Vision Concepts for Small- and Medium- Sized Enterprises:

Developing a Design-Led Futures Technique to Boost Innovation

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Dissertation

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by

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Para Marcela, Malena, Humo y Pelusa, sin quienes este proyecto no hubiese sido posible.

Propositions about the dissertation Vision Concepts for Small and Medium-Sized Enterprises: Developing a Design-Led Futures Technique to Boost Innovation by Javier Ricardo Mejia Sarmiento

1. The field of future studies has unjustly ignored the making of concept cars (this thesis).

2. The principles of concept cars as a design-led futures technique also hold for small and medium-sized enterprises (this thesis).

3. Vision concepts convert speculative design from academic explorations into business reality (this thesis).

4. Design-led futures techniques require enterprises to take an ethical stance when envisioning the/their future (this thesis).

5. Because design-led futures techniques emphasize experiential activities, enterprises can easily appropriate these techniques to envision the/their future.

6. Business-centered images of the future are difficult to operationalize, whereas human-centered visions promote actionable outcomes.

7. Training in research-through-design makes you both a better researcher and a better designer.

8. Prototypes do not speak for themselves but require that you tell clear-cut stories.

9. Family and pets can be as valuable as sparring partners as your academic colleagues.

10. Nothing is more rewarding than connecting what you take home (European rigor and method) with what you brought home (Latin realism and spontaneity).

These propositions are regarded as opposable and defendable, and have been approved as such by the promotors: Prof. dr. P.J. Stappers and Prof. dr. H.J. Hultink.

Contents

Preface

Since my graduation as a designer in 1999, I have had a growing interest in the way *design*, as a creative activity, helps people envision the *future*, a fictional terrain. Nevertheless, it was after several years working as a design consultant that I realized exploring the future is a difficult task to undertake. It happened during a workshop that I organized, in Palmira, to support innovation for small businesses, which are essential for the development of this underprivileged town in Colombia. As part of the icebreaker for the workgroup, I asked several questions to the business owners about their future, with the intent to identify their desires and act accordingly. After an awkward silence and several attempts to rephrase the questions, one of the participants said, *"you know Ricardo, we don't have a future here."* This was an unexpected answer for me, as a designer who is used to dealing with tomorrow.

This was not the only time I found this lack of a sense of destination. Years later, when I led the National Design Program of the Ministry of Commerce, Industry, and Tourism of Colombia, I worked with a substantial number of small businesses. As part of this duty, I realized that although they are firmly connected with the future as they seek to leave a legacy to their families and communities, they are stuck in the present because they must solve obstacles to survive now. Therefore, it became apparent to me that thinking about the future might prove problematic for these smaller players. As a result of the lack of skills for thinking ahead, these small enterprises have fewer possibilities to discover opportunities for change and thus create new ideas that will allow them not just to survive, but also to have a positive impact on society.

Looking for inspiration, I found that designers who work in the automotive industry already have a long tradition of thinking ahead through the making of *concept cars*. In these practices, *design*, as a visionary activity with strong emphasis on communication, and the *future*, as a speculative space, come together. Considering this inspiration, in this inquiry, I would like to democratize this design practice to support smaller players, boosting their capabilities for thinking ahead as key social actors who can change our society as they work towards a better future, which is socially and ecologically desirable, just, and sustainable.

Introduction

1

Introduction

1. Introduction

This thesis focuses on the confluence of *futures studies* with *design* and the way this blend can serve *small- and medium-sized enterprises*, from now on referred to as *SMEs*. This chapter sets out the domain of this study –the intersection of these two fields–, introduces the problem, and outlines the purposes of this inquiry. It ends with a reading guide.

For the last three decades, we have known that organizations need to reinvent themselves, not only to deal with the pressures of competition but above all else to lead society towards a sustainable future: a future where communities can meet their demands, in view of the limitations of our planet, without compromising the needs of future generations (The World Commission on Environment and Development, 1987), but today it is even more important.

However, looking at the future is a difficult task, especially because enterprises are tied to the limiting and restrictive present with all its problems, instead of to the future with all its opportunities. To discover these opportunities, enterprises have several techniques known as *futures studies*, which help them in "thinking, mapping, and influencing the future" (Hines, 2016). Along these explorations, they set images of the future to work backward defining a path and thereby guide their actions in the present. One such technique is *scenario thinking*, which uses an examination of the world to come to create strategies for innovation (Wright & Cairns, 2011). Although these techniques have been used successfully by many corporations, they require difficult and resource-intensive activities, and the results they generate are often complicated and designed for specialized audiences. This makes them useful for large enterprises, but not for SMEs.

SMEs are defined as organizations employing fewer than 250 people and with an annual turnover of less than EUR 50 million (European Commission, 2003). They represent the vast majority of the global productive sector, giving jobs to two-thirds of the world's population (United Nations Environment Programme, 2003). SMEs are managed "based on intuition, emotions, and the will to succeed" with the firm commitment to make a difference (De Lille, 2014). The size and flat structure of these organizations ensure employees have easy access to the owners –the decision makers–, creating an informal culture with close relations among members and with users (Augustine, Bhasi, & Madhu, 2012). Therefore, SMEs can speed up the decision-making resulting in flexible and fast innovation procedures (De Lille, 2014). Generally, SMEs representatives "view its size as a competitive advantage" (Hammok, 2015) that makes them able to navigate towards the future more smoothly.

An example of such an SME is Sellarte, a Colombian family business that employs 47 people to produce and sell raincoats (see Figure 1-1) to a large market. While the company is growing steadily, it is unprepared for what will happen when the free-trade agreement between Colombia and China, which is a game changer in this industry, is finalized. The owner urgently needs ideas for the next years, but short-term issues consume all the company's resources as it searches for better suppliers, trains its employees, and improves the factory.

Figure 1-1. Picture of a raincoat from the Sellarte` portfolio. Source: Sellarte web page.

Even though SMEs urgently need to envision the future, as Sellarte exemplifies, they have lagged behind in applying futures techniques. This is mainly due to the inadequacies of the techniques mentioned above, which do not fit these enterprises' distinctive characteristics: informal, emotional, and flexible structures, and lack of sufficient skills and resources. The absence of simplified futures techniques impedes innovation (van der Duin, 2007) and thus their effective contribution to achieving the goals of a sustainable future.

However, there might be an alternative better suited to the characteristics of these smaller players: the *design approach,* which uses a particular way of envisioning the future, focusing on people and their experiences, translating abstract visions into tangible artefacts. Some of the futures techniques that use the design approach are new and come from academia and freelancers, such as *critical design* and *design fiction*, while others amount to long-standing practice in the automotive industry, such as *concept cars*. The first, *critical design*, "uses speculative design proposals to challenge narrow assumptions, preconceptions, and givens about the role products play in everyday life" (Dunne & Raby, 2013). It has been developed in academia, as the Design Interactions program at Royal College of Art, where designers, such as Anthony Dunne and Fiona Raby, deliver unconventional artifacts to open up the discussion about the social implications of new technology. The second, *design fiction*, is a technique to develop "micro futures-studies [that focus] on the everyday life, its short-term evolutions, and the standard objects or services that might fill these possible futures" (Girardin, 2015). It has been explored by design agencies, as the Near Future Laboratory, an atelier that develops fictional objects, such as magazines and product catalogues, through workshops with clients, where they ask questions about the application of future technologies and its strategic applications. The third, *concept cars*, is a well-known design practice used extensively in the automotive industry for exploring the future and thus innovating. Figure 1-2 shows the example of the BMW GINA concept car.

Figure 1-2 Picture of the prototype of the BMW GINA (Geometry and functions In 'N' Adaptations) 2001, a sports concept car entirely covered with a light fabric skin (Squatriglia, 2008). Source: BMW web page.

Although the futures techniques that use the design approach and their results seem closer to the management style, needs, and resources of SMEs, there is no particular technique for exploring the future of these firms. There is no technique, for instance, that helps Sellarte make a *concept raincoat* to envision the future and thus map opportunities, and inspire the design of solutions to face their Chinese competitors.

The aim of this inquiry, then, is to bring the benefits of applying these futures techniques –from academia, freelancers, and the automotive industry– as a design approach to supporting innovation in SMEs.

This aim leads us to define the following *research questions*: the inquiry first focuses on the current situation, the different techniques to envision the future, to study the research questions:

    A. *What are the main activities of the futures techniques used in practice?*

    B. *(How well) do these techniques fit SMEs?*

After that, the research concentrates on the design approach. First, exploring the prevailing practice, of how automotive corporations use concept cars as a futures technique in the context of innovation, to investigate these research questions:

    C. *What are concept cars?*

    D. *How are they used?*

    E. *What value do they bring?*

Second, the inquiry explores other industries, in which the notion of concept cars has been extended to concept products and services, and rechristen them *vision concepts*.

It also compares vision concepts with other design-led futures techniques, such as critical design and design fiction. This exploration seeks to answer the following research question:

> F. *What design-led futures techniques are used outside the automotive industry?*

After this exploration, the inquiry consolidates the insights drawn from all these design-led futures techniques, inside and outside the automotive industry, to help develop a futures technique for SMEs. This consolidation leads to the *design question*:

> G. *How can SMEs make use of vision concepts to anticipate the future?*

In view of the guidelines of the ID·Studio·Lab, the design research community where this research is developed, the answer will take the form of a technique that improves the design practice. It will help designers and SME representatives make and share vision concepts to support innovation. In the end, the inquiry evaluates the use of the technique with SMEs, according to the main research question:

> H. *What are the benefits and limitations of applying vision concepts for SMEs?*

To address both the design question and the research questions, we selected a *research-through-design approach*. This approach helps (design) researchers deal with these two kind of questions by encouraging them to iteratively build and test prototypes of products, services, or techniques, which will lead them to confront issues while developing knowledge (Stappers, 2007). An example that illustrates this approach, introduced by Stappers and Giaccardi (2017), is the Wright brothers. They made several prototypes, including a wind tunnel, a launching catapult, and an airplane itself, to develop the first successful airplane, along with the theory of propellers and a protocol of human-controlled powered flight. Accordingly, research-through-design approach can uncover new knowledge by making.

This investigation addresses a practical problem for SMEs, which have usually been neglected by design, and contributes to the body of knowledge on futures studies and design from a novel standpoint. When focusing on the problem, this inquiry offers a technique that takes advantage of the strengths of design to support SMEs in increasing their futures-thinking skills and thus their innovation capabilities. In the process, we have recognized a well-established design practice in automotive corporations, which has not been previously studied as a futures technique. Moreover, in trying to democratize this design practice for SMEs, we gained insights into the benefits of this way of thinking/making about the future for smaller players in a more restrictive context.

Reading guide

In view of the research approach and the contributions described above, we break this inquiry down into eight chapters (see Figure 1-3). The inquiry moves gradually from large enterprises to SMEs along to the theory and practice poles. Each chapter builds on either theory or practice and is the basis for the following one. It ends with a contribution to both: a technique for the practitioners (Chapter 7) and a reflection for the academics (Chapter 8).
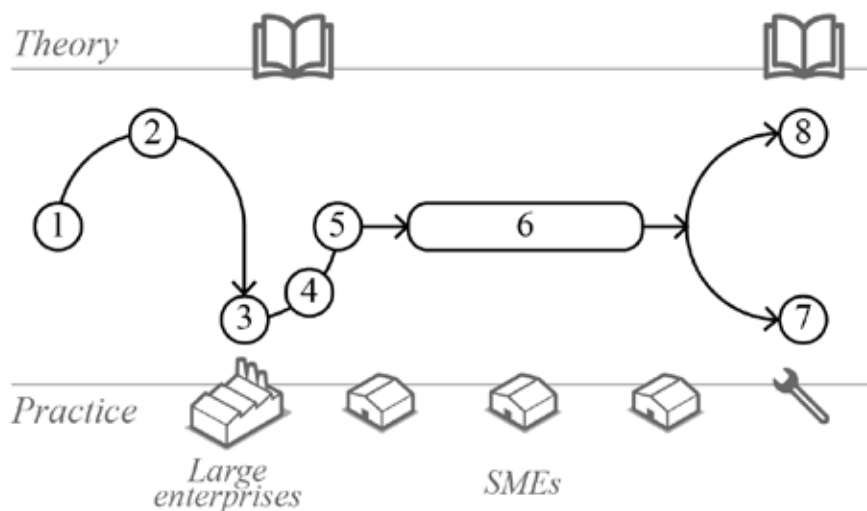
1. Introduction

2. Futures techniques

3. Concept cars as a design-led futures technique for automotive corporations

4. Design-led futures techniques used outside the automotive industry

5. Development of a design-led futures technique for SMEs: DIVE

6. Evaluation of DIVE with SMEs

7. Application of DIVE 1.0 in practice: recommendations and considerations

8. General discussion

Figure 1-3. Blueprint of the inquiry. Source: the author.

Chapter 1 consists of this introduction. *Chapter 2,* which follows the research questions A and B, draws on futures studies and the design literature to identify the main components of the futures techniques used in practice and the ones that best suit SMEs. After discovering the opportunity to use the design approach to envision the future for SMEs, the next two chapters make use of empirical explorations to understand the techniques that take this approach. *Chapter 3* attends the research questions C, D, and E, discussing *concept cars* as one of these techniques in the

automotive industry, and *Chapter 4* proposes *vision concepts*, such as concept cars, products, and services, in other industries. This chapter also explores other design-led futures techniques in different industries to answer research question F. *Chapter 5* describes the development of DIVE, a technique for applying vision concepts for SMEs, including two iterations with enterprises. This chapter addresses design question G. *Chapter 6* presents the test of DIVE through five cases with SMEs providing an overview of the cases and the lessons from each one. Incorporating these lessons in the final two chapters, *Chapter 7* introduces DIVE 1.0, the technique that results from this inquiry. *Chapter 8* then answers the main research question (H), describing the benefits and limitations of applying vision concepts to boost SMEs' innovation capability. It also comprises a reflection on the research's contribution to the state of the art and illuminates its value for design practice. It ends with some ideas for further research.

This thesis has three different audiences:

- *Design researchers* who focus on futures studies and design. This thesis provides insights into the way practitioners have applied concept cars (Chapter 3), and also vision concepts and other design-led futures techniques (Chapter 4) for innovation. The dataset (Chapter 6) and the proposed technique (Chapter 5 and 7) can be used as starting points for further studies that involve SMEs or other smaller players, such as communities or individuals. Chapter 8 condenses the lessons from the application of this technique with SMEs.

- *SMEs representatives*. This dissertation offers a step-by-step guide to apply vision concepts as a design approach for exploring and communicating the future in SMEs (Chapter 5 and 7). Also, the cases presented in Chapter 6 show how other enterprises have developed these explorations.

- *Designers* and *design students* who are (interested in) working with smaller players. They will have access to all the information on the proposed technique in Chapter 6, which offers guidance to facilitate these exercises with smaller players. More importantly, they will find various considerations of how to work with SMEs in this type of future-oriented research (Chapter 7).

Futures techniques

Futures
techniques

2. Futures techniques

The previous chapter introduced the intersection between futures studies and design as the domain of this inquiry, defining its goals and the challenges it faces. It described how many futures techniques involve demanding activities and result in sophisticated outcomes that are primarily useful for large corporations. However, SMEs, which are the greater part of the industry and which urgently need to increase their innovation capabilities, lack comparable techniques for envisioning the future. The aim of this chapter, then, is to identify the type of futures techniques that best fits SMEs. To make this selection, this chapter studies futures techniques, including their main activities and characteristics.

Section 2.1. uses literature from futures studies as a basis for describing the main activities that constitute futures techniques. The keywords futures studies, futures thinking, strategic foresight, and anticipation, were used in the literature search through Scopus, Web of Science, Google Scholar, and IEEE Xplore. Section 2.2. identifies a set of preliminary characteristics of these techniques, gathered from interviewing experts in these fields; it ends by clustering the futures techniques into two groups. To further investigate these two groups, Section 2.3. conducts a literature review that uses the keywords technology roadmapping, scenario thinking, trend analysis, critical design, design fiction(s), concept car(s), and advanced design on the search engines mentioned earlier. This chapter ends with Section 2.4., which compares the activities and characteristics of the futures techniques, to find the technique most suitable for SMEs. Chapter 3 and 4 build on this work in their exploration of concept cars and vision concepts as futures techniques.

2.1. Futures techniques' main activities

Enterprises need to be aware of the changes in the business environment and changes in the behaviors of customers, competitors, and suppliers (van der Duin, 2006). These changes may seem far away, they could impact organizations to a certain extent in due time. This impact ranges from minor issues, having little repercussion for the organization, to significant changes, which can put the company at serious risk. Anticipating these changes expands the range of options during the strategic exploration (Voros, 2001), and thus provides insights to support decision-making. These insights are particularly useful when organizations try to innovate, or when they attempt to introduce novel goods, methods, or materials, to enter into –or even to create– a new market and thus survive (Schumpeter, 1912). And, as we already

mentioned in Chapter 1, these novel goods, methods, or materials are also key to achieve the goals of a sustainable future.

As a result, enterprises have several techniques available to conduct inquiries into images of the future (Voros, 2007) as a way to shine a light when acting in the present, commonly known as *futures studies*. Comparing the generic foresight process framework defined by Voros (2003) and the futures techniques described by Popper (2008), these techniques typically consist of four main activities: *(i) setting the domain and time frames, (ii) analyzing the context factors, (iii) envisioning the alternative futures*, and *(iv) mapping the preferable future.*

2.1.1. Setting the domain and time frames

The first activity consists of setting the domain, the area covered by the inquiry, and the time frames, the different intervals that divide the future. These intervals are the *world as it is*, the *near future*, and the *speculative future* (Sanders & Stappers, 2014b). According to Curry and Hodgson (2008), the world as it is represents the dominant –political, economic, social and technological– discourse, the near future is a space of transition, and the speculative future is a space of consolidation. Figure 2-1 shows the example of the automotive industry, in which the time frame for new vehicle launches is about three to four years and the time frame for foresight exercises is more than fifteen years (Hirsh, Kakkar, Singh, & Wilk, 2015).

Figure 2-1. Time frames of the automotive industry. Source: the author.

Although, Eisenhardt and Brown (1997) suggest that futures techniques must reach as far as possible to create an impulse and maintain the organizational drive to innovate. Defining the appropriate time frames is all about finding a satisfactory compromise between a near future, which is not too close to be obvious, and a speculative future, which is not too far to be unachievable. Figure 2-2 compares various examples of time frames of different industries.
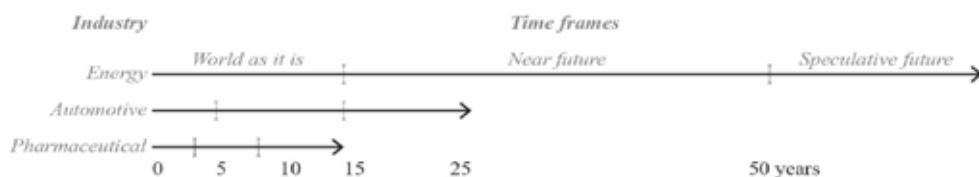
Figure 2-2. This plot compares the time frames of the automotive industry with the energy sector, which explores fifty years away (Curry & Hodgson, 2008), and the pharmaceutical industry, which looks ahead less than ten years (Cook, 2015).

2.1.2. Analyzing the context factors

In view of the domain and the time frames, organizations use the second activity to identify and understand the context factors. Figure 2-3 shows the context factors that include the trends, the way in which society changes, and the drivers, the forces that specific organizations, such as governments, apply when trying to control those trends (Kreibich, Oertel, & Wolk, 2011). According to Conway (2006), a trend begins when an issue emerges at the outer edge of society, which evolves into a trend when the degree of public awareness increase, and ends when it progresses into a mainstream. To identify the relevant ones, organizations search between two levels: the macro- and the micro-trends. The macro-trends are the patterns of social change that mark a meaningful alteration of the social structure through time (Galtung & Inayatullah, 1997), and the micro-trends are change and innovation "experienced by everyone in more or less the same contexts" (Kreibich et al., 2011). This activity ends with an understanding of how these trends and drivers influence one another (Popper, 2008) when moving from the past to the future.

Figure 2-3. The context factors (trends and drivers) moving along the time frames. Source: the author.

Therefore, the domain and time frames are useful to split the future up into smaller parts, which depends on the industry to which the enterprise belongs, to facilitate the identification and analyses of the relevant context factors.

2.1.3. Envisioning the alternative futures

Given the context factors analyzed earlier, in the third activity, organizations envision the likelihood of futures. In this activity, the future is no longer understood as a linear sequence of facts coming from the past –as a timeline–, but rather as a space of opportunities. This space is demarcated by three concentric cones, whose vertexes are in the world as it is. According to Hartmann (2007), the cones show that the variability of the future will increase along the time frames, the farther, the broader. Within this space of opportunities, many possible developments are envisioned (Amara, 1981) to create ideas about the future (Dator, 2002). These various possibilities are commonly known as *alternative futures* which are classified by Henchley (1978) into: *possible*, *plausible*, and *probable* futures (see Figure 2-4).
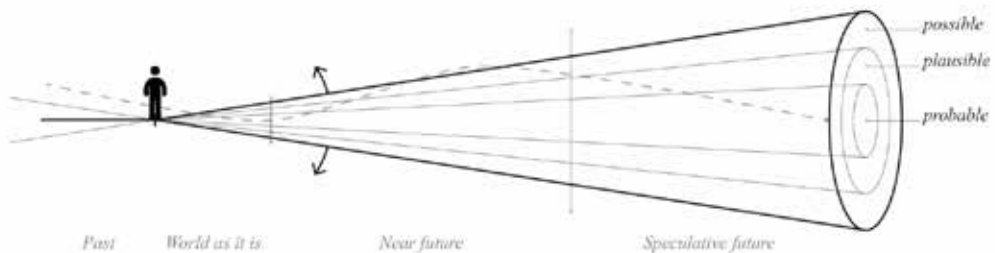
Figure 2-4. The image shows the alternative futures: possible, plausible, and probable. Notice the arrows that show how the timeline opens into the cones. Source: Adapted from Henchley (1978) and Voros (2003).

According to Voros (2001) the *possible futures* cover the larger cone, representing all the images of the futures that might occur, including "all the kinds of futures we can possibly imagine", which rely on knowledge that is not yet discovered. A smaller concentric cone then shows the *plausible futures* which include the images of the futures that could happen depending on state-of-the-art knowledge. A tiny cone, right in the middle of the other cones, also shows the *probable futures* limited by the images that are likely to happen as a continuation of the present, which are linked to current context factors and knowledge.

Through this activity, organizations follow the context factors along the time frames to envision the alternative futures which includes diverse images of the future. The further these images are from the central axis, the more radical, less conventional these images become.

This activity is based on probabilities and thus is susceptible of being anticipated.

2.1.4. Mapping the preferable future

This activity asks for action, in which organizations evaluate the likelihood and desirability of the different images of the future (Mannermaa, 1986) developed earlier. With this activity, organizations define the image of the future that they want to happen, which Voros (2003) calls *a preferable future*. This preferable future lies in the other alternative futures –possible, plausible, and probable– (see Figure #2-5) or even outside those cones. There may be multiple of these preferable futures to work towards, and the strategic decision for one or the other can be aided by the definition of a vision. According to Curry and Hodgson (2008), a vision is deeply informed by beliefs and values. This activity, then, revolves around values and strategy and a decision that is both emotional and subjective.
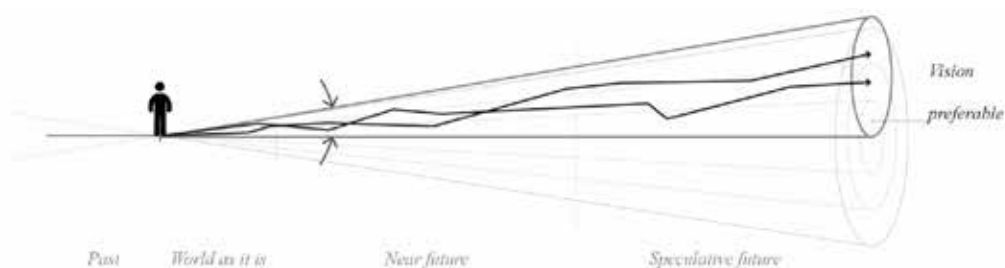
Figure 2-5. Giving the space of opportunities -the alternative futures-, companies map the preferable future through the definition of a vision, and the plot of the different paths to achieve it. Source: the author.

2.1.5. Discussion

Futures techniques help enterprises in scoping the future, analyzing its context factors, anticipating the possible and probable, and mapping and deciding on the preferable way forward.

These activities and their results enable organizations to see the world as it is in a different way that enlarge the choices they have and help them in the decision-making, such as identifying and timing opportunities and risks, and suggesting several possible solutions to these risks. In view of the results of these activities, organizations influence people inside and outside their business to provoke change, a change that can help them grow as an organization. Through its inspirational values, this change can have a broader impact in society, beyond the organization.

2.2. -Study on the- Futures techniques' characteristics

While the previous section presented a generic list of activities towards the future, this section focuses on the futures techniques used in the field. We conducted interviews to uncover a preliminary set of characteristics that differentiate the futures techniques.

2.2.1. Method

All interviews were conducted by the author, in a one-on-one setting, and lasted between thirty-seven and sixty-eight minutes. They occurred face-to-face and in English.

Participants

The interviewees were chosen for their experience using futures techniques. Of the five participants, four have more than ten years of experience and one less than five years working with these forward-thinking techniques. Table 2-1 shows an overview of the sample.

Table 2-1. Sample of the interviews with experts

Interviewees	Area of experience	Years of experience	Conducted in person at	Length
Expert 1	Technology roadmapping	› 10	Sept 10, 2014	47 min
Expert 2	Design and innovation	› 20	Sept 16, 2014	45 min
Expert 3	Foresight and innovation	› 15	Sept 19, 2014	46 min
Expert 4	Design and innovation	› 15	Sept 19, 2014	37 min
Expert 5	Design and innovation	› 5	Sept 23, 2014	68 min

Procedure

All interviews started with a short introduction that includes a preliminary questionnaire about the area of experience and the years of experience in it. It also contains a non-disclosure agreement. Kelly's (1955) Repertory Grid Technique was used as an elicitation method. It enables the elicitation of a range of constructs and the relation between them, involving specialists with experience in the subject of study (Boyle, 2005), and free of the interference of the researchers (Whyte & Bytheway, 1996)"According to Sanders & Stappers (2012), in this technique, the participant is given stimuli and asked to create an arrangement and afterward explain this, in order to evoke a fresh story, and bring tacit knowledge to the fore.

The stimuli used in these interviews include: six cards (see Figure 2-6), each of which describes a futures technique, and two templates. We chose six futures techniques

that are easily recognized by experts of this topic, even though they may not have direct experience with them. The template 'constructs' is a horizontal line with three divisions to sort three cards and the template 'rating' is a horizontal line with six divisions to rate all the cards.

Figure 2-6. Image of the cards, one of each futures technique (e1) concept cars, (e2) haute couture, (e3) visionary urbanism, (e4) technology roadmapping, (e5) scenario thinking, and (e6) trend analysis. Source: the author.

As part of the interview, in Repertory Grid Technique, an expert received a random triplet of stimuli, arranged them in two groups, and described the difference between the groups as one construct: one dimension described through two labelled poles. The expert then ranked the cards from left to right (and rank order was used as the rating value). This process was then repeated for a number of stimuli triplets. Experts continued until they could not find a new construct or time ran out (15 minutes), which led to between 5 to 10 dimensions, and 32 ratings. After this task, the expert was asked to explain the individual dimensions and rankings.

Data analysis

Data from the Repertory Grid Technique consisted of 32 rating values and 64 labels and their explanation. This data was treated with statistical and semantic analysis following Fällman (2003). On the basis of the ratings, a two-dimensional scaling solution –a 'Cartesian plane'– was derived, clustering the constructs on correlation between the ratings that were obtained for the different techniques. In the semantic analysis, clusters of nearby constructs were grouped together. For each group, the differences and similarities were studied, and a common denominator was formulated. Sample, stimuli, and raw data are reported in detail in Appendix Chapter 2 online http://dive.pktweb.com/

2.2.2. Results

Figure 2-7 shows the results of the Repertory Grid Technique on the Cartesian plane. It displays which characteristics the experts assigned most often to the futures techniques mentioned earlier, and clusters them in four groups: Short Term—Long

Term, Narrow—Broad, Abstract—Tangible, and Textual—Visual.
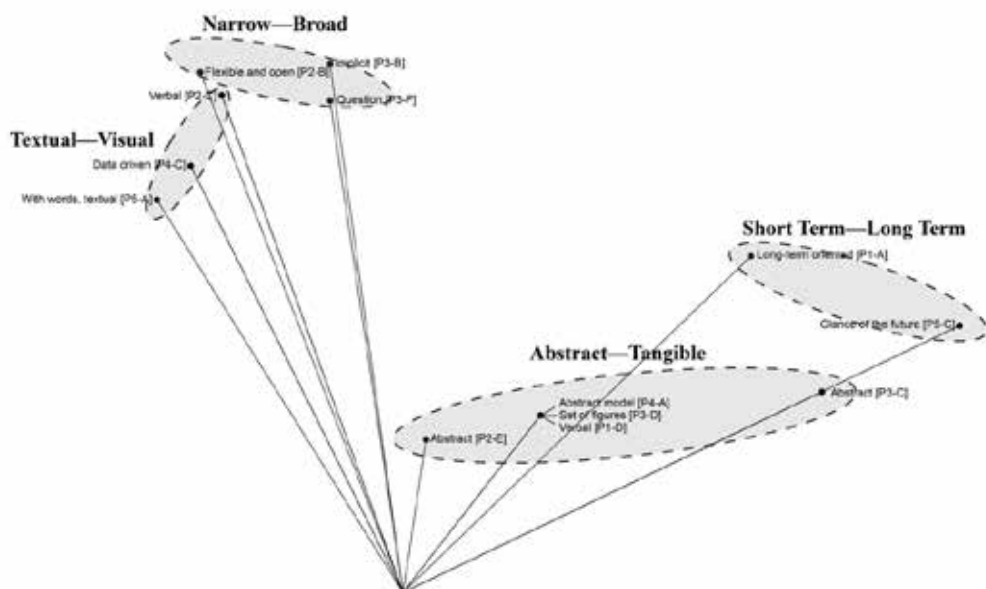
Figure 2-7. Top section of the Cartesian plane that shows the four groups of characteristics clustered based on its similarity. Considering that the diagram is symmetric, we just show the top section, but the vectors extend until the opposite coordinates. Source: the author. See Appendix Chapter 2 online http:// dive.pktweb.com/ for the original diagram and the full list of characteristics and ratings.

Short Term–Long Term

Experts refer to the future orientation of these techniques and the way that some of them explore further time ranges than others (see Table 2-2). They agree on the findings from the literature review on time frames, more specifically on its relationship with the type of industry. Expert 1 says that "[companies] have to look at different time horizons, it depends of course on the type of company […] If you look at Philips in consumer lifestyle, it explores three years, the medical [industry] ten years…".

Table 2-2. Rating on Short Term–Long Term (techniques with the same ratings are highlighted in gray)

	Short Term (1)	e1	e2	e3	e4	e5	e6	Long Term (6)
Expert 1	*Short-term oriented*	2	1	6	5	4	3	*Long-term oriented*
Expert 5	*Reporting current situation*	2	1	4	3	5	6	*Glance of the future*

According to the interviewees, *(e2) haute couture* and *(e1) concept cars* explore most shorter ranges, closer to the world as it is. No clear consensus was found regarding the techniques that explore the long-term range, the speculative future.

