadth of interdependent barriers that hindered the use of such approach in my project. The question that remains to be answered is: *could all these barriers have been prevented in case I would have been aware of them?* I believe the answer is: *yes, to a great extent.*

As presented in Figure 3, I believe that the origin of these challenges lies in the way the project was set up, more in particular: (1) how the team was assembled and trained and (2) how the team autonomy and resources were protected. During the project setup, I made many assumptions that proved to be wrong. Just to mention a few of them:

- a. That as a facilitator I would have the power to set the course of action.

- b. That the team members would embrace the DT methodology and allow me to guide them in the use of the different methodologies.
- c. That the boot camp would be enough to set them in a learning attitude.
- d. That everyone who was in the team wanted to be there and shared the same passion for the challenge.
- e. That one day per week for the DT project would be enough to keep most team members engaged.
- f. That the lack of co-location would be fine as long as we kept regular online meetings together with physical meetings at critical points.
- g. That conflicts would be resolved organically without the need of proper decision-making mechanisms.
- h. That there was not any existing internal research in the field of the challenge and that we needed to start from scratch.
- i. That everyone in the team needed to be part of the consumer research (or problem finding phase) in order to create a common understanding during the solution finding phase.
- j. That fully involving technologists from the very beginning of the project, up to the point of getting them to execute consumer research, would be beneficial.
- k. That you needed to stay with the same team across the different DT phases.
- l. That involving external resources (e.g.: agencies) to do part of the work is *cheating*.
- m. That there would not be bureaucratic procedures (e.g.: consumer test approval) hindering the use of the tools.
- n. That senior management would not interfere with the development of the project.

In hindsight, I believe that a more careful composition of the team would have solved many DT adoption barriers at the individual level regarding *the lack of trust for the DT approach, the lack of time and the lack of co-location*. At the team level, *team management mechanisms* could have been established upfront to reduce many of the tensions and conflicts that appeared. Finally, at the organizational level, the right supporting structures could have been defined to ensure the protection of the *team resources and autonomy*.

With the goal of providing advice to future adopters and facilitators working in similar conditions, in Chapter 8 I will highlight the elements that I believe are more critical to setup a DT project by carefully (1) assembling and training the right team and (2) setting the supporting organizational structures to protect their work.

7. Limitations

Before introducing my set of recommendations, it is important to highlight the limitations of this research, which constrain the generalizability of the findings to similar contexts.

First, the empirical learnings from this thesis are grounded within a single case study of using DT with a novice multidisciplinary team in a large industrial organization. The barriers I faced are therefore bound to the particular organizational context of my project (see Chapter 5), which may differ from that of other organizations. Even within P&G, other business units have different cultures towards RI and DT principles (see Section 5.2). And even within the same business unit in which this project took place, a selection of different individuals and project setting could have led to a different course of events, as I will propose in Chapter 8.

Second, several personal conditions of me as a facilitator may not be true for other DT facilitators. More specifically: (a) I had a personal relationship of trust with the company sponsor, who I knew already for several years and came from the same university; (b) I had already been part of the company as an intern two years before the project, although in another department; (c) I was hired by the R&D function, not the Marketing one, as an intern, which is how I was seen by the rest of the team; (d) I did not have working experience in corporate management. While conditions (a) and (b) probably lowered certain barriers by conferring trust and protection towards my persona by the company sponsors, (c) and (d) probably aggravated some of the challenges I faced, particularly in regard to the lack of trust by other team members and the way in which the teamwork was managed.

These conditions are important because, in a complex system composed of so many interdependent elements (see Section 6.3), such as it is the case of RI capabilities (O'Connor, 2008), small differences in the starting point may lead to a very different development of events. For instance, if the company sponsor would have lost the trust in the DT approach when facing the first major crisis, the project would have most likely ended after Phase 1 (see Section 6.2.1). Similarly, if P&G would not have a strong tradition of consumer-centered innovation, deploying such methods would have been much more challenging than it already was, and we would have faced stronger political struggles.

Given these limitations associated to a single case study, the learnings of this thesis rely not only on the empirical evidence, but also on an extensive literature review around barriers and enablers for RI and DT (see Chapter 3).

Finally, it is important to mention that, although being an active team member is a requirement of the action research methodological approach (see Section 4.2.1), it also introduces

a subjective bias in the observation of the facts. To mitigate this effect, frequent meetings were scheduled along the project with senior management to arrive at a better understanding of the facts.

As a consequence of these limitations, both the previously described set of barriers (see Section 6.3), and the following recommendations in Chapter 8, should not be taken as exhaustive—they do not cover all the potential challenges that could appear in similar projects—, nor as necessary—some of my barriers may not materialize in other projects—.

8. An integrated framework to help new corporate adopters of DT

In this chapter I provide some recommendations on how to manage the *fuzzy front-end* of RI initiatives in large organizations through DT. Within such an early phase of the RI process, the goal is double. First, to generate design concepts for new products with a strong value proposition that are technologically feasible and commercially viable. And second, prepare the ground for the transition of the concepts into later stages of development and market launch.

Using the learnings from my project, but also from existing literature and other successful DT teams in P&G, I explain how to set up a project that fulfills the two aforementioned goals, minimizing many of the potential barriers than can hinder the development of RI initiatives. More specifically, I provide a framework of reference on how to assemble the right team and how to ensure the protection of its resources and autonomy.

Prior to this, I start by offering an overview of the RI process and the role that DT has in it, clarifying some of the frequent misconceptions that business practitioners have around the concept and setting the basis of the framework.

8.1. The four phases of human-centered RI and the role of DT

A simplification of a human-centered RI project would be: (1) find a relevant consumer problem, (2) generate design concepts to solve it, (3) develop and test such concepts and (4) launch them to market. Figure 4 offers an overview of such process.

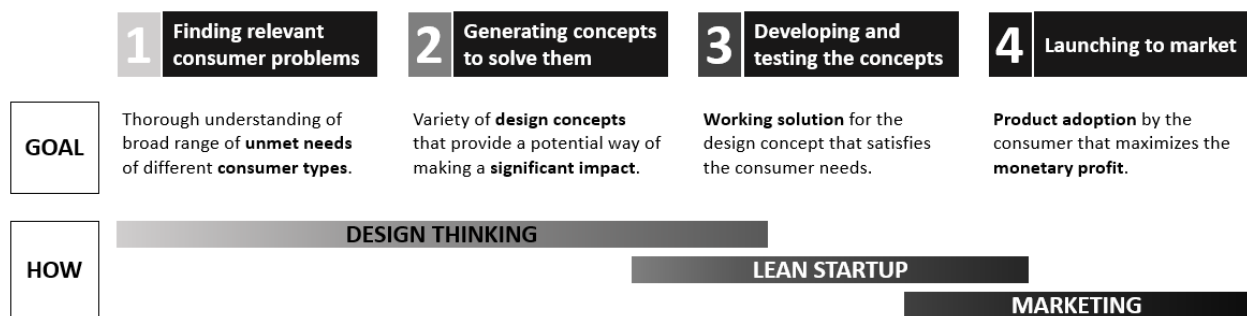


Figure 4- The four phases of human-centered RI

While in the core of any RI project there is a consumer problem that needs to be solved, it is not always the case that this need is still not defined at the beginning of the RI project (see Learning 2 in Section 5.3.4). This is often the case, for instance, when a new technology or concept appears to solve a need that is well understood and framed already by the innovation team. In those cases, the innovation efforts should be focused on efficiently moving towards a marketable solution through iterative cycles of product development (see steps 3 and 4 in Figure 4). For such

cases, approaches like the Lean Startup (Ries, 2011) or Business Model Generation (Osterwalder & Pigneur, 2010) offer a good framework to develop such work.

In other RI projects, however, this consumer problem is not yet framed from the start and there is just the will to create a new product that expands the company portfolio, sometimes leveraging a particular trend or company asset. These more upstream type of projects deal with the *fuzzy front-end* of innovation and require that the innovation team finds a relevant consumer problem (see step 1 in Figure 4) before they can start thinking of powerful solutions (see step 2 in Figure 4). This was the case of my RI project (see Section 6.1.1). In such cases, DT tools and methods can be very useful for the innovation team (See Section 2.2).

8.1.1. What DT is useful for, and for what it is not

DT is a good tool to create strong value propositions but, as some other authors have pointed out: “design doesn’t solve all problems. It helps people and organizations cut through complexity. It’s great for innovation. It works extremely well for imagining the future. But it’s not the right set of tools for optimizing, streamlining, or otherwise operating a stable business” (Kolko, 2015, p. 7), which is better done through other approaches.

Other marketing tools (e.g.: Porter’s Five, the 4 P’s, SWOT analysis, Net Present Value analysis, competitive overviews, market sizing, product life cycle, etc.) are needed for determining important new product commercialization aspects such as which business partnerships to build, in what markets to play, which launch strategy to use, what capabilities to grow, which distribution channels to use, what the optimum price for your product is, etc.

In the same way, technical skills are usually required to develop working solutions, particularly when the generated design concepts involve some sort of physical or digital element.

8.1.2. DT as a mean, not an end

In my project, following the DT management discourse (see Section 2.1), I intended to get past the existing compartmentalized silo structure and stage-gate models, and join technologists (R&D) and marketers (Marketing) within a tightly-united team that would stay together and learn together throughout all the DT process. From the early phases of problem finding (Phase 1 in Figure 4), all the way to solution finding (Phases 2-3 in Figure 4). The rationale was that, when the project would move into concept development (Phase 3 in Figure 4) and market launch (Phase 4 in Figure 4), the generated concept designs would integrate viability and feasibility constraints better, and therefore the transition towards a marketable product would be easier and faster.

Therefore, although in this project I tried to get a novice multidisciplinary team to adopt DT to tackle the *fuzzy front-end* of RI together, and explained the difficulties of doing so (Chapter

6), the ultimate goal of the project was not this one *per se*. The real objective was for the organization as a whole to have the internal capabilities to leverage a technology trend (the Internet of Things). DT would be used to create a new product concept that would be desirable, feasible and viable, and could be later developed and launched into market. This is an important point because the adoption of DT mindsets and methods by a variety of individuals should not be seen as an end in itself, but only as a mean for a more successful execution of human-centered RI.

8.1.3. The real high-level barriers for RI and the benefits of DT

Among the benefits that using DT provides, we can find solutions for several challenges that some organizations face when developing new products, e.g.: *lack of exploration, lack of consumer-centeredness, lack of creativity, lack of experimentation or lack of multidisciplinary integration*, just to mention some of them (see Chapter 5).

However, these benefits can only be achieved if a corporate team is able to adopt the approach. Both my experience (Chapter 6) and existing literature (see Chapter 3) prove this point to be challenging.

If DT in itself can be beneficial, but a project setting like the one I had (see Section 6.1) led to so many difficulties, *what are the adaptations required for a successful adoption of DT?* As mentioned in Section 6.4.6, I believe that these have to do with the way of (1) assembling and training the right team, and (2) setting the organizational support structures.

8.2. Assembling the right team

The main problems I faced at the individuals and team level were: *lack of trust for the DT approach, lack of time, lack of co-location and lack of team management mechanisms* (see Section 6.4). The solution is simple: find individuals that are willing to trust the DT approach, that have the availability to execute the time-demanding DT activities and that can be co-located. And prior to starting the work, establish adequate accountability and decision-making mechanisms.

In my project I sacrificed the three first aspects (see Section 6.1) in exchange for being able to have a multidisciplinary team composed of people from different functions in the organization so that I could have commercial and technical expertise from the beginning. The main underlying assumption of such setting is that you need a constant team throughout all the phases of the RI project (see Figure 4) where everyone needs to actively take part in every phase of the process, particularly in the problem finding (see Phase 1 in Figure 4). This, I believe, is not necessarily the best approach, bringing more problems than the ones it solves.

In my case, these compromises done in the assembly of the team put a spoke in our wheel, making our progress very slow and difficult without any significant profit coming out of it, significantly eroding the team cohesion.

8.2.1. A fluid team structure with a core team and surrounding experts

I believe that a structure that would work better than the one we had is that of a smaller core team, which manages the RI project and stays together throughout all its phases (see Figure 4), surrounded by an outside layer of other professionals that provide expertise and resources for particular phases, but without managing the process.

Different phases, different expertise

A successful new product needs to match what people need, with what is technologically feasible and commercially viable (T. Brown, 2008). In that sense, successful product innovation is multidisciplinary, integrating technical and business know-how with consumer understanding.

However, not all the phases of the RI process (Figure 4) require the same type of expertise. In fact, different methods are used to achieve the different goals for each phase (see Figure 5).

	1 Finding relevant consumer problems	2 Generating concepts to solve them	3 Developing and testing the concepts	4 Launching to market
GOAL	Thorough understanding of broad range of unmet needs of different consumer types .	Variety of design concepts that provide a potential way of making a significant impact .	Working solution for the design concept that satisfies the consumer needs.	Product adoption by the consumer that maximizes the monetary profit .
WHAT	<ul style="list-style-type: none"> - Qualitative consumer research - Literature review - Trend scouting - Competitive market analysis - Company analysis 	<ul style="list-style-type: none"> - Creativity techniques - Co-creation methods - Business Model Canvas - Low-fidelity prototyping 	<ul style="list-style-type: none"> - Engineering know-how - Prototyping - UI design - Consumer testing - Patent analysis 	<ul style="list-style-type: none"> - Pricing - Promotion and advertising - Business models - Finance - Distribution channels

Figure 5- The different expertise associated with the RI phases

Analogously, if design skills such as brainstorming or ethnographic research can be mastered (Nigel Cross, 2004; Kelley, 2001), not everyone is necessarily equally good at them independent of their amount of experience.

Subsequently, the fact that the innovation process should integrate different disciplines by the use of different experts does not mean that all these experts need to be actively involved throughout all the phases and activities. For instance, if your product is likely to require a graphic interface or an app, *does it make sense to involve a deeply specialized graphic designer or programmer in the problem finding phase and get him to conduct and analyze consumer interviews?* Based on the experience of this project, I believe the answer is *no*.

A core team surrounded by functional experts and service providers

Rather than a stable multidisciplinary team, large organizations can opt for a more adaptable team structure composed of (a) a reduced core team that manages the direction of the innovation process by (b) integrating different experts when required (see Figure 6).

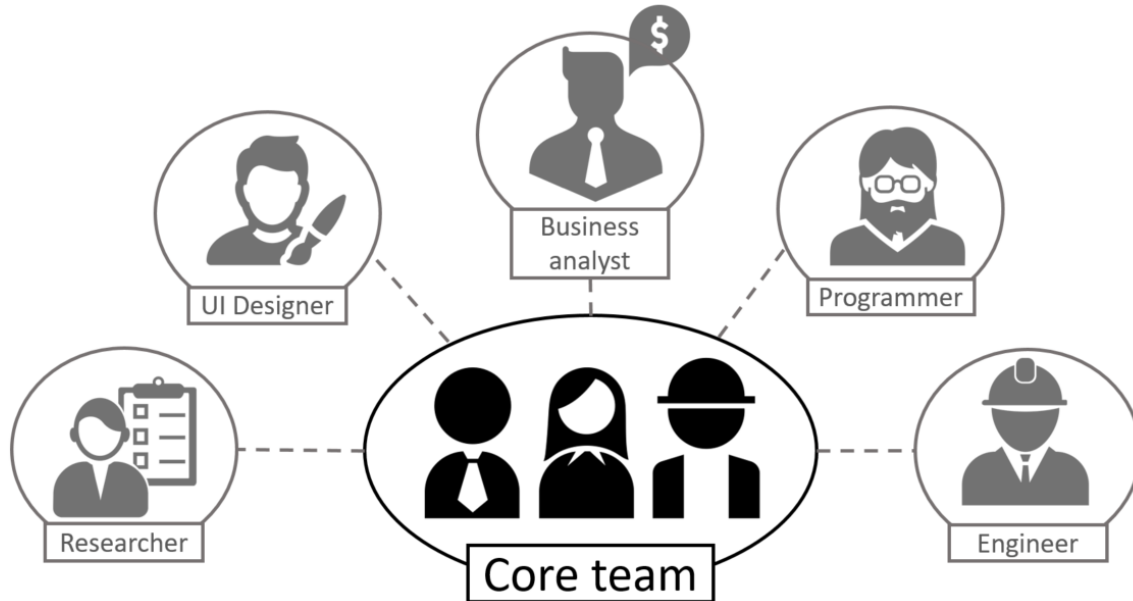


Figure 6- An adaptive team structure with a core team and surrounding experts

In the case of our project, this would resemble the team re-structuring we made after the first month (see Section 6.2.2), in which we decided that a reduced core-team with skills in qualitative consumer research would do the problem finding and later involve others for the ideation, the prototyping or the commercialization strategy, depending on the needs of the project.

These expertise providers do not need to be company employees. The important part is not *who does the work*, but rather that *the work gets done* and properly integrated in the RI process. In our case, for instance, due to our limited capacity, we decided to use an external market research agency to conduct a competitive overview that would help us better frame the problem and define the solution space. In the same way, freelance work can be commissioned to anthropologists, illustrators, graphic designers, programmers, mechanical engineers, pricing strategists, etc. (see Figure 6).

The role of the core team

Within this setting, the role of the core team is not perform all the RI activities by themselves, but rather manage the project and give continuity to it across all the RI phases (see Figure 4). Their task is to make sure that a problem is identified, that concepts are generated, that these are developed and tested and that they are, eventually, launched into the market. Along all

these phases, they keep the work grounded to a particular consumer benefit (*consumer-centeredness*).

Given this role, it is important that this core-team has some DT and RI expertise to be aware of the different available methods and manage the phase dependency and iterations (Beckman & Barry, 2007). This can also be achieved through the help of external facilitators (Calabretta, Gemser, & Karpen, 2016), such as I did in our project.

They also need to be resourceful since their roles is also to integrate different perspectives, making sure that desirability, feasibility and viability constraints are addressed. In order to do so, they need to act as a bridge between the different phases and tasks, and be able to establish connections with different experts.

The importance of managing the transition between phases

If opting for a layered team structure like this one, the risk could be for knowledge, tacit or explicit, to be lost in the transition between phases. The core team, which is responsible of preventing this from happening, needs to be able to actively document the process outcomes so that new experts can be on boarded smoothly (Seidel & Fixson, 2016). This is achieved by combining and synthesizing the knowledge generated from the different activities so that it can serve as input for the next phases (Calabretta & Gemser, 2015).

This knowledge transfer between the new product development phases is a well-known problem that requires the use of boundary objects (Carlile, 2002).

In our project, for instance, we spent long hours to translate the insights from days of consumer research into storyboards and persona definitions that could be read in a few minutes. These were used to make sure that those that had not been involved in the consumer research, but which were part of the ideation sessions, would be able to develop empathy for the real consumer problem. And they also served for the purpose of showing progress to senior management.

Similarly, moving from concept design into prototyping (Phase 2 to Phase 3 in Figure 4) requires that consumer benefits are translated into a defined set of technical requirements to onboard the technical experts with a clear brief that generates a usable outcome.

8.2.2. Selecting the right individuals for the core team

Now that we have established a clear role for this core team it is easier to define *who should be in it*: employees that are motivated about the project, who have a predisposition to use a DT approach, who have the time to do so, and who are geographically available. At least someone in the team, it can be an external facilitator, needs to be experienced with RI and DT to be able to effectively manage the high-level process. In addition, the team composition should ideally cover

the whole spectrum of learning styles (Basadur et al., 1986; Beckman & Barry, 2007; Kolb, 1983), and have a minimum combined business, technology and consumer research acumen that will allow them to bridge between the different experts.

To give an impression of the kind of collaboration you are after, it is interesting to show the case of a P&G Ventures (the RI capability of P&G) team which was composed of a Brand director, a senior R&D technologist and a Design associate director. One of them explains what he thinks was the key of their success: “we were a small team where everyone was 100% fully committed to this project. We had a very entrepreneurial mindset, the one in which you think: if the project doesn’t work with P&G I am determined to go outside and found my own startup. The involvement was so high that even this Brand director was doing the work of a research analyst at some points because that is what the project needed and he wasn’t afraid of getting his hands dirty. There is no hierarchy or functional boundary. In the end of the day the whole team needs to be successful, it doesn’t matter who gets the job done”.

Suitable mindsets to look for

The lack of trust for the DT approach proved to be one key barriers at the individual level in my project (see Section 6.4.1).

Besides being passionate about the challenge to keep the engagement strong, it is important that there is a predisposition to learn and use the DT process. The likelihood that a person will be able to adopt its methods can be linked to particular mindsets such as: *being empathic, curious, non-judgmental, playful and humoristic, learning-oriented, comfortable with complexity, open to differences in personality, eager to share, having a democratic spirit*, etc. (Carlgren, Rauth, et al., 2016). These mindsets can, in theory, be activated through experiential learning like DT boot camps (Wilner, 2015). In my project, however, this proved not to be possible within acceptable time constraints (see Section 6.1.3).

While accurately assessing the presence of these mindsets during the team selection can be challenging, asking for previous type of work and motivation can offer an experienced team leader or facilitator the insights required to assess whether the person is a good candidate. This is, for instance, the approach followed by P&G Ventures, the RI capability, to select employees from the mainstream organization.

Time availability and co-location

As I learnt during my project, thorough exploration takes time and usually involves failure, which in turn leads to unplanned adaptations in the process. Because of this, it is important that the team members have the availability to execute the time-demanding activities of a DT and RI

process (see Section 6.4.2), and be able to come together to share and process their learnings, as well as decide the next steps (see Section 6.4.4).

At the beginning of my project I believed that one day a week would be enough for most of the team members, and that the lack of co-location could be solved through regular online and sporadic physical meetings (see Section 6.1.2). Reality proved otherwise.

First, DT activities (e.g.: conducting research, synthesizing materials, organizing and hosting ideation sessions...) take time. While the team can use external resources to expand its capacity (see Section 8.2.1), dedicating just a few hours a week destroys the flow of learnings as it happened in my project. Another experienced DT team leader in P&G explains how he setup this part: “if someone wants to work in my DT project, I ask them for at least half of their time, no matter what else they are involved in”.

Second, the core team also needs to be able to have a space where they can come together: “a project room whose walls can be used to lay out the data from interviews, ethnographic observations, drawings, storyboards, and findings” (Seidel & Fixson, 2016, p. 169). While this could potentially be achieved through online collaboration tools, the second purpose of creating a safe space that signals the end of business as usual and provides a way of resolving conflicts, would be missed. As an experienced designer from P&G ventures shared: “you need the physical space to be creative: the ideas need to be on the wall not just in the computer”.

Diversity not only in functional expertise, but also in learning styles

Diversity does not mean that you need to persuade a deeply specialized employee –e.g.: a computer scientist whose passion lies in cloud computing programming–, to get to do something they do not want or know how to do. Instead, the core team should be better composed of people with a breadth of skills, the so-called T-shaped professionals (T. Brown, 2005) who can work together in more conceptual activities while, at the same time, leveraging their professional networks when more specialized knowledge in a certain technology or business area is needed for the project.

Deeply specialized employees, as opposed to T-shaped professionals, tend to be too constrained by their current field of expertise which may prevent them from being solution agnostic, affecting the breadth of the generated ideas. This was the case in our ideation sessions. Our experience gets also confirmed by a P&G Ventures employee: “in my mind, in order to drive incremental innovation you have to be very technically deep in that space. If it is a diaper and you want to improve absorbency, you need to know a lot about that. With a complete new product, if you hire someone with a deep skill in that, the project will end up focusing on that kind of products, while the breakthrough innovation could be very different”.

In addition to this functional breadth of understanding, the team leader should also aim for assembling individuals with different learning styles (Basadur et al., 1986; Beckman & Barry, 2007; Kolb, 1983) in the core team, making sure that there is a good balance between *thinking* and *doing*. Otherwise, the project has the risk to stay for too long in the conceptual level, rather than move into prototyping and testing, as it happened in my project. Some authors have developed tools to assess this learning styles mix of the individuals in an innovation team (Basadur et al., 1986), and manage upfront the potential conflict that this brings (see Section 6.4.3).

8.2.3. Training the individuals

Design skills take time to master (Nigel Cross, 2004; Kelley, 2001), particularly knowing when to iterate or what methods to use at a given time (Beckman & Barry, 2007; Seidel & Fixson, 2016). However, with enough guidance, people can execute different methods, genuinely contributing to the development of the project. This was the case, for instance, with the *company sponsor* (see Section 6.2.2).

If the core team members have been carefully selected, training them in the basic DT skills and overall process should not be particularly challenging. This again was the case with the *company sponsor*, who understood, by provided examples, the potential benefits of the DT approach and was willing to learn its methods (see Section 6.4.1).

In these cases, boot camps can be of help for the novice adopters to get acquainted with the different phases of the approach (see Appendix 5). Prior to this, however, a way of getting novice DT adopters more acquainted with the variety of tools and methods of DT could be by looking over someone's shoulder for some time. For instance, the *company sponsor* related how, after overseeing the work of the university students for several months of a DT project, she felt much more confident to learn about it.

8.2.4. Establishing team management mechanisms

Finally, even within a well selected team, conflicts may appear (see Section 6.4.3). The team needs to have established the adequate mechanisms to resolve these without running into major dissent when they appear. More specifically, there need to be accountability mechanisms as well as decision-making mechanisms.

Accountability mechanisms

Like in any business organization, people in the RI core team need to be evaluated and rewarded for their work. This does not just offer a way of distributing the fruits of the success, but also a mechanism to ensure that individuals can receive feedback on their performance.

While in many organizations, like P&G, individuals get rewarded for individual contributions in the yearly reviews, this approach does not fully account for the highly collaborative projects where job attributions get mixed (see Section 6.4.3). The team needs to establish a different mechanism, e.g.: internal peer rating, which in turn translate into job compensations. Doing this, however, may require a particular organizational structure.

Decision-making mechanisms

Differences in opinion may appear along the process, and this is something desirable (De Dreu & West, 2001; Nemeth & Wachtler, 1983). These opinion differences may appear within a particular phase of the RI process (Figure 5), e.g.: on deciding what methods to use or what ideas to test, but also during the transition between phases, e.g.: whether to do more research or move into ideation. While in some cases these discrepancies will be resolved democratically through negotiation and consensus, such as it happened at times in our project, in other occasion the differences in views may be irreconcilable through simple negotiation, like with the original team (see Section 6.2.1).

Because of this, the team needs to have established a commonly-accepted mechanism to solve these differences, e.g.: simple democratic majority, escalating the decision to an external advisory board, leaving the ultimate decision to a project leader, etc. The suitability of different formulas will depend on the combined expertise of the team and other cultural factors.

8.3. Protecting the team

Because the RI project is executed within a large organization and not as an independent startup, adequate organizational support structures need to be established, particularly relating to project governance and performance metrics (O'Connor, 2008). This is important because, within a corporate venture, the resources (human and monetary) that the RI team require are provided by the company, who owns the initiative. This is an aspect I largely overlooked in my project, giving it for granted. As I experienced, however, the RI project may be deprived of some of such resources for political reasons if not properly protected (see Section 6.2.1 and 6.2.2), significantly affecting the quality of the outcomes and the speed of the project (see Section 6.4.5).

8.3.1. The importance of finding a suitable challenge to generate buy-in

To generate the adequate organizational support for this approach it is important for the team leader to assess (a) whether the RI project fits the company's strategy and (b) whether DT is the right methodological approach.

Strategic fit of the RI project

Although the purpose of RI is to expand the company's portfolio beyond the current offering, not every project fits strategically with the company (e.g.: a local cheese manufacturer moving into the gun industry). In a context where many initiatives compete for a limited amount of company resources, the project needs to be set around an opportunity area that leverages at least some of the company assets (e.g.: core technological capabilities, distribution channels, customer base, brand image...) and has the potential to create significant company value beyond the opportunity cost.

In addition, the organization's management needs to consider whether conducting an explorative RI project with internal staff is the right approach. While this provides the company with a closer control over the direction of the process and helps in keeping the confidentiality and retaining the generated know-how, it can also lead to lower quality of deliverables and slower development times due to potential barriers (see e.g.: Figure 3). Alternatively, the company can completely externalize the work to specialized professionals such as innovation agencies or (joint) venture capital startups, and, if successful, acquire it into their mainstream business.