Narrow–Broad

Apparently, another important characteristic for the experts is how narrow or broad the explorations' scope is (see Table 2-3). To a certain extent, this scope is related to the alternative futures found in the literature review, in which possible futures research broader scopes, while probable futures explores narrower scopes.

Table 2-3. Rating on Narrow–Broad (techniques with the same ratings are highlighted in gray)

	Narrow (1)	e1	e2	e3	e4	e5	e6	Broad (6)
Expert 2	*Close and narrow*	4	2	1	6	5	3	*Flexible and open*
Expert 3	*Explicit*	3	1	2	6	5	4	*Implicit*
Expert 4	*Answer*	3	1	2	6	5	4	*Question*

Where the interviewees assess *(e4) technology roadmapping* and *(e5) scenario thinking* as ones that explore broader scopes, *(e2) haute couture* is one of the techniques with a more specialized scope. Expert 3 says: "*(e2) haute couture* […] tries to portrait a trend but it excludes the context. You don't know what is happening around it".

Abstract–Tangible

Experts state that the results of these techniques have a distinctive level of concreteness. The results, shown in Table 2-4, can be as abstract as the *(e6) trend analysis*, *(e5) scenario thinking*, and *(e4) technology roadmapping* or as tangible as *(e1) concept cars*.

Table 2-4. Rating on Abstract–Tangible (techniques with the same ratings are highlighted in gray)

	Abstract (1)	e1	e2	e3	e4	e5	e6	Tangible (6)
Expert 1	*Verbal*	6	5	4	3	2	1	*Tangible object*
Expert 2	*Abstract*	6	4	5	3	2	1	*Tangible model*

| Expert 3 | Set of Figures | 6 | 5 | 4 | 3 | 2 | 1 | Tangible |
| Expert 4 | Abstract model | 6 | 5 | 4 | 3 | 2 | 1 | Tangible |

According to Expert 3, "*(e1) concept cars*, *(e2) haute couture*, and *(e3) visionary urbanism* are tangible objects that help make the abstract more concrete". Expert 4 also expresses that "a *(e1) concept car* is a tangible, materialized model, which rep

resents an idea that a designer, or a group of people, have and used as a reference for discussions and to get to agreements or to come up with final ideas".

Textual–Visual

The type of language used to communicate the outcomes of these techniques is the final characteristic found through the interviews. While all the experts (see Table 2-5) consider that *(e3) visionary urbanism* is the most visual oriented, *(e4) technology roadmapping* is associated with words, being textual and data driven.

Table 2-5. Rating on Textual–Visual (techniques with the same ratings are highlighted in gray)

	Textual (1)	e1	e2	e3	e4	e5	e6	Visual (6)
Expert 2	Verbal	4	5	6	1	2	3	Visual
Expert 4	Data driven	5	4	6	1	2	3	Visual
Expert 5	With words / textual	5	4	6	2	1	3	With images / visual

Expert 5 states that she "sees something in common between *(e3) visionary urbanism*, *(e1) concept cars*, and *(e2) haute couture*: they are quite graphical, they are concepts that are represented as images."

Most of the ratings in Tables 2-2 to 2-5 show a high level of agreement in the techniques –similar values in each column– strengthening our confidence that adding more participants would not bring out new perspectives.

2.2.3. Discussion

The Cartesian Plane and the ratings not only provided the aforementioned characteristics, but also clarified the commonalities between the characteristics. Characteristics Short Term—Long Term and Narrow—Broad are related to the techniques' activities, and characteristics Abstract—Tangible and Textual—Visual are linked to the techniques' outcomes. We clustered these techniques into two groups, as shown in Figure 2-8: the *management-led futures techniques*, which include (e4) technology roadmapping, (e5) scenario thinking, and (e6) trend analysis, and the

design-led futures techniques, conformed by (e1) concept cars, (e2) haute couture, and (e3) visionary urbanism.

Activities   ## Outcomes
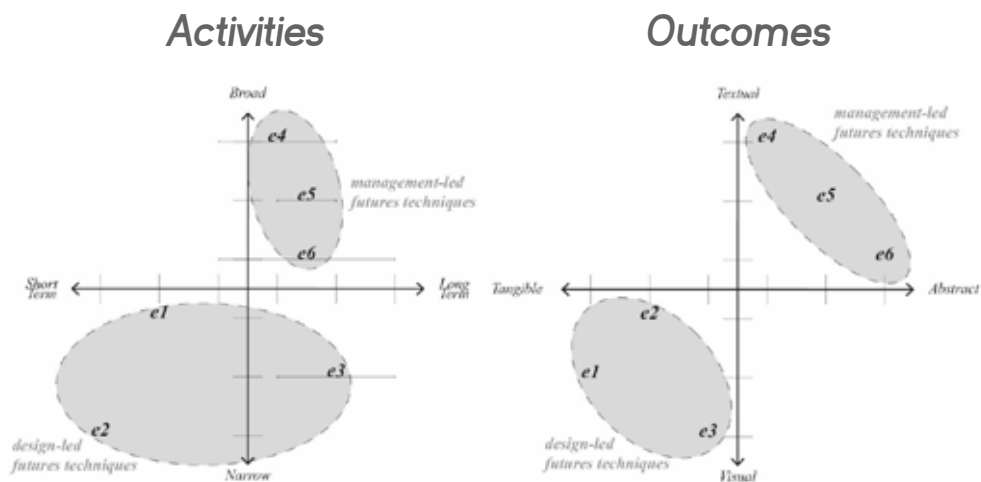
Figure 2-8. Relationship of the characteristics related to the activities (Short Term–Long Term and Narrow–Broad) and outcomes (Abstract–Tangible and Textual–Visual) of the futures techniques. Source: the author.

On one hand, the management-led futures techniques are long-term oriented explorations that cover broader scopes and result in abstract outcomes, which are communicated mainly in words. On the other hand, design-led futures techniques cover diverse time frames of narrow scopes, producing more tangible results, which are shared visually. The more tangible the result of the technique is, the narrower is the scope it addresses. Table 2-6 shows a summary of the characteristics of the management-led and the design-led futures techniques.

Table 2-6. Comparison of the management-led and design-led futures techniques

	Management-led futures techniques	Design-led futures techniques
Techniques		
Activities	*Long Term*	*Short Term and Long Term*
	Broad	*Narrow*
Outcomes	*Abstract*	*Tangible*
	Textual	*Visual*

This exploration deepened our insight into futures techniques, focusing on their characteristics which uncovered the similarities and differences of these approaches in the field. It gave us a set of ingredients for creating a new futures technique or improving an existing one.

2.3. Futures techniques' types

With the ingredients from the previous exploration, we conducted a new iteration of a literature review on futures studies and design to define three examples of each of the two groups –the management-led and the design-led futures techniques–. It concludes with a comparison of these groups.

2.3.1. Management-led futures techniques

This section presents the three examples of management-led futures techniques used in the previous study: *technology roadmapping*, *scenario thinking*, and *trend analysis*.

Technology roadmapping

Technology roadmapping was originally developed by Motorola in the 1980s to assist strategic product planning (Kreibich et al., 2011). According to Simonse, Hultink, and Buijs (2015), it is "a process to think and analyze the market, product, and technology conditions [to] elaborate on a plan". These conditions are studied by tools such as portfolio analysis, SWOT analysis (strengths, weaknesses, opportunities, and threats), and Quality Function Deployment (Groenveld, 1997)as well as their mutual relationship over a five-year period. Teamwork, integral involvement by the organization and good communication are essential characteristics of the process. Benefits include a shared product–technology strategy and a cross-functional approach to product and technology planning and vision building. The roadmap drafting process can be supported by such tools as maturity grid, Quality Function Deployment and the Innovation Matrix.". The study ends in a "visual portray" of these conditions plotted on a timeline (Simonse, Buijs, & Hultink, 2012), the technology roadmap (see an example in Figure 2-9). This roadmap usually leads to a vision –right after the near future.
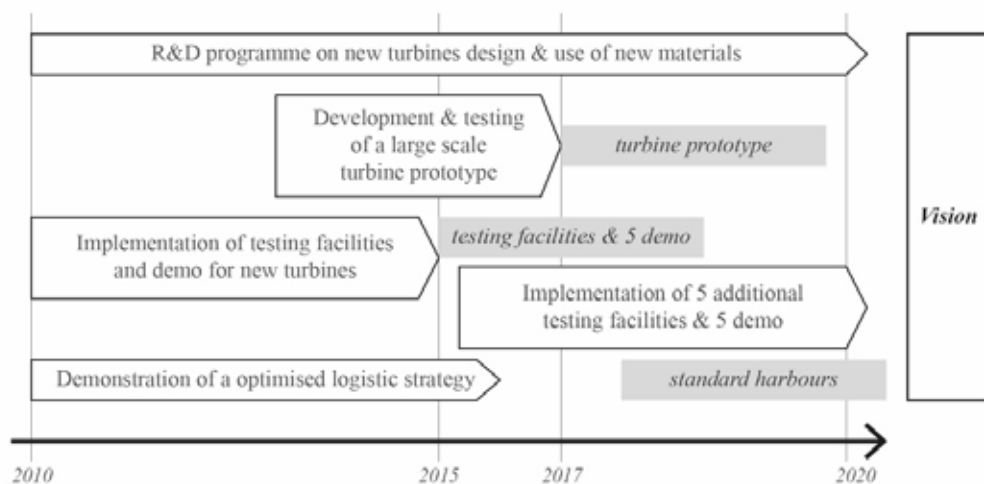
Figure 2-9. A section of a technology roadmap from the European industrial initiative on wind energy. It arranges different ideas along a timeline divided in three time frames, 2010-2015, 2015-2017, and 2017-2020, and four domains, here just the Initiatives of the first one, New turbines and components. The ideas of each domain follow the vision of the sector: "to enable a 20% share of wind energy in the final EU electricity consumption by 2020". Source: Adapted from SETIS - European Commission (2009).

Scenario thinking

Scenario thinking was developed by RAND Corporation in the 1960s (van der Duin, 2006) and used later, in the 1970s, by corporations such as Royal Dutch Shell, to anticipate risk and weather the oil crisis (Kleiner, 1996). Moreover, the Club of Rome made use of it to produce the report The Limits to Growth (Meadows, Meadows, Randers, & Behrens, 1972) which sparked an intense debate about the future of the world and "caused a major reorientation in politics, industry and civil society" (Kreibich et al., 2011). The World Commission on Environment and Development also applied scenario thinking through the document Our Common Future, commonly known as the Brundtland Report, published in 1987 (van der Duin, 2007). Scenario thinking is the exploration of the speculative future to make flexible long-term plans, where managers combine various tools of strategic analysis (Wright & Cairns, 2011). According to Kreibich, Oertel, and Wolk (2011), some of these tools, used to study the context factors, are: SWOT analysis, STEEP analysis (social, technological, economic, environmental, and political), and Porter's five forces analysis. It results in several future scenarios "that describe consistent and plausible futures for the company" (van Notten, 2006). Figure 2-10 shows an example of a set of futures scenarios that is arranged in a 2x2 matrix.
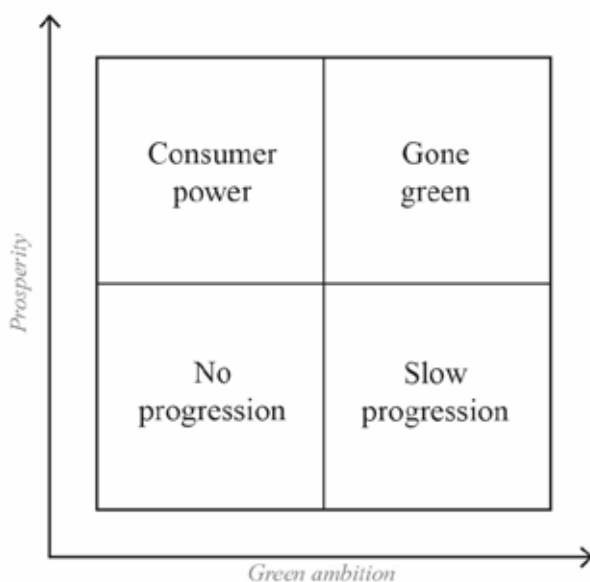
Figure 2-10. Four future energy scenarios for 2050 (No progression, Slow progression, Consumer power, and Gone green) arranged along two axes: Green ambition and Prosperity. The former distributes the scenarios depending on the focus of its scope and the latter depending on the capital available. Source: Adapted from Stewart (2016).

Trend analysis

Trend analysis, also known as forecasting, is a futures technique that focuses on the activity *Analyzing the context factors,* described in #Section 2.2.2 of this chapter. It consists of a systematic collection of trends across time and the subsequent analysis of their relationships (Conway, 2006) to anticipate the future course of actions. According to Kreibich et al. (2011), this extrapolation uses tools such as Delphi, which seeks opinions about the future from experts, and STEEP analysis. The core of this activity is done by the application of cross impact analysis, which explores the impact of trends on each other (Conway, 2006). It results in different types of reports (see Figure 2-11) that cover diverse domains and time frames: from the competitor and competitive intelligence, which belongs to the world as it is, to the environmental scanning and the social intelligence, part of the speculative future (Choo, 2002).

Figure 2-11. The different trend reports offered by the innovation agency Van Berlo. The company, as part of the trend research`s service ˝identif[ies] trend directions and give[s] targeted advice for […] innovation˝ (˝Empathise / Service / VanBerlo,˝ n.d.). These reports cover domains as mobility, food and consumer electronic products, among others. Source: Van Berlo webpage.

Therefore, whereas technology roadmapping examines the near future and scenario thinking explores the speculative future, trend analysis moves between both time frames. The first technique ends in a set of desirable ideas about the future organized as paths along the time frames, the second one in an arrangement of plausible images of the future, and the third one in reports of the contextual factors and their possible impact. The three techniques make use of quantitative and qualitative strategic tools to comprehend the context factors and use the results to make decisions now.w

2.3.2. Design-led futures techniques

A literature review showed that the three design-led futures techniques used in the interviews –concept cars, haute couture, and visionary urbanism– shared most characteristics. Essentially, haute couture is like concept cars in that a prototype of a futuristic product is displayed at shows. However, the design research literature shows emerging techniques explored in academic settings but which have not yet reached practice. Examples are *critical design* and *design fiction*. These two design-led futures techniques are explored below in addition to *concept cars*.

Critical design

Dunne (2008) originally developed the notion of critical design as a technique to

make people reflect "on values, mores, and practices in a culture [thereby] provoking new ways of thinking about the object, its use, and the surrounding environment". These provocations make use of several design actions to create unusual "artifacts as an embodied critique or commentary on consumer culture [...] to challenge the audience's preconceptions and expectations" (Dunne & Raby, 2013). Critical design uses the language of design to trigger discussions within the design and art community, encouraging them to question in an imaginative way. Figure 2-12 introduces an example of a critical design exercise.

Figure 2-12. Picture of the exhibition of the Respiratory dog by Revital Cohen. It suggests making use of retired working dogs as oxygen generators for patients with respiratory diseases. A device that is connected to the dog "uses the dog's rapid breathing rate to pump a bellow and push air into a patient's lungs" (Cohen & van Balen, 2008). Source: Revital webpage.

Design fiction

Design fiction was coined by Bleecker (2009) as a "prototyping technique tailored to facilitating conversations about the near future". It is notably influenced by science fiction, in which "narrative and technology converge" (Hales, 2013). Grand and Wiedmer (2010) define the activities related to this technique as informal and experimental in which "designers can create and embody new possible futures". They also state that this form of design about ideas results in prototypes of common artefacts and short videos of individuals interacting with them. Both prototypes and videos are used in workshops with clients, or other people involved, to spark discussions where ideas emerge (Lindley & Potts, 2014). The end goal of this 'forward-

thinking intervention' is to draw public attention and to influence the audience's thoughts about the future (Sterling, 2011). Figure 2-13 shows an example of a design fiction project.

Figure 2-13. Picture of the prototype of Song of the machine by Superflux. It is an alternative remedy for visually impaired people. The patient`s nerve cells are inoculated with new genes. After that, the patient will wear a device that interprets the visual scene and sends coded pulses to the brain, enhancing the visual experience (Pavlus, 2011). Source: Superflux webpage.

Concept cars

Concept cars were originally developed as a design exercise by General Motors in 1938 and nowadays is a standard practice in the automotive industry. The first concept car in history was the Buick Y-Job (Nishimoto, 2016), which was made by Harley Earl, a designer entrusted to explore a new 'vision of Buick's future' (Lamm, 2015). This vision aimed to draw the attention of the young to estimate their taste (Dunham & Gustin, 2002) and also demonstrate the full potential of the new styling department (Mroz, n.d.; Lamm & Holls, 1997; Strohl, 2016) consolidating an entirely new way of developing a car within the company (Edsall, 2009), which included the use of full-size clay models (Mroz, n.d.). The development of the Buick Y-Job finished in the end of 1939 when the fully working prototype (see Figure 2-14) was unveiled as the 'car of the future' (Panait, 2016; Strohl, 2016). This concept car had a substantial effect on commercial cars such as the 1950 Buick Super Convertible (Mroz, n.d.; Bailey, 1983;

Rees, 2000; Lamm, 2015; Panait, 2016).

Figure 2-14. Picture of the Buick Y-Job' prototype, a two-seater sports concept car with strong horizontal lines and smaller wheels than those that were standard at that time. This combination gives the feeling of a longer and lower car, in accordance with Earl's design philosophy: longer/lower/wider (Bailey, 1983; Lamm, 2015). It also included retractable headlamps, a power convertible top flush door handles, and electric windows (Rees, 2000). Source: Photo by Michael Furman http://www.buick.com/experience/heritage.html

Concept cars are a way to share the "visions of future design and technology trends" with others (Backman & Börjesson, 2006), which affects the company from inside and outside. From inside, this technique is useful in "foreshadowing long-term scenarios" to formulate the new product development strategy (Crea, 2015). As part of this strategy, concept cars help in gaining a better understanding of trends and opportunities (Evans, 2011) that stimulate imagination, defining new ideas in regards to car design (Backman & Börjesson, 2006; Santamala, 2006; Lv & Lu, 2012). Apart from the design area, these concept vehicles also support the development of guidelines for different functions of the organization (Backman & Börjesson, 2006). From outside, these one-off cars are built for the purpose of testing the potential customers' response to new ideas and thus decrease the risk of the commercial car's development (Crea, 2015), which is costly and time-consuming. In contrast to the standard commercial car's development, this technique grants a design exercise with more freedom (Styhre, Backman, & Börjesson, 2005). It comprises several creative activities that allow "freedom to experiment without being too constrained by existing platforms, regulations or industry standards" (Backman, Börjesson, & Setterberg, 2007). An example is the case of Chris Bangle, formerly BMW's head of design, who

says that GINA, the concept car shown in Chapter 1 Introduction, allowed his team to "challenge existing principles and conventional processes opening possibilities to be more creative" (Squatriglia, 2008). This process results in 'experimental artifacts' (Styhre et al., 2005), not expected to be manufactured at present (Crea, 2015), which are embedded as full-scale prototypes (Santamala, 2006). These prototypes, which "look as realistic as possible" (Buijs, 2009), are showcased at motor shows to the media (Lv & Lu, 2012), experts, and the general public (Berlitz & Huhn, 2005).

2.3.3. Discussion

Given the characteristics described in Section 2.3 and the examples explained earlier, we found that the management-led futures techniques follow a way of making decisions that is primarily verbal and relies on facts. Through these futures techniques and their results, companies can identify opportunities and risks, make plans, including ideas for goods and processes, communicate those plans to others, and learn from their experiences. However, these futures techniques make use of activities that are resource intensive and time-consuming. Although some of these techniques have been simplified for the smaller budgets of SMEs, such as Future garage process and Collaborative foresight −see Vishnevskiy et al. (2015)−, they still favor abstraction. The management-led futures techniques result in outcomes only available to top managers, and usually take the form of high-level roadmaps, scenarios, and reports without a sense of human-scale. The lack of contact with real situations and the difficulty to communicate their outcomes make these management-led techniques ill-suited to the SMEs and their characteristics, mentioned in Chapter 1 Introduction. In sum, these top-down techniques tend to fall short in engaging all the people who could be potentially involved in innovation, thereby making the implementation and diffusion of new ideas more difficult.

The design-led futures techniques, in contrast, are more intuitive and action-oriented. As Candy and Dunagan (2016) mention, these techniques "engage people more viscerally in futures conversations, [...] bringing futures studies out of the abstraction and into the experience; into the body". These techniques use the design way of knowing, which translate abstract questions into concrete objects (Cross, 1982), to creatively explore the speculative future. To do so, they use making activities, such as prototyping, "as vehicles for [...] exploring, expressing, and testing hypotheses about future ways of living" (Sanders & Stappers, 2014a). The results of the design-led futures techniques are fictional artefacts which are more accessible and engaging to smaller players and the general public.

2.4. Conclusions

This chapter reports a literature review that has found the central activities of the futures techniques, a set of interviews with experts which helped identify two type of futures techniques and their characteristics, and a second literature review that compared these types. Table 2-7 summarizes the findings from the literature and the interviews with experts.

Table 2-7. Characteristics of the management-led and design-led futures techniques

	Management-led futures techniques			Design-led futures techniques		
Examples	*Technology roadmapping*	*Scenario thinking*	*Trend analysis*	*Critical design*	*Design fiction*	*Concept cars*
Activities	*Long Term and Broad scope*			*Short Term to Long Term and Narrow scope*		
Setting the domain and time frames	*Near future*	*Speculative future*	*Near and speculative futures*	*Not clear yet*		
Analyzing the context factors	*SWOT, QFD*	*SWOT, STEEP, Porter's five forces*	*STEEP, cross impact analysis*	*Not clear yet*		
Envisioning the alternative futures	*A vision*	*Plausible future's matrix*	*Trends report*	*A prototype*	*A prototype and a video*	*A prototype*
Mapping the preferable future	*Timeline with the time frames*			*Not clear yet*		
Outcomes	*Abstract and textual images of the future*			*Tangible and visual images of the future*		

According to the evidence of the experts' panel, these various futures techniques could be classified either as management-led or design-led. These two types are differentiated by four characteristics, two linked with the activities (Short Term—Long Term and Narrow—Broad) and two with the outcomes (Abstract—Tangible and Textual—Visual).

At first, it seems that the management-led techniques explore long time frames and broad scopes, resulting in abstract and textual outcomes, and the design-led techniques explore a short-term time frame and a distinctive scope, ending in tangible and visual outcomes.

Where the management-led futures techniques require demanding activities, involving top executives to deal with high levels of abstraction, the design-led futures techniques use spontaneous and experiential exercises close to reality. Unlike

management-led techniques, which produce outcomes difficult to communicate and thus hard to implement, the results of the design-led techniques are prototypes that are appealing to more people inside and outside the company.

It seems that the design-led futures techniques are most suitable for SMEs due to the hands-on activities they apply and the tangible outcomes they produce. However, as shown in the cells highlighted in gray (Table 2-7), a more in-depth investigation is needed to understand their activities and outcomes.

The activities and characteristics of the design-led futures techniques described in this chapter are used as the frame to develop a more in-depth empirical exploration of the examples of these techniques –concept cars in Chapter 3 and critical design and design fiction in Chapter 4. This exploration is also useful for the development of the design-led futures technique for SMEs in Chapter 5.

Concept cars as a design-led futures technique for automotive corporations

3. Concept cars as a design-led futures technique for automotive corporations[1]

Chapter 2 proposed that the futures techniques that use the design approach to think ahead, including concept cars, are the most suitable for SMEs. Although there is an abundance of literature about management-led futures techniques and a growing number of publications about some of the design-led futures techniques, such as critical design and design fiction, there is almost no academic discourse about concept cars in the field of innovation and futures studies. This is especially surprising since concept cars have been used in the automotive industry for more than seven decades, and have become a widespread practice –each year, more than 50 concept cars are presented at motor shows around the world. In view of this gap in the extant literature, the purpose of this chapter is to understand concept cars in the context of innovation and position this technique with respect to the futures studies' field of knowledge. Following the insights from the previous chapter, this chapter explores the main activities, outcomes, and characteristics of concept cars as a design-led futures technique and the value that this technique brings to automotive corporations.

This chapter reports on three empirical methods and their results: interviews with automotive designers (Section 3.1.) which sketch the characteristics of concept cars as an end and as a means, a field observation (Section 3.2.) that describes the role of these artefacts in motor shows, and a comparative analysis of three concept cars (Section 3.3.) that uncovers the activities used to make and share concept cars. It ends with Section 3.4., where we discuss these results in regards to the activities and characteristics defined in Chapter 2.

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1   This chapter is based on the paper: Mejia Sarmiento, J. R., Hultink, E. J., Pasman, G., & Stappers, P. J. (2016). Concept Cars as a design-led futures technique. In Proceedings of the 23rd Innovation and Product Development Management Conference (Vol. 1, pp. 1–21). Glasgow, U.K.

3.1. Interviews with automotive designers

A set of semi-structured interviews were conducted with –automotive– designers to understand concept cars as a design-led futures technique.

3.1.1. *Method*

All interviews were conducted by the author, in a one-by-one setting, and lasted between forty-five and seventy-five minutes. Six interviews occurred face-to-face in English and four interviews were via video calls and conducted in Spanish.

Participants

Table 3-1 presents an overview of the interviewees. Participants were selected based on their experience with concept cars as part of design, research and development, or marketing departments. Of the ten participants, seven have more than twenty years of experience with concept cars, two more than ten, and one less than five years. Participants developed different concept cars for different companies in the automotive industry, such as car manufacturers (Ford Motor Company, Nissan Motor Company, Tesla, Sherco, and Aprilia), suppliers (EDAG Engineering), and automotive design studios (Vercarmodel Saro).

Table 3-1. Sample of the interviews

Interviewees	Years of experience	Area(s) of experience	Conducted	Language	Length
Participant 1	› 20	-automotive- design	in person on March 23, 2015	English	45 min
Participant 2	› 20	-automotive- design	in person on March 24, 2015	English	49 min
Participant 3	› 20	design, innovation, & strategy	in person on May 1, 2015	English	58 min
Participant 4	› 10	-automotive- design & clay modeling	via Skype on March 3, 2015	Spanish	75 min
Participant 5	› 20	design & aesthetics	in person on March 19, 2015	English	46 min
Participant 6	‹ 5	-automotive- design	in person on March 9, 2015	English	73 min
Participant 7	› 10	-bike- design	via Skype on March 12, 2015	Spanish	47 min
Participant 8	› 20	-automotive- design	in person on March 14, 2015	English	49 min
Participant 9	› 20	-automotive- design & innovation	via Skype on March 27, 2015	Spanish	49 min
Participant 10	› 20	-automotive- design, innovation, & strategy	via Skype on March 31, 2015	Spanish	71 min

Procedure

In view of the previous chapter's findings, these semi-structured interviews followed a set of questions pre-arranged based on three categories: activities, outcomes, and the value that concept cars bring to automotive corporations. The interviews start with the author giving a non-disclosure agreement for the participants and presenting them the aim of this study. After that, the first part of the interview includes questions about the main activities that constitute this technique and their characteristics. The second part focuses on the technique's outcomes and the third, and final part, asks about the value that these companies can get from the application of this technique. During the interviews, the author took notes and recorded audio, which he subsequently transcribed.

Data analysis

Qualitative analysis of the interviews results followed the method suggested by Sanders and Stappers (2012): first, selecting quotes from the transcript, second, grouping these quotes, third, coding the groups, and finally, comparing the groups.

3.1.2. *Results*

The findings from coding and analyzing the interviews concern the three categories defined earlier: activities, outcomes, and value of their applications.

Activities

Regarding activities, the participants were most outspoken on the findings that are discussed and summarized in Table 3-2.

Table 3-2. Coding of the category activities

Definition	*An isolated multidisciplinary team makes concept cars in classified and costly explorations that include three making activities: (i) sketching, (ii) prototyping, and (iii) storytelling. As mentioned earlier, these explorations envision near and speculative futures of narrow domains*
Evidence quotes	*"You have a team that launch production cars within the product Participant 9 portfolio and another team that presents concept cars that feed that portfolio. We can say that in these two lines of work, one feeds the other, otherwise they cannot run so fast"*
Contrast with the literature	*Like Crea (2015), the participants mentioned that in the automotive industry, designers are divided in two types: ones that develop the series production vehicles and others that envision the visions of the future cars. It seems like the latter inspires the former. Also like Berlitz and Huhn (2005), Styhre, Backman, and Börjesson (2005), and Backman and Börjesson (2006), the respondents claim that concept cars are part of expensive and short projects*

According to the interviewees, concept cars are made by teams which include multiple professionals from anthropology, sociology, psychology, marketing, engineering, and –interior, exterior, and color and trim– design. The multidisciplinary nature of these teams, which embraces diversity, is used to "stimulate creativity and force team members to confront different perspectives" (Participant 7) when making the concept cars. The respondents mentioned that these teams are small, vary from three to nine participants, and they are led by a senior designer who reports directly to a board of chiefs. When one of these senior designers joins the company, it is customary for automotive companies to give him or her the opportunity of making a concept car. For instance, according to the Participant 6, "when the senior designer Laurens van den Acker joined Renault, he developed a concept car to get rid of the styling of Mazda –his previous employer– and explore the Renault aesthetics and design language."

Most of the time, these teams are in in-house, isolated units, which "are separated to avoid contamination regarding the daily work in projects that are part of the commercial [or production] portfolio" (Participant 1). Another reason of that isolation is confidentiality, or as said by Participant 3, "when making concept cars we shape the brand, that is why, if we have guests, which is not common, they are not allowed to enter with their cell phones, so they cannot take photos, and we also keep the prototypes covered".

The participants report that, due to the team members' high profile, the final cost of these activities varies between 200.000 and two million Euros.

According to the data, these making activities last up to 15 months. The teams start with an open creative brief, usually formulated by the marketing department and the chief designer, who work as holders that are "looking at the world to capture trends and then translate them to the concept" (Participant 2). In parallel, the chief designer put together a team including professionals from different areas. Subsequently, the team members sketch a large number of ideas following the creative brief. According to Participant 6, "the team makes around 500 sketches in the first period". These drawings are presented to the board of directors to select the best idea. Once the best one is selected, its author is appointed as the lead designer. According to the respondents, the lead designer coordinates the detailing part that includes comprehensive sketches, which in some cases cover a 1:1 tape drawing on the wall, and intricate illustrations of the interior and the exterior of the concept car. Next, the team makes a 1:4 scale model. When the board of directors approves that model, – external– professional modelers make a 1:1 model in clay and try several finishes on it. The interviewees indicate that depending on the way that the company will share the concept, the type of finishes or even the kind of prototype changes, but "they show concept cars using detailed finishes" (Participant 1). Finally, the team defines a story to showcase the prototype, which is presented internally through different workshops and externally at motor shows.

Participants also mention that concept cars are explorations, limited by the business

of the company, which can go along the different time frames, from the world as it is to the speculative future. First, the concept cars of 'upcoming vehicles' that are in a range of five to ten years. These are "concepts developed using existing technologies and normally are built on existing platforms" (Participant 7). Participant 2 says that "these concept cars aim to mark the territory, exaggerating some features of the car to verify it on the market [...] in a certain way, these concept cars are the projection of the expected series production cars."