Fit with the DT approach

The RI challenge needs to fit not only the company, but also the DT approach if to be executed in such manner. This was something that needed to be clarified at the beginning of my project. The original challenge that was proposed by the *company sponsor* had already a well-defined consumer benefit and design concept as the starting point, which had been generated in a DT project a few months before. A project like this would mainly involve product development and consumer testing (Phase 3 in Figure 4). While this is a perfectly suitable way of starting a RI project, it does not heavily involve the explorative methods associated to the *fuzzy front end of innovation* for which DT is particularly well suited (see Figure 4). In such cases, spending the team resources on very explorative consumer research and ideation (see Phases 1 and 2 in Figure 4) would potentially lead to low returns on the investment and would just delay the project times unnecessarily. This perspective would make it difficult to generate organizational support for the approach.

8.3.2. The importance of adequate resources and governance mechanisms

The lack of resources is a common barrier to RI (Christensen et al., 2003). In some companies, for example, employees may only be provided real resources (e.g.: time and monetary) once they show a proof of concept of a product (e.g. a prototype). This approach overlooks the importance, and associated cost, of more exploratory phases of the RI process (see Phases 1 and 2

in Figure 5) and can be linked to the lack of organizational dualism (Cosier & Hughes, 2001; Moorman & Miner, 1997; Paap & Katz, 2004; A. Sharma, 1999).

When this is the case, the team needs to ensure that the organization's senior management is aware of the need for such resources and is willing to provide them. In addition, the organization needs to be aware of the fact that RI outcomes are difficult to predict upfront, since the product is not even defined yet, and that these projects have higher inherent risks (King et al., 1992; Madjar et al., 2002; Rice et al., 2000; Sandberg & Aarikka-Stenroos, 2014), as opposed to more incremental innovation projects.

Consequently, different financial and performance metrics are required (Harper & Becker, 2004; O'Connor, 2008), preferably under a different organizational structure (Christensen, 1997; O'Connor, 2008). This applies at the project level, but also at the individual level (see Section 8.2.4). These metrics need to allow for experimentation and failure (Damanpour, 1991; Madjar et al., 2002; Nyström, 1990). In the case of my project, a specific structure had already been set up (*Pampers Startup*) to separate the financial assessment from that of mainstream business initiatives. Similarly, P&G Ventures is set as an independent structure from the business units which reports directly to the CEO.

Having a specific organizational structure, can also help in developing the type of culture required for RI (Damanpour, 1991; King et al., 1992; Madjar et al., 2002; O'Connor, 2008; West & Anderson, 1992). As one P&G Ventures employee explains: "At P&G Ventures we have our unique culture, which has some tones of P&G. But it is very different from existing business units. We are a small organization, very externally focused for product development, and with highly entrepreneurial people. In the hiring process, when we recruit internal people [P&G only hires recent graduates and promotes from within], our mission is to just bring in people that have an entrepreneurial spirit. If you come with an incremental innovation mindset or without a bias towards action, we have a good mechanism to leave you out from the team".

Adequate governance and team autonomy

Provided that the team is working on a suitable design challenge (see Section 8.3.1) and has the right mastery to do so (see Section 8.2.2), it is important that they have the autonomy to decide the next steps by themselves. This does not mean that they should not take the advice of those not being part of the team, but that the final saying on how to proceed should not come from upper management as it happened in our project.

The micromanagement of the innovation process has been identified as a barrier to innovation (Ashmos & Nathan, 2002), and can be linked to inadequate leadership styles (Goleman, 2000). Among other things, it erodes the motivation of the entrepreneurial core team, which to an

extent comes from owning the project. Complete independence, however, would create significant barriers in the transition of the RI project into the mainstream business, for which *interface mechanisms* are required (O'Connor, 2008).

P&G Ventures is a good example again of how to manage all these element: “The way we manage the transition of the generated business to the mainstream BUs is by forming an advisory board of which the president of the receiving BU is a member. This helps dramatically with the transition. In addition, we have a very strong commitment from general management that the P&G Ventures team will drive that business that they are creating up to revenues of 50-100 million dollars per year before we even consider turning it to the mainstream business. For our project, we get a budget and we inform the people that financed us what we are going to do. We are not seeking for permission. The team decides. We listen to our mentors and business owners and reflect on what they told us”.

As part of this autonomy, it is also important that the team does not run into significant bureaucratic problems that might severely hinder the adoption of iterative innovation approaches which rely heavily on rapid involvement with consumers (see Section 6.4.5). This excess of bureaucracy has been identified as an important RI barrier by previous literature (see e.g.: Quinn, 1985). A caveat, however, is to understand the motivation of these procedures before skipping them. As the *company sponsor* indicated: “as painful as they are, there are reasons why there is this system in place. Sometimes there is a legal risk, like personal data from interviews being leaked; or laws that forbid certain type of activities. It should be right-sized”.

8.4.The four elements to successfully setup a DT project

In the previous Sections I have covered a wide variety of considerations around team assembly and protection. Addressing all these aspects may seem overwhelming for novice adopters since it can require significant work and negotiation before the project has even started. While it might be tempting to simply assemble a team of colleagues and get them to work in a DT project, skipping this careful project setup can lead to many barriers as identified in literature (see Chapter 3) and in my own experience (see Chapter 6).

In a way, investing time to setup a RI project can be seen as growing a flower (see Figure 7). Without proper care, the new fragile flower may not bloom before it dies, resulting in an even greater waste of resources. To grow a plant, one needs good soil [a suitable challenge that fits the company and DT] and good seeds [the right team composition]. But before it can be planted in the garden with the rest of the flowers [*transition to mainstream business*], it needs to grow [*project development*] in its own pot [organizational support and independent structure]. To do so, the gardener [*project leader or facilitator*] needs to plant the chosen seeds and water them [team

cohesion mechanisms]. Once the flower seeds are planted, they require time and mineral nutrients [*monetary resources*] to grow its leaves and roots [*consumer understanding, technical know-how...*]. And even with such a careful investment, only if there is enough sun and rain [*external factors out of the control of the team*] the flower will eventually bloom.

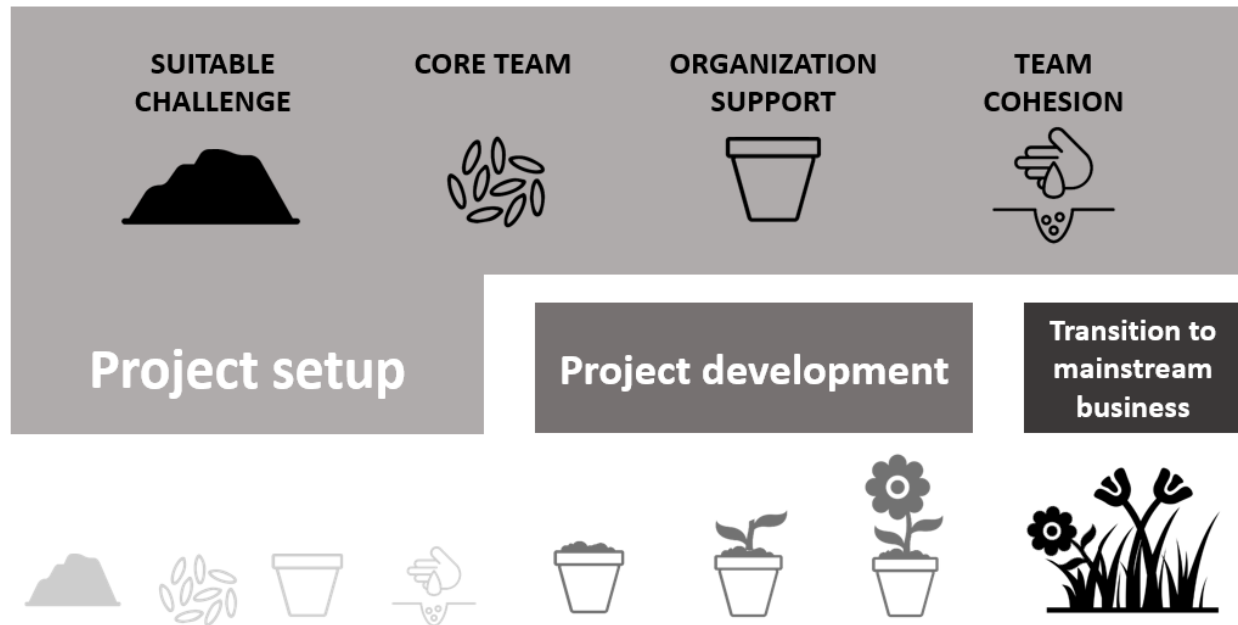


Figure 7- Four elements for a successful RI and DT project setup

Like when growing a flower, careful attention needs to be paid to four elements of the project setup:

1. Finding a suitable challenge
2. Selecting the right core team
3. Ensuring organizational support
4. Preparing the core team

As a complex system composed of interdependent elements (see Capra, 1996; O'Connor, 2008), how these elements and associated sub-elements relate to project outcomes depends on the context, and may only become apparent to novice adopters once they start working on the project.

The following four sections in this document provide a set of questions relating to the critical aspects within each of the four setup elements. The goal of such questions is to help new DT corporate adopters, be it a project leader or a facilitator, reflecting on which actions could be taken to minimize the potential barriers ahead. While examples have been provided along this chapter, these mitigation actions are dependent on every context, and the ability to implement them will vary greatly based on the influencing ability of the project leader.

8.4.1. Ensuring the challenge fit with the company and DT methodologies

- Does the project leverage any of the company strengths?
 - Why should the company invest resources in this project?
 - Is doing it internally the best way to execute it?
- Is DT the appropriate methodology?
 - Is the problem well framed and understood already instead?
 - Is this just a well-defined idea that requires execution rather than exploration?

8.4.2. Ensuring the assembly of a suitable team

- Are these individuals interested in the challenge?
- Will they have available time for the demanding hands-on activities of DT?
- Can they be co-located?
- Are individuals in the team knowledgeable of the DT methodologies?
 - Do they have the right mindsets for working with DT?
- In case they aren't, will it be possible to train them?
 - Are they aware of their lack of skills?
 - Are they predisposed to learn?
 - Do they trust the facilitator or project leader?
 - How am I going to train and coach them?
- Is the team diverse?
 - Is there a good balance in learning styles?
 - Is there a good representation of different fields of knowledge required for the different RI phases and associated expertise?
- Is there an accessible external network of professionals that will help the team develop particular activities?

8.4.3. Ensuring organizational support for the DT initiative

- Does the company leadership believe in the need for RI?
- Does the company leadership believe in the usefulness of DT?
- Are there appropriate financial and evaluation metrics in place?
 - Do they understand that there is an inherent risk that requires different assessment approaches?
- Does the team have protected resources, including a working space, a budget, time to get results, and the autonomy to manage them all?

- Are there major bureaucratic impediments to conduct consumer research in a fast iterative way?
- Are there mechanisms to handover the result of the explorative project into the mainstream exploitation structures?

8.4.4. Ensuring core team cohesion and effective collaboration with others

- Are there appropriate leadership mechanisms for decision making?
 - How will consensus be reached in case of conflict?
 - Do the different team members trust the leader?
- Are there accountability mechanisms in place?
 - How is the common goal and success defined?
 - How are individuals evaluated?
 - How do individuals receive feedback and coaching?
- Are there communication mechanisms in place?
 - How do we manage the integration of the work from different ends?
 - How do we prevent information from being lost if there is team turnover?
 - How do we onboard new team members to the work previously done?
 - How do we report to senior management?

9. Conclusions and future research

This project started with one goal: take a multidisciplinary team of novice DT adopters through the *fuzzy front end* of the innovation process and document the difficulties of such journey. In all fairness, I never imagined there would be so many of them (see Chapter 6). In particular, five barriers seemed to have the greatest impact in my project: *the lack of trust for DT, the lack of time, the lack of team management mechanisms, the lack of co-location and the lack of team autonomy* (see Figure 3).

Despite being aware of many of these risks upfront (see Section 5.3.4), many assumptions (see Section 6.4.6) prevented me from getting past the reluctance or unavailability of some team members to go through the DT approach (see Section 6.2.1). It was painful to experience how, despite all the initial effort and excitement (e.g.: planning the project, finding people for the team, creating the space, organizing the boot camp...), the project gave signals of termination just one week after starting. Even more so when, after one month, it was just the *company sponsor* and me in the team (see Section 6.2.2), which limited the ability to conduct the original intended research on the team dynamics and individual adoption of the DT methodology over a longer period of time.

What I learnt, I believe, was much more valuable: with the new reduced team composition, the project started gaining momentum (see Section 6.2.2), and we could still involve others at particular times if needed (see Section 6.2.3), even external contractors. This, which proved to be a much more effective approach within the context of a large organization like P&G (see Section 8.2.1), helped me understand the importance of assembling the right team composition (see Section 8.2). We still run into other organizational problems (see Section 6.3), but the project could acceptably move forward towards the real goal (see Section 8.1.2) of generating a variety of creative design concepts beyond incremental (see Chapter 1), as we finally did.

This situation triggered me to dive deeper into the RI literature, which despite not being yet clearly connected to that of DT, had already identified and offered solutions to many of the problems I experienced in my DT project (see Chapter 3). From this, as well as the experiences that were shared with me by other RI teams in P&G, I was able to construct the framework of reference offered in Chapter 8, in which I highlight the importance of setting up the project carefully by *finding a challenge that fits the company and the DT approach, assembling the right team, ensuring organizational support and building the team cohesion through appropriate management mechanisms*.

Rather than only describing the potential barriers, the framework integrates a multi-level (individual, team and organization) set of enablers linked to such barriers, and offers success examples. This integration, which was missing in the current DT literature (see Chapter 4),

provides managers with an actionable set of levers to execute their projects in a corporate setting. Therefore, I believe that this framework and its accompanying questions will be of help to other DT facilitators and team leaders in large organizations by bringing awareness for the variety of potential challenges ahead and minimizing their risk of encountering them.

9.1.Future research

This being said, the limitations of this research need to be accounted for (see Chapter 7), particularly the fact that this is a single case study. While partially compensated by the use of extensive literature, more research is needed to validate the findings of this thesis and proposed model. In particular, longitudinal ethnographic studies following teams with the proposed structure over the course of the DT project could help in better understanding the newly generated micro-dynamics at the individual and team level, but also the macro-dynamics at the organizational level.

In addition, tools could be developed to help team leaders and facilitators in the critical step of selecting the right individuals in a more systematic way. In the same way tools have been developed to assess the different learning styles (see e.g.: Basadur, Graen, & Scandura, 1986), questionnaires could be developed to identify the appropriate set of mindsets for DT adoption.

Finally, more research is required to assess the effectiveness of DT training programs (e.g.: boot camps). Despite their popularity, several academics and practitioners interviewed during this project manifested their ineffectiveness in the medium and long term for the goal of driving lasting changes in mindsets and skills.

Acknowledgements

Many people collaborated in the execution of this master thesis and supported me along the project. In Spanish there is a proverb that says: “es de bien nacido ser agradecido”, so here it comes:

First, I would like to thank Blanca Arizti, the *company sponsor* who made this project possible. Without her trust, not just in the DT approach, but in me personally, I would not have been able to execute such a complex project embedded in the very core of the organization. This experiment led to significant political tensions, which she had to endure as a pioneer. Eskerrik asko!

Second, I would like to thank Mattias Schmidt, the senior *company sponsor*. His more than 25 years in the organization and influencing skills have proved as invaluable help to interpret and navigate the complex organizational dynamics around the innovation process. Thank you for the weekly meetings despite *being just the intern*.

Third, I would like to thank my academic supervisors, Boris Eisenbart and Jürgen Tanghe for all the feedback they have provided. While it has been painful to hear it at times, it has allowed me to *take a step back* and see the big picture beyond the anecdotal experiences.

Fourth, I would like to thank the people in the different P&G organizations (BabyCare FEI, P&G Ventures, inQbet and others) for all their involvement in the project. To the people of the original team, for their involvement despite the difficulties that we faced in the course of events; sorry I did not know any better at the time. To the more than 30 people that I interviewed during these months and gave me their time without expecting anything in exchange. And to all the participants and organizers of the internal and external ideation sessions. It has been an amazing journey to work with you.

Finally, I would like to thank all the friends and family who had to bear endless monologues around my frustrations and excitements during these months, I owe you one.

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Tables

Table 8- Assink's five clusters of barriers for RI

CLUSTER	BARRIERS
ADOPTION BARRIER	Success and familiarity trap (Ahuja & Lampert, 2001; Christensen, Raynor, & Anthony, 2003; Paap & Katz, 2004; Tushman, 1997); Lacking organizational dualism (Cosier & Hughes, 2001; Moorman & Miner, 1997; Paap & Katz, 2004; A. Sharma, 1999); Excessive bureaucracy (Quinn, 1985); Status quo stifling (A. Sharma, 1999; Thomond & Lettice, 2002)
MINDSET BARRIER	Lack of distinctive competencies (Leonard - Barton, 1992); Lack of awareness of need for new knowledge (Vanhaverbeke, Berends, Kirschbaum, & De Brabander, 2003); Obsolete mental models and theory-in-use (J. S. Brown & Duguid, 2002); Inability to unlearn (Baker & Sinkula, 2002)
RISK BARRIER	Learning trap (Ahuja & Lampert, 2001); Inadequate financial metrics (Harper & Becker, 2004); Lack of resources (Christensen et al., 2003); High risk and uncertainty (Sandberg, 2002); Risk averse climate (Rice, O'Connor, Leifer, McDormott, & Standish-Kuon, 2000); Unwillingness to cannibalize (Cravens, Piercy, & Low, 2002)
NASCENT BARRIER	Lack of creativity (Ahuja & Lampert, 2001); Lack of market sensing and foresight (Trott, 2001); Senior management turnover (Rice et al., 2000); Innovation process mismanagement (command-and-control mental model) (Ashmos & Nathan, 2002); Lack of team chemistry (Levine, 1994)
INFRASTRUCTURAL BARRIER	Lack of mandatory infrastructure (Walsh & Linton, 2000); Lack of adequate follow-through (J. S. Brown & Duguid, 2002)

Table 9- Barriers associated to DT core themes -adapted from Carlgren, Elmquist, et al. (2016)

DT THEME	ASSOCIATED BARRIERS
USER FOCUS	<ul style="list-style-type: none"> - Conducting and processing ethnographic research demands significant resources which are hard to acquire - Subjective user insights are not enough to convince evidence-driven managers - Interaction with users may be explicitly prohibited due to fear of leakage of sensitive information
PROBLEM FRAMING	<ul style="list-style-type: none"> - Iterative process clashes with predominant linear problem solving approaches
EXPERIMENTATION	<ul style="list-style-type: none"> - Deviation from initial plan or failing are negatively perceived - Need to plan and define goals in advance are contrary to the explorative DT, leading to incremental innovation - Knowing when to stop iterating is not easy - Tight times reduce opportunities for testing and failing so ideas are less innovative
DIVERSITY	<ul style="list-style-type: none"> - Flat hierarchies with democratic ways of working clash with more hierarchical structures - New ways of working influence power dynamics in organizations since decision power is moved to the team - Fun (e.g.: icebreakers) is perceived as neither serious, nor productive - Some terms (e.g.: <i>iteration</i> or <i>prototype</i>) have different meanings for different people.
VISUALIZATION	<ul style="list-style-type: none"> - Visualization and prototyping skills are difficult to master - Communication style is found to be inappropriate as compared to Power Point presentations - Showing rough, ugly mock-ups internally and to users is against norms

Table 10- Facilitators of innovation at three levels of analysis -adapted from Anderson et al. (2004)

LEVEL	CHARACTERISTIC	DIMENSIONS
INDIVIDUAL	PERSONALITY	Tolerance of ambiguity (Barron & Harrington, 1981); Self-confidence (Barron & Harrington, 1981); Openness to experience (George & Zhou, 2001; West, 1987; West, Patterson, & Dawson, 1999); Unconventionality (Frese, Teng, & Wijnen, 1999; West & Wallace, 1991); Originality (West & Wallace, 1991); Rule governed (<i>negative relation</i>) (Frese et al., 1999; Simonton, 1991); Authoritarianism (<i>negative relation</i>) (Simonton, 1991); Independence (West, 1987); Proactivity (Seibert, Kraimer, & Liden., 2001)
	MOTIVATION	Intrinsic (<i>vs extrinsic</i>) (Frese et al., 1999; West, 1987); Determination to succeed (Amabile, 1983); Personal initiative (Frese & Zapf, 1994)
	COGNITIVE ABILITY	Above average general intellect ('g') (Barron & Harrington, 1981); Task-specific knowledge (Taggar, 2002; West, 1987; West & Wallace, 1991); Divergent thinking style (Kirtton, 1976); Ideational fluency (Barron & Harrington, 1981)
	JOB CHARACTERISTICS	Autonomy (Axtell et al., 2000); Span of control (Axtell et al., 2000); Job demands (Janssen, 2000); Previous job dissatisfaction (Zhou & George, 2001); Support for innovation (Axtell et al., 2000); Mentor guidance (Csikszentmihalyi, 1996; Simonton, 1991; Walberg, Rasher, & Parkerson, 1980; Zhou & George, 2001); Appropriate training (Basadur, Graen, & Scandura, 1986)
	MOOD STATES	Negative moods (George & Zhou, 2002)
TEAM	STRUCTURE	Minority influence (De Dreu & West, 2001; Nemeth & Wachtler, 1983); Cohesiveness (Payne, 1990); Longevity (Katz, 1982; West & Anderson, 1992)
	CLIMATE	Participation (De Dreu & West, 2001; West & Anderson, 1992); Vision (De Dreu & West, 2001; West & Anderson, 1992); Norms for innovation (De Dreu & West, 2001; West & Anderson, 1992); Conflict (De Dreu & De Vries, 1997); Constructive controversy (Tjosvold, 1998)
	MEMBERSHIP	Heterogeneity (Nemeth, 1986; Paulus, 2000); Education level (Wallach, 1985)
	PROCESSES	Reflexivity (West et al., 1999); Minority dissent (De Dreu & West, 2001; Taggar, 2002); Integration skills (Stevens & Campion, 1994; Taggar, 2002); Decision-making style (King, Anderson, & West, 1992)
	LEADERSHIP STYLE	Democratic style (Tierney, Farmer, & Graen, 1999); Participative style (Manz, Bastien, Hostager, & Shapiro, 1989; Nyström, 1979; Tierney et al., 1999); Openness to idea proposals (Nyström, 1979); Leader-member exchange (Tierney et al., 1999); Expected evaluation (Shalley & Perry-Smith, 2001)
ORGANIZATION	STRUCTURE	Specialization (Damanpour, 1991); Centralization (<i>negative relation</i>) (Damanpour, 1991; Zaltman, Duncan, & Holbeck, 1973); Formalization (<i>negative relation</i>) (Damanpour, 1991; West, Smith, Feng, & Lawthom, 1998); Complexity (Damanpour, 1991; Kimberly, 1981); Stratification (<i>negative relation</i>) (Kanter, 1983)
	STRATEGY	'Prospector' type (Miles & Snow, 1978)
	SIZE	Number of employees (Rogers, 1983); Market share (<i>negative relation</i>) (Rogers, 1983)
	RESOURCES	Annual turnover (Mohr, 1969); Slack resources (Damanpour, 1991; Kanter, 1983)
	CULTURE	Support for experimentation (Damanpour, 1991; Nyström, 1990); Tolerance of idea failure (Madjar, Oldham, & Pratt, 2002); Risk-taking norms (King et al., 1992; West & Anderson, 1992)

Table 11- Potential risks and preventive actions from the organizational assessment

#	Potential Risk	Preventive action
1. Lack of organizational supporting structures		
1.1	The existent short-term incremental processes may not fit with the explorative approach required for more fuzzy transformational long-term challenges. Learning(s): 1-15	Get senior management to support the initiative and ring-fence it from the rest of the organization, encouraging employees to take this as an experiment outside of the organization's usual way of working. Source(s): (Rosenberg Sr. et al., 2015; Wilner, 2015) <i>We were partially able to do this because we had some senior management who believed in the need for RI and in the value of DT, and set up an independent organizational structure.</i>
1.2	The uncertainty in the project could lead to limited engagement due to the incentive system. Learning(s): 4	
2. Lack of integration of multiple functions in the team for radical collaboration		
2.1	Lack of integration with Marketing can lead to problems in downstream development and lack of organizational interest. However, Marketing co-workers may not fully engage in the innovation process but simply audit it. Learning(s): 12, 13	Get at least one person from Marketing into the multidisciplinary team and leverage their business expertise through specific tasks such as conducting competitive market analysis. Use them also as ambassadors for later downstream development within the Marketing function. <i>We managed to secure at least two Marketing employees who would be involved in the DT project from the beginning.</i>
2.2	Employees may become defensive and claim expertise and ownership over specific activities of the DT process, making radical collaboration difficult. Learning(s): 7, 15	Make it very clear that this is a new way of working in which we want to learn together and act together as a team. Leverage functional experts to coach and lead others: as the project advances and different skills are needed –e.g.: consumer research, market research, ideation, prototyping, testing...– organize small workshops led by the different team members. Source(s): (Beckman & Barry, 2007) <i>The goal was to create a sort of shared leadership that would be transferred to those with the most expertise at any given step of the DT process. I had a strong feeling, based on previous DT experiences, that the team should stay together throughout the different activities of the DT process in order to ensure common understanding and enable radical collaboration in the team</i>
2.3	There could be misalignment in expectations and goals between team members from different functions due to the reward system. Learning(s): 14	Spend some time at the beginning to set a clear strong goal for the team. Engage into a team conversation to define what success is for the team as a whole, as well as the individuals. <i>This step was planned as part of the kick-off session (see risk 3.1).</i>

2.4	<p>There could be certain amount of membership turnover, but it may be difficult to onboard new members and take them through the past learnings.</p> <p>Learning(s): 11</p>	<p>Use visual thinking and other synthesizing tools like customer journeys or empathy maps, to capture the learnings after the convergence phases.</p> <p>Source(s): (Calabretta & Gemser, 2015; Seidel & Fixson, 2016)</p> <p><i>In order to create a shared understanding among the team members as well as onboarding new ones, I wanted to get the team to get together to summarize the project learnings through visualization techniques.</i></p>
3. Lack of minimum shared understanding for what DT is		
3.1	<p>There could be a misunderstanding of what DT is.</p> <p>Learning(s): 16, 17</p>	<p>Use an initial DT boot camp to set a common ground for what DT is and the kind of tools and collaboration that is used.</p> <p>Source(s): (Ideo, 2011; Wilner, 2015)</p> <p><i>Following DT best practices, I wanted to organize a kick-off multiday workshop to get the team familiarized with each other as well as with the DT approach and mindsets.</i></p>
4. Lack of thorough problem framing		
4.1	<p>There could be a tendency to push the technological opportunity without a compelling user benefit.</p> <p>Learning(s): 1, 2, 7</p>	<p>Make an emphasis on being solution-agnostic at the beginning and instead starting with a thorough exploration of the challenge and the user. Use consumer research methods to build empathy and ground problems statements on specific identified insights.</p> <p>Source(s): (Luchs, 2016)</p>
4.2	<p>Doing ideation straight away without proper problem framing could lead to incremental ideas, particularly by those in the Marketing function due to short-term focus.</p> <p>Learning(s): 6, 7, 8, 11</p>	<p><i>The company sponsors and I planned to dedicate 3 weeks to consumer research prior to going into solution finding.</i></p>
4.3	<p>Non <i>product researchers</i> may not be at ease with conducting consumer research or be able to see how that links in the overall DT process. There could even be a dismissal of consumer research since “the consumer doesn’t know what he wants”.</p> <p>Learning(s): 7, 15</p>	<p>Leverage <i>product researchers</i>’ expertise to coach and lead others through the consumer research phases (see risk 2.2) so that everyone interacts with consumers to some extent.</p> <p><i>After the DT boot camp (see risk 3.1), everyone in the team would have experienced the importance of building empathy and probably be open to give it a try in the project. This, in turn, would help in creating a shared understanding (see risk 2.2).</i></p>
4.4	<p>There could be a tendency to analyze the consumer research in a very shallow and biased way.</p> <p>Learning(s): 8</p>	<p>Use proper tools –e.g.: peer reviewed interview coding– for systematically going through the gathered data and derive insights reducing individual bias.</p>