The second category includes concept cars that explore new types of vehicles for the brand: "in explorations of up to 15 years [...] companies design concepts that are closed to the market, new categories of products or new lines for the existing products" (Participant 8). Third, the 'visionary models' that explore more than fifteen years ahead and "will never be in production" (Participant 7). Participant 9 states that "these concepts allow you to explore more radical situations, for instance, what will a car looks like if there are no streets? In these kinds of projects, you have a team that includes engineers, anthropologists, and sociologists; [...] these concept [cars] end in radically new vehicles that companies present at shows."

Outcomes

Regarding the outcomes, for instance the prototypes and documentation, their communication value was prominent (see Table 3-3).

Table 3-3. Coding of the category outcomes

Definition	A concept car is an artifact of the future, which is embodied in a prototype and documentation, made to attract diverse people evoking their emotions	
Evidence quotes	"I think a concept car has an important attribute that is to provoke and draw attention"	Participant 10
	"...when concept cars are introduced to the public at the auto shows it's just for making the people say 'wow', the happy wow effect [...] if you don't get the wow effect, well, something is wrong..."	Participant 4
	"...basically a concept car is an element to provoke emotions: basically, they are used at motor shows to display the potential of the company creating expectations about the brand"	Participant 7
Contrast with the literature	In the same way that Santamala (2006) and Buijs (2009) discuss, participants state that concept cars are full-scale prototypes that look like a real series production vehicle. Unlike the sparse literature that study concept cars, interviewees emphasize the emotional evocation that those artifacts produce on people	

According to the participants, concept cars, which "were formerly called 'dream cars' in the 1930s" (Participant 4), currently receive different names depending on the context of use. Some names emphasize their futuristic nature, such as 'visionary models' used by BMW or 'advanced concepts' used by most of the automotive designers. Other names focus on their function, such as 'show cars' which are "the few concept cars exhibited at motor shows" (Participant 1). Another function is related to the styling, receiving the name of 'design studios', which are "just for seeing" (Participant 3), examining the appearance of the interior and the exterior of the vehicle as "workshops of ideas about form" (Participant 10). Moreover, the expressions 'research vehicles' and 'experimental vehicles' employed by Mercedes-Benz are also used as synonyms of concept cars, to emphasize their use as "technology demonstrators, or to test the technology and see whether companies can put it into series production cars" (Participant 7). Therefore, it looks like the notion 'concept car' is an umbrella term that covers artifacts with similar attributes.

According to the interviewees, all these futuristic artifacts are materialized through a variety of prototypes that moves from working prototypes, cars that can be driven, to representational models, in which "pretty much everything is fake" (Participant 3). As Participant 8 claims, "some concept cars are not functional, they are just mock-ups that are useful concerning ergonomics, but not mechanically", "often they are driven by a crane" (Participant 9). That is the case of the 'see-through prototype' which is "like an empty shell with just a piece of the interior to show how the car would look like" (Participant 4).

These prototypes are used to draw the attention of people portraying a futuristic vehicle. Participant 10 states that "as designers, we know which key elements make a car futuristic and thus attractive, [...] it is easy to call the attention, well... if you put wider wheels in the car, and you make the lights smaller so that you do not see them and put a few LEDs there... so eliminate elements such as mirrors or plates, then it is done... all to draw people's attention." These components are possible because this concept does not have to comply with any regulation.

Value of concept cars applications

Regarding the value of these activities and outcomes, automotive designers talked about innovation and communication (see Table 3-4).

Table 3-4. Coding of the category value of the application of concept cars

Definition	*Even though not all of them sell cars, various enterprises, part of the automotive industry, make concept cars to innovate and share this innovation with others. Through these artifacts, companies can foresee the future by (i) experimenting with technologies and (ii) exploring design languages*

Evidence quotes	"The GINA model [the concept car shown in Chapter 1 Introduction] was just to show or to push what technology is about, how you can foresee the future of cars in the next [...] half century, what the future can be, it`s like a what-if question, a complete design exercise"	Participant 4
	"...to open the mind of everybody in the public, saying that this is a company that is not afraid of taking risks, a company that puts a lot into technology, and lot of thinking in future design, so a concept car like that [...] pushes the boundaries of design and engineering"	Participant 5
	"The company can explore different areas to have a forward-looking idea about the coming future, [...] concept cars are design exercises that define the aesthetic appearance of the brand for the coming years..."	Participant 10
Contrast with the literature	Like Evans (2011) and Crea (2015), the interviewees point out that innovation is the primary purpose of concept cars. Unlike Styhre, Backman, and Börjesson (2005), the interviewees perceive branding as a byproduct of concept cars.Like most of the authors (Santamala, 2006; Backman & Börjesson, 2006; Evans, 2011; Lv & Lu, 2012), the respondents consider concept cars as a way to strengthen creativity and design capabilities.	

The interviews revealed that different companies, such as car manufacturers, suppliers, and automotive design studios, make between six to ten concept cars per year, and only 20% of them are shared at motor shows. Participant 8 states that "when [he] worked at Nissan, the production of concept cars was very high; the Advanced Design Department was a real concept car factory" and Participant 3 echoes this, saying that "at Audi, we created an experimental car every three months, whether it is just for the lighting, or for the suspension..." In view of this ratio, the respondents suggest that most of the concept cars contribute to innovation and only a few are used additionally to show as branding exercises.

Through concept cars, these companies can foresee the future, by experimenting with technologies and exploring design languages. From the perspective of technology, most of the respondents claim that concept cars are 'technology-push' activities. In words of Participant 3, "concept cars act as a 'probe' or 'trial balloon' that uses technologies recently developed by the Research and Development Department, or sees a particular technology that is new to the company, or which integration is new to the market". This 'probe' explores the way to integrate the cutting edge of these technologies to make "an advanced vision of what the company intended for [the] near future" (Participant 2) and then shared it with the audience. Other concept cars focus more on the styling and design language of the vehicles.

Supporting this innovation purpose and in view of the literature review of the previous chapter, we found that concept cars are also a means of communication, used internally and externally. When a concept car is shared internally, it is used to discuss different images of the future, "collecting many opinions and perspectives

from inside the company through surveys and user groups" (Participant 9). Externally, it is presented to "the general public, journalists and the other car companies" (Participant 4) at "motor shows like those in Frankfurt, Geneva, and in the United States, the Detroit auto show" (Participant 6).

In addition to the innovation end, the interviewees state that the concepts presented at motor shows are also ways to 'show-off' the capabilities of the company (Participant 1, 4, and 7). They "demonstrate that the company is still alive in the business arena, and it can spend some money, effort, and time developing something that has never been seen before" (Participant 1). Participant 2 claims that "a concept car is to show your muscles; it is to demonstrate to others, especially your competitors, that you are strong, and you can make nice things." Like in the findings of the literature review, most of the respondents agree on the difficulty of capture data about the reaction of the audience when showcasing a concept car at a motor show. According to the respondents, most of the companies measure the impact of the concept cars by counting the number of pictures and the length of articles published by the media. These images and articles are carefully prepared by the companies in advance with the intention to disseminate the concept cars. Moreover, specialized focus group, also known as clinics, are conducted with a small sample of selected customers to ask feedback on the concept car. Interestingly, Participant 3 mentioned that, back in the 70s, different American car companies used to hire private detectives to carefully search for fingerprints on the prototypes every night at the motor show. In this way, companies could identify the concept car's focal points, those parts of the model with more fingerprints on it, and then considered them for further development. However, no clear way of implementing the findings from this data was mentioned.

3.2. Observations of a motor show

In view of the findings of the interviews with the −automotive− designers and the categories defined in the previous chapter, we conducted a set of observations to have a more in-depth understanding of the outcomes of this design-led futures technique.

3.2.1. *Method*

The author observed how concept cars were staged at the 85th International Motor Show and Accessories in Geneva. This, according to the participants of the previous interviews, is one of the most important motor shows in the world.

Procedure

Observations were made over a period of three days, from March 13 to 15, 2015. On the first day, the author conducted a general observation that gave him an idea of the structure of the motor show, as well as an inventory of the brands that exhibited

concept cars there. During the remaining two days, he conducted a two-hour-long observation per brand until the time ran out.

Data analysis

The data was collected in a notebook and through pictures and videos of the concept cars and the stages. Also, one participant was recruited and interviewed for the concept car interview study. The data from the observations were the author's notes, photos, and videos, and the brochures and other handout materials provided by each brand. The data was analyzed with qualitative methods as described in the previous section. Appendix Chapter 3 online http://dive.pktweb.com/ includes the scan of the notebook and a selection of the most relevant pictures and videos.

3.2.2. *Results*

This section presents the results of the observations on concept cars at a motor show, which include the characteristics of these artifacts and the way car manufacturers share them at this event.

The '85th International Motor Show and Accessories' had two main moments: the media event, in which car manufacturers invited journalists and selected members of the public to the concept car's premiere, and the exhibition itself, in which the general public can see the concept cars. At both moments, automotive manufacturers, suppliers, and automotive design studios used prototypes and videos, images, and texts.

At this show, all the artifacts were showcased through representational natural-scale prototypes that have a detailed and glossy finish on the exterior; however, the interiors are just basic volumes that give to the audience only a general idea about the colors and trim. The videos, images, and texts were arranged in press releases, which were available via the companies' websites since the premiere at the media event. We identified that the videos have three main parts: The first part is an introduction of the brand, which connects the concept car to the company; the second part shows the artifact in its context of use; and the third part zooms in on the interaction between the user and the artifact, demonstrating certain concept car's features.

With regards to the exhibition, most of its area is covered by car manufacturers, which showcase up to three concept cars and no more than ten series production vehicles. As Figure 3-1 shows, the prototypes of the concept cars are exhibited on elevated platforms which are located in the most visible spot of the company's stand. Most of these platforms rotate, showing all the possible side angles of the exterior of the vehicle. Also, some of the vehicles have open doors to reveal the interior. Platforms are located in front of panels that act as backgrounds to project the video(s) in a loop. In addition to the prototype and the video, different components of the visual brand identity, such as the logo and the slogan, are arranged in a variety of

ways on the stage and in the concept car itself.

Figure 3-1. Image of two kids posing for a picture using the Infiniti QX30 concept car as background. The stage includes a rotational platform to showcase the prototype and a background to project the videos in a loop. It also displays the visual brand identity. Note the bar that keeps the general public far from the prototype. Source: the author.

We observed that most of the companies restricted the interaction between the audience and the prototype through barriers. Regardless of these constraints, car-enthusiast were anxious to experience the concept cars, to try and touch them, as shown in Figure 3-2. Seems like concept cars are one of the preferred background for selfies.

Figure 3-2. The top row shows a crowd in front of the stand of Peugeot at the 85th International Motor Show waiting to watch the Peugeot Onyx concept car and a young car enthusiast, who finally could reach the prototype. Source: the author. The bottom image displays the prototype of this concept car. Source: http://www.peugeot.com/en/design/concept-cars/peugeot-onyx-car.

Interestingly, only one company designed the exhibition in a way that it invites people to directly interact with the prototype. It had an open door to allow people to slide into the car, open the trunk, and mimic driving (see Figure 3-3).

Figure 3-3. Woman interacting with the concept car of BJC. Source: the author.

The observations also allowed us to identify that while several staff members promote the series production veh icles, answering questions and distributing brochures, nobody is in charge to inform the general public in regards to concept cars.

3.3. Comparative analysis of concept cars

In addition to the interviews with automotive designers and the observations of a motor show, we also conducted a comparative analysis of concept cars.

3.3.1. *Method*

A comparative analysis is a comparison that identifies variations among single cases to form a frame (Yin, 2009; Gerring, 2004; Eisenhardt, 1989). This method involves an examination of diverse subjects based on a set of criteria, which "enables the researcher to explore differences within and between cases" (Yin, 2003) with the aim to replicate findings across cases. The structure of this comparison followed the results of the previous chapter and sections. It focused on the activities of making and sharing concept cars and the outcomes of this design-led futures technique, to then identify the value that they bring to the companies. Through this comparative analysis, we have specific examples that gave us sufficient insights to conclude the study of concept cars within this inquiry.

Following Flyvbjerg's (2001) recommendations, we selected three cases as a sample for comparison. It includes one example of each of the categories defined in Section 3.2 Interviews with automotive designers. These concepts, made by different brands,

were presented in different years and developed for diverse segments. All of them have already been shared internally and exhibited externally.

Procedure

The concept cars were examined following Yin's case study process (Yin, 2003). For each case, documentation was collected, resulting in a rich set of video, photo, and text material provided by the companies on their web pages, in the concept car's press releases, in external reviews from specialized magazines and blogs, and, finally, in relevant academic journals. Appendix Chapter 3 online http://dive.pktweb.com/ shows this data.

Data analysis

For the analysis of the videos, we used the method of Garcez, Duarte, and Eisenberg (2011). First, we watched the videos –one for each concept car– several times to analyze their general structure; then we divided them into units of analysis to code the narrative elements (such as locations, characters, and storyline), which were identified and clustered on a timeline.

With regards to the rest of the data –photo and text material–, we analyzed the similarities and differences of the concept cars' making process along with the characteristics of these artifacts. As a starting point, we identify patterns throughout the cases and match them to the respective activities. As suggested by Miles and Huberman (1991), we tabulated these findings and formulated analytical statements, illustrating these with data from the cases.

3.3.2. *Results*

This section presents the results of the comparative analysis of three concept cars – the Your concept car, the Citröen-Lacoste concept car, and the Mercedes-Benz F 015 Luxury in Motion– using the categories defined earlier.

Activities

With regards to the activities, Table 3-5 shows how these companies explore different time frames: from the world as it is, such as the "not too futuristic four-seat coupe YCC" (Volvo Car Corporation Communication Centre, 2004), to the speculative future, such as the F 015, a self-driving luxury sedan "fifteen years ahead of current developments" (Mercedes-Benz Cars Research & Development Communications Centre, 2015).

Table 3-5.Making and sharing activities of the three concept cars

Case	Your concept car (YCC)	Citroën-Lacoste concept car	Mercedes-Benz F 015 Luxury in Motion
Company	*Volvo*	*Citroën and Lacoste*	*Daimler AG*
Time frame	*World as it is (undefined)*	*Near future (5 years)*	*Speculative future (15 years)*
Team and departments	*2 project managers* *1 technical project manager* *1 deputy technical project manager* *1 communications director* *1 design supervisor* *1 exterior designer* *1 interior designer* *1 color and trim designer*	*Several designers from the Automotive Design Network, a Citroën design department, and the Lacoste Lab program*	*A particular team arranged between the Advanced Design Studios and the Engineering and Construction Department*
Duration	*15 months*	*9 months*	*24 months*
Making and sharing activities			

Appendix Chapter 3 online http://dive.pktweb.com/ includes the visual comparison of the making and sharing activities of the three concept cars.

The inquiry reveals that in making these concept cars, companies arranged specialized teams that integrate employees from different departments or even from two different companies, which is the case of the Citroën-Lacoste. The F 015 is an example of the former strategy; it was made by a team led by the head of one of the Advanced Design Studios departments, "where the decision is made about the brand's design idiom in 20 or 30 years". According to Daimler AG (n.d.-b), these divisions "absorb, analyze and creatively implement […] trends in concept cars, acting as seismographs for movements from areas including the arts, cultural activities or architecture". The head of Advanced Exterior Design says that the advanced designers vigorously lead "the portfolio strategy in the role of visionaries within the company" (Daimler, n.d.-a). The team that made the F 015 also includes other professionals such as designers and engineers from the Engineering and Construction Department and marketing experts who "jointly draw up the technical specifications for [this] new research car" (Mercedes-Benz Cars Research & Development Communications Centre, 2015).

Interestingly, in the automotive industry, which is mainly driven by men, Volvo commissioned the making of the YCC to nine women, four in managerial positions, one expert in communications, and four designers (Styhre et al., 2005). It seems that the company took seriously the slogan of this concept: "a car designed by women for women" (Volvo Car Corporation Communication Centre, 2004).

Table 3-5 shows the flow charts with the making and sharing activities that each company undertook. These activities last less than two years in all the cases. The simplest example is the making of the Citroën-Lacoste concept car, which was approached as the design of a pair of shoes, according to the Lacoste Lab's head. He summarizes the process as: *(i) look*, observing the future trends; *(ii) ask*, inquiring about the users' dreams in regards to their future lifestyle; and *(iii) solve*, designing the concept car with particular attention to the color and trim development.

In sum, the results show that the making activities start *analyzing the context factors*, in which Volvo and Citroën applied trend analysis, and then *envisioning the alternative futures*, in which Mercedes-Benz used scenario thinking. Through these analysis and exploration, designers define an image of the future, such as the future scenario 'City of the Future 2030+' developed by Mercedes-Benz for the F 015. In the second set of activities, which is part of *mapping the preferable future*, all the companies use an iterative way to generate, select, and refine ideas. The three companies made sketches –of the exterior and the interior of the vehicle–, and scale prototypes –of the exterior– to generate and select ideas. Once the final idea is selected, it is refined through more sketches and prototypes, including the final prototype. In the end, as already mentioned, all the companies exhibit the concept car to the public at external shows. Volvo and Daimler AG also mention the use of these prototypes in internal workshops.

Outcomes

Table 3-6 presents the outcomes of the activities explained earlier, including the artefacts.

Table 3-6. Outcomes of the three cases

Case	Your concept car (YCC)	Citroën-Lacoste concept car	Mercedes-Benz F 015 Luxury in Motion
Presented as	¨A not too futuristic four-seat coupe¨	¨A crossroad super-mini SUV with an off-beat sporty design¨	A self-driving luxury sedan ¨ fteen years ahead of current developments¨
Artefact	A functional prototype	A non-functional prototype	A functional prototype
Images of the prototypes			
Documents part of the press release	6 pictures	6 pictures	31 pictures
	18 pages-long text	A short text	2 texts
	1 video	3 videos	2 videos
Videos			
Name	Volvo YCC - Your concept car	Citroën-Lacoste concept car	World premiere of the Mercedes-Benz F 015
Storyline	Interviews with the designers about the user`s expectations, including images of the YCC`s main features	A group of young people enjoying a sunny day at the beach	The self-driving car drives four business people over a desert. In the meantime, they control it through several touch-screens
Characters	Designers: the design team	Users: 2 young women and 1 man	Users: 4 businesspeople

Main message	- Designers' intentions	- Brand identity (user's lifestyle)	- Interaction between users and the car
	- Car's features	- Interaction between users	- Interaction between users
	- Brand identity	- Interaction between users and the car	- Interaction between the car and pedestrians
			- Brand identity
Background	Interior: studio	Exteriors: a beach	Exteriors: a road in the desert
Costumes	Does not apply	Lacoste polos, sunglasses, jeans	Semi-formal dress
Props	Does not apply	Camera and Lacoste accessories	A fictional cellphone
Soundtrack	Voiceover and direct voice during interviews	Music	Music: Empty beaches, night traffic
Length	03:45 min	00:53 min	01:53 min

Concept cars are presented as vehicles of the future, or as Citroën mentions when talking about the Citroën-Lacoste concept car, it is "another step towards the car of the future" ("Citroën Lacoste car, concept cars," 2015). The analysis unveils that the companies share concept cars through different types of artifacts, and videos, pictures, and texts. The artifacts range from functional prototypes, the YCC and the F 015, to non-functional prototypes, the Citroën-Lacoste. Surprisingly, although the F 015 is the concept car that explores a further time frame, it was displayed as a fully working vehicle and selected members of the public, journalists, and stakeholders were given the opportunity to take it for a test drive.

Besides the prototypes, each company also created videos, pictures, and texts, grouped in press releases, which are available on the company's web page. For instance, Volvo presented the YCC in an 18 pages-long text named "Your concept car, by women for modern people" (Volvo Car Corporation Communication Centre, 2004). The document includes an introduction of the initiative "all decisions made by women" and a detailed explanation of the concept car's main features. The inquiry shows that all videos involve users, the context of use, and the brand identity. Just as in the Citroën-Lacoste's video, the F 015's video shows various people making use of the concept car in a particular context. The former focuses on user's lifestyle and the latter on multiple interactions, such as the interaction between users and the vehicle, between users, and between the concept car and pedestrians.

Value of concept cars applications

With regards to the value of concept cars, we divided it in two: the lessons learned by these companies when making the concept cars –the exploration–, and the insights from sharing these artifacts (see Table 3-7).

Table 3-7. Values delivered by the three concept cars

Case	Your concept car (YCC)	Citroën-Lacoste concept car	Mercedes-Benz F 015 Luxury in Motion
Exploration	*It explores various design solutions focusing on ¨the most demanding premium customer: the independent, professional woman¨*	*Co-branding exploration of a new design language, ¨where the car meets fashion and sports¨, focusing on the young user's lifestyle*	*It explores the application of new technology for ¨the efficient professional of tomorrow¨*
Context of the exploration	*¨In Volvo concept cars function as a test bed for new ideas and thereby also as a means for experimentation¨ (Backman, Börjesson, & Setterberg, 2007)*	*¨Concept cars are laboratories for new ideas, which [they] share with the public at major international motor shows … they reflect their ambitions, values and imagination¨*	*¨F 015 addresses the question: how to enable people to do what they want or need to do?¨*
Shared at	*Geneva International Motor-Show*	*Paris Motor-Show*	*Consumer Electronics Show, Las Vegas*
Year	*2004*	*2010*	*2015*

The analysis reveals that companies introduced concept cars as explorations of the future, centered on human beings. This is the case of the F 015, an inquiry that follows the question: "how to enable people to do what they want or need to do?" (Mercedes-Benz Cars Research & Development Communications Centre, 2015). These explorations "combine a variety of boldly innovative technologies in a form which can be visualized, driven and readily evaluated" (Mercedes-Benz Cars Research & Development Communications Centre, 2015). An example is the YCC, used by Volvo to develop a new technology –subsequently patented as Ergovision– that combines ergonomics and the adjustment of the line of vision to ensure good visibility (Volvo Car Corporation Communication Centre, 2004). Daimler AG also made the F 015 to experiment with self-driving technologies under the concept of 'an exclusive cocoon on wheels,' which includes "four rotating seats that allow face-to-face configuration, as well as six display screens … built into the front, rear and side panels" (Mercedes-Benz Cars Research & Development Communications Centre, 2015). In contrast, the Citroën-Lacoste concept car focuses more on styling with "traditional colors like white and dark blue, with touches of bright yellow" ("Citroën Lacoste car, concept cars," 2015).

The three companies arranged these research, development, and innovation activities, in separate and specialized portfolios. Daimler AG, for instance, put the F 015 in the Research Vehicles' Portfolio, which includes a total of 24 concept cars developed between 1993 and 2012. Within those portfolios, concept cars are used as "test bed for new ideas" (Backman et al., 2007), which "cultivate boldness, creativity, and

optimism [...] exploring the future of driving" ("Concept cars, automotive future," n.d.).

Besides this exploratory role, companies also use concept cars as a means to enter into "dialog with [their] customers" (Mercedes-Benz Cars Research & Development Communications Centre, 2015) "shar[ing] with the public at major international motor shows" ("Citroën Lacoste car, concept cars," 2015). In this sharing role, for instance, Daimler AG applied the F 015 to contribute to "the discussion about self-driving cars and their impact on the society" (Mercedes-Benz Cars Research & Development Communications Centre, 2015).

Our inquiry uncovers two types of sharing, *public* and *in-company*. With regards to *public sharing*, the three cases were showcased at international commercial events. Interestingly, Daimler AG presented the F 015 at the Consumer Electronics Show instead of at a motor show. It seems that the company wanted to emphasize the technology behind the interaction between the users and the concept car, as the consumer electronics industries do it. The other two cases were exhibited at the international motor shows closer to their target customers: the Citroën-Lacoste in Paris and the YCC in Geneva. With regards to the number of attendees and the social media coverage, the F 015 was reached by more than 175.000 industry professionals who attended the Consumer Electronics Show. The show reached more than 703.000 mentions of CES2015 during the event, and 7.51 billion total potential Twitter impressions (Pryor, 2015). According to Backman and Börjesson (2006), the YCC was covered by 272 articles and press clipping in 20 countries, representing more than 2.5 million Euro in –free– advertising. About *in-company sharing*, Volvo used the YCC in 50 workshops and presentations to company' employees (Backman et al., 2007), and Daimler AG used the F 015 in more than 15 internal presentations (Mercedes-Benz Cars Research & Development Communications Centre, 2015).

3.4. Discussion

This section discusses the insights from the interviews, observations, and case analysis presented earlier, which come from various sources and different perspectives, answering the research questions C, D, and E, formulated in Chapter 1. It first looks at concept cars as outcomes, then the activities to make and share these artifacts, and finally, list the values that this design-led futures technique bring to the automotive industry.

3.4.1. *Concept cars in the automotive industry*

As *outcomes*, concept cars are fictional artifacts used to render tangible images of a preferable future. The findings suggest that these futuristic artifacts are easily recognizable as vehicles ahead of one's time, cars that one can see at the street in the time to come. They incorporate avant-garde style and cutting-edge technology.

Designers use several tricks to achieve that futuristic appearance, such as applying exaggerated proportions, flimsy structures, fluid lines and surfaces, unusual doors, large transparent surfaces, and bright colors. Their look and feel is reinforced by the implementation of state-of-the-art technology, referring to new or improved engines, components, materials, finishes, and systems of navigation and communication. The exploration of both styling and technology results in new ideas about the interaction between users and vehicles, different users within the vehicles, and vehicles and their context.

These futuristic artifacts are embodied by full-size prototypes and the novel interactions are presented through videos. The 1:1 scale prototypes enable people to perceive the artifacts' appearance, such as seeing their proportions, shapes, transparencies, and colors, and touching their textures, and thus experience the concept cars as true to reality as possible. However, people cannot interact with the prototypes, nor experience the speed and movement, because, most of the time, the prototypes are showcased static. Knowing that an important part of the cars' experience is their movement, automotive companies also provide videos to complement this experience. The videos show the interior and exterior of the prototypes in movement including the different users (drivers and occupants) and the context (such as pedestrians, other vehicles, and roads). The prototypes and the videos are supported by images and texts that are available for the audience through different media, which is also used to experience the concept car. Therefore, the prototypes, the videos, and the visuals help the audience to believe in the novel ideas of the interaction among users and the concept cars in particular future contexts.

Our findings show that the combination of these physical and visual narrative manifestations support companies in sharing tangible images of the future that can be experienced by a large audience, and thus they are easy to understand for most people. In view of that, companies use the prototypes, the videos, and the visuals to trigger conversations that occur inside the organization, including diverse employees at different levels. It seems that these conversations, which can take diverse forms, such as workshops, focus groups, or exhibitions, are useful to collect ideas and identify opportunities about the future of the product and the company, and to aligned the agenda of different stakeholders. As a consequence of the attributes of these manifestations, concept cars evoke strong emotions in people, motivating them to get involved in these conversations actively.

In some cases, these exhibitions also occurred outside the organization, to the general public. Through these shows, companies can claim a position in the market, marking a terrain and demonstrating their capabilities and skills. Even though this branding quality has an important value for companies, we are more interested in the exploratory benefit of these artifacts. Therefore, more than merely striking artifacts that show the brand's values, we consider concept cars as probes, which incorporate futuristic styling, technology, and interaction to influence a large number of parties stimulating innovation in the automotive industry.

3.4.2. *Use of concept cars in the context of innovation*

In the previous section, we considered concept cars as an end; in this section, we understand them as a means, as a *design-led futures technique*. From this perspective, concept cars are applied by diverse companies –car manufacturers, suppliers, and automotive design studios– as a way of exploring the complexity of the future, and thus supporting the decision-making in the world as it is. Our findings show that just like the futures techniques defined –by Voros (2007) and Hines (2016)and suggest a few things we can do about that. Three reasons are offered for why jobs are important to futurists: (1– in Chapter 2, concept cars are applied to envision images of preferable futures. These images move from the speculative or near future back to the world as it is and supports companies in making decisions and mapping some areas of innovation.

Grounded in our evidence, we suggest that automotive companies apply concept cars, as a design-led futures technique, through a set of making and sharing activities shown in Figure 3-4.
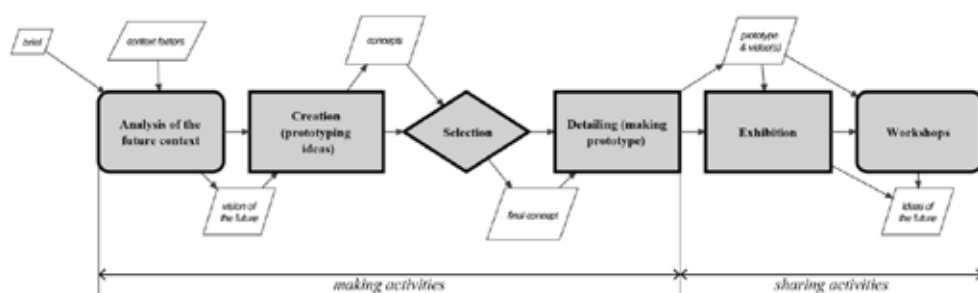

Figure 3-4. Concept cars making and sharing activities. Source: the author.

Before the making activities, the team receive a creative brief that includes a design challenge and the time frame of the exploration. The making activities start with the analysis of the future context factors through observations, interviews, and focus groups. In view of these factors, they define, in alignment with company's values and strategic direction, an image of the future. Based on this vision, designers make sketches and rough prototypes, at different scales and resolutions, to create, develop, test, select, and share ideas with several people within the company. When the final idea is selected, they make a refined prototype and video to visualize the concept car and its iteration with its users within the future context. After the making activities, the company shares the prototype, the video, and the visuals to allow many parties involved in change, both inside and outside the enterprise, to experience the concept car and to spark discussions about its future and present. The evidence suggests that concept cars follow a hands-on way of researching the future where visual synthesis and prototyping play a significant role.

The activities described above resemble what Wright and Cairns (2011) and Kreibich,

Oertel, and Wolk (2011) define as *scenario thinking* (see Chapter 2). However, unlike that technique which ends in various scenarios, concept cars present only one chosen future which impedes the exploration of alternative options. They also differ from the way Styhre, Backman, and Börjesson (2005) and Santamala (2006) describe the concept cars' development process.

Our evidence also suggests that this design-led way of exploring the future plays out on the three different time frames –the world as it is, the near future, and the speculative future–, and end in the preferable future. Based on the combination of time frames and the alternative futures –proposed by Henchley (1978) and Voros (2001)– defined earlier, we classify concept cars into three different groups:

- *Concept cars for the world as it is.* These are made to project and announce modifications into upcoming series production vehicles, which are usually launched one year after the concept cars are presented. These concept cars, which are typically built on existing platforms, extrapolate current knowledge about technology and visible trends into new car models. They examine probable futures with a strong emphasis on branding.

- *Concept cars for the near future.* These concept cars aim to inspire the design of new category of vehicles for the brand, which could be developed during the next five years after the concept cars are showcased. They envision new type of vehicles which incorporate current knowledge and a mix of ongoing and new trends. They push the boundaries between the probable and plausible futures combining branding with innovation.

- *Concept cars for the speculative future.* These concept cars are entirely new 'visionary models', which explore at least fifteen years into the future. These are vehicles built from scratch that propose new styling, ahead of the lines of the current series production vehicles, and explore novel technologies and interactions, even some that have not necessarily been proven to work. These concept cars, which will never be produced, are mainly innovation exercises. They are actively connected to the preferable futures, creating visions of the future that are selected based on the values of the brand and its strategic projections.

The outcomes and activities presented earlier contain the benefits explained below.

3.4.3. *Value that concept cars bring to the automotive industry*

Grounded in our evidence, this design-led futures technique offers several benefits for automotive corporations.

First, this way to investigate the future uses an intuitive approach in which designers focus on the users. Designers research the context factors by being immersed in the context –living in it–, which gives them the possibility to observe people's behavior empathically and thus discover the trends and emerging themes first-hand. In view

of these trends and emerging themes, they can define a future vision which is human centered. Therefore, all the results derived from this vision, such as artifacts, visuals, and narratives incorporate the users to a certain extent. Maintaining a human-centered focus throughout the whole exploration ensures that the outcome, the map of the preferable future, will incorporate a human perspective. This helps companies develop innovation driven by people's needs, desires, expectations, which can end in new products, services or businesses that are closer to the users; hence, an innovation that positively impact the company, users, and society.

Second, concept cars are 'vehicles' to innovate and to share this innovation with others. The findings suggest that concept cars are a way to stimulate the creation and exchange of ideas with consumers, opinion leaders and innovation team players at three different context levels, team, in-company, and public. With concept cars, companies share tangible images of the future that are easy to understand for people inside the company as well as outside. Presenting these visions to diverse stakeholders stimulates conversations that generate numerous new ideas and opportunities concerning the company's future at different levels, from a company's strategy to its products. It also helps align the agendas of different stakeholders.

The other benefit of concept cars is that by making these artifacts, companies effectively increase their innovation capabilities, learning by doing. They incorporate new knowledge about trends and technology and discover how to make an idea concrete and actionable, and also find a way to communicate this idea.

Although the features described here present concept cars as an attractive futures technique, they have two clear limitations: the implementation of this technique requires a substantial investment of resources and it presents a singular outcome, hiding the opportunities offered by other futures.

In view of the characteristics defined in the previous chapter, we can clearly identify the tangible quality (Abstract—Tangible) of concept cars as outcomes and the visual richness of their communication (Textual—Visual). Through the analysis in this chapter, we established facts that helped us to understand that car manufacturers, suppliers, and automotive design studios apply various kind of concept cars to conduct precise (Narrow—Broad) explorations along all time frames (Short Term—Long Term). Moreover, considering the benefits and limitations of these artefacts, we propose that designers who work in the field of design and innovation management can use concept cars as a design-led futures technique or as a 'vehicle' to complement other futures method.

Considering that this design-led futures technique does not fit SMEs due to the limitations introduced earlier, we will continue this inquiry comparing concept cars with other design-led futures techniques in Chapter 4. With the results of this comparison, we will also investigate how to apply concept cars from the current niche of large corporations to the area of SMEs in Chapter 5.

4

Design-led futures techniques used outside the automotive industry

4. Design-led futures techniques used outside the automotive industry[1]

The previous chapter studied concept cars as a design-led futures technique and uncovered its relevance for SMEs. This technique and the resulting artefacts evoke discussions about the company's future that increase the range of opportunities when making-decisions on the world as it is that feed the innovation strategy. However, the technique is costly and requires a highly skilled team, which make it difficult for SMEs to implement. In view of these limitations, the objective of this chapter is to research related design practices outside the automotive industry and thus identify the ingredients to develop a design-led futures technique for SMEs, topic of the next chapter.

To cover these design-led futures techniques, this chapter conducts two literature analyses on designerly ways to speculate about the future and two comparisons of these design practices. Section 4.1. and 4.2. discuss two literature reviews –the former used the keywords concept product(s), concept service(s), and vision concepts, and the latter speculative design, critical design, and design fiction– in the literature search through Scopus, Web of Science, and Google Scholar. This literature analysis serves as a transition from concept cars to design fiction, including critical design, to introduce two comparative analyses, described in section 4.3. The first one compares different vision concepts (concept cars and concept kitchens/products) to identify the similarities among these techniques and thus identify what other design-led futures techniques have been proposed in a business-oriented context. The second comparison aims to identify and clarify the characteristics of critical design and design fiction in comparison with vision concepts and thus reflect on design's potential value for contexts other than product development in large corporations. In Section 4.4., the lessons from the two studies are brought to a conclusion about design-led techniques for envisioning the future.

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1   This chapter is based on the papers:

Mejia, J. R., Simonse, L. W. L., & Hultink, E. J. (2015). Design of vision concepts to explore the future: nature, context and design techniques. Presented at the 5th CIM –Creativity and Innovation Management– Community Workshop, Enschede, The Netherlands.

Mejia, J. R., Pasman, G., & Stappers, P. J. (2016). Vision concepts within the landscape of design research. In P. Lloyd & E. Bohemia (Eds.), Proceedings of DRS2016: Design + Research + Society – Future-Focused Thinking (Vol. 4, pp. 1659–1676). Brighton, U.K.

4.1. Vision concepts, the confluence of visions of the future and concept cars

This literature review starts by discussing the way in which the notion of concept cars has been extended from the automotive industry to other contexts in a business-oriented setting. The term 'concept car' is used in technology settings to describe a pioneering result, or an experimental approach applied to encourage creative thinking. That is the case of the 'Intel's information technology (IT) concept car program' that, according to Pickering (2004), stimulates the delivery of "proactive solutions that anticipate needs before they arise". She states that these IT concept cars are the result of a process in which employees prepare a proposal and build out the experimental prototypes, such as posters with annotated sketches, proof-of-concept demos, storyboards, or videos that embody the ideas. These prototypes are used to communicate the concept car internally through "a community of practice" and in internal workshops, or externally through international fairs. Along with these – internal and external– events, focus groups, interviews, observations, and surveys are used to capture the user's feedback. The insights of these tools are captured in the form of white papers, demos, videos, and case studies.

These experiments, in which "the funding process is streamlined", usually take less than three months (Pickering, 2004). Although these exercises involve images of the future in the form of prototypes, they are just ideas of probable future products that are not necessarily used to give direction on the business' future.

As the previous example illustrated and the literature analysis revealed, concept cars, as an approach and as an end, has been applied with microprocessors, cars, kitchens, or insurance, among others, to generate ideas of new products and services, or as a way to clarify the vision of the company and thereby generate concrete ideas regarding the business' future innovation strategy.

To be as inclusive as possible, in this dissertation, we rechristened the notion of concept car, which is limited to the automotive industry context, as the broader *vision concepts*, which indicates that the artefact that is made does not have to be an automobile (it can be a product or a service), and that it embodies a vision of the company's future. The notion of vision concept was developed by Keinonen and Takala (2006) as part of a classification that defined three type of concept products:

(i)   *product development concepts* used to unlock the problem and map the possibilities in the new product development process;

(ii)   *emerging concepts* that support the learning and decision-making process with regards to future product generations; and

(iii)   *vision concepts* used "to go a stage further"; these are made to support

the company's strategic decision-making beyond the scope of product development.

This classification matches with the findings of Chapter 3, in which we defined concept cars for the world as it is, for the near future, and for the speculative future. In this dissertation, we understand vision concepts as a notion that blends the main findings of previous chapters: (i) vision and (ii) concept –cars for the speculative future. On one hand, as mentioned in Chapter 2, a vision, which in general terms is described as "conditions as we would like them to be" (Stokes, 1991), is located in the speculative future as part of mapping the preferable. According to Kaufman and Herman (1991), this destination is presented generally as a brief narrative that defines the focus and purpose of the organization in the long-term. Recent scholarly work in the field of innovation management defined three types of vision: market visioning (Reid & Brentani, 2015), technology visioning (Reid, Roberts, & Moore, 2014), and product visioning. The latter has been relatively unexplored, apart from a prior study (Simonse & Perks, 2014) that mainly investigated the relation between product visioning and new product development performance. These studies found that product visions exert a large influence on a new product's success (Lynn & Akgun, 2001; O'Connor & Veryzer, 2001; Reid & Brentani, 2012). Empirical evidence also suggests that a clear and shared product vision in the front end of innovation can subsequently enhance and speed up functional integration during new product development (Tessarolo, 2007), whereas a weak product vision can lead to time-consuming efforts to integrate disparate functions. Similarly, Kessler and Chakrabarti (1999) suggested that a lack of shared vision can result in ambiguity and greater speculation among functions about what should be developed, often leading to conflict and delayed, and thus unsuccessful, new products. On the other hand, Chapter 3 stated that a concept is the combination of different abstract ideas, which in the case of the concept cars are related to technology and styling, to create a new interaction between the car and the user(s).

There are several design methods available to formulate a *vision* and explore what *concepts* are possible tomorrow. One is the Vision in Product design method by Hekkert & van Dijk (2011), who propose it as human-centered, context-driven, and interaction-based. This method is divided into two steps: the first for preparation and deconstruction of the present, and the second for the design work itself, design of the future. The second step is based on an in-depth understanding of the needs of people and the awareness of –future– context factors. These needs and factors are key to proposing a vision of what the future product should do and be before it has been conceived, including its reason for existence. In Vision in Product design, the vision consists of a statement that describes what the designer wants to offer people, within a particular domain. It should also include a definition of how this goal is to be attained through specified interaction qualities and product qualities. In this dissertation, we understand that while a method is related to a particular procedure of doing something, usually according to a systematic plan, a technique focuses more on the skills needed to effect a desired result. In this case, designers can use diverse

techniques when using the Vision in Product design method.

Although this method has been successfully applied by academics, designers, and companies, it does not provide explicit guidance on how to share the vision and concepts of these explorations with people inside and outside the company. Moreover, research has suggested that a collaborative approach is important to the product/market vision. O'Conner and Veryzer (2001), for example, espoused the importance of a shared mental model of the potential future product/markets before the new product development process itself starts. We are beginning to learn more about what this sharing process is. For example, Reid and Brentani (2012) found empirical support for the proposition that resource dedication, allowing for the timely dissemination of information to appropriate people, supports strong visions. To enable this, it is suggested that vision development should be shared between individuals and organizational systems (Stacey, 2001). Within organizations, the individuals typically engaged in envisioning are designers, and design techniques might facilitate the vision sharing.

4.2. Critical design and design fiction, other design-led futures techniques for a different context

This section continues with the analysis of the two design-led futures techniques defined in Chapter 2, *critical design* and *design fiction*. So far, these have been applied mainly within the design research and art community, not the business arena. According to Dunne and Raby (2013), these techniques typically use design as a promoter to start a discourse about the desirability of a new product or to open up the discussion about social implications of new technology. The resulting physical and/or digital manifestations of these techniques are not meant to be considered in their own right, but rather as provocations or stimuli, that should trigger and inspire people to consider their ideas concerning the future. These two techniques are studied under the umbrella of 'speculative design' (Auger, 2012). Speculative design is an area of design research, present in different design disciplines, where design is about ideas, not –factual– products. It produces artefacts, which are not intended to be mass-produced. Both Auger (2012) and Dunne and Raby (2013) distinguish speculative design from other design techniques as a space containing different forms of design that all happen when designers use fictional or imaginary worlds, thereby creating a space of challenges free from the restrictions of commercial products and separate from the marketplace. These imaginary worlds take place in alternative presents or diverse types of futures. Through the different forms of speculative design, designers facilitate "a dreaming process that unlocks people's imagination" (Dunne & Raby, 2013) asking what-if questions and developing alternative visions. Speculative designers "use fictitious objects at the core of [their enquiries]" (Auger, 2012) as a way to trigger discussions with a broad audience. Several authors have looked at the aims these speculative designs serve and found that they can function as a form of

thinking, questioning and dreaming, as provocation and critique (Hales, 2013) and according to Dunne and Raby (2013) as inspiration, aesthetic exploration, speculation about possible futures, and as a catalyst for change.

In view of the landscape of design research, developed by Sanders (2006), in speculative design, "the designer is the expert who creates things to probe or provoke response" from their audience. Later, in 2014, Sanders and Stappers identified critical design and design fiction as design and making activities, which differ with regards to their time-frames. They argue that these activities "can be used in the early phase of the design process for making sense of the future, as vehicles for collectively exploring, expressing and testing hypotheses about future ways of living" (Sanders & Stappers, 2012). Figure 4-1 positions these design-led futures techniques across (i) the different time-frames: the world as it is, the near future, and the speculative future; and (ii) the design intent: provoking, engaging and serving people.
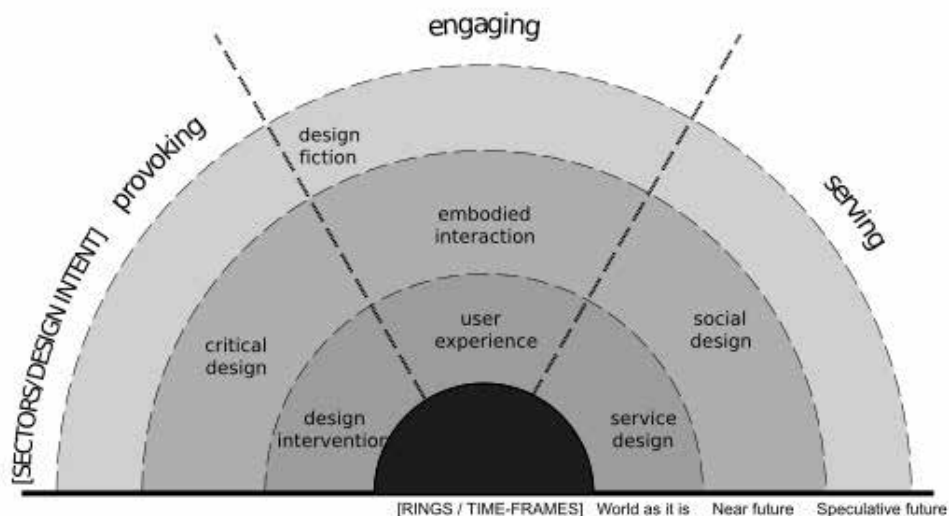

Figure 4-1. Critical design and design fiction as techniques to design and making based on time-frames and design intent. In the inner ring, the world as it is, in the middle ring, the near future, and in the outer ring, the speculative future. From left to right: design as a way to provoke, engage, or serve. Source: Sanders and Stappers (2014).

Sanders and Stappers (2014) position design fiction mid-way between engaging and provoking, on the outside ring of the speculative future. Critical design is located in the center of provoking, on the middle ring of near future. Although the spots assigned to critical design and design fictions seem adjusted to their characteristics, vision concepts are not part of this landscape.

In general, both in the field of innovation (management) and in the field of design, we found a lack of understanding on how vision concepts, critical design, and design fiction explore the future. It includes a lack of knowledge on how designers share these artifacts and what is the position of vision concepts within the landscape of design research.

4.3. Comparative analysis

In view of this gap in the literature, this chapter conducts two comparative analysis to collect the main characteristics of these techniques and then used as ingredients to develop a design-led futures technique for SMEs. This comparison also helps us to identify the position of vision concepts in the landscape of design research.

4.3.1. Method

The methods used in this chapter are the same as in Chapter 3, and for the same reasons. The goal is to unravel the characteristics of the design-led futures techniques used outside the automotive industry, more specifically vision concepts, critical design, and design fiction. In this chapter, we conducted two comparisons using the same categories defined in the previous chapter: activities, outcomes, and value of these design-led futures techniques applications.

In the first round, three vision concepts were compared. One, from the automotive industry, was described in Chapter 3. The other two cases come from another economic sector that has traditionally used design to explore the future, the consumer lifestyle industry: Concept kitchen 2025 by Ikea and Bio-digester –concept– kitchen island by Philips. To facilitate the comparison between the vision concepts, the chosen cases were designed for the same context, the kitchen, and with the same purpose, to cook food. All the selected cases had been completed, exhibit, and described in literature.

In the second round, we compared an example of vision concepts (the findings of the previous study); two examples of critical design, Digicars by Dunne and Raby, and Respiratory dog by Revital Cohen; and two examples of design fiction, Helios by Near Future Laboratory, and Song of the machine by Superflux. The latter four examples were critically discussed in Chapter 2. This comparison also positions these practices in the design research landscape.

Procedure

As in Chapter 3, this study followed Yin's (2003, 2009) method. We began with the collection of qualitative data recorded by videos and documented case material from multiple sources. This qualitative data includes internal information provided by the companies or designers om their web pages and in press releases, which comprise text, images, and videos; external reviews from specialized magazines and blogs (some including interviews with the designers); and related research papers published in scientific journals or books, if available. After selecting the cases, we analyzed the gathered materials.

Data analysis

The data analysis included the coding of the texts and the audiovisual material. In analyzing the materials, we looked for similarities and differences in the activities to make and share the artefacts. Then, we identified patterns throughout the cases and matched these to the respective aspects of the vision concepts. We tabulated these findings and formulated analytical statements, and illustrated them with individual examples and data from the cases (Miles & Huberman, 1991). Then, we iteratively compared the documented experiences with the videos. Finally, we generated a construct definition, characteristics of the sharing context, and an initial framework for design technique by induction (Eisenhardt, 1989; Pratt, 2008).

Appendix Chapter 4 online http://dive.pktweb.com/ includes the videos and documented case material.

4.3.2. Results

Comparative analysis of vision concepts

This section presents the results of the comparative analysis that explores the consumer lifestyle industry, in which concept cars have been migrated to concept kitchens/products, on the criteria: activities, outcomes, and value of this design-led futures technique application.

Activities

With regards to the activities followed by the designers, Table 4-1 compares the three cases of vision concepts and the ways in which automotive and consumer lifestyle product manufacturers make and share them.

Table 4-1. Making and sharing activities of the three vision concepts

Case	Concept car	Concept kitchen 2025	Bio-digester -concept- kitchen island
Company	*Automotive companies (findings of Chapter 3)*	*Ikea*	*Philips*
Time frame	*World as it is, near future, or speculative future*	*Speculative future (12 years)*	*Speculative future (10 years)*
Team and departments	*A specialized team that integrates around 6 designers and engineers from different departments*	*Depending on the stage of the project, special teams were arranged in 27 sub-projects. In total 54 designers worked together, including -senior- designers from IDEO and design students from Lund and Eindhoven University*	*The design team includes designers with ¨a wide range of design competencies, such as product design, interaction design, data visualization, service design, and communication design¨*
Duration	*Around 12 months*	*18 months*	*Between 6 to 8 months*
Making and sharing activities			

Appendix Chapter 4 online http://dive.pktweb.com/ includes the visual comparison of the making and sharing activities.

In Table 4-1, the analysis reveals the techniques used to make and share vision concepts with particular attention to the role of the designers within the team, the staging of activities, and the inputs-outputs.

The comparison reveals that in making these vision concepts, companies arranged specialized teams that bring together designers and engineers from different departments. It seems as if these teams have expertise in broad areas of design, including research, prototyping, storytelling, and communication. On average, these teams worked together for nine months, which is considerably longer than the case of IT concept cars introduced earlier in this chapter. The comparative analysis includes the visual comparison of the flow charts of the making and sharing activities that each company engage in, which shows that the activities to make a concept car are quite similar to those for the other vision concepts. Grounded in the data, the three examples show that, in most of the cases, the team starts with *setting the*

domain and time frame. Ikea, for instance, set up the domain, which they define as an 'opportunity area,' an area of interest that includes the people who are within this area and the emerging themes that can affect them, and a research question, which in this case is "how might we behave around food in 2025?". Then, as part of *analyzing the context factors,* the team conducts activities to explore this domain identifying opportunities and trends. Philips, for example, starts with the "definition of a terrain to explore [and then] researches the chosen area to position this problem in context." Concerning the methods of analyzing the context factors, some automotive companies (see Volvo and Citroën Lacoste in Chapter 3) and Philips monitor trends, whereas others (see Mercedes-Benz in Chapter 3) use future scenarios. Ikea opts to use observation to gain insights from the users whereas Philips employs expert interviews. Later, for *envisioning the alternative futures* and *mapping the preferable future,* all the companies use an iterative way to generate, select, and refine ideas and thus define a vision of the future. Like the automotive companies in Chapter 3, all the companies indicate that they use sketching and prototyping as the method of generating ideas. The team produces sketches and mock-ups as a result of several creative activities. Unlike the other companies, as uncovered in the previous chapter, the three automakers, which focus on the artifact, sketch the exterior and the interior separately and make scale models of the exterior to generate and then select ideas. Another important difference between the automotive companies and the lifestyle companies uncovered by the analysis is that the latter rely heavily on storytelling in combination with sketching and prototyping. When the designers share ideas, whether a new style, technology, or interaction, they create short stories to give the ideas context. Philips, for instance, "looks for disruptive narratives that connect the issues" and Ikea uses storytelling "to turn stories into [vision] concepts." At the end of this activity, the team selects the final idea, details it through –CAD– models, and makes a final prototype. In all cases, this prototype, as well as the narrative, is used in a short video. At Philips, for example, they "produce a provocation in the form of a video and a physical materialization."

In sum, the evidence suggests that storytelling support the visual synthesis and prototyping when companies make and share vision concepts. As defined in Chapter 3, all the companies exhibit the vision concepts to the public at external shows. According to Philips, "an exhibition can stimulate debates and generate ideas." Ikea and Philips, as well as Volvo (see Chapter 3), use the vision concepts in private workshops and presentations with managers. Ikea is the only company that mentions another phase where they "take forward these ideas" for use in "product development for the future."

Outcomes

The Table 4-2 displays the three vision concepts and presents the outcomes of the activities explained earlier, including the artefacts.

Table 4-2. Outcomes of the three cases

Case	Concept car	Concept kitchen 2025	Bio-digester -concept- kitchen island
Presented as	*A futuristic vehicle*	*A system of products for the kitchen*	*A repositionable kitchen island part of the Microbial home*
Artefact	*A functional or non-functional prototype*	*A non-functional prototype*	*A non-functional prototype*
Images of the prototypes			
Documents part of the press release	*Several pictures* *Short texts* *A video*	*23 pictures and posters* *A short text* *2 videos*	*13 pictures* *Short texts* *A video*
Videos			
	The automaker usually produces a video about the concept car	*Ikea produced a set of separated videos for each part of the system. This analysis is about ¨the table for living¨*	*Philips produced a general video with all the components of the Microbial home*
Storyline	*The videos show various people making use of the concept car in a particular context. Most of the videos focus on the interaction between users and the vehicle*	*The video presents the interaction between a user and the table during the process to cook a recipe*	*The Microbial home is presented as a system including a summary of all the components and the interaction between the users and each element*
Characters	*Users*	*Users: a female cooking and a child playing*	*Users: a group of people cooking*
Main message	*- Interaction between users and the car* *- Brand identity*	*- Interaction between the user and the product* *- Interaction between the product and other products (props)*	*- An overview of the system of products and the products* *- The interaction among the users and the products* *- The research project context, opportunities and research question*

Background	Exteriors	Interior (the kitchen): several illustrations of the concepts and top views of the prototype	Interior (where the prototypes are exhibited): several illustrations of the system to present the sequence
Costumes	Does not apply	Does not apply	Does not apply
Props	Different artefacts	Cell phone and tablet	Does not apply
Soundtrack	Music and voiceover	Voiceover	Music
Length	Around 1:30 min	02:36 min	06:50 min

The data shows that companies name their vision concepts in diverse ways. As mentioned in Chapter 3, most of the automotive firms call their vision concepts "concept cars." Ikea describes the outcome of the project as "Concept kitchen 2025," and Philips uses the name "design probe," which according to its design department is part of the design futures portfolio. These difference show that Ikea intends the outcome to be considered as a product proposal, just like the automotive examples, but the Philips team emphasizes the use of the design as an open-ended provocation about future life and the role of technology in it.

The analysis in Chapter 3 revealed that the outcomes of these explorations in the case of the automotive companies are products (vehicles), unlike the consumer lifestyle industries, which made systems of products, comprising several products and the relationship between them. That is the case of the Concept kitchen 2025, which includes a dining table, the "heart of the kitchen"; a pantry, which "makes food visible"; a composting and waste system; and a "mindful design" sink, which informs users about how to use water. Philips also introduced the Bio-digester concept as a repositionable kitchen island that is the central hub in the Microbial home system. The island consists of "a methane digester that converts waste into methane gas that is used to power a series of functions in the home".

The comparison uncovers that all the companies deployed the vision concepts as prototypes, 1:1 models that present the main features of the –system of– products. Most of them are non-functional prototypes, like the Concept kitchen 2025, a set of full-size mock-ups that demonstrate the key elements of the product-user interaction, for instance "the system to recognize objects and their movement and to project a display through the camera and projector positioned above the table" (Ikea, 2015), but they are not functional: they cannot be used to cook a meal. In addition to these prototypes, the companies produce press releases for journalists, a set of supporting material that includes descriptive texts, a comprehensive set of images, and videos that present the vision concepts in their context, which round up a communication system.

Value of vision concept applications

Following Chapter 3, with regards to the value of vision concepts, we presented the lessons learned by the companies when making these artifacts –the exploration–,

and the insights from sharing the prototypes and videos (see Table 4-3).

Table 4-3. Values delivered by the three vision concepts

Case	Concept car	Concept kitchen 2025	Bio-digester -concept- kitchen island
Exploration	*It explores the application of new technology and a new design language for a specific segment of users*	*This exploration aims ¨to inspire ourselves and inspire people around us [through] a tangible communication of what are the behaviors of the future and what the kitchen looks like in 2025¨ (Ikea, 2015)*	*This concept kitchen is intended ¨to stimulate discussion around waste and how we deal with it¨, it is ¨testing a possible future - not prescribing one¨ (Philips, 2015)*
Context of the exploration	*Concept cars are investigations, guided by -what-if- questions, that explore the future to discover possibilities*	*Ikea and the external stakeholders have developed this ¨investigation around the question: how might we behave around food in 2025?¨*	*Philips has developed this project ¨to ask questions about the viability of biological processes in our home and places of work¨*
Shared at	*Motor-shows*	*Several workshops at a six-months exhibition Ikea Temporary in Milan in which the general public could interact with the prototypes*	*The Dutch Design Week in 2011. Alongside the exhibition, the ¨Philips foresight initiative¨ was developed*
In-company sharing	*Additionally, some concept cars are used internally in presentations to employees*	*During the process, several presentations were arranged with different employees of Ikea*	*Together with the exhibition and the webpage, they used a comprehensive report that ¨captures all the concepts, though processes and intellectual property ideas¨ as the input of several workshops within the company*
Year		*2015*	*2011*

The evidence suggests that, when it comes to the exploration and its sharing context, the purpose of making and sharing vision concepts is clear: exploring the future and communicating a message to a broad audience. These explorations inspire designers and –design– researchers, and such communications seek to state a strategic intent to the audience, stimulating discussions and dialogs with various stakeholders. That is the case with the Concept kitchen 2025, whose central goal is "to inspire ourselves and inspire people around us" by tangibly communicating "the behaviors of the future and what the kitchen will look like in 2025," as one of the Ikea managers explains. Similarly, probes projects from Philips "are intended to understand future socio-cultural and technological shifts" and test possible outcomes, culminating in "a provocation designed to spark discussion and debate around new ideas and lifestyle

concepts". Correspondingly, as critically discussed in Chapter 3 in the case of Daimler AG, the intention of the vision concept is to "enter into a dialog with customers." This analysis suggests that the insights gained from the debates around the vision concepts feed into the future innovation strategy of the company, improving the innovation hit rate.

In examining how companies shared the vision concept in their organizational context, we found three types of sharing: public, in-company, and team.

Unlike other prototypes used in the front end of innovation or new product development, which are usually kept confidential form the outside world, these vision concepts are shared either in-company or publicly. Quite strikingly, Philips explicitly wants to make it clear that the vision concept "is not intended as a production prototype nor will it be sold as a Philips product." All of the studied vision concepts were showcased publicly at international events to the general public. Just like concept cars, which are exhibited at international motor shows, but also with no test drives. The two concept kitchens were demonstrated at international events. The Ikea concept kitchen was showcased at an independent exhibition (#IKEAtemporary) in Milan including several workshops, and the Philips Bio-digester was presented at the Dutch Design Week in Eindhoven. It was used in several workshops and also, as Philips claimed, in a dedicated foresight project, a "far-future research dialogue by Philips Design to track emerging developments in politics, economics, environment, technology and culture." Evidence of this project is the webpage https://www.90yearsofdesign.philips.com

The analysis shows that, with respect to in-company sharing, some car companies such as Volvo (see Chapter 3), and the consumer lifestyle companies Ikea and Philips use the vision concept in several workshops and presentations for the internal innovation community. Philips also includes a report that "captures all the concepts, thought processes and intellectual property ideas." The strategic choice for concept cars is part of a dedicated vision concepts portfolio (see Chapter 3 for the example of the Mercedes-Benz Concept Vehicles portfolio, first created in 1991), and the concept kitchens are part of particular innovation programs, such as the Philips design probes program that ran from 1996 to 2012.

As presented in the previous chapter, in-company and team sharing is only exclusive in the Volvo case where a dedicated (future) monitoring and concept center unit was established. In all other cases, joint management of tangible vision concepts and commercial prototypes is practiced across different departments. In most cases, special teams co-created the vision concept, involving non-design stakeholders.

Comparative analysis of critical design and design fiction

This section presents the results of the comparative analysis of five examples of three different design-led futures techniques: one vision concept, which corresponds to the findings of the previous study; two cases of critical design; and two cases of design

fiction.

Activities

Table 4-4 shows the analysis of the activities with special attention to the approach, type of team, role of the designer, and role of the others.

Table 4-4. Making and sharing activities of the five design-led futures technique

	Vision concept	Critical design		Design fiction	
Case	*Findings of previous study*	*Digicars*	*Respiratory dog*	*Helios: Pilot, quick start guide*	*Song of the machine*
Author	*A large corporation*	*Dunne and Raby*	*Revital Cohen*	*Near Future Laboratory*	*Superflux*
Time frame	*Speculative future (more than 10 years)*	*Speculative future*	*Near future*	*Near future (less than 5 years)*	*Near future*
Team and departments	*A multidisciplinary in-house design team with around six designers*	*A multidisciplinary independent design team*		*A multidisciplinary independent design team with external advisors*	
Duration	*Around 9 months*	*Unknown*	*3 months*	*4 hours*	*Unknown*

This comparison shows that, in all five cases, design is used as the main instrument to achieve the desired goal, discuss the present in view of an exploration of the future. This exploration of the future covers two different time frames: the near future, in which designers envision the changes of the next five years or less, and the speculative future, in which companies anticipate the next 10 years or more.

When it comes to the role of the (individual) designer, though, there appears to be a clear distinction between vision concepts, driven from a strategic and business-oriented perspective, and critical design and design fiction, which use a non-commercial view. Vision concepts are typically created by an in-house design team within a corporation context, in which the resulting outcomes should primarily reflect the image and values of the brand rather than those of the designer. By contrast, critical design and design fiction especially seem to be much more driven from a designer's personal stance and opinions than vision concepts that depends
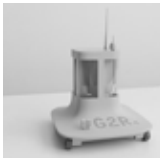
on the company strategy. The analysis revealed that some cases are presented under the name of a large corporation or brand, such as Philips as in the case of the vision concept Bio-digester kitchen island; a design agency, such as Superflux, the author of the Song of the machine; or an independent designer, such as Revital Cohen, the designer of Respiratory dog. In the cases of the Digicars and the Respiratory dog, for instance, the names of the designers are explicitly stated; In case of the vision concepts, such as the Mercedes Benz F 015 Luxury in Motion presented in Chapter 3 and the Philips Bio-digester kitchen island, introduced earlier in this chapter, the designers remain anonymous.

Although the approach of these designers is well-documented through books, such as *Speculative Everything* by Dunne and Raby (2013), the Ana Jain's (Superflux founder) TED talk 'Why we need to imagine different futures', the blog of the Near Future Laboratory (2009), and the online portfolio of Revital Cohen (http://www.cohenvanbalen.com/), the specific making and sharing activities that they follow are unknown. However, this analysis found that the Near Future Laboratory, which designed the Pilot, quick start guide, started with a broad spectrum of questions that guided them into a discussion about generic interactions with a fictitious car, with detailed definitions of these interactions but without the definition of the actual product or its technical requirements. Creating the guide was thus considered more of an exercise that provided room for conversations about the topic, rather than an end in itself.