		<i>Within the framework of “not business as usual” type of project (see risk 1.1), I was expecting participants to be open to being guided by the team facilitator, myself, through the use of the different methods.</i>
5. Lack of enough divergence and experimentation during solution finding		
5.1	<p>During brainstorming for idea generation, there may appear some destructive attitudes that need to be managed.</p> <p>Learning(s): 9</p>	<p>Have a creative facilitator to manage the sessions so that the team differentiates between convergence and divergence phases, and all participants feel safe to share their own ideas without being judged.</p> <p>Source(s): (Osterwalder, Pigneur, Bernarda, & Smith, 2014; Tassoul, 2009)</p> <p><i>I was planning on using my experience with creative facilitation in order to manage the idea generation sessions.</i></p>
5.2	<p>There could be a tendency to endlessly discuss hypothesis due to risk aversion, rather than take further actions.</p> <p>Learning(s): 10</p>	<p>Encourage an experimentation mode through the generation of learning plans when spotting vicious circles in which additional consumer input is needed.</p> <p>Source(s): (Ideo, 2011; Ries, 2011)</p>
5.3	<p>There could be a need to reinforce the idea of building rough low-fidelity prototypes and use visual thinking.</p> <p>Learning(s): 15</p>	<p><i>The kick-off boot camp (see risk 3.1) was intended to create this predisposition to learn through prototyping and testing, which would be complemented with small workshops on visualization and prototyping when the skills would be more needed in the solution finding phase, after the first value propositions would be generated (see risk 5.1).</i></p>

Table 12- Intended team composition

ROLE	EXPERTISE
1. THE TECHNOLOGIST	Electronic devices; Data analytics; Prototyping
2. THE DESIGNER	Digital/App design; Sketching; User Interfaces (UI)
3. THE CONSUMER RESEARCHER	Qualitative and quantitative consumer research; UX
4. THE BUSINESS STRATEGIST	Market research; Business Models; Go-to-market
5. THE DT FACILITATOR	DT approach; DT methods; Creative facilitation

Table 13- Initial team composition

Role	Function	Background	Time @PG	Location
Technologist	R&D	Materials expert with passion for Big Data	+10 years	Germany
Technologist	R&D	Electronics expert for smart products	+10 years	Germany
Consumer researcher	R&D	Company sponsor for the IoT initiative	+10 years	Germany
Business strat.	Marketing	Communication strategy for Pampers	+10 years	Switzerland
Business strat.	Marketing	Brand management for e-commerce	+5 years	Switzerland
Business strat.	Marketing	Consumer & Market understanding	+5 years	Switzerland
<i>DT facilitator</i>	<i>R&D</i>	<i>N/A</i>	<i><1 year</i>	<i>Germany</i>

Figures

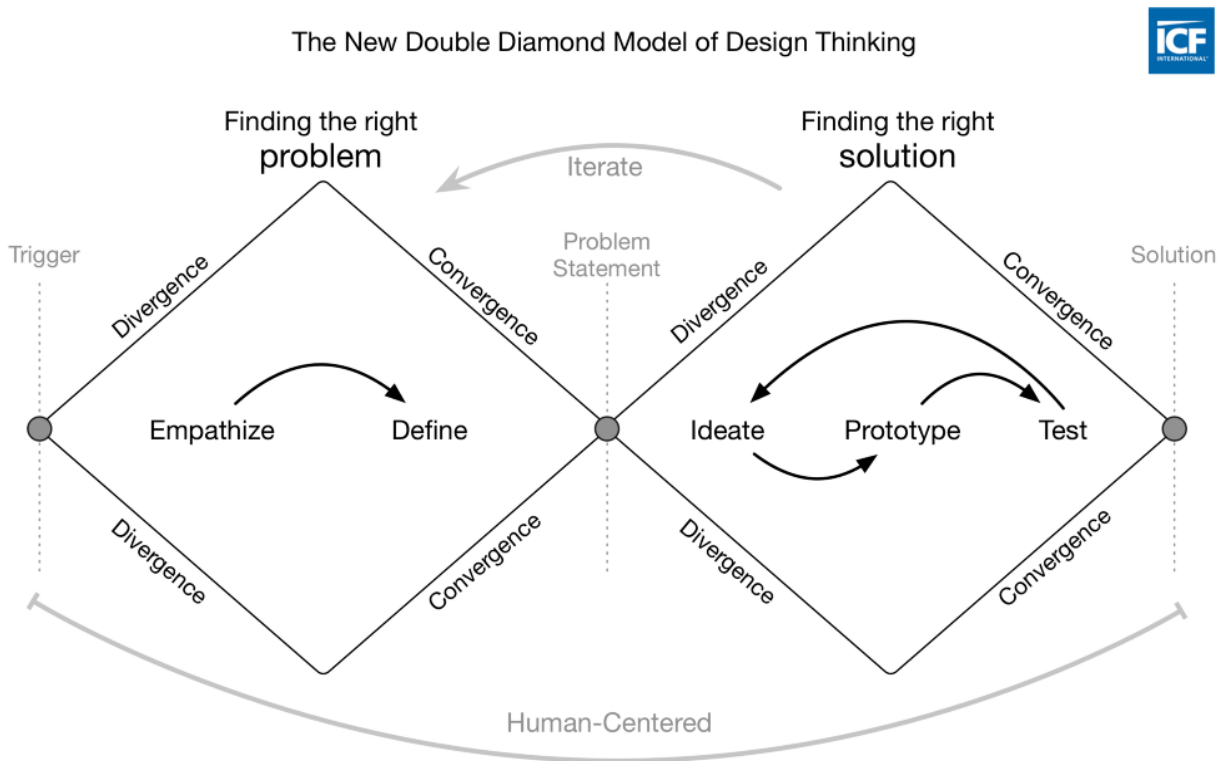


Figure 8- DT model developed by designer Trish Willard from ICF (Liu, 2016)

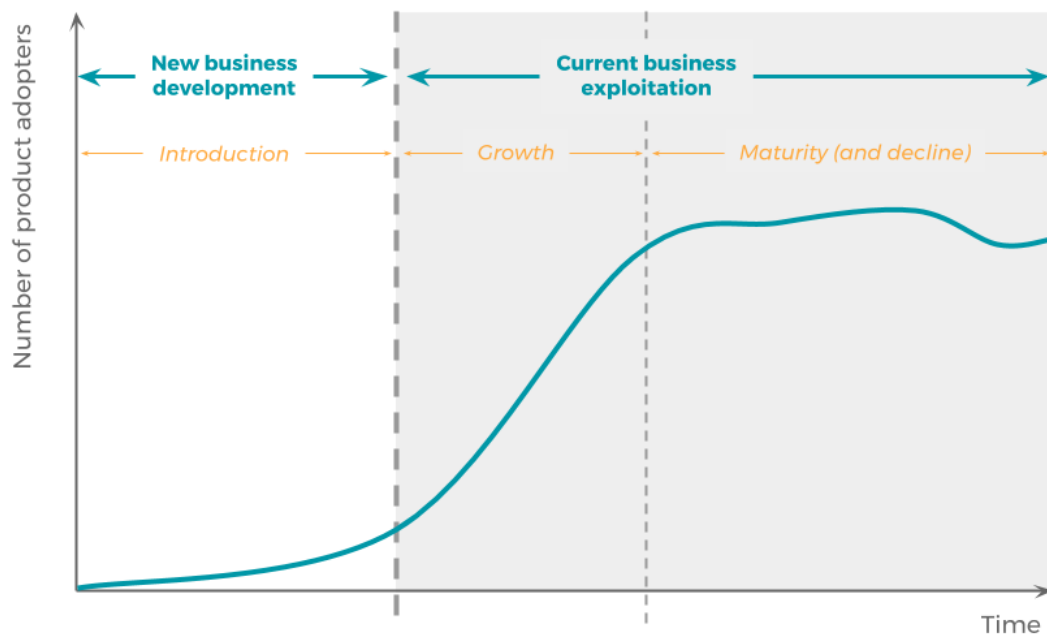


Figure 9- Product Life Cycle: the difference between exploration and exploitation

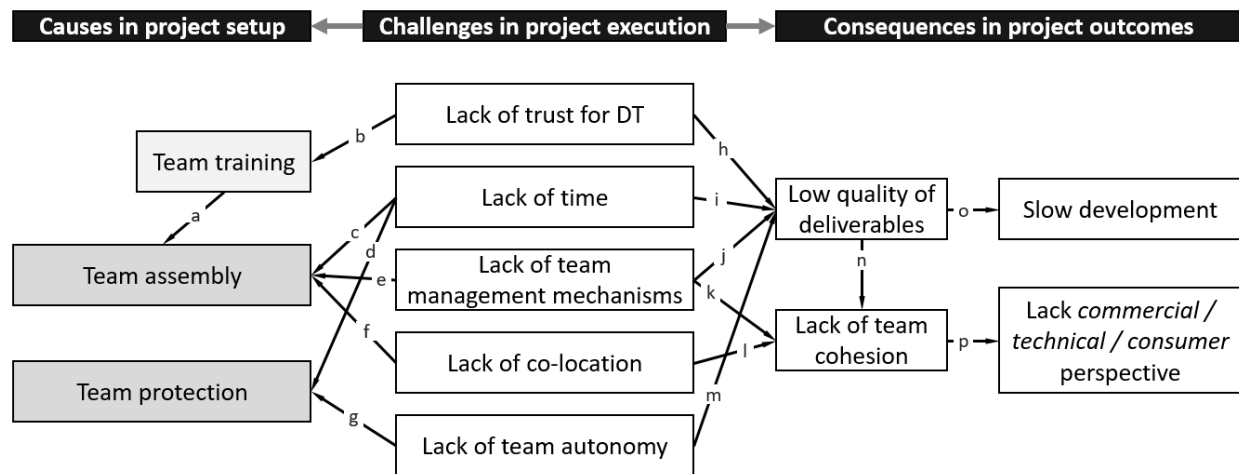


Figure 10- A simplified causal model of barriers in the adoption of DT

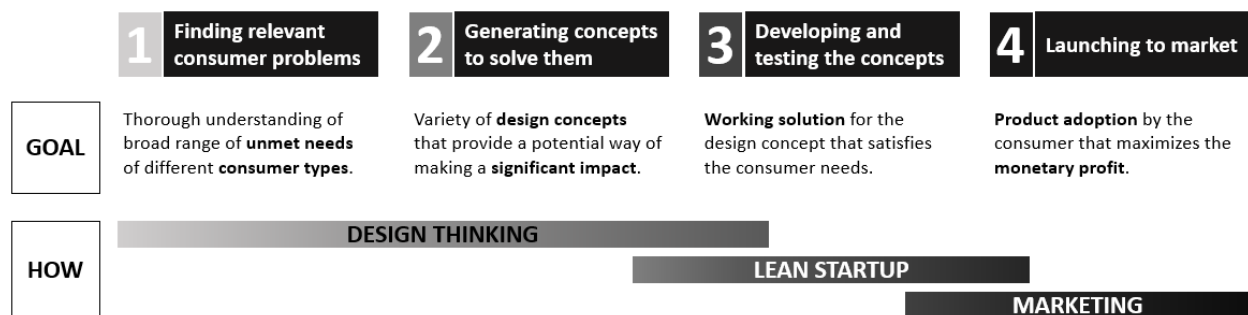


Figure 11- The four phases of human-centered RI

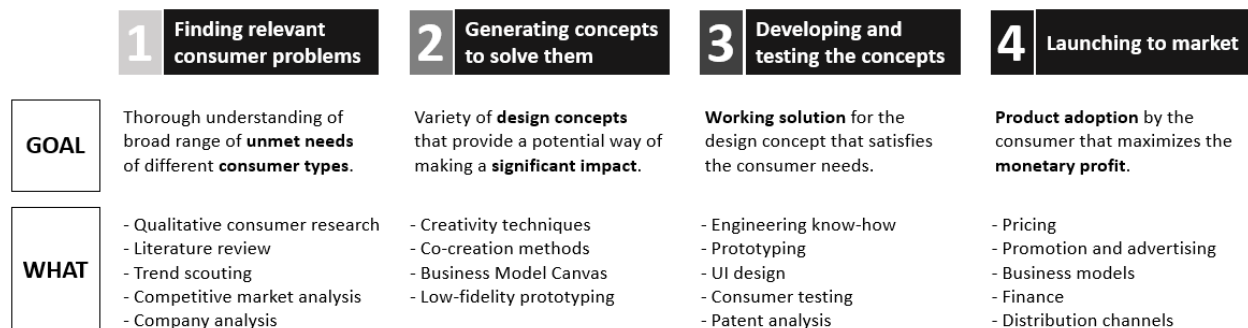


Figure 12- The different expertise associated with the RI phases

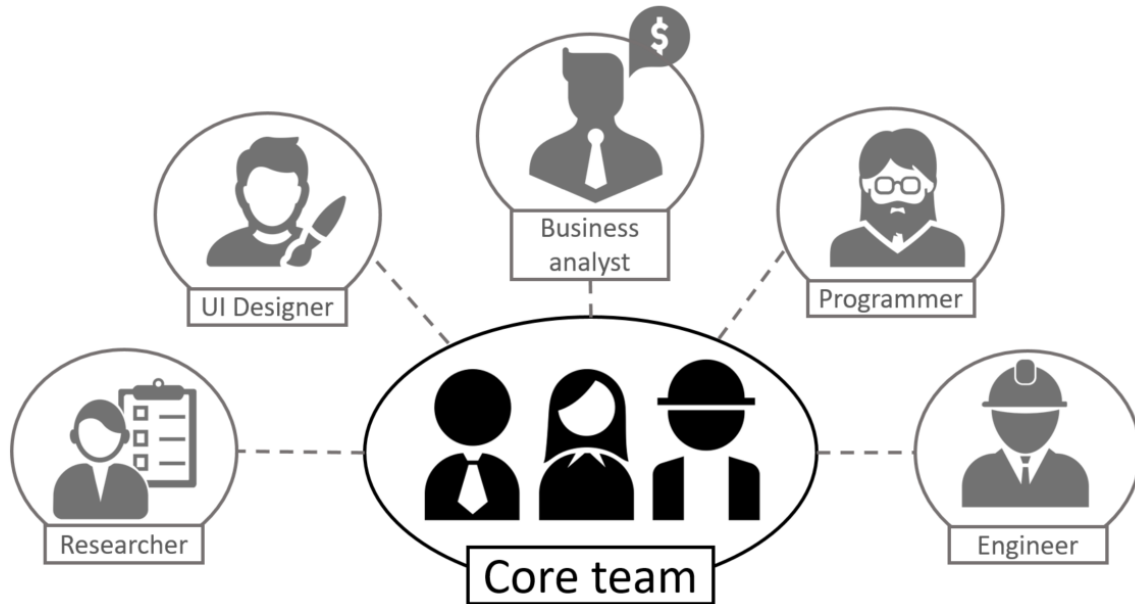


Figure 13- An adaptive team structure with a core team and surrounding experts



Figure 14- Four elements for a successful RI and DT project setup

Appendix 1 - A simplified version of the organizational structure of P&G

Innovation projects usually require the involvement of different functions within the organization. This appendix provides some insight on how this large organization is structured.