Outcomes

The Table 4-5 presents the outcomes of the vision concepts, critical design, and design fiction, including the artefacts.

Table 4-5. Outcomes of the five cases

	Vision concept	Critical design		Design fiction	
Case	*Findings of previous study*	*Digicars*	*Respiratory dog*	*Helios: Pilot, quick start guide*	*Song of the machine*
Presented as	*A futuristic product service system*	*A piece of art*		*A design exercise*	
Artefact	*A functional or non-functional prototype*	*Scale models*	*Non-functional prototype*	*Mock-up*	*Non-functional prototypes*
Images of the prototypes					
Documents part of the press release	*Pictures* *Texts* *Videos*	*Pictures* *Texts* *Videos*	*Pictures* *Texts*	*Pictures* *Texts* *Videos*	
Videos					
Storyline	*The video focuses on the interaction between a user and the vision concept*	*An animation describes a variety of scenarios of traffic systems, in which the Digicars are the main characters*	*No video is available*	*No video is available*	*The video describes a day in the life of Mark, a blind user of Song of the machine. It includes the different features of this treatment such as infrared radiation and gesture control to attend a video call*
Characters	*Users*	*Digicars*			*A user*
Main message	*- Interaction between users and the vision concept*	*- Interaction between the product and other products*			*- Interaction between the user and the artefact* *- The interaction among the users*
Background	*Exteriors and interiors*	*Exteriors*			*Interior (Mark's apartment and train interior) and exteriors (park)*

Costumes	Does not apply	Does not apply		Does not apply
Props	Different artefacts	Does not apply		Cell phone and tablet
Soundtrack	Music and voiceover	Music		Music
Length	Around 1:30 min	1:56 min		05:11 min

The analysis reveals that all five cases produce physical manifestations that companies and designers use to communicate their results to the outside world. Although all these manifestations are shared externally, the treatment that the companies or designers gave to the artefacts and the way they share them are different. While vision concepts are presented as futuristic product service systems in commercial settings, the critical design outcomes are exhibited as pieces or art, and the design fictions are showcased as design exercises.

Overall, this comparison identified a difference, going from very detailed, full-scale or even functional prototypes, in vision concepts to scale models and sketchy prototypes in critical design and design fiction. In the case of the Mercedes-Benz F 015 Luxury in Motion project, presented in the previous chapter, its main manifestation is a fully working prototype, a car that can actually be driven and experienced. In the Philips case, presented earlier, the displayed prototypes were non-functional, but full-scale and highly detailed. The Digicar case, on the other hand, presented the outcomes by means of small-scale models, which were supplemented by visual supporting material, and the quick start guide, produced in the Helios case, is a basic mock-up made by the designers in a couple of hours.

With regards to the use of video, all the cases of vision concepts analyzed in the previous study, including all the concept cars discussed in previous chapter, and one example of critical design and one of design fiction of this comparative analysis, show the value of this medium. In the case of the Song of the machine, we observed that the main manifestation is a video, and the artefacts are mainly props part of this visual storytelling exercise. We also observed that while the videos of the vision concepts look like finalized commercials with professional actors and well-produced effects, the videos of the critical design and design fiction are more exploratory, using amateur setups and simpler props. That is the case of the Song of the machine video, in which the designers designed the artefact, made the prop, produced the video, and played the role of the characters.

Value of the application of critical design and design fiction

As in the previous study, we divided the value of the application of critical design and design fiction in two: the lessons learned by these explorations, and the insights from sharing these artifacts (see Table 4-6).

Table 4-6. Values brought by the five cases

	Vision concept	Critical design		Design fiction	
Case	*Findings of previous study*	*Digicars*	*Respiratory dog*	*Helios: Pilot, quick start guide*	*Song of the machine*
Exploration	*It explores new interactions, related to the application of new technology and a new design language, to envision the future and thus discover opportunities*	*The project presents perspectives on a fictional future for a country. It experiments with different forms of government, economy and lifestyle*	*The project asks questions like could animals be transformed into medical devices? and could humans become parasites and live off another organism's bodily functions?*	*The project asks questions like how does the car pick up groceries? and how do you activate and lock the "Child Safe Mode" for your teenage son to take to football practice?*	*The project asks questions like what if we could change our view of the world with the flick of a switch? and how might you choose to 'compose' your vision of the world?*
Context of the exploration	*Vision concepts are investigations, guided by research questions, that explore the future to discover possibilities*	*Critical design projects formulate questions about the way that products, services and systems are made and used*		*Design fiction projects are "micro futures-studies [that focus] on the everyday life, its short term evolutions, and the standard objects or services that might fill these possible futures" (Girardin, 2015)*	
Shared at	*Commercial shows*	*Design Museum in London*	*Royal College of Art exhibition*	*Conference Interaction 15, IxDA 2015*	*Science Gallery's HUMAN+ exhibition*
In-company sharing	*Some vision concepts are used internally in presentations to employees*	*Does not apply*		*Does not apply*	
Year		*2012*	*2008*	*2015*	*2011*

When it comes to motive, this analysis revealed that there is a distinction between the vision concept example and the critical design and design fiction examples.

As the previous study defined, vision concepts are currently primarily developed within large companies, in a business environment, and the knowledge and exposure gained through these explorations should directly benefit the company's innovation strategy. In the case of the Mercedes-Benz F 015 Luxury in Motion (introduced in the previous chapter), for instance, Daimler's main intent is to show its leading

position with regard to self-driven cars, building its brand image in relation to this significant business trend. According to Dieter Zetsche, head of Mercedes-Benz Cars, the company is sharing this experimental vehicle to stimulates the dialog about autonomous cars. Daimler claims that their concept cars feature innovative technology that enter into a dialog with customers, inspiring the market and helping them sound out customer interest (Mercedes-Benz Cars Research & Development Communications Centre, 2015). In view of the findings of the previous chapter and study, we also observed that concept cars and vision concepts require considerable resources in terms of budget, people, and time.

This analysis shows that critical design and design fiction, on the other hand, are mainly applied within the context of a design –research– lab, a design agency, or even created by an individual designer. These contexts are usually unable to free up the amount of resources that a vision concept requires. Moreover, we also observed that when applying these design techniques, their main motive is not to make money, but to generate awareness, raise concerns or challenge values about (the use of) new, emerging, and future technologies, products and services. That difference in motive is apparent, for instance, in the Song of the machine case. In that case, Superflux, a collaborative design practice, and Dr. Denegaar, an optogenetics researcher at Newcastle University, collaborated to design for the 'imminently probable'. They sought to explore the design possibilities and near-future implications of emerging technologies on people, culture, and the environment. At the core of this discussion was "a conscious awareness of the substantial difference between this hybrid optoelectronic system and the 'closed' technology of bionic implants" (Song of the machine, 2011b).

As in Chapter 3, and the previous study, this analysis also exposed that all these design-led futures techniques, even if they are in a business-oriented or non-business-oriented context, are investigations guided by a research question. Some of these questions are more pragmatic, such as the case of how to enable people to do what they want or need to do? formulated by Daimler AG, and others more inspirational, such as could animals be transformed into medical devices?

The differences in motive and design intent also lead to differences in the 'main audience' that is targeted as well as the venue that is used to present the results. This study observed that vision concepts are generally aimed at large audiences and are therefore typically showcased at big international commercial events, to generate as much attention and exposure as possible. On the other hand, critical design and design fiction target a smaller group of specialized people, usually within the design research and art community. These are communities with a lively discourse that expresses itself through blogs, magazines, and (scholarly) events. As a consequence, both techniques require less promotional efforts, but their results are also less apparent to the general public.

In sum, this analysis provided us with arguments to state that vision concepts are designed to engage the general public about the brand and the innovative and future-

oriented character of the company. As a consequence, exposure to the outside world is directed completely towards communicating this positive image, using design primarily as an aesthetic tool to attract attention and polish the message. Critical design and design fiction, however, both use design as an instrument to challenge and provoke, resulting in representations that are usually less polished and sometimes even uncomfortable to experience. Although design fiction mostly tries to at least wrap its provoking message into an engaging video or appearance, as with both Helios and Song of the machine, critical design typically uses a more confrontational and direct approach. The Respiratory dog case, for instance, presents the somewhat unusual prospect of a retired greyhound acting as a human prosthesis in the form of a piece of art.

4.4. Discussion

4.4.1. Design-led futures technique outside the automotive industry

The comparison among concept cars and concept kitchens/products shows that, as *outcomes*, vision concepts are tangible prototypes and visual narratives used to create and discuss new strategic ideas for innovation in the future. An important difference between concept cars and concept kitchens is that the former's outcome focus on the object, the car itself, while the latter's outcome presents a context or scenario in which diverse products and services interacts within a product service system. Whereas the concept car is embodied by a prototype of an object that is staged in a video of the future context, the concept kitchen is represented by a set of prototypes of objects, such as stove, oven, counter, and table, that are showed as a system and also presented in a video. In this sense concept kitchens, can be seen as a material scenario that includes a collection of concept products. Both the scenario and products share the tangible properties of concept cars.

With regards to the tangible artifact, vision concepts seem to differ from new product development prototypes in three different ways: (i) the embodiment of the vision concept in a 1:1 prototype can be similar, but the narrative about envisioned interactions with the product in the future is different; (ii) these prototypes and narratives are part of a dedicated portfolio, outside of the commercial portfolio, in which the experimental artifact is not intended as a production prototype nor will it be sold; and (iii) unlike commercial products, which are part of a new product development project that is kept confidential from the public, the tangible prototypes of vision concepts are shared with an internal and external community. With regards to the visual narrative, its richness and inherent narrative structure could provide designers with the opportunity to merge the richness of today's everyday life with the possibilities of the near future in a believable and compelling way.

The findings suggest that vision concepts are usually shared at three different context levels: *public* in commercial shows with the media, the opinion leaders, the

specialized public –consumers–, and the general public, and, and *in-company* and *team* with innovation team players. Since vision concepts are aimed at large and diverse audiences, they typically use a variety of rich visualizations with high levels of detail and fidelity, such as glossy pictures, videos, and texts to be distributed as press kits for maximum exposure. Showcasing the vision concept in public also aims to convey positive images that benefit the business contributing to a positive brand image regarding a specific brand value.

The comparison among vision concepts, critical design, and design fiction demonstrates that while the prototypes and videos of vision concepts leave little to the imagination, the open-ended probes in critical design provoke the audience to actively create their own impressions. While vision concepts and, to a lesser extent, design fiction generally are aimed at presenting a 'comprehensive' picture, critical design intentionally leaves blank spaces which need to be filled in by the audience. Again, the models used here were intended as vehicle for speculation about potential scenarios of transportation in an imaginary country.

In sum, no matter the level of resolution of these tangible –futures– concepts supported by the stories of the videos, they embody several ideas, which make the ideas concrete and actionable.

4.2.2. Use of these design-led futures in the context of innovation

Our findings suggest that the process of future exploration, regarding vision concepts, is led by a research question and developed by a highly skilled team. Designers are part of all concept visioning teams and some also include a brand and communication professional and an engineer.

We suggest that the design of a vision concept is not a simplified new product development process. Instead, these activities appear to be part of a special exploration project that yields a conceptual solution and has a strong focus on communication. In view of the findings of this chapter, we incorporate some insights to complement the making and sharing activities of concept cars defined in Chapter 3, Figure 3-4:

- In the first part of the process, the (i) analysis of the future context, the design team should conduct interviews, focus groups, and observations to uncover trends and drivers. Through these activities, designers identify future opportunities and risks, define a domain, formulate a research question and then define an image of the future. This is similar to the first part of the Vision in Product design method (Hekkert & van Dijk, 2011) that includes the description of a domain and timeframe and the collection of context factors to design the future context.

- In the second part, the (ii) creation, the design team could use the outcome of the first step, the image of the future, and create several ideas through sketches and short storylines. Then, the team (iii) selects one concept and narrative

from this initial idea, one that fits well within the predefined domain. The design of the narrative is somewhat distinctive, especially because the story is about the future vision and not just about the description of the product. In some way, this step is similar to the definition of a vision statement proposed by Hekkert and van Dijk (2011). The statement explains the desired relation between the product(s), people (including users and other stakeholders), and their context.

- The four last parts of the process concern the distinctive parallel design of the vision concept and the narrative. Based on the selected idea, the design team (iv) details the concept through making the prototype(s) and producing the video, which is part of the press kit, including several texts and images of the vision concept. The prototype and the video are then (v) exhibited and (vi) used in workshops with the managers or other stakeholders.

With regards to the position of these design-led futures techniques within the landscape of design research as proposed by Sanders and Stappers (2014), Figure 4-2 presents the location of vision concepts, critical design, and design fiction, as making activities. The three speculative design techniques we compared encompass the three different time-frames. They use fictional time-frames as a mechanism to unlock the imagination, gain a fresh perspective on reality, and to escape from the constraints imposed by the market. While the speculative future opens possibilities, designers establish a distinct area of interest, as a scope for the project, which guarantees that they remain focused during the exploration and the discussion.
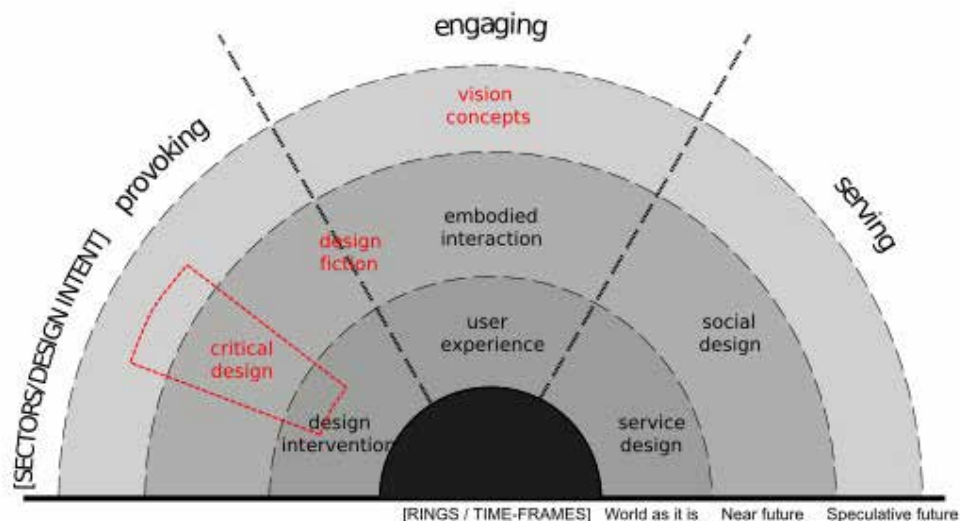

Figure 4-2. The spot of vision concepts, critical design, and design fiction within the landscape of design across time scales. Source: the author.

Based on our findings, we suggest repositioning critical design and design fiction. Design fiction should be moved from the speculative future to the near future in response to its interest in mundane short-term speculations. It is now located in the central slice just in the middle of embodied interaction and critical design, mediating between technology and its impact. Design fiction is also mid-way between engaging and provoking, producing videos and other types of visualizations that both attract and challenge design research and art communities. Critical design can cover a wider variety of times, ranging from alternative presents to speculative futures. It is clearly in the provoking area, making unpleasant proposals presented as rough prototypes and other type of visualizations to trigger reactions.

Vision concepts would be positioned on the outside layer of speculative future, while concentrating on a particular domain. These two characteristics are consistent with their business-oriented approach, taking into account the type of business and the market dynamics, as well as the domain in regard to its strategic direction, e.g. fifteen years into the future for automakers within the domain of private mobility solutions.

4.4.3. Value that these design-led futures techniques bring outside the automotive industry

Concerning the purpose of these design-led futures techniques, the findings suggest that they are a way to stimulate the creation and exchange of ideas and thus to engage the public at large.

Overall, we found that while the three techniques are all future-oriented and design-led, they clearly differ in terms of intention and character. Because of its business context, vision concepts are mainly oriented on generating strategic value for a company. As a consequence, their perspective on the future tends to be on the safe side, resulting in outcomes that are mostly in line with the brand and mainly presented and discussed within the limited scope of the domain in which the company operates. Critical design and design fiction, on the other hand, are not bound by commercial restrictions and are thus able to generate scenarios that are more challenging and disruptive, addressing certain issues from different viewpoints (social, cultural, technological, environmental, or economical) other than a commercial one. This freedom also enables designers to actively facilitate and engage in the discussion that should result from their work.

Unlike design as a problem-solving strategy, where the design process has a (commercial) product as the end result, in speculative design, designers make prototypes, videos, and other visualizations as means (of communication). The end goal, then, is to engage and (or) provoke a discussion about a well-defined domain. To do this, designers explore the future to develop a set of neat ideas: a concept. The concept is deployed in a narrative for a certain audience and shared through different manifestations, combining prototypes and other type of visualizations.

DIVE
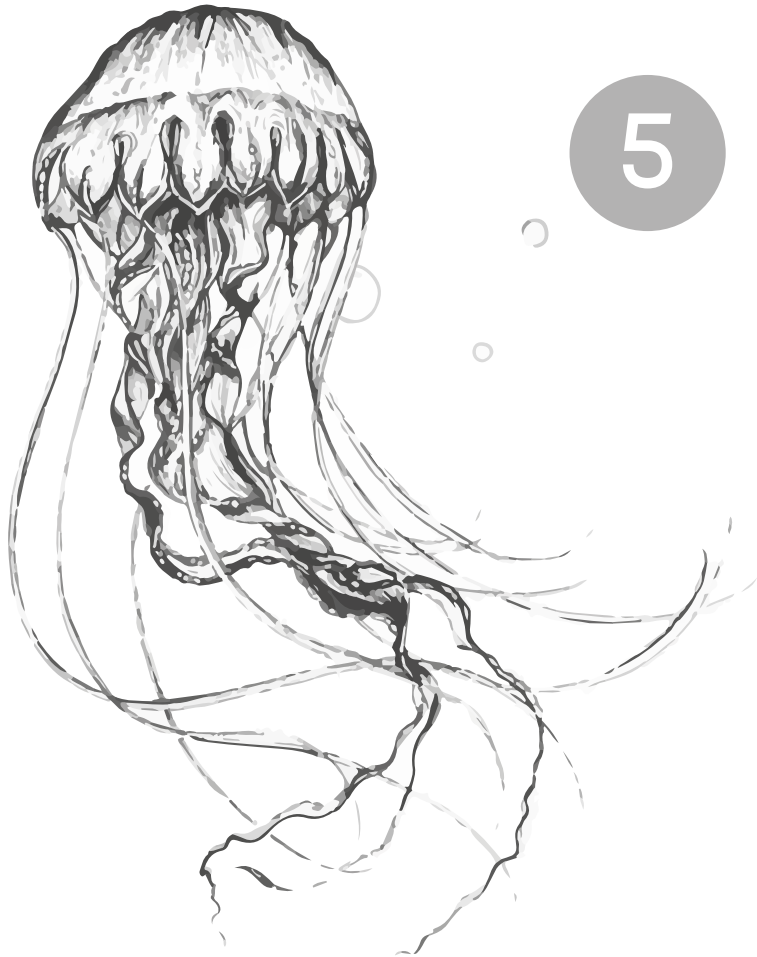
Development of a design-led futures technique for SMEs: DIVE

5. <u>Development of a design-led futures technique for SMEs: DIVE</u>[1]

In Chapter 3, we found that concept cars are experimental artifacts of the future, that put the company's vision into action. These artifacts are made using a hands-on process that uses visual synthesis and prototyping. This vision of a preferable future is defined by a team of designers, engineers, and communicators in accordance with the context factors and the corporate values. After iterating several ideas, the team makes a refined prototype, which renders the concept car, and a video, which displays the interaction between the users and the artifact in the future context. Both manifestations, which can be experienced by different people inside and outside the company, spark discussions about the speculative future helping them make better decisions about the world as it is, such as defining the design language of a family of new products.

Subsequently, Chapter 4 identified that this design-led futures technique is not for the exclusive use of automakers, as different corporations in other industries also make and share concept cars, products, and services, called vision concepts by Keinonen and Takala (2006). Because this design-led futures technique is often a time-consuming and expensive practice, only large corporations use these artifacts to assertively guide their innovation. In view of this limitation, we also identified lessons from critical design and design fiction. Both techniques taught us that there is a way to use fewer resources, less money and time than techniques used by large corporations; effectively use rough prototypes and simple videos to trigger reactions and spark conversations; and create more radical concepts, which challenge the present situation and propose a large change for a broad range of topics, from social to environmental, including technological issues.

Through these two chapters, we covered most of the design-led futures techniques, gaining a complete view of this approach to look at the future. Although these techniques promise value for smaller players, none are specifically adapted to fit the characteristics of SMEs.

This chapter then develops a design-led futures technique for SMEs to contribute to answer the design question G formulated in Chapter 1.

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1 This chapter is based on the paper: Mejia, J. R., Pasman, G., Hultink, E. J., & Stappers, P. J. (2017). Developing DIVE, a design-led futures technique for SMEs. In C. Vogel & G. Muratovski (Eds.), Proceedings of the IASDR Conference Re:Research (pp. 770–787). Cincinnati, Ohio, USA.

Section 5.1 consolidates the insights of Chapter 2, 3 and 4 and the author's experience with SMEs to define the characteristics of the design-led futures technique by a preliminary iteration with the medium-sized enterprise Marlioü. It is followed by Section 5.2 which describes the technique, named DIVE: Design, Innovation, Vision, and Exploration, and its components, defined by a second iteration with the small-sized enterprise Continental Boilers. Both iterations illustrate how the characteristics of these SMEs influenced the development of the technique.

5.1. Consolidation of previous insights

As mentioned in Chapter 1, SMEs are characterized by having limited resources when compared to large corporations and a hands-on approach with regard to these kind of explorations, thus we consider that DIVE must be *"a rapid, inexpensive, and practical design-led technique to support designers and business people who run SMEs in exploring and communicating speculative futures to boost their innovation capabilities."* Rapid in view of the limited time available to involve high-level SMEs' employees, inexpensive considering the tight budgets for this kind of explorations, and practical with regard to their work style.

Iteration 1: The Alchemist Club 2025 for Marlioü

This value proposition clarifies the way in which the value –or benefit– will be delivered and experienced by the SMEs. Combining it with the insights from concept cars, vision concepts, critical design, and design fiction, we collected and defined initial ideas in an ad-hoc iteration with Marlioü: a Colombian medium-sized enterprise focused on hair care products. In this iteration, summarized in Figure 5-1, the author acted as the designer.

Iteration 1			
Enterprise		*Marlioü*	
Product		*Hair care products*	
Participants			
	Company representatives	*Without company representatives*	
	Designers	*1 senior designer*	
Tools		*DIVE 0.0*	
Duration		*40 hrs.*	
Location and date		*The Netherlands, 2015*	
Case web-page		*http://pktweb.com/dive/*	

Figure 5-1. Summary of Iteration 1.

To explore the future of Marlioü, the author followed the futures techniques' main activities listed in Chapter 2 –(i) setting the domain and time frames, (ii) analyzing the context factors, (iii) envisioning the alternative futures, and (iv) mapping the preferable future– and used the specific tasks to make and share vision concepts discussed in Chapter 4.

As part of *(i) setting the domain and time frames* of this exploration, the author had to understand the company first, for which he used a tool he created several years ago: *Strategic PES*. This tool was selected because it is coherent with the value proposition mentioned earlier and the author has extensive experience with it. While tools such as SWOT analysis and Business Model Canvas can give a clear overview of different businesses, Strategic PES is a rapid, inexpensive, and practical design-led tool specially developed for SMEs. Therefore, Strategic PES is better suited for this inquiry.

Strategic PES deconstructs SMEs to identify their values and know-how, products and services, facilities and stakeholders, and end-users, through a workshop (Mejia & Parra, 2014). It builds on the similarity between a company and a living being: a fish[2], whose goal is to survive and reproduce in a body of water. Following this metaphor, the fish embodies the company, the river, lake, or ocean symbolizes the context in which the company delivers value, and the adaptation to the context's change implies the innovation. Only those fishes that survive a changing context –through innovation– can grow up and reproduce. Since 2011, the author has applied this tool in twenty-five projects with SMEs, and around eighty workshops with more than four-thousand business people in Colombia and Suriname. It proved to be effective in disentangling the business people from the company and facilitating a more objective diagnosis of the firm's condition. Furthermore, participants can see the company as a whole, understand its complexity and recognize the relationships among the company, external stakeholders, and the context, as well as the internal relations (Mejia & Parra, 2014).

More information about Strategic PES in Mejia, Jimenez, and Chavarria (2014), and Mejia and Parra (2014) .

In this iteration, Strategic PES revealed that "Marlioü is a two-headed trout, living in a peaceful pond". Living in permanent service to the community, the trout changed, and sprouted a second head; as the family enterprise is handing down the business to the third generation, the company seems to move in two opposite directions at the same time. One head, the incoming director, wants to move to an unexplored small pond, a high-income market where the company can use information technologies; the other head, the outgoing director, is focused on the current pond, where the fish is already well known by many low-income users. Marlioü needs a new vision of a preferable future, genuinely informed by its beliefs, that blends the desires of the relevant heads, the family members.

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2 In Latin America 'pez', which means fish in Spanish, is pronounced PES.

After *(ii) analyzing the context factors*, which included products, trends, and users' expectations, the author defined a vision for 2025, part of *(iii) envisioning the alternative futures,* in which "Marlioü wants to reinforce its presence in the low-income market by offering a personalized care service via a network of beauty consultants, who are fully supported by information technology, helping them to identify users' needs." With that vision, the author sketched the service offered by the consultants and the equipment they needed. With these sketches, he made rough cardboard prototypes of various initial ideas of products and mobile apps, and then tested these in a role play with two designers (see Figure 5-2).

Figure 5-2. Image of an external designer role playing with the rough prototypes. Source: the author.

This exploration resulted in a vision concept: The Alchemist Club 2025 shown in Figure 5-3 as part of *(iv) mapping the preferable future.* It is a network of beauty consultants assisted by a kit of hair products; an input device which interact with tablets and cellphones to measure, compare, and experiment with the hair products; and a do-it-yourself apron. All elements are supported by a mobile app, which trains the beauty consultants and collects insights from the clients. Finally, the author developed a sequence of screenshots of a Twitter account to share the vision concept. The sequence of tweets presents the story of a fictional beauty consultant, part of The Alchemist Club, in 2025.

Figure 5-3. Above, a picture of the final prototype including the tablet Alchemist Board and the app Alchemist Lab. Below it, the screenshots of the Twitter account. A detailed description of this iteration online http://pktweb.com/ dive/2017/08/04/the-alchemist-club-2025/. Source: the author.

In this iteration, the author examined how to align the conflicting visions of the incoming and outgoing directors, and the company values. The vision he came up with shows how the company can use information technology to improve client contact. It also identifies how the company can engage with beauty consultants to reinforce Marlioü's presence in low-income markets.

This iteration demonstrated that the futures techniques' main activities were sufficient to make the vision concept for Marlioü. The author incorporated Strategic PES, a simple tool guided by an easy to understand metaphor that, with little time, brought many insights about the company for *(i) setting the domain and time frames.* However, a visual aid is needed to reinforce this metaphor. A simplified trend analysis, the STEEP analysis (social, technological, economic, environmental, and political) was sufficient for *(ii) analyzing the context factors.* After that, again with little time, the author tested the initial idea using rough prototypes in a role play as part of the *(iii) envisioning the alternative futures.* It is useful to take this leap out of the abstraction of the domain and time frames, and the context factors into the

vision concept, at the earliest phase of the process, as it gives time to reflect on the experimental artifacts and the service, the vision concept, and therefore, collect more ideas about its context, the future. However, we needed a closing activity for *(iv) mapping the preferable future*, in which the designer shares the vision concept with the company representatives, and the recommendations emerge in consensus with them, instead of just from the designers. This iteration only required a few resources: forty hours of a senior designer.

At a content level, this iteration provided evidence that this design-led futures technique starts by analyzing the company values and continues by identifying the values of the people, who are or will be related to the enterprise. The technique ends with a vision concept, an artifact that explores the desirable interactions, informed by those values, between the company and these people in the speculative future.

5.2 DIVE: Design, Innovation, Vision, and Exploration

Based on the lessons from this iteration, we developed the first version of DIVE (see Figure 5-4) by extending the metaphor of Strategic PES into a more complete analogy. The technique consists of a quick dive into the speculative futures and a swim back to the world as it is. During this journey, designers act as instructors and the company representatives as scuba divers. Initially, underwater, the company is seen as a fish that swims in calm or troubled waters. Instructors then accompany the divers in envisioning future waters and defining a vision. Using this vision as an inspiration, instructors and divers draw, make prototypes, and create stories to setup the vision concept, resulting in a rough prototype and a video. Finally, on land, the instructors use these artefacts to spark a conversation among several people about the future of the fish, shining light on the decision-making in the present.

DIVE is a design-led futures technique that assists designers in making and sharing vision concepts with company representatives for SMEs. As in the case of the other design-led futures techniques explained in Chapter 3 and 4, DIVE is developed to be used by a team which includes −up to six− *external designers* and −no more than three− *company representatives*. The former should have expertise in design research and communication, and the latter, are the experts of their own business experience. In this preliminary version of the technique, the making and sharing of the vision concept takes forty hours in total, which includes forty hours of the designers' time and ten hours of the company representatives' time.
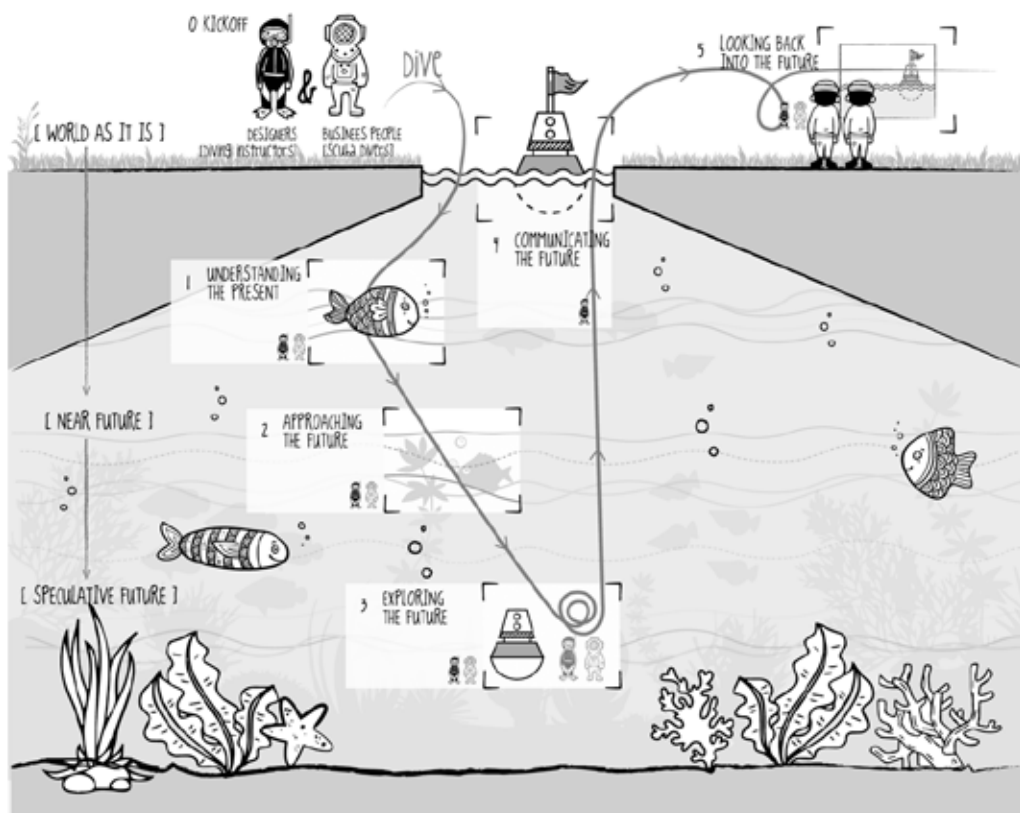
Figure 5-4. DIVE`s blueprint, including a path that guide designers and the company representatives exploring and communicating the depths of speculative futures. Source: the author.