It is not surprising that a global company with over 100.000 employees and a portfolio of 65 brands has a complex organizational structure. The business is structured around four business groups composed of different business units (BU). The different BUs (e.g.: Baby Care) are grouped together based on the synergies that can appear both from a commercial and a technology standpoint.

Within the BUs, there are different business functions (Brand, R&D, Engineering, HR, IT, Legal, Purchasing, Finance...) that can be shared by various BUs.

A detailed explanation on what each business function does can be found in <http://pg-fit-tool.com/>

Besides these global business functions, the company has regional market organizations called Selling & Market Operations (SMOs) which are in charge of developing the strategic partnerships with the points of sale for P&G products in different markets.

It is also important to mention that the company has a hierarchy consisting of different *bands*. *Band 1* being the entry level and *Band 10* the CEO. *Band 7-9* positions are occupied by the Presidents of the business groups (leading the Brand function for specific BUs) as well as the chief officers from the different functions (CTO for R&D, CFO for Finance, CHRO for HR, CDO for Design, CLO for Legal, etc.). This gives significant power to the Brand function but keeps a balance with the other business functions.

For the purpose of this master thesis we will focus on the core functions around innovation: Brand and R&D. The integration of both in the NPD process has been frequently advocated for in literature (Griffin & Hauser, 1996; Moenaert & Souder, 1990).

1. Brand

Three sub-functions are particularly interesting for us:

- **Marketing & Brand Management:** they are in charge of the brand's strategic choices when it comes to product and commercial innovations, holistic communication plans and brand executions across all media and consumer touch points. They are accountable for developing and executing strategies and plans in

partnership with internal multidiscipline teams and external creative and communication agencies to make the business grow.

- **Consumer & Market Knowledge (CMK):** they are business analysts in charge of conducting market research to spot trends and bring the voice of the consumer. Their role is similar to that of a business consultant.
- **Design:** originally set up as an independent function, design managers are in charge of partnering with design agencies to develop the brand's visual identity, coming up with innovative concepts and developing in – store communications, counters, and displays. Besides design managers, in BUs like Baby Care there are in-house designers taking care of the diaper graphic design.

2. Research and Development (R&D)

Within the R&D function, there are (1) specific-BU R&D and (2) cross-BU R&D organizations. These organizations, which employ scientists and engineers, are spread across the 14 innovation centers that the company has all over the world. The ones working in BabyCare are mainly located in Germany:

a. Baby Care BU R&D

Within the R&D of a specific BU we can distinguish between upstream innovation (FEI) and downstream innovation (SIMPL):

1. **Front End Innovation (FEI):** this organization is in charge of developing the new generation of products
 - a. **Product Research (PR) and Product Development (PD):** PR uses extensive qualitative consumer research (in-home visits, interviews, focus groups...) to understand what are the Jobs To Be Done (JTBD) by the next generation of products. PD translates that qualitative consumer understanding into technical specifications and develops the concepts.
 - b. **Strategic Technology Platforms (STP):** in order to develop and apply the latest technological developments, R&D has a set of STPs based on the core product technologies (e.g.: absorbency).

- c. Process and Engineering (P&E):** since new products usually require adaptations of the manufacturing process in the plants, this department works as a link between R&D and Engineering.
- 2. Successful Initiative Management & Product Launch (SIMPL):** products developed by FEI are not immediately ready for market launch. Further adaptations to comply with the requirements in different markets are needed.

b. Cross-BU R&D

For those initiatives that are not specific to a single BU but instead can be of benefit to several of them, there are some organizations. The two most relevant for our project are:

- 1. Transformative Platform Technologies (TPT):** for example, the Smart Products TPT, who provide in-house expertise to any BU that may want to develop a product using such technology not present among the BU's STPs.
- 2. Connect & Develop (C&D):** P&G is well renowned for its *open innovation* program, C&D. Through it, strategic partnerships are developed with universities and companies to accelerate our innovation processes by incorporating external expertise.

Appendix 2 – Interview guide for assessment of ambidexterity and DT

RESEARCH GOAL FOR THE INTERVIEWS

Understanding the current innovation approach within the Baby Care business unit of P&G, with a special focus on:

1. Organizational support for RI: the type of innovation projects and their origins.
2. The methods and mindsets for tackling innovation and their relation to DT –and RI.
3. The type of cross-functional interactions between Marketing and R&D functions.
4. The perception of DT.

The findings in these areas should be helpful for understanding the challenges that the facilitator will need to tackle when defining:

1. the kind of training needed to set the team to work with DT methodologies
2. the changes needed in the organization for implementing a sustainable approach for disruptive innovation within the existing organization

SEMISTRUCTURED INTERVIEW GUIDE

A. OPENING (3' mins)

First of all, I would like to thank you for accepting my invitation on such a short notice. I am really looking forward to better understanding the current innovation approach and leverage your learnings along these years in P&G.

Since this is part of the research that I am doing for my master thesis, I have prepared a semi-structured interview guide that will help me cover the topics that I believe are more interesting for what we are trying to accomplish with Blanca.

Before we start, I would like to ask you for permission to record the interview for later analysis, so we can have a fluent conversation and I don't need to take notes about everything. Since I want you to speak with total freedom, the recordings would be handled anonymously and confidentially and, in case any quote would be interesting for my thesis, I would ask for your explicit permission before publishing it. This also applies regarding the confidential details of innovations that are not yet in the market. Is that ok with you?

B. INTRODUCTORY QUESTIONS (5' mins)

- Please, tell me a few words about who you are:
 - what is your educational background?
 - what is your role within the organization?
 - what kind of projects do you work on?
 - what other roles have you taken in the past?

C. TACKLING INNOVATION PROJECTS, EXAMPLES FROM THE PAST (30' mins)

I would like to start by asking you to think of a recent disruptive innovation project in which you have been involved.

- Could you tell me shortly what the project was about?
 - What sort of innovation did you work on?
 - How long did it take?

If innovation is too technical, make them think of a more user-centric project

- What was your personal role in the project?
- What **originated or triggered** this project?
 - How many of the innovation projects you were involved with had a new technological opportunity as the starting point? *(as opposed to a specific identified consumer need)*

- Where do you find inspiration leading to new projects?
- What were the main **phases of the project** from beginning to end?
 - Is this high-level process very project-specific or is it the common approach towards innovation projects?
 - What are the reasons for not following the commonly used approach?
 - Can you give me examples of when that happened?
 - When did you iterate and go back to previous steps?
 - What was the reason?
 - Can you remember the situation that led to iterations?
 - How did people in the team feel about it?
- What was the **team composition**?
 - Which functional areas were involved in the project?
 - What were the benefits of doing so?
 - What were their respective contributions?
 - What kind of interaction was there? (weekly video-meetings? Day to day working together?)
 - What kind of problems appeared from interacting with other functions?
 - Could you give me a few examples?
 - Which activities were done individually?
 - Why?
 - Which ones were tackled with a group?
 - Which ones were tackled collectively with the whole team?
 - What was your impression about these meetings?
 - What went well?
 - What could have gone better?
 - Was the team composition stable in time or did it change over the months?
 - Why?
 - How did you handle those changes?
- What **main activities** (methods) were carried out in each of these phases of the new product development? (*Go one by one through the ones he mentioned before. To prevent bias in part D, don't ask about the specific methods for each part of the Design thinking process: consumer research, ideation, prototyping, validation, etc*)
 - What was the input and outcome of the activities? (*look for diverge-converge*)
 - What was the rationale behind doing a certain activity? (*ask about most relevants*)
 - Who was in charge of choosing to use one method over the other?
- Were there any major problems that you identified regarding...?
 - the definition of the problem?
 - lack of agility?
 - transition from upstream to downstream (concept → market)?
 - Did you have any problems with engineering/commercial teams when moving an idea to the next stage?

D. A THEORETICAL EXERCISE & METHODOLOGY (20' mins)

Thank you! The next part of my interview is about a theoretical problem that will help me understand your line of thought. There are no wrong or right answers to this. Imagine your boss would tell you that, for the

next couple of months, he wants you to focus on working towards a solution to increase the number of employees that come to work by bike. How would you go about it?

- Does he jump directly into solutions? Does s/he try to reframe the problem? (laddering)
- Does he cling on a specific solution?
- Does he think about involving others in the team or doing it individually?
- Does he consider using any of the tools of human-centered design (see below)?
- Does he think about playing with experiences and emotions?
- Does he think systemically? (stakeholder mapping, holistic solutions...)
- Does he think about prototyping as a way of learning early on?

This may not work as expected (too general), so start putting constraints/resources (3 months, 10,000 €, you can involve others...). In case they don't come up with it: "what would be the main phases of your project? What methods would you use to...?"

Thank you very much, that was an interesting approach! Now, to dig deeper into the activities you did during your innovation projects in the past.

- what methods have you or your team used for...
 - ... spotting opportunities?
 - ... understanding your consumer needs?
 - ... framing your insights?
 - ... coming up with new ideas?
 - ... choosing from your ideas?
 - ... testing your ideas
- What was your personal involvement in each of these methods?
- How did you learn about these methods?
- How do you decide whether to use one or another?
- Which methods did you perceive to be very valuable?
 - Why?
- ... less valuable?
 - Why?

E. DESIGN THINKING WITHIN P&G (5' mins)

Before we finish, I would like to ask you about the corporate efforts that have been developed to embed Design Thinking in the organization.

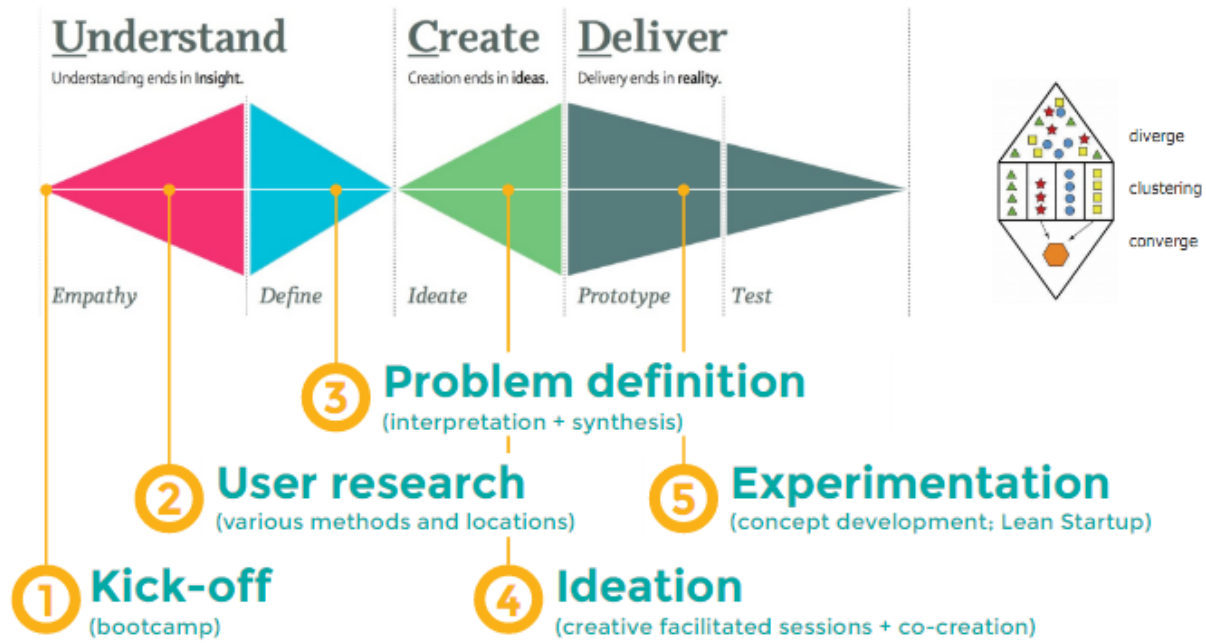
- What is Design Thinking to you?
- What are your thoughts around the Design function?
- Have you attended any creativity or design thinking workshop or "the clay street project"?
 - How did you translate the learnings into your day-to-day work?

E. CLOSING (1' mins)

Thank you very much for your time! Are there any questions that you want to address to me before finishing?

Appendix 3 – The original DT project planning

To create a first high-level planning for the project I took as a basis the experience from previous DT projects developed at the university. I divided the project in 5 different phases which can be linked back to the DT model we showed in Section 2.2.