As Figure 5-4 shown, DIVE follows a path along five activities:

1. *Understanding the present:* the designers apply Strategic PES with the company representatives to set a domain and a time frame. As described in Mejia, Jimenez, and Chavarria (2014), the company is rendered as a fish that is divided into four parts: its head describes the company's know-how; the tail shows the users as a rudder that steers the company; the back displays the company's infrastructure; and the belly plots the products and services. Hekkert and van Dijk (2011) discuss how the domain delimits the focus area of the process in which designers aim to contribute, "acting as a [path] that guides [the] exploration of the context and the factors to be taken into account. [It is] (preferably) a particular area in life." Moreover, as we defined in

Chapter 2, the time frame is an interval of time which moves from the world as it is to the speculative future, to help companies map change when they think about the future.

2. *Approaching the future:* the designers conduct desk research and field work to collect context factors. As defined in Chapter 2, these context factors are the changing trends and developments and the stable states and principles. These factors are descriptions, which include observations, thoughts, theories, beliefs, or assumptions, of world phenomena (Hekkert & van Dijk, 2011) as they emerge. With this picture of the future, they cluster these factors with the company representatives to define a vision, which captures what the vision concept should do and be before it is made. The vision consists of a statement describing what the designers want to offer people within the domain, including a definition of the interaction qualities (Hekkert & van Dijk, 2011).

3. *Exploring the future:* following the vision, the designers make multiple prototypes: sketches, diagrams, and mockups, which are useful to, as discussed by Sanders and Stappers (2014), imagine, experience, test, select, transform, develop, and complete early ideas. By the end of this activity, they will have a collection of information that describes the vision concept: a concept product, service, or product-service system.

4. *Communicating the future:* the designers make a rough prototype and create visuals and a narrative to share the vision concept. The last two elements support the prototype, placing the vision concept in an image of the future, complete with people, context, and their relationships. This support is important because, as Stappers (2013) argues, rough prototypes are physical manifestations of ideas or concepts that only give the overall idea, to evoke discussion and reflection.

5. *Looking back into the future:* the designers facilitate a conversation with the company representatives and other stakeholders to map the company's future. The designers use the vision concept, embodied in the prototype, the visuals, and the narrative, to help participants express their thoughts, feelings, and ideas about the company's future. Along the conversation, the designers make a roadmap with strategic recommendations for the SME's near and speculative future.

Following the insights of the previous iteration, we developed a toolkit, DIVE 0.1, consisting of three tools: a *booklet* that gives theoretical background and instructions about the activities, and fifteen *worksheets* and two *canvases* to visually record the activities and outcomes.

The *booklet* (see Figure 5-5), developed to be printed in a small format (A4), gives a brief theoretical summary of design-led futures techniques, including examples such as concept cars, concept products, critical design, and design fiction. It ends with an overview of DIVE and a detailed explanation of the activities. It aims to support the researcher in explaining the technique and its antecedents to the designers and company representatives.

Figure 5-5. Image of the booklet. Source: the author.

The fifteen *worksheets* (see Figure 5-6), three per activity, were developed to be printed in A4 and support the designers in documenting the activities. These small formats help designers to consolidate the results after each activity and they work as the deliverable for the company representatives who can collect all the findings of the exercise.
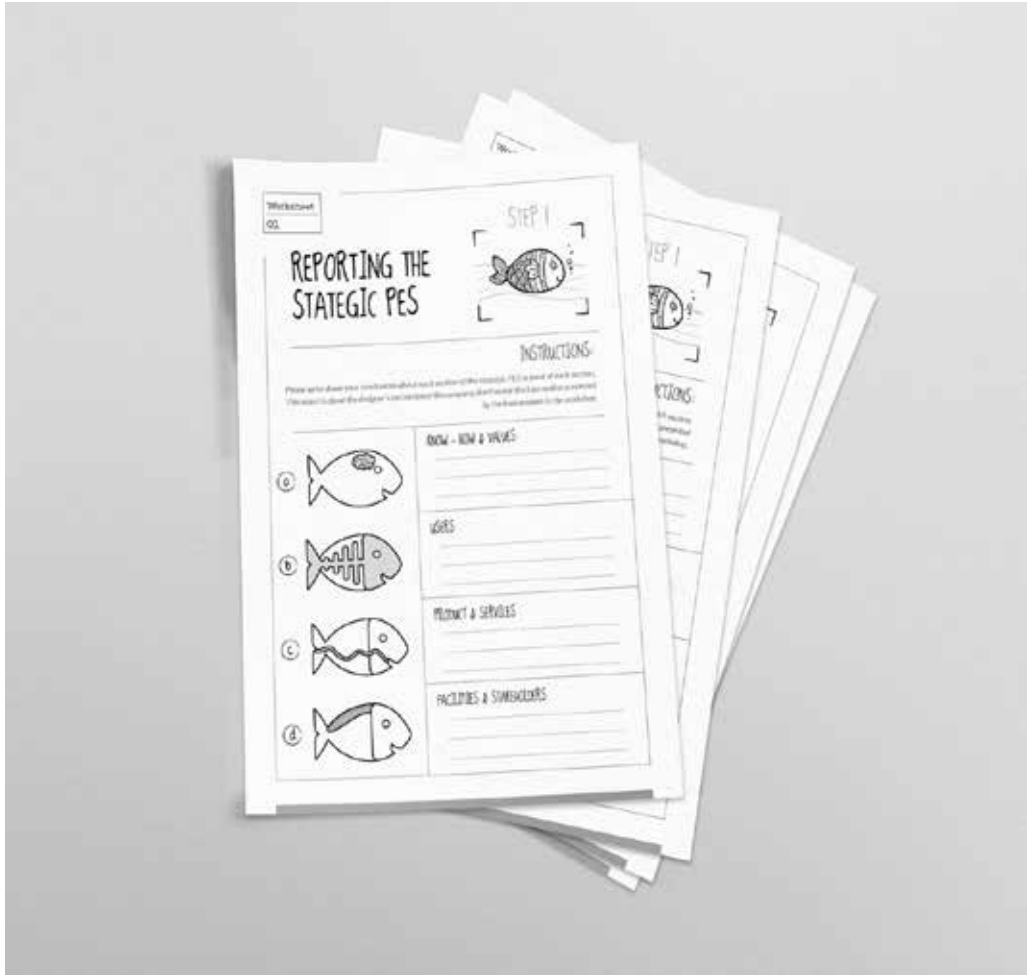
Figure 5-6. Image of some of the worksheets. Source: the author.

The *canvases*, developed to be printed in large formats (A0), are useful to hang on the wall and support designers in collecting insights when facilitating the first two activities. Both canvases include a large illustration at the top with sufficient space to write down the insights and comments during the workshop, and a strip on bottom, which includes a tag to identify the canvas and the keys of the large illustration. *Canvas 1* (see Figure 5-7) helps designers through Strategic PES. The illustration of the fish includes four letters to connect with the keys that explain the four parts of Strategic PES using an image of each part and some keywords per part.

Figure 5-7. Canvas for Strategic PES. Source: the author.

Canvas 2 (see Figure 5-8) reports the different changing and stable context factors using different waves. It also has a quadrants chart to cluster these factors and define a 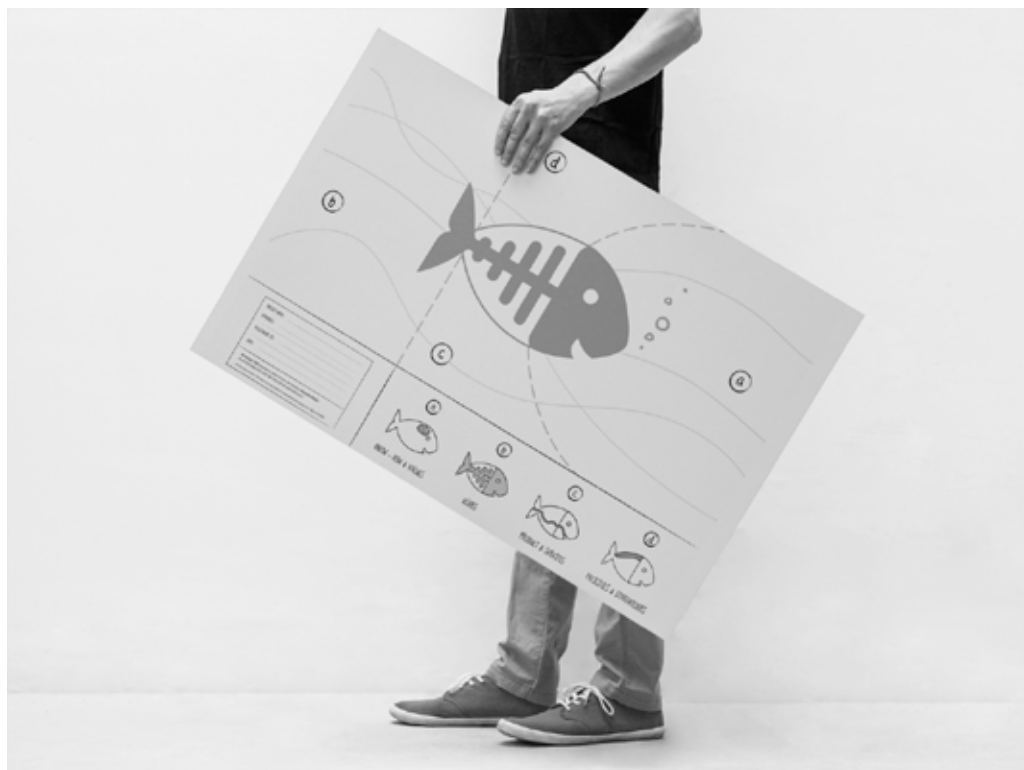vision. As in the previous canvas, it also includes a strip with the keys connected with the letters of the top illustration.
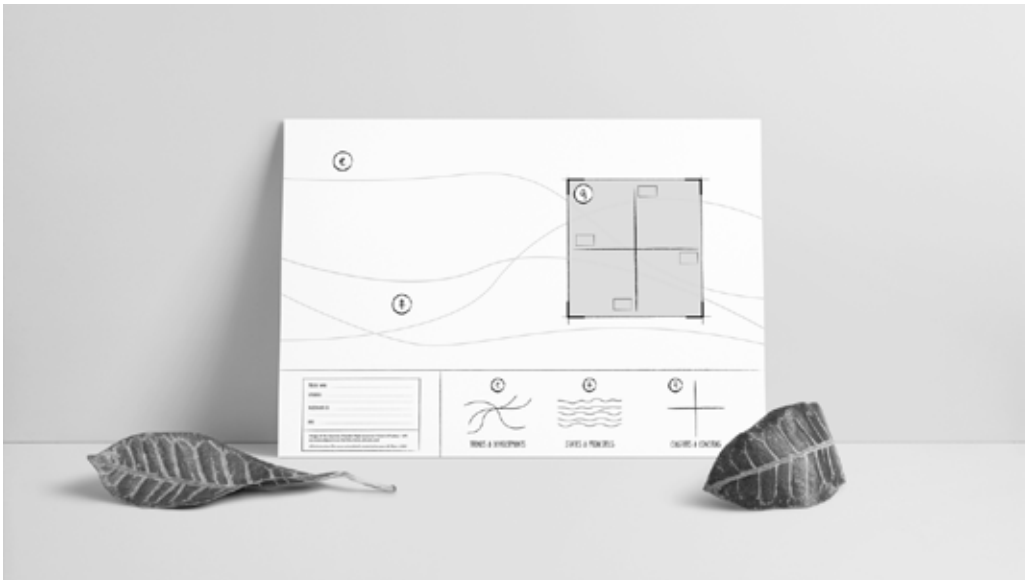
Figure 5-8. Canvas for the context factors. Source: the author.

Iteration 2: Continental Energy 2030 for Continental Boilers

The author, in collaboration with two senior designers, ran this second iteration (see Figure 5-9) with Continental Boilers, a small-sized family enterprise focused on the production and delivery of steam boilers, hot water systems, and heat exchangers.

Iteration 2		
Enterprise	*Continental Boilers*	
Product	*Steam boilers, hot water systems, and heat exchangers*	
Participants		
Company representatives	*Managing director, Innovation manager, and Marketing and sales manager*	
Designers	*3 senior designers*	
Tools	*DIVE 0.1*	
Duration	*40 hrs. (25% of collaborative working)*	
Location and date	*Colombia, 2015*	
Case web-page	*http://pktweb.com/dive/*	

Figure 5-9. Summary of Iteration 2.

Through Strategic PES, part of *Activity 1*, we found that "Continental Boilers is a salmon with small fins –products with minimal turnover, long life-cycles, and inexpensive maintenance– and it is swimming against the current." To survive in the river, the salmon either needs to grow the muscles of its fins or find an alternative

way to swim, for instance, by introducing new products or another business model.

As part of *Activity 2*, we conducted a simple STEEP analysis (social, technological, economic, environmental, and political), in which several context factors were organized in a 2X2 matrix in which a vision emerged: "Continental Boilers wishes to provide steam and hot water to factories within industrial parks through a service that follows the client's needs, being at the forefront of the environmental regulations."

After several iterations, part of *Activity 3*, which included sketches of new services and products, we created the vision concept: Continental Energy 2030, a service that includes the selling of steam and hot water and the renting of portable boilers and heat exchangers. To support this service, the company will offer the client a mobile app to control its consumption and receive technical support.

Following this ideation, as part of *Activity 4*, we produced a simple video of a fictional client, an industrial laundry, in need of steam and hot water for its washers and dryers to help reduce its energy consumption. Through the video (see Figure 5-10), we introduce the main features of the 2030 service.
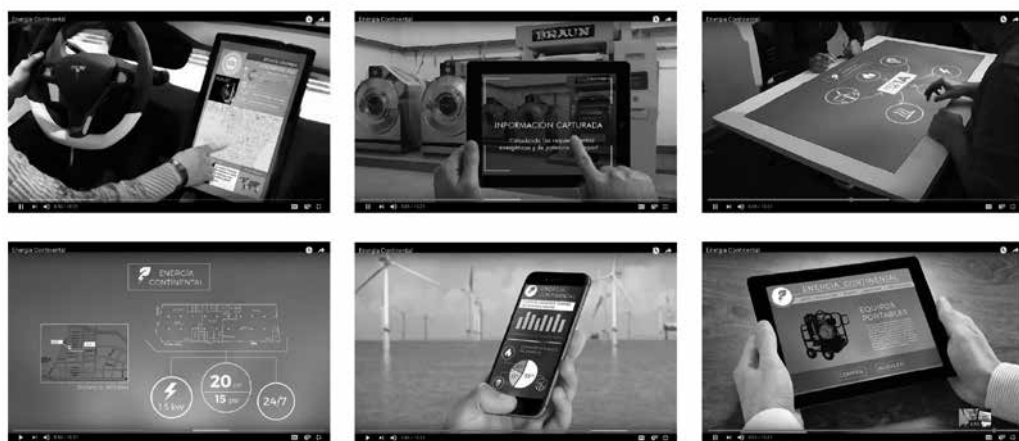
Figure 5-10. Frames of the video Continental Energy 2030. Source: the author. A detailed description of this iteration and the full video (in Spanish) online http://pktweb.com/dive/2017/08/04/continental-energy-2030/

As part of *Activity 5*, we arranged a workshop with three company representatives: Managing director, Innovation manager, and Marketing and sales manager (see Figure 5-11). We used the video to stimulate a conversation about the Continental Boilers' desirable futures. Based on this conversation, we formulated a series of recommendations setting a track between the present and the future, explored by the vision concept.

Figure 5-11. Picture of the final workshop where designers and company representatives sketch a roadmap of the futures. Source: the author.

This iteration explored how Continental Boilers might increase its business with a solution that is aligned with its values on sustainable development. The vision concept describes a transition from a product-driven business to a product-service system model and portrays the potential allies that can help this transition.

This iteration was useful to consolidate the DIVE's activities and the technique's resource: forty hours of the senior designers' time and ten hours of the company representatives' time. Although this iteration needed an extra activity and more resources than the previous one, the consolidated activities were sufficient to make and share the vision concept within the limitations of an SME.

Both the initial analysis and making the video took longer than expected, but the video proved essential in sharing the vision concept and its context to effectively stimulate the conversation with the company representatives in the closing activity.

According to the designers, standards by which they could judge the quality of the outcomes are needed; they additionally suggested templates to document the process. Considering that not all designers have the same skills facilitating workshops, they also proposed incorporating recommendations on how to deal with the company representatives, who tend to talk mostly about the present instead of the future, especially during the closing activity.

The company representatives were positively surprised by the way the designers incorporated the company values within the vision concept, and the insights delivered by this exercise that they described as "design for strategic innovation." They considered DIVE to be beneficial to identify short-term challenges; some of them related to the product, such as the question raised by the Managing director: "how do our boilers adapt to different types of energy?"; and other challenges, related to the general business strategy, such as the value proposition formulated by the Marketing and sales manager: "I don't sell boilers, I sell energy solutions." Having identified these challenges, company representatives put them on the agenda, stimulating their feeling of urgency, motivated by the way the 'world as it is' is changing. They also identified potential alliances and allies that could help the enterprise face this change.

The Managing director summarized the DIVE experience as the "first moment, in a long time, that [they] had the chance to look at the future." According to him, they are "so involved in the daily life –[they] have been doing the same for 48 years– that it's difficult to think ahead". However, he identified that "it's hard to manage change within the enterprise's culture, in particular when it involves family members' interests. But this exercise was useful to see the company in the light of international trends and understand their potential effect on the business." He also mentioned that "it was nice to see a concrete example of our environmental values in practice and guiding our future actions."

5.3. Discussion

Throughout the development of DIVE, in particular during both iterations, it became clear that design can be a powerful instrument to get representatives of SMEs thinking, talking, and acting about their company's future. DIVE seems to be well suited to the preferences and idiosyncrasies of this particular type of enterprise. It is compact, both in terms of time and money; it has a hands-on character, as it involves making prototypes and videos; and it emphasizes concrete outcomes on a human-scale rather than abstract strategies.

By turning concepts into simple physical prototypes and visual narratives, DIVE makes it easier for participants to understand and adopt a future vision that fulfils their expectations. While these vision concepts may be less 'showy' than high-end concept cars, their down-to-earth qualities and unfinished nature make them accessible for discussion and reflection. Even though the making of these prototypes and videos takes up a considerable part of the available resources, its application is essential and should therefore be included in a design-led futures technique.

While DIVE certainly shares elements with other techniques that apply co-creation principles, its novelty is in its visionary character and the value it puts on the making of a realistic vision concept. The experiences from both iterations indicate that this forward-thinking exercise provided the participants with some new horizons as well as specific directions for their company's future. More development is needed, however, to tailor these aspects further.

Finally, DIVE has so far been evaluated mainly in settings in which the author acts as the leading designer and facilitator. The next challenge will, therefore, be to put DIVE out in the field, to be able to evaluate how it will stand up on its own.

Evaluation

6
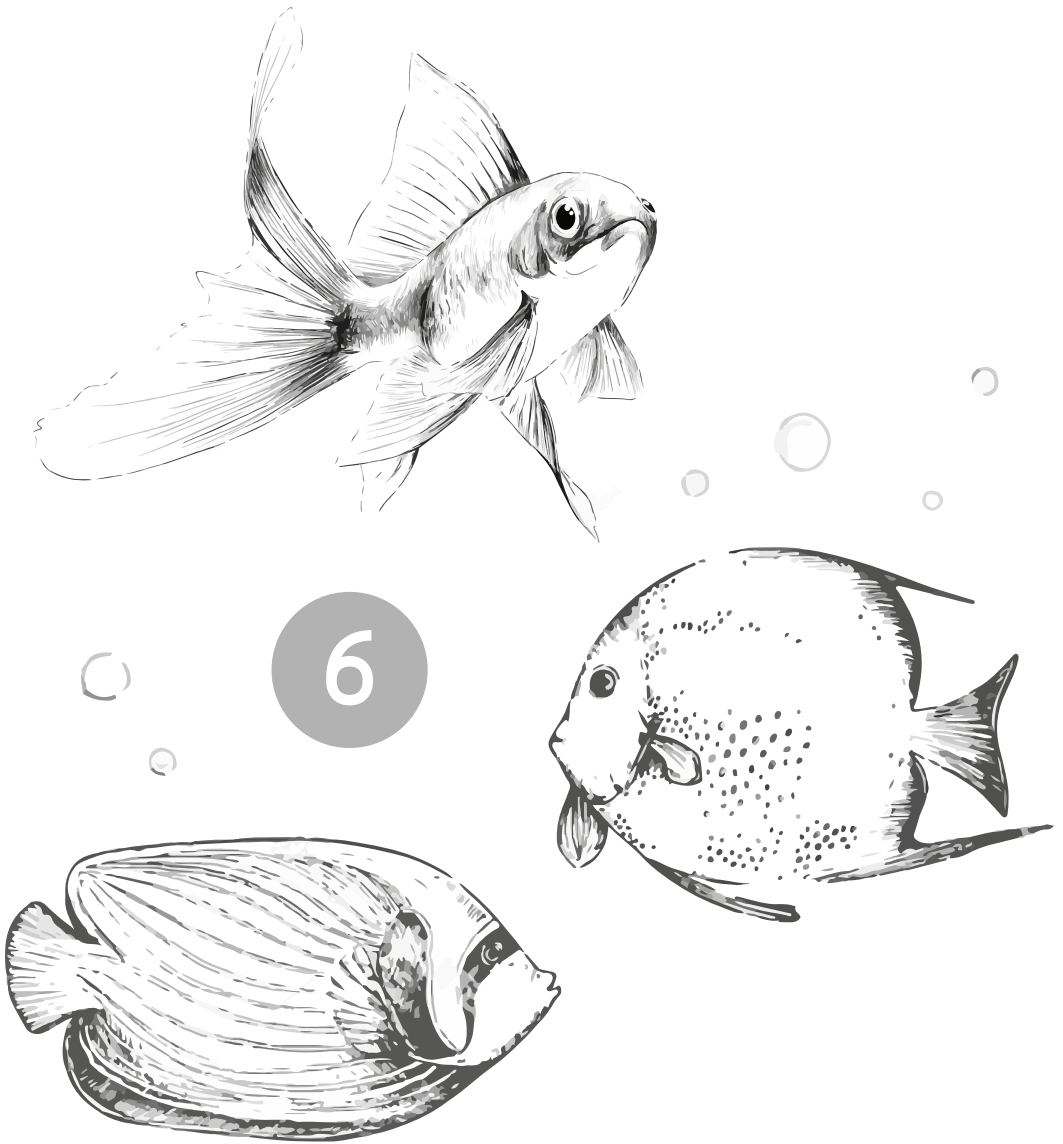
Evaluation of
DIVE with SMEs

6. Evaluation of DIVE with SMEs[1]

The previous chapter developed a design-led futures technique to make and share vision concepts for SMEs: DIVE. Two iterations were used to tune it to practice, and resulted in various adaptations, and a proposed, consolidated technique, DIVE 0.1. This chapter seeks to (i) *improve the technique*, allowing to make better versions of DIVE's toolkits (0.1, 0.2, and 0.3) regarding the needs of SMEs, and (ii) *uncover the benefits and limitations of applying vision concepts for SMEs*. To achieve these goals, we developed three rounds of evaluations (see Figure 6-1) which were sufficient to form the basis to the insights that this inquiry provides in Chapter 7 and 8. Chapter 7, which answers the design question of this research, describes a set of recommendations for designers when they use the final version of the technique: DIVE 1.0. Chapter 8 answers the final research question providing insights to the futures studies and design fields.
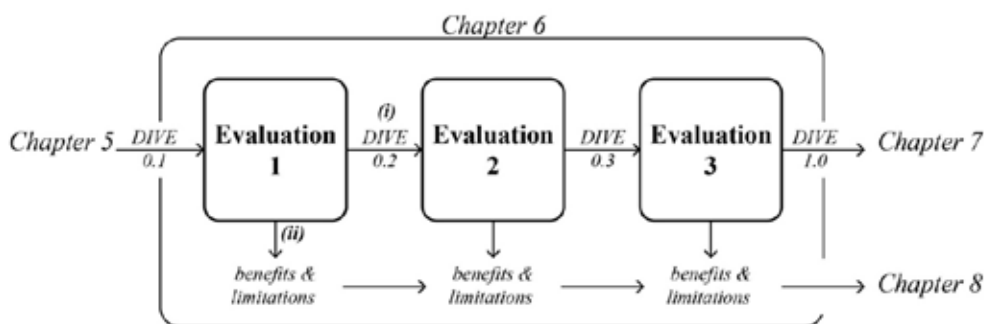
Figure 6-1 Overview of the three rounds of evaluations and how these rounds serve Chapter 7 and 8. Source: the author.

This chapter comprises three sections. Section 6.1 gives an overview of the method for the evaluations. The next section reports the results of the three rounds. Section 6.3 discusses the implications of these results for the design practice and the fields of futures studies and design.

6.1. Method

The three rounds of evaluations include six cases with SMEs. In Evaluation 1, we

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1   This chapter is partially based on the paper: Mejia, J. R., Chitiva, A., van Bruinessen, T., & Verhoeff, W. (2018). DIVE in SMEs: a design-led technique to explore product and service futures. In Touchpoint, The Journal of Service Design, 10(2), pp. 56–61.

conducted two consecutive cases with one enterprise to learn from one case to conduct the other. This evaluation was also useful to adjust the research methods and the criteria of assessment. In Evaluation 2, we conducted three cases with three enterprises at the same time, which allowed us to compare the lessons learned among the cases. In Evaluation 3, a last case with one enterprise served to consolidate all the lessons learned.

As shown in Figure 6-2, in each case, the *participants* followed the instructions of a *toolkit* to undertake the activities and create the outcomes defined in Chapter 5, along a specific time (*duration*).
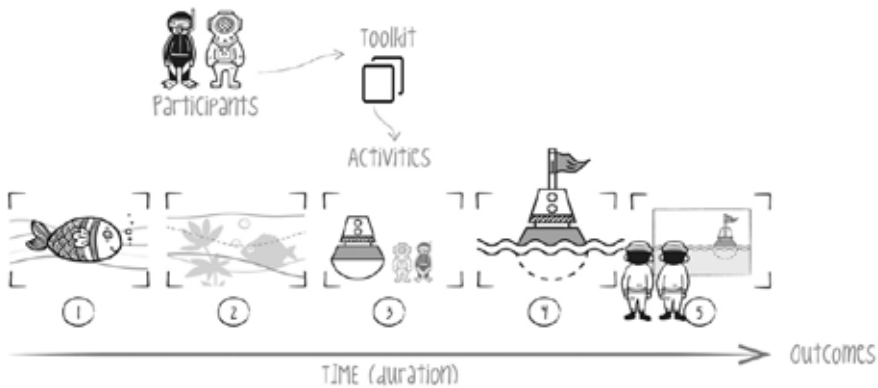
Figure 6-2. Structure of each case. Source: the author.

We planned a series of modifications across the cases to find the most efficient conditions to apply DIVE and thus gather the benefits and limitations of this practice in view of the SMEs' characteristics, described in Chapter 1. Table 6-1 shows these modifications, which include the involvement of different number and type of *participants*, the improvements of the *toolkit* that they used to follow the activities, and their *duration*. While the *participants*, *toolkit,* and *duration* were modified, the activities and type of outcomes remain unchanged.

Table 6-1. Overview of the cases

| Eval. | Cases | SMEs | Participants | | Toolkit | Duration |
			Company representatives	Designers		
1	1	Solutions Group	2 directors & 1 manager	3 without professional experience	DIVE 0.1	68 hrs.
	2			4		70 hrs.

2	3	Campo Real	1 director & 1 manager per company	6	1 with ‹7 years of professional experience	DIVE 0.2	24 hrs.
	4	Ethos		6			
	5	Ci2		6			
3	6	Oceanco	2 managers	5	with › 9 years of professional experience	DIVE 0.3	20 hrs.

The next sections give a detailed description of the *participants* and the *procedure* that includes *the toolkits* and *duration*.

6.1.1. Participants

To determine whether the technique is useful for different size and type of SMEs, we involved two small-sized enterprises and three medium-sized enterprises across different products such as dairy products and superyachts, and services, such as software and technology solutions (see Table 6-2). These SMEs include business-to-business (B2B), which sell products or services to other companies, and also business-to-consumer (B2C), which sell directly to end-users.

Table 6-2. SMEs part of the evaluations

Ev.	Cases	Enterprise	Size (*)	Products or services	Clients
1	1 & 2	Solutions Group	Medium-sized	Point-of-purchase material	Consumer goods corporations
2	3	Campo Real	Small-sized	Dairy products	End-users
	4	Ethos	Small-sized	Software	Financial institutions
	5	Ci2	Medium-sized	Engineering projects	Maritime and security corporations
3	6	Oceanco	Medium-sized	Superyachts	End-users

(*) The first four companies are Colombian, where the law (Ley 905 de 2004 (agosto 2), 2004) defines small-sized enterprises as companies with fewer than 50 employees and no more than EUR 1.2 millions of total assets and medium-sized businesses with fewer than 200 employees and no more than EUR 6.5 millions of assets. Oceanco is located in The Netherlands where medium-sized companies employ fewer than 250 people and with an annual turnover of less than EUR 50 million (European Commission, 2003).

Following Chapter 5, participants of these cases were *company representatives* with comparable levels of responsibility within the enterprises, and *designers* with different levels of experience in design research and communication. The former acted as problem owners, who would benefit from the insights of the exploration, and the latter as process owners, who were in charge of facilitating the process.

Company representatives

To find the appropriate type and number of company representatives for DIVE, we included three or two top- and middle-level managers who represented at least two of the functions of the companies: the managing, the innovation (sometimes also called R&D), the design, and the marketing (see Table 6-3). Given these managerial positions, the company representatives have a clear sense of the company's evolution and enough influence to define its future. These participants had more than 20, 12, and 11 years of experience in management, innovation, and design, respectively, bringing to the cases complementary knowledge of these fields.

Table 6-3. Company representatives of the three evaluations

Ev.	Cases	SMEs	Company representatives	Area of expertise	Years of experience
1	1	Solutions Group	Managing Director (˙)	Management and design and innovation	› 20
	&		Innovation Director (˙)	Design and innovation	› 20
	2		R&D Manager	Design and innovation	› 10
	3	Campo Real	Managing Director (˙)	Management	› 20
			Design Manager	Design and innovation	› 5
2	4	Ethos	Customer Service Director (˙˙)	Marketing	› 15
	5	Ci2	R&D Director	R&D and design and innovation	› 15
			Design Manager	Design and innovation	› 10
3	6	Oceanco	R&D Manager	R&D and design and innovation	› 7
			Design Manager	Design and innovation	› 5

(˙) The directors of Solutions Group and Campo Real were also the founders and owners of these companies. (˙˙) Because none of the owners of Ethos could attend the workshop, moments before the exercise they entrusted this duty to the Customer service director.

Designers

As shown in Table 6-4, we have moved along two dimensions in regards to the participating *designers*. We started with a large number of student designers, because students were easily reached in the context where this inquiry was conducted and they can be instructed and are used to reflecting explicitly on their experience. In later cases, we moved to fewer designers, and professionals rather than students, in order to come closer to relevance for practice and to commercial constraints on

budget. These changes gave us the opportunity to understand in which form the level of experience is determinant in these explorations and allocate the size of the design team.

Table 6-4. Designers of the evaluations

Evaluation	Cases	Designers	Area of expertise	Years of experience (average)
1	1 & 2	2 groups of 3 student designers each	Design	0
		4 student designers	Design	
2	3, 4 & 5	3 groups of 5 student designers each	Design	‹ 2
		3 professional designers, 1 per group	Design	‹ 7
3	6	5 professional designers	Design	› 9

Evaluation 1 comprised designers from the Faculty of Industrial Design Engineering at the Delft University of Technology. In the first case, six second-year undergraduate student designers who voluntarily took part in an Honors Program, which is followed by students who have higher than average grades. In the second case, four second-year master student designers who follow a Joint Master Project, a collaborative assignment from the Masters' programs. Three professional and fifteen student designers took part in Evaluation 2. The junior industrial designers were from Solutions Group, looking for more practical training with DIVE in view of the valuable results of the first evaluation. The fifth-year industrial design students were from the Faculty of Architecture and Industrial Design at the Pontifical Xavierian University, who followed the course Design Project: Technology and Innovation. Evaluation 3 included a team of five professional designers from the Service Design Studio at Oslo, Norway.

6.1.2. Procedure

After the preliminary arrangements in each case, we led a *kick off meeting* with the *participants* in which we gave them an abbreviated theoretical background and the instructions of DIVE's activities (see Figure 6-3).

Figure 6-3. Whereas the kick off meetings of the Case 1 and 2 were conducted via video chats (image of the left), these meetings were plenary lectures for the other cases. Source: the author.

As part of these meetings, the *participants* received the different versions of the *toolkits* (see Figure 6-4), which we improved, making more useful and user-friendly, following the insights from the evaluations.
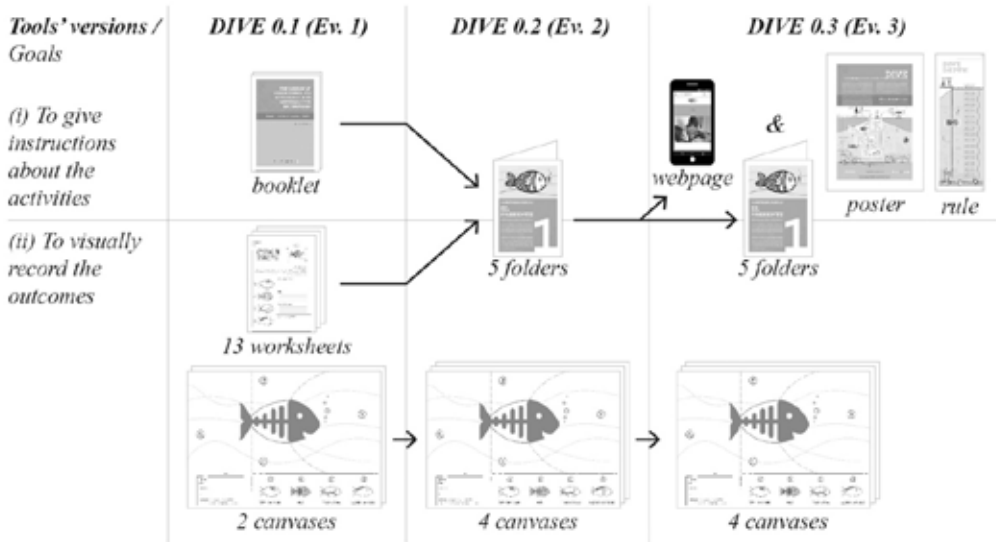

Figure 6-4. The three versions of DIVE in which some tools aim (i) to give instructions about the activities or (ii) to visually record the outcomes. Notice how the worksheets and booklet of DIVE 0.1 unified into the folders of DIVE 0.2, and subsequently separated again in the webpage, poster, rule, and folders of DIVE 0.3. Source: the author. The three versions of the toolkits are available in Appendix Chapter 6 online http://dive.pktweb.com/

DIVE 0.1, developed in Chapter 5, consists of a booklet to provide participants background information and the instructions for the activities, and the worksheets and canvases to report the activities and their outcomes. In view of the insights from Evaluation 1, we identified that designers acknowledged the value of the canvases of the first two activities, but they lacked the opportunity to visually record the other activities and their outcomes. Moreover, participants mentioned that the information included in the worksheets and booklet is repetitive. These insights lead us to develop *DIVE 0.2*, which is reported in the section Discussion from Evaluation 1. We included four canvases instead of two, and five folders. The folders integrate the instructions from the booklet and the separate worksheets. Evaluation 2 gave us positive feedback on these changes to the toolkits. However, having taken the booklet, participants missed some theory and an overview of the technique. Moreover, we observed that keeping the participants focused on the future is a hard task to achieve. Given these insights, we developed *DIVE 0.3* which is reported in Discussion from Evaluation 2. It included quite similar canvases and folders; both incorporated the modifications based on the previous evaluation. In addition, it contained a website –http://dive.pktweb.com/– with some theory to support the participants through the entire process, a

poster with an overview of the activities, and an artifact to support designers keeping company representatives in the future. The artifact is a rule with a slider that helps participants indicate the time frame(s) of the exploration.

Depending on the needs of the participants, the cases were conducted either in English or Spanish. The toolkits were written in English and, when necessary, translated into Spanish to facilitate understanding. English was used as a standard language for Evaluation 1 and 3, which involved participants with different mother tongues and Spanish was used for the Evaluation 2, which involved Colombian participants.

Figure 6-5 illustrates the *company representatives* and *designers* working towards the activities including a picture of a designer filling out one of the tools.

Figure 6-5. Participants in the different activities of the cases. Source: the author.

After all the activities, we led a *closing meeting* where the toolkits were consolidated as final deliverables for the *company representatives* and final thoughts were collected. In all cases, DIVE's activities result in comparable *outcomes*; however, in Case 2 and 6 the recommendations took the form of concept products for the world as it is.

Table 6-6 shows the way we have moved along two dimensions in regards to the *duration* of the cases. First, we decreased the duration of the activities –from 70 hours in Case 2 of Evaluation 1 to 20 hours in Evaluation 3– trying to find the participants' minimum investment in time, in view of the characteristics of the SMEs introduced in Chapter 1. Second, we increased the collaboration among participants in view of the collaborative characteristic of DIVE which responds to the managerial style of the SMEs. The time for collaborative working moved from 20% in Case 1 of Evaluation 1 to 60% in Evaluation 3. Participants of Case 1 only had contact in Activity 1 and 5 via video calls because they were in different countries: the company representatives

in Colombia and the designers in the Netherlands. Participants of Evaluation 2 and 3 worked together at the same location. As there is not much space for collaboration and learning from the company representatives in making the prototypes and the video in the focus of this research, we defined that Activity 4 is the only one in which the designers should work alone.

Table 6-5. Duration of the three evaluations. The cells highlighted in gray represents the collaborative working between company representatives and designers

Activities	1	2	3	4	5	Total time	Collaborative working
Evaluation 1							
Case 1	4 hrs.	10 hrs.	4 hrs.	40 hrs.	10 hrs.	68 hrs. in 10 weeks	20%
Case 2	4 hrs.	10 hrs.	12 hrs.	40 hrs.	4 hrs.	70 hrs. in 14 weeks	25%
Evaluation 2	4 hrs.	4 hrs.	4 hrs.	8 hrs.	4 hrs.	24 hrs. in 3 days	50%
Evaluation 3	2 hrs.	2 hrs.	4 hrs.	8 hrs.	4 hrs.	20 hrs. in 2.5 days	60%

6.1.3 Data analysis

We used *mixed methods*, as defined by Creswell (2009), to identify what participants say, do, and make while making and sharing vision concepts (see Figure 6-6). According to Sanders and Stappers (2012), listening to what people say provides explicit knowledge, observing what people do gives observable knowledge, and analyzing what people make addresses tacit knowledge; therefore, researchers can gain a better understanding of a case. They also propose interviews, observation, and generative sessions to uncover the explicit, observable, tacit, and latent knowledge respectively. The use of these mixed methods help us look at the application of vision concepts with SMEs from multiple perspectives, thus triangulating the methods of gathering data.
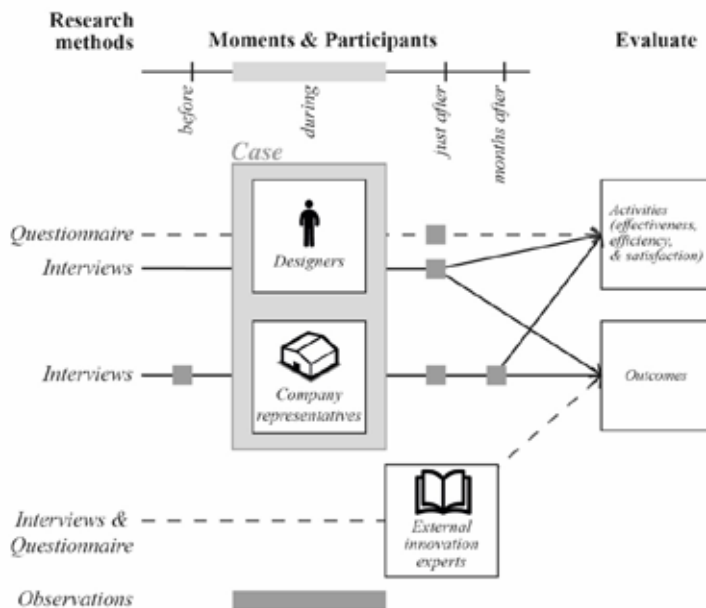
Figure 6-6. Research methods. Just after each case, external innovation experts assessed the outcomes. The full line represents the research methods that mostly bring qualitative data and the dotted line the quantitative data. Source: the author.

To evaluate the activities, we gave the designers a questionnaire and conducted interviews with the participants. The outcomes were evaluated with company representatives and experts. Other sources were field notes from our own observations during the sessions.

Questionnaires for designers

After finishing each case, the author sent the designers an online questionnaire which included the instructions and an average of nine questions per activity. These questions used the five-point Likert rating scales suggested by Mosley (2013) to measure:

- *Effectiveness:* whether the designers could complete the activities successfully and whether these activities were easy to understand and follow

- *Efficiency:* whether the toolkits and time available for them were sufficient and appropriate

- *Satisfaction:* whether the designers were *satisfied* in applying DIVE

Designers took about thirty minutes to complete the questionnaire, which was written in English and translated to Spanish for Evaluation 2.

As suggested by Sauro (2011) in cases with a small sample, we analyzed the quantitative

data by comparing the grades of the assessments with 3, the middle of the scale. In view of the questionnaires' results, we identified the critical aspects of the activities that were investigated more deeply through the interviews.

Interviews with participants

The author interviewed the *company representatives* before the cases, immediately at the end of the cases, and nine months after the sessions. The author also interviewed one *designer* at the end of each case. These face-to-face interviews lasted thirty-five minutes on average and were conducted in English for Evaluations 1 and 3 and in Spanish for Evaluation 2.

All interviews started with the author giving an introduction which included a non-disclosure agreement. After that, we used a guide with the same topics of the questionnaire. During the interviews, we asked follow-up questions to clarify the insights collected before and to identify other aspects that respondents overlooked when they answered the questionnaires.

These interviews followed the same data collection and analysis explained in Chapter 3. In Evaluation 2 and 3, the author had the support of a second coder, a junior design researcher, along the analysis of these interview. As recommended by Sanders and Stappers (2012), he received the same transcriptions, organized including labels with who recorded, where and when –time and date– it was recorded, and the code of the participant. Following them, he then read each transcript to select the most representatives quotes and clustered them into groups with comparable characteristics. During the process, he labeled the quotes and groups using his own set of codes, which were subsequently compared with the codes of the author, trying to find agreements and discuss the disagreements. By combining these two interpretations, the author tried to overcome the intrinsic biases and the issues that come from a single-observer attempting triangulation.

We used this combination of quantitative and qualitative data to ensure that the most critical aspects of the activities were identified and subsequently explained by the participants. The questionnaires and the structure and questions of the interviews were simplified in subsequent cases. In Evaluation 1, these instruments included a set of broad and comprehensive questions to explore; in Evaluation 3, they were small and specialized inquiries to validate and complement previous insights.

Interviews and questionnaires for external innovation experts

Whereas the research methods applied with the participants brought an internal point of view of the cases, the experts brought an informed outside opinion. This perspective helped us to assess the technique's outcomes and the way that they affect the enterprise from a more objective viewpoint.

We invited three experts chosen for their experience in design-driven innovation

(see Table 6-6). The selection of these experts followed the same criteria in all the evaluations resulting in the same number and equivalent type of practitioners.

Evaluation	External innovation expert	Area of expertise	Years of experience
1	Expert 1-1	Design and innovation	› 10
	Expert 1-2	Design	› 5
	Expert 1-3	Design and innovation	› 15
2 (*)	Expert 2-1	Design and innovation	› 15
	Expert 2-2	Design	› 10
	Expert 2-3	Design and innovation	› 10
3	Expert 3-1	Futures studies	› 10
	Expert 3-2	Futures studies and innovation	› 15
	Expert 3-3	Design and innovation	› 10

(*) In Evaluation 2 we selected experts who speak Spanish because this round's outcomes were written in this language.

Evaluation 1 included three industrial design engineers; one holds a Ph.D. and the others have a MSc degree. Two of them worked in a design practice in the Netherlands, and they also were design educators at the university. The other one worked as a freelance designer. Three industrial designers were invited to assess the outcomes of Evaluation 2. Two of them have a MSc degree; and all of them have experience in design and innovation, either as freelancers, employees in design agencies, or as design educators. Evaluation 3 involved three people: one expert in futures studies, who holds a Ph.D., and a sociologist and an industrial design engineer, who hold a Master of Science degree. They had experience as advisors in futures studies and innovation and the other as a researcher in design-led futures.

These interviews were conducted by the author, in English for Evaluation 1 and 3, and in Spanish for Evaluation 2. The interviews in Evaluation 1 and 2 were in a one-by-one setting, and in Evaluation 3 in group, and all lasted between forty-five and sixty minutes.

In Evaluation 1 and 2, every expert was invited separately to a room where the canvases and worksheets hung on the wall, to display the outcomes. Experts viewed these outcomes, the videos, and answered the questionnaire. In Evaluation 3, experts joined the final activity with the participants. Along the discussion, they filled in the same questionnaire. It included the activity's goal, the expected outcome, and four questions, one per criterion (see Table 6-7).

Table 6-7. Criteria of assessment for the outcomes: domain and time frames, vision statement, vision concept, prototype and video, and recommendations

Criteria	Definition that applies to all outcomes
Plausible	The outcome must be an artifact that seems possible or real in a future context
Relevant	It must give a clear sense of direction, where the company is going in the future, which is coherent with the company's strategic goals and pertinent to its stakeholders
Inspiring	It must open up new opportunities for the company at different levels, not just in new product development
Human-scale	It must consider human beings in its definition

These criteria were developed by the author and two of the experts. In their view, these standards contain the appropriate and sufficient principles by which experts could judge the outcomes.

We used the same rating scale and quantitative analysis as in the questionnaire for designers.

Observations

During all cases, the author observed how participants interacted with each other using the toolkits to follow DIVE's activities making and sharing the outcomes. In Evaluation 1 and 2, the author assumed the role of an 'observer as a participant' (Sauro, 2015), who collaborates with the participants in an active manner, facilitating the activities, while watching them. To assess if the technique is self-explanatory, in Evaluation 3, the author distanced himself a little bit from the participants and assumed the role of a 'complete observer'. In all evaluations, the participants recognized the researcher and knew the research goals.

We used the same data collection and analysis explained in Chapter 3.

All questionnaires and data are reported in detail in the Appendix to Chapter 6 online http://dive.pktweb.com/

6.2. Results

Using the same structure of Chapter 3 and 4, this section presents the results of the three rounds of evaluations with SMEs, compressed into four parts. First, the description of the cases, giving information about the company and its current use of futures techniques, and the activities and results of these cases. Second, the evaluation of DIVE that, in accordance with the previous section, includes the effectiveness of the activities and outcomes, the efficiency of the toolkits and time allocated per

activity, and to what degree the toolkits suited participants' expectations. Third, other benefits and limitations of the application of DIVE. Fourth, the discussion of each evaluation which summarizes the benefits and limitations of DIVE's application in SMEs and introduces the new version of the technique.

6.2.1. Evaluation 1

We began the evaluation of DIVE with two consecutive cases, summarized in Figure 6-7, which explored the future of the shopping experience for the company Solutions Group. This enterprise develops and produces promotional material for corporations such as Procter & Gamble. It has 15 in-house designers that develop the point-of-purchase material, but is eager to implement design to innovate in other areas. Their eagerness is apparent in their collaborations with the Illinois Institute of Technology and the Design and Emotion Society.

	Enterprise	Solutions Group
	Product	Point-of-purchase material for consumer goods corporations
	Participants	
	Company representatives	Managing director, Innovation director, and R&D manager
	Designers	Case 1: 2 groups of 3 student designers each
		Case 2: 4 student designers
	Tools	DIVE 0.1
	Duration	Case 1: 68 hrs. (20% of collaborative working)
		Case 2: 70 hrs. (25% of collaborative working)
	External innovation experts	3 experts in design and innovation
	Location and date	The Netherlands and Colombia, 2015
	Case web-page	http://pktweb.com/dive/2017/09/21/400/

*Figure 6-7. Summary of Evaluation 1.*

According to the company representatives, Solutions Group has been using scenario thinking, including tools such as SWOT analysis and Business Model Canvas, to envision a set of future scenarios for the year 2022. These scenarios, which are updated annually by the board of directors and an external advisor, include a roadmap with several new business ideas for the near and speculative future. Although this practice is perceived by the company representatives as valuable, it is an activity limited to only the directors and its results are difficult to share with other employees and externals. The Managing Director considers that this future-thinking exercise is like "a couple's therapy for the two directors, where we can talk freely about our ideas of the future." He also states that "all these scenarios are tricky to land, put them on the ground, and above all, hard to communicate to others, so, they are so hard to be executed and monitored, that is why, most of the time, they just end up being

pigeonholed."

Company representatives were attracted by these cases because they were looking for ideas to add value to the company's products that are becoming a commodity. They expected ideas about products or services for dealing with this commoditization and thus feeding the future scenarios.

Case 1: Vision concepts 'The Real Experience' and 'The Experience Box' for Solutions Group

Using the Strategic PES, participants described the company as "a fish that could help its reef more". Following this analysis, they focused on a more aware shopping experience, one that considers environmental and social aspects, and in accordance with the trends in which "large retail stores will disappear as the majority of shopping will take place online". They also selected the year 2022 as the time to be explored. This domain and time frame led designers to a vision in which "people combine online platforms to research in advance and offline platforms to test the products". Based on this statement, designers created two complementary vision concepts that offer users a physical testing out of the products: The Real Experience (see Figure 6-8) and The Experience Box (see Figure 6-9).
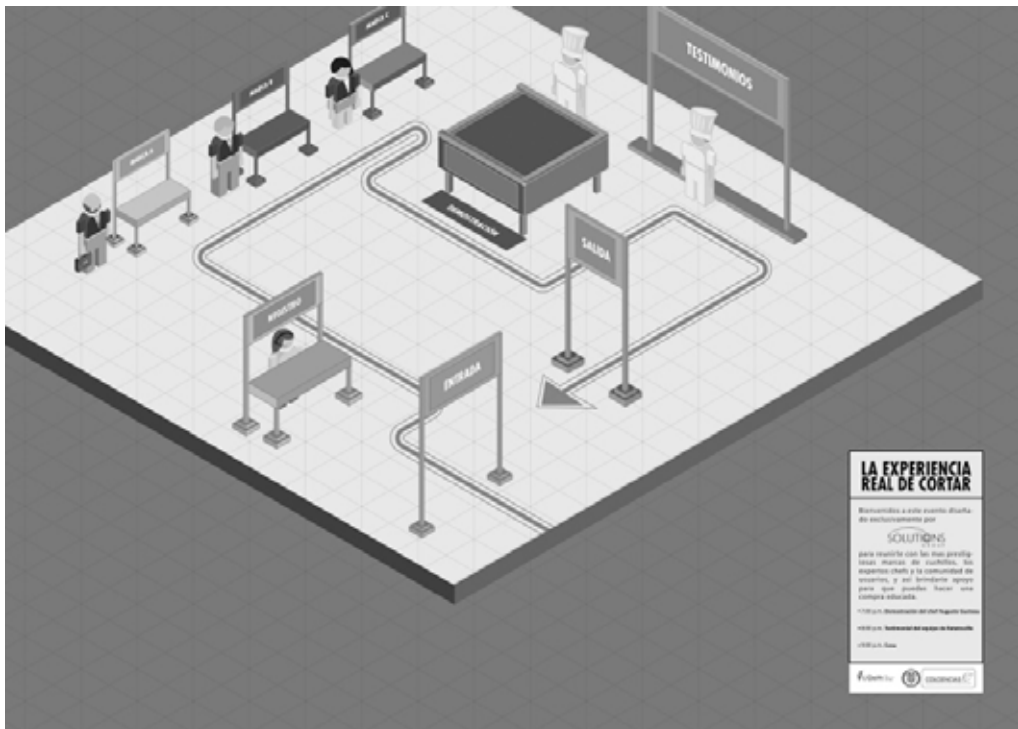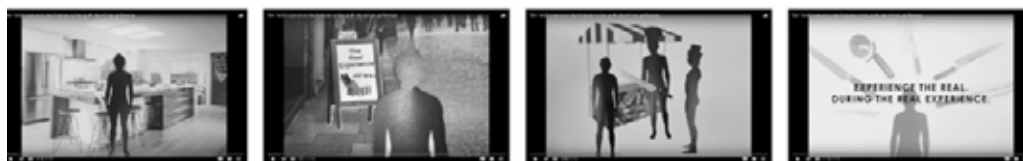
Figure 6-8. Above the illustration and below the frames of the video that present the vision concept 'The Real Experience.' It is an event, organized by Solutions Group, which advises users to make an educated purchase decision, instead of convincing them to buy some products. The video introduces Timo, a customer who wants to buy a kitchen knife. He takes part in The Real Experience to learn about knives from his own experience, trying out different products, and by talking to experts and producers, receiving first-hand information. Source: the author.

According to the designers, this vision concept recommends that Solutions Group' products should be reconciled with the values of the company, "shifting from promotional materials that stimulate rampant consumerism to ones that support buyers when buying what they need". They mentioned that, right now, as a first step towards that vision, the company should add screens to the promotional material allowing buyers to watch videos of experts comparing different products; thus, buyers can make a more educated decision.
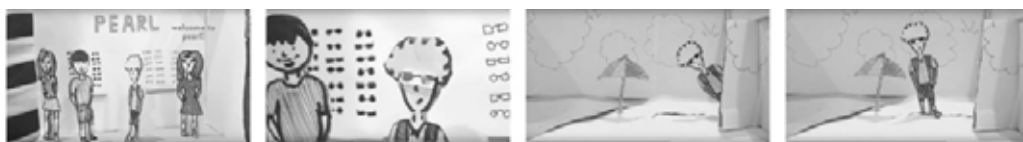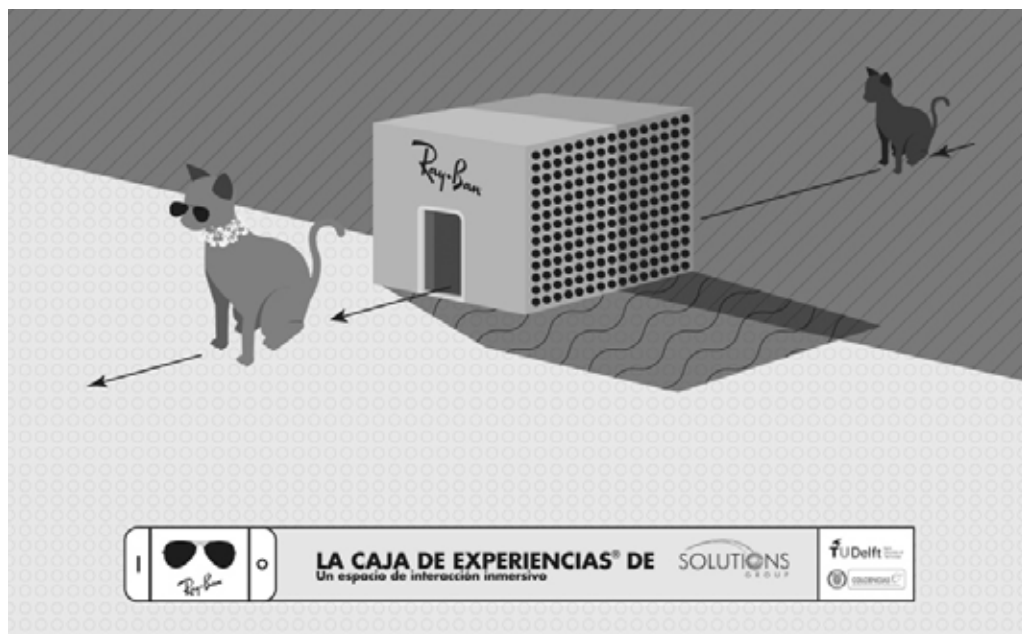

Figure 6-9. Above, an image of the vision concept 'The Experience Box'. It is a futuristic store, where a

brand can offer an interactive and immersive experience, allowing users to explore and discover products in an enjoyable fashion. Below, some frames of its video, made by the designers to communicate this vision concept. It introduces a user who is looking for a pair of sunglasses in a store. There, a saleswoman offers him The Experience Box where he can thoroughly enjoy the sunglasses on a virtual beach to make a better decision. Source: the author.

Through this vision concept, participants concluded that Solutions Group should create promotional material that allows buyers to test the products physically under some minimal real context conditions, such as the use of specialized lights for the sale of sunglasses. According to them, in this way, users can buy the appropriate products for their needs. They also suggested that, right now, the company should conduct technology forecasting on topics related to virtual reality and simulators.

More information and the full videos of these vision concepts in the Appendix online http://dive.pktweb.com/

Case 2: Vision concept 'Inventienda' for Solutions Group

Following the Strategic PES, the participants drew Solutions Groups as "a bighead fish, which despite its big eyes is myopic"; they said that the company has evident curiosity but lacks a clear strategic direction. Moreover, they mentioned that "it has a muscular back, small belly, and tiny tail" that, in their opinion, represents its extensive facilities, limited portfolio, and few clients, respectively. According to the participants, "its body forced it to move slowly, focusing only on the needs of their clients instead of coming up with innovative solutions itself." Given this analysis, participants focused on traditional small convenience stores, which, according to them, are a legitimate domain to grow following the company's values; they also enlarged the time frame to fit with the planned retirement of one of the business partners, the year 2031. Considering the domain and time frame, participants collected several context factors regarding the way society has disconnected from where it came from. They used these factors to define a vision in which "Solutions Group wants to help users to have a convenient, authentic, and social shopping experience, while using the facilities of contemporary technology, and for them to be better informed about the products they purchase." Following this statement, the designers made the vision concept 'Inventienda'. It is an application that helps the shopkeeper and users to communicate with each other to have a modern and convenient shopping experience, one that remains personal. Along this exchange of information, designers suggested that Solutions Group should better understand the behavior of the end-users to proactively design solutions for shopkeepers. To share it with the relevant stakeholders, the designers made a video (see Figure 6-10) in which María uses the app to buy at Doña Monica's store.

Figure 6-10. Frames of the video 'Inventienda'. Source: the author.

Given the recommendations captured during the conversation with relevant stakeholders, the designers arranged a roadmap that uses Inventienda as the destination –year 2031– and the world as it is as the origin –year 2015. Following one of the paths of this roadmap, which focuses on promotional material to enhance the shopping experience, the designers developed the concept product 'Tienda tastes' for the year 2016 (see Figure 6-11).

Figure 6-11. Above, prototypes of 'Tienda tastes', a concept point-of-purchase material that includes: a promotional bike with different containers, a mobile app, and a display stand for convenience stores. All these elements promote the store and also collect information about its users. Below, frames of the video. Source: the author.

More information and the full videos of these vision concepts in the Appendix online http://dive.pktweb.com/

DIVE's evaluation

Participants and experts saw DIVE as a valuable practice to understand the current and future context, users, and business, to explore possibilities, and to connect the future with the present. The Innovation Director was "happy to see a tool that helps designers in conducting research and creative activities before even defining a design brief." Company representatives defined this exploration as a "survey of what the customer would need 15 years from now, and therefore how [the company] should be prepared to achieve their satisfaction and growth in this future market."

Table 6-8 compresses the results of the two cases with regards to the activities and outcomes. Positive grades are indicated in grey and the negative ones in white. Appendix shows the detailed grades of the evaluation of the effectiveness of the activities and outcomes, the efficiency of the toolkits and time allocated per activity, and the satisfaction of the participants.

Table 6-8. Results of the two cases

| Evaluation 1 | | Effectiveness | | | | | | | | | Efficiency DIVE 0.1 Canvase Workshe | | | | Satisfaction |
		Activities	Clearness	Usefulness	User-friendly	Outcomes	Plausible	Relevant	Inspiring	Human-scale	Time	Usefulness	User-friendly	Usefulness	User-friendly	
Case 1		(1) Understanding the present				(a) Domains and time frames									
		(2) Approaching the future				(b) Vision statement									
		(3) Exploring the future				(c) Vision concept									
		(4) Communicating the future				(d) Prototype and video									
		(5) Looking back into the future				(e) Recommendations									
Case 2		(1) Understanding the present				(a) Domains and time frames									
		(2) Approaching the future				(b) Vision statement									
		(3) Exploring the future				(c) Vision concept									
		(4) Communicating the future				(d) Prototype and video									
		(5) Looking back into the future				(e) Recommendations									

Effectiveness

DIVE proved its *efficacy* as a technique by supporting designers and company representatives in exploring the future of Solutions Group through making and sharing vision concepts.

Designers highly valued *Activity 1*, in particular the way that it uses the analogy between the company and a fish. One of the designers interviewed mentioned that she likes "the Strategic PES, the fish, the one with the head and the tail because you can visualize the information about the company in a kind of playful way." Experts also recognized the value of the analogy as a means to communicate the insights of this activity. Expert 1-2 said that "the fish gives a good idea to an external party to understand what this company is about […] when you see a bighead fish, you realize that this organization is very innovative, but it doesn't have cash flow because the belly is small. Then, when you observe all the other fishes together, it gives a precise idea of where this company is positioned." Even though this activity was positively evaluated in Case 1, experts found that its outcomes, the *domains and time frames*, did not inspire enough and missed human-scale in its definition. These outcomes improved considerably in Case 2.

The data shows that designers evaluated *Activity 2* significantly better in Case 2, in which they conducted desk and field research to gather context factors compared to Case 1, in which they just conducted desk research due to their location. In both cases, experts recognized the power of the outcomes of this activity, the *visions*. About these strategic directions that point to the company's future, Expert 1-1 stated that "a company such as Solutions Group with a strong analog product also need to develop a digital service system, one that supports its future products. This vision gives useful insights for the company and proposes a significant leap from where

they are now, to where they would like to be in 20 years". Although this activity and its outcomes received good feedback from the designers and experts respectively, they suggested that it needs to be simplified for designers without experience in research. Experts recommended that it also should stimulate participants to produce more risky visions of the future, ones that push the boundaries of the companies and also are meaningful to people.