The following table captures how the different phases were envisioned based on my previous DT project experiences. It is important to mention that, rather than a prescriptive plan, this was intended as an initial guide to estimate the kind of resources that would be required. Both the student and the manager were aware of the explorative nature of the *Design Thinking* process and the need to be flexible and adapt accordingly to the new findings made along the journey:

#	Phase	Description	Activities & methods (full working days)
1	Kick-off	Three days (co-located) of multidisciplinary team bonding activities, training on design thinking mindsets (boot camps) and alignment of our goals and plan.	<ul style="list-style-type: none"> - Team bonding activities (0.5 days) - Bootcamp: introduction to DT (1.5 d) - Aligning goal + mapping research plan (1 d)
2	User research	A month for planning and executing our user research. We will use several methods in different contexts and geographies. Everyone talks to at least two consumers.	<ul style="list-style-type: none"> - Competitors - complementors map (1 d) - Research planning + preparation (2 d) - Interviews, observations... (3 d)
3	Problem definition	Raw data is processed (in pairs). The whole team comes together to cluster	<ul style="list-style-type: none"> - Data processing: transcripts + coding (2 d)

		the insights and transform them into various problem statements. Quantitative validation is carried out. Visual synthesis tools are used.	<ul style="list-style-type: none"> - Data to insights + clustering (1 d) - Insights to problem statements (1 d) - Quantitative validation survey (2 d)
4	Ideation	The problem statements and synthesis tools are used as input in creative facilitated session. Experts (internal and external) and users are invited to different sessions.	<ul style="list-style-type: none"> - Ideation session with whole team (1 d) - Planning of co-creation sessions (1 d) - Sessions with external participants (2 d)
5	Experimentation	The ideas from the creative sessions are analyzed by the team and the best are selected for exploration. Development through prototyping and testing with users follow.	<ul style="list-style-type: none"> - Clustering + evaluation of ideas (1 day) - Prototyping, validation, research (indefinite)

The following graph maps the activities along the four months of the master thesis project. While the previous layout appears as very linear for simplicity purposes, the plan allowed for iterative waves of learning through different methods.

Month	October					November				December				January				
Year week	40	41	42	43	44	45	46	47	48	49	50	51	52	1	2	3	4	5
Project week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Phase	1	2		3					4			5 (+ iterative 1-4)						
Days/week from each team member (except facilitator)	3	1	1	3	1	2	2	2	2	2	3	3			5	5	5	5
Need for co-location	3	-	-	-	-	2	-	-	2	-	-	2			?	?	?	?

Research in location 1

Research in location 2

Research in location 3

Data analysis, prob. sts 1 & survey prep.

Survey launch

Data processing + Problem sts. 2

Ideation in group

co-creations

Evaluation and selection for low-fi prototyping research plans

Appendix 4 – Interview participants' overview

#	Experience (years)	Educational background	Function	Manager?
1	15+	Physics	Product technologist	NO
2	15+	Electrical engineering	Product technologist	YES
3	10+	Electrical engineering	Product technologist	NO
4	15+	Chemical engineering	Product technologist	YES
5	10+	Chemical engineering	Product technologist	NO
6	20+	Chemical engineering	Product researcher	NO
7	10+	Civil engineering	Product researcher	YES
8	10+	Mechanical engineering	Product researcher	YES
9	10+	Chemical engineering	Open innovation manager	YES
10	<5	Industrial design engineering	Designer	NO
11	<5	Business management	Marketer	NO

Appendix 5 – Design Thinking boot camp

Facilitating a creative session to improve the canteen of P&G in Schwalbach (Germany)

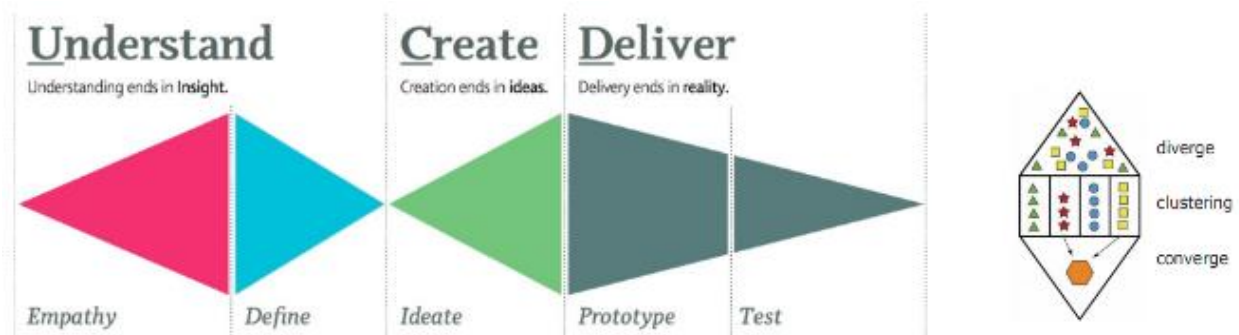
1. Introduction

I prepared and facilitated a 1-day bootcamp to introduce a multidisciplinary team of P&G to the Design Thinking (DT) process and some of the methodologies. This was the kick-off of a larger project to be tackled with the DT approach.

For the kick-off I chose the topic in the title: “how to create a better canteen at GIC (Germany Innovation Center)?”. The topic was broad enough to allow for exploration and creativity, and far away from the regular day-to-day problems to create a safe environment to get to know the process and the rest of the team members.

The team was composed of 6 participants (3 from R&D -based in Germany- and 3 from Brand -based in Switzerland- who specifically flew to Germany for this kick-off). The two groups did not know each other previously and, at large, were not acquainted with the DT process.

The team was introduced to the following model of the [Design thinking process](#) (created by the d.school in Stanford) and I will refer to these phases along this Appendix. They were also introduced to the three main parts in each diamond: Diverge, Clustering and Converge, as explained in the Creative Facilitation approach (Marc Tassoul):

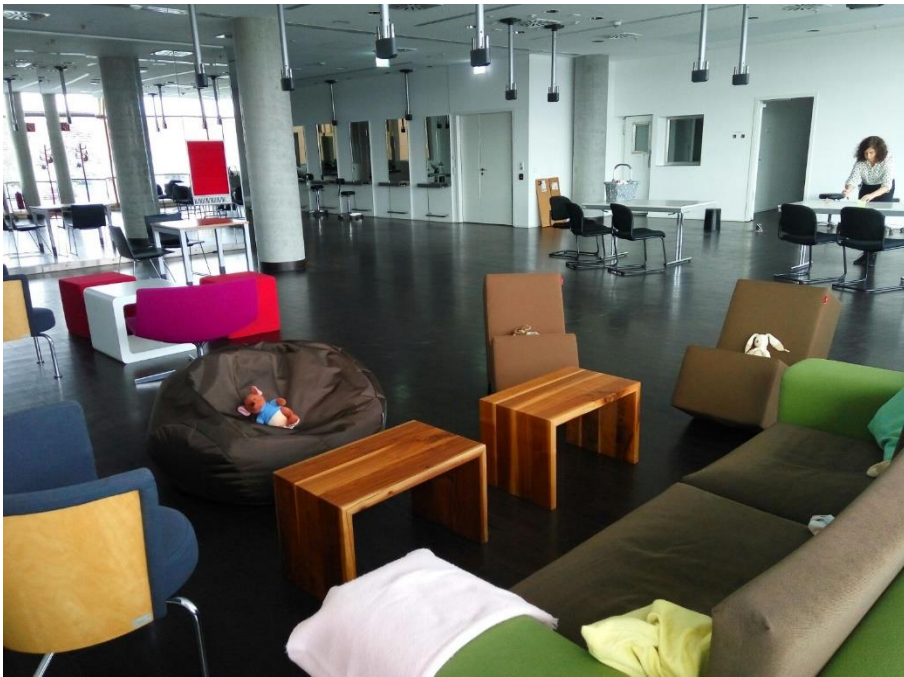


2. Setting the scene

Prior to the kick-off, I needed to create the right physical space for hosting my creative session. In addition, I wanted to create some team bonding by having a fun evening together before working on the aforementioned challenge. Finally, before jumping into the challenge, the team received some inspirational talk by a senior leader and was introduced to the nature of fuzzy innovation challenges and visual thinking as a tool for the bootcamp.

2.1. Creating the right space

Aware of the fact that the team would need a safe environment for learning and experimenting with the new methods, I located an un-used space of the site (a hairsalon). Using as inspiration my previous experience at the TU Delft and other inspiring office images, I went out to find some comfortable and modular furniture (chairs, tables, movable wall panels, a large screen monitor...).



Finally, I purchased or borrowed the right materials for creating and prototyping the ideas: papers, post-it notes, sharpies, colored markers, dot stickers, scissors and glue, Legos, colored papers, notebooks, pens, etc. Also, snacks and drinks were bought to keep the teams energized.

2.2. Building the team before jumping into the task

It is no secret that R&D and Brand don't always share a common language. With the goal of getting to know each other in a relaxed environment, the evening before the bootcamp, the team was invited for a team bonding activity after work, including an escape room and dinner.

2.3. Inviting a senior leader for supporting the process

The day of the bootcamp, I invited a senior leader in the organization to explain in a few words why the project we were about to kick-off was important for the company and the different nature of fuzzy problems like ours, as opposed to more incremental innovation projects.

Since this explorative and collaborative way of working and the methods used in Design Thinking are not within the comfort zone of a silo-structured organization with a strong focus on

technological capabilities, I felt the need of having a senior leader to endorse me (“just an intern”) to work as a facilitator with an “unconventional” approach. While this helped, it was not enough as I will explain in the final reflection.

2.4. Introducing the basics: human-centered design and visual thinking

Before presenting the challenge for the day (“improving the canteen”), the team was exposed to the main phases of the DT approach, my role as a facilitator, the difference between clear and ill-defined problems, the nature of human-centered design (as opposed to technology-driven approaches), and the iterative process of DT.

On top of that, the team was introduced to Visual Thinking. Just after that, they trained it by introducing the person next to them with a simple visual. This also worked as an ice-breaker.

3. Problem intake: mess & data finding

The team was asked to conduct some consumer research and synthesize it before deciding which problem they were going to tackle later in ideation and prototyping.

3.1. Building empathy for the user: ethnographic research

After a short introduction to concepts like “laddering” and “tacit knowledge”, the 6 team members were grouped in pairs to prepare their research guide and, later, conduct the research at the canteen during lunch time. The techniques they were exposed to included: observations and shadowing, short interviews and immersion (for $\frac{2}{3}$ of the team this was their first time at the canteen). They were given 90 minutes to conduct the exercise, and I asked them to bring back at least 3 pictures that they thought were interesting together with their field notes.

3.2. Defining the design challenge

Once the research had been conducted, it was time to make common sense of what the three pairs had generated, and come up with an agreement across the 6 team members regarding the challenge they were going to solve during the ideation session.

3.2.1. Energizer: “Who am I?”

To get the team energized after lunch and into the analytical mode needed for converging during the Define phase, they played the game: “Who am I?": with a post-it stuck in their backs with a certain character or object, they needed to guess who they were by asking only binary questions.

3.2.2. Downloading the insights using empathy maps

As a way of systematically capturing the insights, the pairs were asked to create an empathy map (a design tool with boxes for: what users said, what users did, what users think and

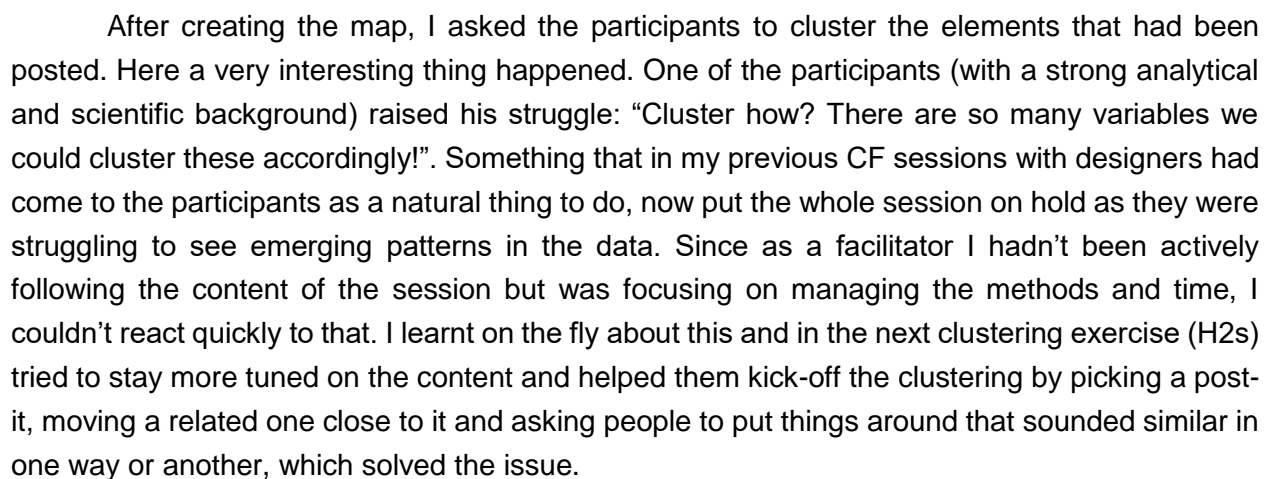
how users feel). They were asked to focus on the “pains” and “gains” of the user, by using two post-it colors.



3.2.3. Bringing the knowledge together through a shared customer journey map

Instead of directly clustering the insights from the 3 empathy maps together, which would have been very messy since the researched users were very diverse, I asked them to build together a “generic” customer journey map. The provided map included four rows: (1) the steps of the user at the canteen, (2) the pains at each step, (3) the gains or positive experiences and (4) other relevant insights.

With the insights fresh in their mind from what they had just downloaded into their empathy maps, they went on to create a shared understanding of the things that could be improved through their design (the pains), but also the things that should be reinforced or at least maintained (the gains).



3.2.5. Using POV for coming up with a design vision

The POV are tools used to converge and create some design vision. They follow the structure: **[user (specific)]** needs to **[need (verb)]** because **[surprising insight]**. It is a way of identifying opportunities grounded on the research that has been previously conducted and

synthesized in the empathy map and customer journey map, and precedes the generation of H2 (“how to...”) problem statements.

The participants were given examples of good and bad POVs, fostering them to move away from simple statements of fact or putting a specific solution in them instead of a need. They were asked to create inspirational and generative statements focusing on user tensions that would allow for a wide solution space.

Two interesting problems appeared in this phase regarding the fine balance between [having a clearly defined design vision of what is the problem to be solved] and [making sure that the richness of the insights generated in the research is not lost when creating it] :

As it can be deduced from the structure of the POV, it forces the participants to focus their efforts on one specific **target user**, avoiding the trap of creating solutions that try to solve everyone’s needs and end up satisfying no one. Some participants are not good at making compromises and instead of going for a specific vision (or POV) they end up creating one that accommodates for several users and several needs at the same time. Therefore, it is useful to have defined different **personas** (or type of users) before. While I intended to do this in the original session planning, because of limited time I decided to get rid of the persona definition. This was a mistake since eventually the team unsystematically did it on their own. They established that two dimensions were relevant when it came to users’ experiences at the canteen: (1) relaxed users that love the experience vs. people on a rush that consider food as fuel, and (2) new users vs. regulars.

Another very important problem, and I think quite recurrent in most design processes, is that the convergence was of poor quality: the final POV didn’t necessarily capture the richness of the insights generated in the research. At some point, the same very analytical team member who had raised the concerns while clustering asked me: “what was the point of doing consumer research to come up with problem statements if I could have come up with these POVs without it?”. One could reply that behind the apparent shallowness of the POVs there was a good understanding of the situation by having been immersed in the context and that the richness of the insights was still in the back of their minds which would be implicitly used for creating better ideas. Nonetheless, he had a point: as a facilitator one should watch out for and probe team members converging shallowly into statements that are not necessarily grounded on the research but on their personal vision of life. I will discuss this topic further in my conclusions.

We used “dots” for the team to choose their favorite POV, which turned out to be: **[users that enjoy the experience of eating and feel it to be part of their culture] needs to [gather people and have a food option that suits me] because [it ensures I don’t feel isolated and I feel valued]**. This was a selection therefore based on personal passion, but they were reminded that in a real project, some quantitative research to identify the most relevant target group and most pressing needs would be necessary before settling for a certain POV.

Just before we moved into generating solutions for the H2, and since we were running low on energy after the effort, the team took a small break by playing an energizer called “The king is dead”. This worked well and people ended up laughing and loosening up. After that, the team was introduced to the Osborne rules of brainstorming.

4.1. Brainstorming to purge the known

Before using any more complex techniques, the team was simply exposed to the problem **“How to create an atmosphere of a restaurant instead of a military camp?”** and asked to generate ideas around it.

When the flow of ideas was decreasing, I turned to a technique that I had successfully used in some previous sessions: I started picking H2 post-its from the cluster of “atmosphere” (e.g.: “How to facilitate comfy group gatherings?”). By doing so, you are able to bring back some of the richness and different perspectives that originated your problem statement and push people to think of the problem from a slightly different angle, which triggers new ideas.

One interesting thing here was that, since they had been trained on visual thinking just before and asked to go visual in their post-its, some overdid it. For instance, one participant made the drawing of an apple without any further notes, making it very difficult to recall what it was about afterwards.

4.2. Problem reversal to spark some more out-of-the-box ideas

When there were no more H2s in the cluster to pick, and inspired by the fact that one of the participants had previously said that the canteen resembled 1984 (by George Orwell), I decided to use problem reversal to generate some more ideas. I asked the participants to generate ideas on “How to make the canteen feel like 1984?”.

Plenty of ideas appeared at a very fast pace and people seemed to really enjoy the exercise: “having to clean your plates”, “eat standing up”, “being told where to sit”, “TV screens endlessly repeating the CEO message”... Following this, they were asked to reverse these ideas, and concepts to address privacy, being served and sharing food with others, started appearing.

4.3. Clustering together ideas into concepts

Since there was no more time for ideation, and clustering so many ideas would have been a long and difficult process, I gave 5 dots to each person to be placed on the favorite post-its that should be saved. Everything without a dot was left aside. To do this, I didn’t bring back the POV, so the participants probably made the decision based on personal interest rather than seeing what would fit best their original design intent as captured in the POV.



Finally, the remaining post-its were clustered: I asked them to put together those ideas that would complement each other into a final design solution. Five different categories emerged around:

- Food
- Decoration and atmosphere
- Modularity of the space
- Human touch in the service
- Automation

The lack of connection between the POV and these categories should be noted. As a facilitator, not having been fully involved in the content of the session, I didn't notice it until the boot camp was over.

5. Prototyping and final presentations

To move further into the development and prototyping of the ideas, the participants were asked to choose the category in which they would be more interested to work on. "Automation" and "Modularity" were the favorites, so I split the team in two groups of three and provided them with materials for prototyping.

5.1. Developing the concepts

The two groups were asked to think of the specifics to bring the idea into a solid concept solution. They were also asked to prototype their ideas using low-fidelity models that would help them in presenting their concept to users and fastly learning about specific aspects on which they still had some uncertainties.

While the team working on modularity used legos to configure their new modular space, the team working on automation preferred to draw their solution, including some “screenshots” of their new application.

5.2. Testing the concepts: playing devil’s advocate

After 20 minutes, the teams were asked to test their prototypes. Although in the original planning they would have gone out again and talked to fellow employees, due to the lack of time I asked them to play devil’s advocate among themselves: one of the three team members went to the other table to play devil’s advocate while the other two stayed to explain their concept and capture the reactions. To do so, they were provided a template to write the comments of the user (what they liked, what they didn’t understand and things that should be changed). To avoid the potential temptation of being over protective with their concepts, I asked them to stay neutral when receiving the criticism.

5.3. Presenting the improved concepts

Finally, the teams were given 20 more minutes to incorporate the feedback into their final concepts and prepare a presentation to introduce them to the rest of the team. On top of that, they were provided a new template to capture the essence of their concept: the name, the opportunity for design, the solution, the prototype, the highlights from the field learnings that went into their concept and the potential next iteration they would take.



in advance (and getting points while doing so), with the intention of getting the user to relax and wait for their food to be served either at the restaurant table or at their desk. It is interesting to note that while attractive, the idea is far from solving for the POV statement. Nonetheless, they included an option in their app to see the ingredients of the menu, which was in line with the users' desire for more transparency in knowing what goes into the menu as learnt in the research.

The second idea, "Quark Canteen", was a new layout of the space using modular furniture around a central space to pick the food. This space would accommodate for both groups and more private spaces to discuss business or personal matters in a relaxed atmosphere. This concept, although closer to the POV and grounded on research insights, also misses to address the key issue around accommodating different cultures into a lunch social experience.

If anything, this partial disconnection of the final concepts with the POV shows the importance, as a facilitator, of keeping present in the minds of the participants what their design goal is, especially during the clustering and convergence (selection). Otherwise, it's very easy in the course of the ideation phase to end up solving other problems that, although still relevant, are not in line with the core challenge. That being said, the ideas were still valid solutions for the original problem of "How can we create a better canteen at GIC?".

6. Conclusion

To conclude this report, I want to include some final learnings, both from what the participants shared with me at the end of the session and some personal reflection. For an overview of the methods and planning of the bootcamp, please check Appendix 1.

6.1. Participants' feedback

The following is a collection of the most interesting ideas that were shared. It should be mentioned that some of them were personal opinions not representing the impression of the group.

Tips

- *In some of the first exercises it was not clear to us what we had to do.*
- *The logistics of the ethnographic research weren't completely figured out.*
- *The different cycles of convergence and divergence felt too messy. It was not clear how the output of some methods was being used in the next one.*
- *You let us too much time to brainstorm at some points, even when most people had already run out of ideas, so some people started to feel disengaged.*
- *I believe that mastering this approach (design thinking) takes a lot of practice: I wouldn't be able to apply this on my own at this point.*
- *The approach felt too shallow at some points, we had to make a lot of assumptions and the ideas aren't outstanding.*

- *It would have been interesting to see upfront the whole overview of what specifically we were going to do along the session.*
- *Facilitation is not for us, we don't like being told what to do, we want to have a saying on the process.*

Kicks

- *You facilitated well overall, pushing us when it was needed.*
- *It was easy to follow through with the different methods.*
- *You were not leading us content wise, but simply facilitating. We liked that you were not pushing your own ideas.*

6.2. Personal reflection

In addition to the reflections included in the different sections of this document, there are some concluding remarks that I want to point out.

First, when working with non-designers, one needs to be prepared to help them in apparently obvious tasks such as clustering or crafting POV or H2 statements. In order to do so, it's good to be partly involved in the content and not only on managing the process and timing. By doing so, it is much easier to help in creating the first POV or initiating the first cluster.

Second, good quality converging is a critical step in order to maintain the richness that has been generated with the divergent and research techniques. Proper combination and selection is important to avoid shallow statements. This is especially critical when introducing these design approaches to non-designers, who may be skeptical about the approach and look for opportunities to disavow it. Of particular importance is crafting a good design vision or POV that captures the richness of the consumer research. To do so, creating a JAM visual thinking kind of drawing will probably be more powerful than a simple sentence. This vision needs to be present later on during the ideation and selection of ideas so that they are in line with it.

Third, a rich design vision of the challenge to be solved may require good quality solutions that are difficult to capture in a post-it or to think about in the hectic 5 minutes of a brainstorming. Brainwriting (individually or in pairs) over a longer period of time may give this opportunity to think on the problem and create better quality solutions.

Finally, for some experienced professionals it may be difficult to let themselves go and accept the "authority" of the facilitator, particularly when that facilitator is a newcomer or an intern. To avoid problems in this sense, it should be very clear upfront the benefit of the approach (maybe by showing success stories from the past) and the role of the facilitator, preferably endorsed by senior leadership in the organization. On top of that, no one should be forced to take part in a session like this one, participation should follow a self-selection basis so that people are predisposed to exploring a different approach.

Session planning:

Time	Phase	Method	Rationale
10.00	Intro	Introduction to Design Thinking and Visual Thinking. Presenting the challenge.	Explain the basics about the approach and when to use it, together with the phases they will go through
Step 1: Problem finding			
11.00	Diverging	Preparing and executing ethnographic research: interviews, observations, immersion	Creating a good first hand understanding of the different pains and gains of the users.
13.20	Energizer	"Who am I?"	Getting people into analytical thinking mode
13.30	Diverging / Clustering	Empathy map	Downloading the learnings from the consumer research in a systematic way
13.45	Clustering / Converging	Customer journey map	Creating a shared understanding of the pains and gains of the users across the 3 pairs of researchers
14.10	Converging	Creating different POVs and choosing one using dots	Creating a design vision of who they were trying to design for and what they were trying to solve.
14.45	Diverging / Clustering / Converging	Creating H2s for the chosen POV, clustering and picking one cluster	While the design vision talks about a persona and their needs, that statement needs to be translated into specific design challenges using H2s.
Step 2: Idea finding			
15.20	Energizer	The king is dead	Getting people to recharge their batteries after the effort of the first diamond and putting them into the creative mood
15.30	Diverging	Brainstorm: use main H2 and sub H2s	Getting the most obvious solutions out, but also solutions from slightly different angles captured in the richness of the sub H2s in the cluster.
15.45	Diverging	Problem reversal	Get some more out-of-the-box ideas
16.10	Clustering / Converging	Select most interesting idea and put the rest, aside. Cluster selected ideas.	Not all ideas have the same quality. To move further, only the best ones should be selected. On top of that, they can be grouped together into coherent concepts
Step 3: Concept finding			
16.30	Diverging	Develop the concept	Develop your ideas and prepare your low-fi prototypes for testing and learning

16.50	Diverging	Testing prototype: Devil's advocate	Prior to further developing the concept, some criticism is added to help them spot the flaws to be improved of their concept
17.10	Converging	Improve idea and prepare your final presentation	Using the previous feedback, a first iteration of rapid prototyping and learning can be completed.
17.30	Final presentations		

The general structure follows the Creative Problem Solving (CPS) revisited model as published by Tassoul and Buijs in 2007, with three main phases: (1) problem finding / statement, (2) idea finding / generation and (3) solution finding / concept development. Within each phase, diverging, clustering and converging techniques are used.

Appendix 6 – An internal ideation session

Time	Activity	Rationale	Outcome
13:00	Welcoming & ice-breaker	Getting people comfortable with each other and set a mark “not-business-as-usual”	People engaged positively and no one questioned the “silly” games.
13:10	Debriefing	Telling the story (challenge) helps in creating common understanding and set the goal	This helped in making sure that ideas weren’t too much off-topic.
13:20	Free brainstorming	“Shedding the known” helps in making sure that people can dump the first obvious ideas and be open towards thinking beyond	It helped in getting the conversation started and getting an idea of where everyone stood. Facilitated next step.
13:35	Laddering	Creating a systematic <i>tree</i> of causes around the main problem helps in re-framing the challenge and understanding the dependency	This created a whole range of different starting points for ideation, since this was a multi causal challenge.
13:45	Brainwriting (selecting 2 causes)	With a complex multi causal problem, individual ideation helps in creating a whole range of divergent ideas	People had difficulties choosing their starting points (causes). The ideas weren’t visual and got too complex.
13:50	Rotation of papers (x2)	Building on each other’s ideas	Not having worked visually made this difficult. Solutions were broadened, not deepened.
14:10	Developing final concepts	The originator of the paper would get it back and incorporate the feedback into a final pitch of a specific concept	Essence of original ideas got lost by the provided feedback, bringing too much bias towards shared single complex solution.
14:20	Final pitches	Participants had to explain how their idea was solving the original challenge	Final ideas were fairly technical without a clearly identifiable value proposition.
14:30	Discussion	The ideas were evaluated, clustered and discussed. Debate on next steps.	People really engaged although this was off-time, it was difficult to close the session.

Appendix 7 – An external ideation session: a hackathon

Cases on Tour: our external ideation session

An opportunity for open innovation (Chesbrough, 2006) with external students presented during the project. The name of the initiative was *Cases on Tour*, an event organized twice a year by the Students Association of the Industrial Design Faculty of TU Delft. During four days in a row, 25 design master students go to four different companies to solve some design challenges. The cases take one full day and the four teams of students are self-facilitated.

Hosting the event

The agenda for the day was set by the students themselves. The four teams worked in the three challenges coached by the core team, who were available for questions throughout the day. For this occasion, we invited a third colleague from the C&D community who had been involved in both ideation sessions and who became the problem owner of one of the three challenges.

Time	Activity	Description
9 - 10	Welcoming	Brief introduction by P&G. Teams split by challenge and get debriefed by the Core team.
10 - 12	Work on cases	Teams start framing the problem. Questions are asked to Core team to build empathy.
12 - 13	Lunch	An opportunity for the students and the company to get to know each other at the canteen.
13 - 14	Back to work	Their first concepts are built and materials are prepared to run their ideas through the panel.
14 - 15	User panel	In slots of 15', teams present their thoughts to 3 parents and capture the reactions.
15 - 16	Final sprint	Teams incorporate the feedback into their final concepts and craft their elevator pitches
16 - 17	Pitches	12 ideas are presented (3 per team) in slots of 3'. Core team listens and provides feedback.
17 - 18	Drinks	We provided drinks and used the opportunity to get feedback from the students.