Activity 3 was recognized as valuable and easy to comprehend by the designers. Even though the outcomes of this activity, the *vision concepts*, were evaluated as neither plausible nor inspiring by the experts, it was highly appreciated by the company representatives. The R&D Manager considered that these "prototypes of the future are useful during the initial discovery of the innovation strategy" for setting a vision, embedded in an artifact.

According to the designers, *Activity 4* of Case 1 was challenging to conduct and, in view of the experts, its resulting *prototypes and videos* were not credible, nor consistent with the future context, and not inspiring. In Case 2, we did not identify any concern in regards to the activity or its outcomes, concluding that it has been improved considerably. In the company representatives' opinion, the *prototypes and videos* of both cases made the vision concepts tangible and evocative, and would help them in dealing with employees, allies, and investors. The Innovation Director stated that "while other futures techniques focus just on the strategic level, a set of recommendations for the board, DIVE produces 'stuff' linked to the operational level; this helps us make ideas that can run fast." In view of its relevance as inputs of Activity 5, these outcomes need consideration.

Although the designers in both cases mentioned that they understood the purpose of *Activity 5*, they acknowledged facing a significant challenge when facilitating the final conversation with the company representatives and other stakeholders. During the discussions, they tried to move gradually from the speculative future, the vision concept, to the world as it is, to collaboratively generate recommendations for these time frames. However, that transition was not smooth because the company representatives repeatedly jumped back to the present and then forward to the future, and thus both parties lost track of the conversation several times. In Case 2, designers had a longer and more comprehensible conversation with a broader audience, including several enterprise members and externals guests from academia and government. Although it was also difficult to facilitate, in this case, designers used the managing director's expected retirement date to formulate questions such as: "what do you want to leave to your family and business partner when you retire?" These questions allowed attendees to be fully immersed in the discussion, facilitated their perception of time, and brought them a feeling of intimacy on the decisions producing numerous ideas for the different time frames. According to the experts, the improvement of the *recommendations* obtained in the final conversation of Case 2 was evident, in particular because it took the form of a concept product for the world as it is, which were "no longer just words, they are concrete things that are almost

ready to be produced by the company" (Expert 1-3).

Participants and experts were pleasantly surprised with the *technique's analogy* used to understand the current and future context, users, and business. According to the managing director, "DIVE uses a unique analogy that helps designers explore the present and future [...]. One always thinks of the future as something that is ahead or above us, and one has to come running or flying; in contrast, DIVE proposes a future that is below us, in an imaginary underwater world, that one has to access by diving. Besides, it creates all the elements of that world, the company as a fish, me as a scuba diver, the trends as waves". However, we observed that the impact of these comparisons fading during the last three activities. This reflects a failure in the design of the activities that could be related to a problem of consistency in the use of language. The technique does not work around the comparison in the last three activities; it does not even mention its components anymore, whereby some coherence is lost and the power of the analogy further diminishes.

In view of this evaluation, *user-friendliness* and *inspiration* are the criteria that need improving. Following the evaluation of the designers and company representatives, the activities should be more friendly with the users, simple for participants to use. Moreover, considering the company representatives and experts' evaluation, the outcomes should inspire more radical ideas, encouraging company representatives to look at new opportunities for the company at different levels. Company representatives considered that the teams were restricted in the exploration by themselves, producing artifacts that were not sufficiently futuristic and thus do not inspire much. The company representatives sought to obtain risky ideas from the designers, which will be later landed by the managers. With that in mind, the Managing Director stated that "we want designers to fly; they should be 'smoking the green' and after that we will take care of the rest, but they are the ones who should throw a line and build a path in this strategic exercise."

Apart from the results mentioned earlier, along these cases we identified that DIVE was also beneficial as a way to reflect on sensitive topics. Along this exploration, participants and experts identified how different *sensitive topics* that are deeply related to the company's values, such as consumerism, emerged. In that regards, Designer 1-3 acknowledged "the difficulty in discussing issues like consumerism with a company that works in advertising." The R&D Manager also mentioned that "DIVE makes vision concepts that point in new directions, perhaps overlooked by the company or even painful for us, opening opportunities to create new products ideas, and change the business in a better way." The experts also identified some of these sensitive topics and the way in which participants approached or even avoided them when defining a preferable future.

Efficiency

With regard to the *efficiency*, the designers considered that the *time* allotted per

activity as sufficient. However, in Case 1 designers mentioned that four hours for Activity 3 is too short; they indicated that they need "at least eight hours to create the vision concept" (Designer 1-3). Extending Activity 3 from four hours in Case 1 to 12 hours in Case 2 and cutting Activity 5 from ten to four hours were both observed as positive. The designer interviewed after Case 2 considered that DIVE could be applicable in a flexible way, "you can do the process in one afternoon, really quick, or you can do it longer and then have better outputs."

Concerning the *collaborative working* between company representatives and designers, in Case 1, most designers requested "more moments of contact with the enterprise, at least one per activity" (Designer 1-2). Designer 1-1 mentioned that "we really missed a face-to-face workshop with the company for Activity 3 and 4, so I think giving this workshop in the future is essential for a better project." The company representatives also asked for a more intensive collaboration among designers and company representatives to learn more about the technique and its insights. In the interviews, company representatives acknowledged the value of working with external designers. They considered that their lack of professional experience and the Dutch background brought a different perspective to looking at the future of the company; "it is always nice to work with young people, they contribute by giving us a fresh view, in this case, a new and, more interestingly, international impression" (Innovation director). Even though the company representatives felt invigorated by the independent design team, they also recognized the difficulty that these internationals face when trying to understand a domain which is so rooted in the Colombian culture; "for Dutch people, understanding the traditional small convenience stores is quite difficult, especially if they cannot see the place and talk with the shopkeepers, the auxiliaries, or even the delivery boys" (R&D Manager).

Participants acknowledged the value of the *toolkit DIVE 0.1*. Designers thought that the booklet, worksheets, and canvases were beneficial, helping them to "come up with recommendations about the company's future," and were simple to use. In both cases, the canvases demonstrated their value as a visual record of the process. According to the company representatives, the visuals of the two canvases –one that sketches a fish and its parts and another that draws calm or troubled waves– and the worksheets, made it easier for participants to focus on the analogy. However, as observed earlier, this emphasis was not strong enough in the final three activities. Moreover, the worksheet of Activity 4, which supported designers writing the storyline, is not beneficial, and hard to use.

Satisfaction

With regards to the level of *satisfaction* that designers had when applying the technique, in both cases, they assessed this criterion with the highest possible grades. The data shows that designers were pleased with the first three activities and the last one and their outcomes: domains and time frames, visions, and vision concepts. In

Case 1, both Activity 4 and the prototypes and videos were the ones that produced less satisfaction for the designers. Even though the designers were satisfied with Activity 5, in which they talked with the company representatives about the transition from the future to the present, they were not happy with the recommendations they brought to them at the end of the case. One designer expressed his enjoyment of working with SMEs: "these companies allow one to have greater flexibility, other than corporations that already have very fixed identity factors that limit to certain extent the ideas that one could propose them."

Nine months after finishing this evaluation, the R&D Manager stated that "the company has internalized part of the technique delivered by these exercises, such as the Strategic PES and others tools to conduct observations, analysis, and ideation." In view of the need to approach the users differently and thus their experience when shopping within the channel, these cases also inspired them to create PoP (point-of-purchase material) Solutions. According to the innovation director: "whereas in the past, we only reactively developed promotional material based on the client' requirements, now through PoP Solutions we also proactively develop promotional material based on the clients' needs and opportunities." In general terms, according to the Managing Director of the company, "this exercise has allowed [the company] to accumulate a transversal knowledge [...] that is sometimes difficult to measure, but that you can feel in the evolution of the business". He has "gained more insights with this exercise than with a five-months advice with a world-famous consulting group."

Discussion about Evaluation 1

This evaluation investigated the design-led futures technique DIVE to validate and improve it. DIVE 0.1 was used in two cases by external designers and company representatives of Solutions Group, a medium-sized enterprise in the retail domain, to explore its speculative future.

Both cases demonstrated that ten weeks were sufficient for four designers with little experience and two directors and a manager to successfully make and share vision concepts with an SME.

With regard to the designers, this exploration's success may be due to the curriculum of student designers, part of Case 1, which focused on setting strategic design directions for companies and in Case 2, three of the four student designers came from Master of Science programs that focus on conceptualization. The difficulties that the first group faced in Case 1 could be due to Activity 2 requiring research skills, which are not adequately developed in undergraduate students. In Activity 4, it might be the designers' lack of experience in dealing with the complexity of making prototypes of services, which involves a high level of abstraction. Moreover, in both cases, the challenge dealing with Activity 5 could be due to the designers' limited skills as facilitators. In Case 1, this difficulty may have been exacerbated by the intricacy of facilitating discussions over the Internet, with company representatives

from a different culture, while using a second language. It also could be related to the short-term perspective of the company representatives, who tend to talk about the difficulties to implement the vision concepts instead of the ideas that these artifacts trigger for the different time frames.

Following the participants' suggestion, participants collaborated more during the second case. It allowed us to observe that this shared work was valuable and apparently, it helps produce better outcomes.

Participants and experts highly appreciated DIVE 0.1. However, in their opinion, this toolkit should give a more detailed advice to conduct the first and last activities. To strengthen the analogy, it should also include new canvases that report the last activities and some redesigned worksheets. This redesign should incorporate two observations. First, participants found that there were too many worksheets and some contained unnecessary duplication of information in relation with the booklet and canvases. Second, although the instructions of the booklet were essential to fill the worksheets, these documents were separated in two different tools, making it difficult to consult the instructions and fill out the forms. In view of these insights, we developed a new version of the toolkit, DIVE 0.2, shown in Figure 6-12, 6-13, 6-14, and 6-15.

Figure 6-12. An example of one of the five folders of DIVE 0.2. These folders, one per activity, merged information from the booklet and the separate forms from the worksheets to help participants to understand and report the process. Each folder includes a brief description of each activity in the front cover, the instructions of the activities, its times and suggestions, and a worksheet to report the activities in the interior, and a worksheet to describe the outcomes in the back cover. These folders were designed to contain the canvases when folded. Source: the author.
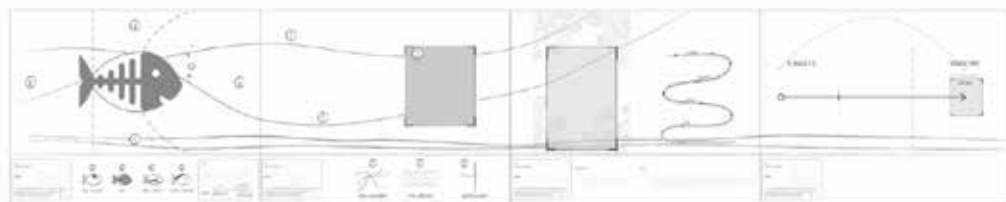
Figure 6-13. General view of the canvases of DIVE 0.2. It consists of four large-sized canvases instead of two. The first two, which worked well in the previous evaluation, include small modifications based on Evaluation 1. The newest third and fourth extend the previous canvases, generating a continuous format that help describe the progress of each activity and its respective outcomes. These forms contribute to documenting the vision concept and support the recollection of ideas for the world as it is and the near and speculative futures, respectively. Source: the author.
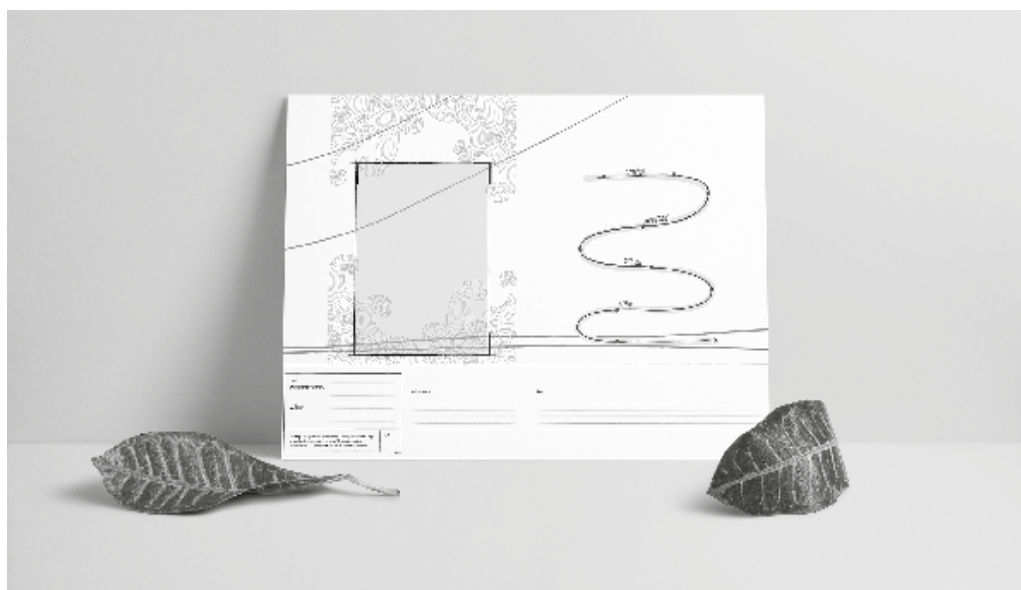

Figure 6-14. Canvas 3 helps designers document the generation of ideas about the vision concept and the creation of a story to contextualize this artifact. The serpentine line on the right includes the four elements -situation, complication, question, and answer- suggested by several authors to document simple and compelling stories. This line guides the participants in the process to introduce the context, create a hook in the future, conceive a tension in the story which trigger a question, and introduce the vision concept as part of that question or as a possible solution. Source: the author.

Figure 6-15. Canvas 4 supports designers and company representatives in documenting the final activity. It contains the timeline presented in Chapter 2, which is divided in three time frames, starting in the world as it is, continuing in the near future, and ending in the speculative future. It places the vision concept in the speculative future and draws an arrow back to the world as it is, inviting participants to conduct a backcasting exercise: discussing the future to then convey to the present. Source: the author.

The full version of the toolkit is available in Appendix Chapter 6 online http://dive. pktweb.com/

6.2.2. Evaluation 2

This evaluation included three simultaneous cases with the enterprises Campo Real, Ethos, and Ci2.

Case 3: Vision concept 'Cava' for Campo Real

Figure 6-16 summarizes Case 3 with Campo Real, a family business that sells cheese to end-users through retailers. Even though its Design and Development Division is considerably new, the company has a long-standing tradition of applying design, in particular regarding packaging and branding. Its directors had participated in different training projects related to design and innovation with governmental and non-governmental institutions, such as the Bogota Chamber of Commerce.

Figure 6-16. Summary of Case 3.

According to the managing director, Campo Real has been using "a strategic plan projected towards 2020; this plan is developed every five years, updated yearly, and monitored monthly." The development of this plan concentrates on three dimensions: the social, environmental, and economic for which it includes several 'levers for growth,' among others: innovation and shared value. The latter prioritizes social issues, establishing business opportunities in public problems, it "is one of the values that [Campo Real] strongly emphasized and for which the company is well recognized" (Design Manager). For the application of this shared value in the strategic plan, the company uses the Total balance tool: a balance of future compensations assuming a sustainable future as the goal. The tool helps Campo Real to "keep a clear track with indicators and with current and permanent results" (Managing director).

The topic of this design-led futures workshop was perceived by the company representatives as novel, valid, and closely related to innovation, a relevant area in which they want to learn more. This workshop triggered the managing director's attention; she mentioned that "when someone says speculative [design], I think that this is out of the ordinary, which is the kind of thing that we like: a tool that supports us for doing disruptive innovation, which is key for us."

Considering the analogy proposed by the Strategic PES, participants drew Campo Real as "a female fish with a large head linked to its heart; it is one of the few fishes that one can find that has an artery that comes directly from the heart to the brain" (see Figure 6-17). They mentioned that its purpose is to take care of the other sea creatures, providing them food and protection. Given this analysis, participants defined "shared value in the areas of health, nutrition, and well-being" as the domain, and set the year 2025 as the time frame, which coincides with the company's twentieth birthday. After the context factors' analysis, in which participants included several trends regarding the way people have been disconnecting more and more from the earth and their origins, and new developments in the field of Food 3D printing, they defined a future vision. It claims that "Campo Real wants to offer end-users, identified with the

purpose of care –as one of the company's values–, the possibility of participating in the creation of new experiences of sustainable consumption, which connect them to their origin and the inheritance of the countryside."

Figure 6-17. From left to right: the illustration of the Strategic PES in Folder 1, one of the designers testing the prototype for the video, and the final discussion. Notice how participants used the canvases as the background of this part of the session. Source: the author.

As result, the designers developed 'Cava, make your own cheese', a 3D printer in which users can make several cheese preparations in different shapes and sizes to take care of themselves. Cava has special pressurized tanks with which people can prepare several types of fresh and matured cheeses and mix them with spices, herbs, fruits, and oils, among others. The printer interacts with other user's devices to suggest products for the grocery lists, preparations for menus, and takes actions that maximize the possible cheese preparations based on dietary conditions, moods, and weather, among others. To present this vision concept to the company representatives, the designers made a video (see Figure 6-18) that introduces Juan, a young man who is planning a date with Laura. He used Cava to define the menu and to prepare small portions of fresh cheese with strawberries.

Figure 6-18. Frames of the video 'Cava, make your own cheese'. Source: the author.

Cava allowed the participants to discuss the necessary actions for Campo Real to learn more about its users and strengthen its relationship with them. Participants suggested to transform the company's value proposition from "selling quality food" to one that focuses on supporting people in establishing better nutritional habits, which includes dairy products. This speculative exercise posed a series of challenges in the short and medium-term related to new products and services.

Case 4: Vision concept 'Manta' for Ethos

Ethos is a company managed by engineers, architects, programmers, and developers who develop software for financial institutions such as Family Compensation Funds. Although the company does not have a formal design department, it has participated in different programs related to design and innovation, such as the Integral Design Tutoring Project of the Ministry of Commerce, Industry, and Tourism of Colombia. Figure 6-19 presents this case.

	Enterprise	Ethos
Case 4	Service	Software for financial institutions
	Participants	
	Company representatives	Customer service director
	Designers	1 professional designer and 5 student designers
	External innovation experts	3 experts in design and innovation
	Tools	DIVE 0.2
	Duration	24 hrs. (50% of collaborative working)
	Location and date	Colombia, 2016
	Case web-page	http://pktweb.com/dive/2017/09/22/327/

Figure 6-19. Summary of Case 4.

Ethos' Customer Service Director mentioned that although "the company mostly develops client-server applications for financial institutions, it must soon take all these applications to the cloud and open it to a bigger market." She also mentioned that, every year, the board of directors outline several strategic goals and plans following this vision. The Innovation Director responsibility is "to develop the projects to attain these plans", projects that can take two or three years, depending on the complexity of the development. Considering the high cost of these developments, the enterprise relies on several governmental financial supports. In 2015, for instance, Ethos received a grant from the government to conduct a preliminary research study about the end-users' needs of the Family Compensation Funds, cooperatives that manage the savings of workers and used it to provide subsidies to them. Based on the insights of the study, the company developed and subsequently launch 'Integra', a digital application that facilitates communication between the end-users and the funds.

Participants perceived Ethos as "a giant oceanic manta ray that navigates in international waters [...] without even knowing its context and users" (see Figure 6-20). Following this analysis by the Strategic PES, they selected 2026 as the time frame for this exploration to investigate how to better understand the users in the domain of "interactions between Family Compensation Funds and their users." As part of this exploration, participants gathered several trends related to people's desire to have more free time, the growth of alternative currencies, which operate independently

of governments, and the advance of biometric security systems. In view of these insights, they set a vision in which "Ethos would like to offer an efficient virtual interaction between the Family Compensation Funds and their users with guaranteed security and immediacy in the transmission of data."

Figure 6-20. On the left, a model of Ethos as manta ray; in the center, designers using this model to prototype ideas for the vision concept; and on the right, the canvases used during the final conversation. Source: the author.

Given this statement, the designers played with the metaphor of the manta ray to make the vision concept 'Manta, Ethos at your fingertips'. This futuristic service aims to help the end-user of the Family Compensation Funds to manage their finances more intelligently. It joins the funds with the users through a mobile application controlled by a smart card. Both the application and the card work together to manage the savings, investment funds, and other financial services but always keep in mind the more beneficial scenario for the user. This system also allows Ethos to know more about the behaviour of the end-users to help them and the funds develop a better relationship. The video (see Figure 6-21), which presents this vision concept to the company representative, tells the story of Hugo, a Family Compensation Fund's user. In planning his holidays, he used Manta to check the possible destinations given his financial situation and personal preferences. Following a simple protocol, he chooses a place and thus plans in advance the costs and the way to manage these payments.

Figure 6-21. Frames of the video 'Manta Ethos.' Source: the author.

Using the existing application Integra as the starting point in the world as it is – year 2016–, the participants developed several recommendations for Ethos. They considered that Ethos needs to gain more and better insights on the end-users to be a potent mediator between the funds and its affiliates. They also mentioned that the company needs to focus more on the human-centered interaction of its applications to facilitate the integration and understanding of financial information for people,

who are not necessarily familiar with all the abstraction of this data.

Case 5: Vision concept 'Burbu Pack' for Ci2

Ci2 develops engineering projects for corporations. The company recently initiated an R&D division, in which design is at the core. Figure 6-22 presents Case 5.

	Enterprise	Ci2	
	Service	Engineering projects for maritime and security corporations	
	Participants		
	Company representatives	R&D director and Design manager	
	Designers	1 professional designer and 5 student designers	
	External innovation experts	3 experts in design and innovation	
	Tools	DIVE 0.2	
	Duration	24 hrs. (50% of collaborative working)	
	Location and date	Colombia, 2016	
	Case web-page	http://pktweb.com/dive/2017/09/22/340/	

Figure 6-22. Summary of Case 5.

According to the R&D Director, Ci2 extensively uses strategic planning in which it relies on various technology forecasting tools. He mentioned that, in the light of this anticipation and because "the company needs things that can be turned into business as soon as possible, Ci2 always envisions the near future. It identifies market trends and the state-of-the-art technology in three lines of research: simulation, robotics, and control." In the former, for instance, Ci2 makes an inventory of the most advanced technology to project it into the near future, such as 2020. This inventory is constantly updated through its strategic alliances with technology centres, which carry out comprehensive technology forecasting exercises. The technology forecasting is developed by the R&D department every six months and subsequently is authorized by the directors. Although the R&D Director believes that these activities require a significant amount of time from his team, he does not consider it an onerous practice because of its strategic value.

The primary motivation to participate in this case was "the 'applied format' of the workshop, which sounds practical" (Design Manager); both company representatives mentioned that they prefer a hands-on workshop instead of a theoretical lecture. They would like to learn a new technique for envisioning the future that helps them to understand how innovation can be applied to the business.

Following the Strategic PES, the participants considered that Ci2 is a self-confessed tech geek, "a whale who uses its muscular back, qualified engineers, to propel a massive brain, full of state-of-the-art knowledge" (see Figure 6-23). It suffers from stomach pain due to a disorganized portfolio of services and products, in which "it is not clear what the enterprise really offers." Participants focused on finding a

painkiller to alleviate this stomach issue in the domain of "training using simulation technology" for the year 2024, time in which the company will celebrate its twenty-fifth birthday. According to the trend analysis, participants gathered context factors related to the increasing interest of corporations in their employees' emotional intelligence growth, and the use of new technologies such as virtual reality, internet of things, and artificial intelligence. In view of these insights, participants defined that in 2024 Ci2 wants to offer "platforms of immersion in virtual worlds that support the apprentice in the process of developing decision-making capabilities in situations of high risk, such as environmental disasters, that imply extreme emotional demands for it."

Figure 6-23. From left to right: the illustration of the strategic PES, a designer filling out a worksheet using the insights of the canvas, and the final group discussion with the company representatives. Source: the author.

Considering this image of the future, the designers made the vision concept 'Burbu Pack'. It is a simulation kit that contains a capsule, which generates a massive bubble in which the simulation is performed; a uniform to be worn during the simulation, including an apron, gloves, and safety glasses; and a sleeping pill for after the simulation. This pack put together part of the future company's portfolio. To spark a conversation about the future of the company, the designers made a video (see Figure 6-24) in which a soldier uses the Burbu Pack to go through several levels of combat training that emphasise his emotional demands. He had to deal with strong feelings, such as fury, anxiety, hopelessness, sorrow, and disappointment. The training is divided into different rounds in which three moments are defined. First, a simulation that uses virtual reality technology to immerse the soldier into fictional worlds within the bubble. Second, a short induced sleep to make it easier for the person to calm down and consolidate what he learned. Third, a feedback session from a panel of experts via video call.

Figure 6-24. Frames of the video 'Burbu Pack.' Source: the author.

All recommendations derived from the discussion between company representatives and designers point to the need to increase the company's expertise in areas related to virtual reality. In particular, the use of this technology in combination with physical spaces to create realistic sensations –such as images, sounds, smells– that simulate a user's physical presence in virtual worlds.

More information and the full videos of these vision concepts in the Appendix online http://dive.pktweb.com/

DIVE's evaluation

Participants found that DIVE applies design differently. According to the Ci2 R&D Director, "DIVE uses design in a way different from what SMEs normally do; it is a creative methodology to conduct strategic foresight" which, in his opinion, helps these enterprises to broaden their view of the design, from designers who solve current problems to designers who envision the future. According to one of the designers, DIVE "does not try to identify opportunities through data, rather it uses an experimental way, which is about what will happen in the future. [...] It is useful to see the impact of design on people's lives, and therefore to understand how design delimits the future." A designer stated that this is a "didactic experiment in which one can let the imagination fly a little bit more to learn" without being restricted by the requirements of the design for the world as it is. Similarly, another designer stated that "the participants were experimenting through a creative process, one that can be divergent and convergent, creating ideas at the beginning and also at the end; [they] were always in the mood of change."

Table 6-9 shows, highlighted in grey and white, the positive and negative grades of the three cases' activities. As in the previous table, Appendix #6 shows the detailed grades of the evaluation of the effectiveness of the activities and outcomes, the efficiency of the toolkits and time allocated per activity, and the satisfaction of the participants.

Table 6-9. Results of the three cases in regards to the effectiveness, efficiency, and satisfaction

			Effectiveness									Efficiency DIVE 0.2				Satisfaction
			Activities			Outcomes					Canvase			Folders		
			Clearness	Usefulness	User-friendly		Plausible	Relevant	Inspiring	Human-scale	Time	Usefulness	User-friendly	Usefulness	User-friendly	
Evaluation 2	Case 3	(1) Understanding the present	(a) Domains and time frames													
		(2) Approaching the future	(b) Vision statement													
		(3) Exploring the future	(c) Vision concept													
		(4) Communicating the future	(d) Prototype and video													
		(5) Looking back into the future	(e) Recommendations													
	Case 4	(1) Understanding the present	(a) Domains and time frames													
		(2) Approaching the future	(b) Vision statement													
		(3) Exploring the future	(c) Vision concept													
		(4) Communicating the future	(d) Prototype and video													
		(5) Looking back into the future	(e) Recommendations													
	Case 5	(1) Understanding the present	(a) Domains and time frames													
		(2) Approaching the future	(b) Vision statement													
		(3) Exploring the future	(c) Vision concept													
		(4) Communicating the future	(d) Prototype and video													
		(5) Looking back into the future	(e) Recommendations													

Effectiveness

In all three cases, the participants made and shared the vision concepts for the SMEs successfully. According to them, DIVE follows a process that is clear, useful, and easy to follow. The Managing Director of Campo Real mentioned that DIVE is "a unique technique that uses a clear set of activities, which in combination with an exact timing guides the participants to achieve its objectives." One of the designers reported that "whereas in other foresight methodologies, one jumps from one thing to another which are very different or not even related at all, in DIVE everything follows the same story." Another designer echoes this view saying that "DIVE compresses activities that are well-organized and have much cohesion among them: from the way to think about the company now to the way to imagine it in the future, fifteen years ahead."

Designers did not report any difficulty in the *Activity 1, 2* and *3*. They were able to grasp the companies and their future context, formulate a vision, and made the vision concept using DIVE 0.2. Experts acknowledged the value of the outcomes of these activities, in particular the *visions*. According to Expert 2-3, "With DIVE, a pool of external designers review the SME and its context, giving a vision of the future that allows it to move forward, offering proposals that do not stray too far from their core at the present, but that are equally driven to reach that future."

While designers did not report any problem in regard to *Activity 4* in Case 3, they stated few issues when making the prototypes in Case 4 and 5. According to them, this activity was easy to follow in the case of Campo Real, an enterprise that develops products, but it was hard to achieve in the case of Ethos and Ci2, companies that offer services. In regards to the outcomes of this activity, experts were positively surprised

about the quality of the *videos*, especially considering the time of production. Expert 2-1 mentioned that he "was amazed by the capacity of synthesis achieved through the videos. It is an excellent tool to effectively communicate the results of the exercise, to specify and materialize the ideas of the designers, and to generate a discussion with the organization about the strategic direction that should be taken." More than just means to communicate ideas, we observed that videos were also beneficial during the ideation as ways to develop ideas, and during the final conversation as ways to spark discussions about the future and thus produce more ideas. We identified that no matter in which part of the process these ideas are produced, the videos compelled designers to create ideas in a context, which involves people displayed as characters of the story. These characters were used across the discussion to refer to the impact that the ideas could have on them in the future.

While designers acknowledged the importance of *Activity 5*, in the three cases they assessed this activity as unclear and difficult to follow. Even though the participating designers planned the agenda and defined the goals of the discussion in advance, following the instructions of DIVE 0.2, the closing dialogues about the companies' future and present were hard to facilitate. Designers mentioned that the most challenging part of these dialogs for them was to "keep flexible responding to what happens moment-by-moment with the participants to gather the insights." Participants also noted that the presence of the external innovation experts in this final conversation invigorated the discussion. Despite the fact that the activities were negatively assessed, its outcomes were highly valued by the experts. They acknowledged the *recommendations* as "beneficial for companies, especially Ethos and Ci2, because the scenarios created were realistic and can be executed partially or totally" (Expert 2-2). However, experts missed a more emphatic reflection on the values of sustainability as part of these recommendations.

In general, according to participants, DIVE's activities were guided by a *strong analogy* that allowed them to *take a reflective distance from the everydayness*.

According to the designers, the analogy "is [a] fun, interesting, and formative" way to support the analysis and the sharing; "it helps to have a clearer understanding of the company, and, at the same time, support [designers] to discuss with the other members of the group" (Designer 2-4). In regards to the analysis, one of the designers mentioned that "from the moment participants begin to use DIVE, they are already applying analogies: it is about interpreting the company as a fish, where each component of this creature is some characteristic of that company and, eventually, it gives more insights about the business." With regard to the sharing, according to another designer, DIVE's analogy "employs a very poetic way of 'making' the ideas that turns out to be very effective in communicating [...]. As a designer, sometimes you have a lot of difficulty communicating with non-designers and this analogy allows you to do it quite well." In his opinion, this support in the sharing is related to the fact that, as part of the analogy "designers created stories that generate empathy among people and the project, which makes the people feel closer to the

exploration." Company representatives also mentioned some benefits from the use of the analogy. The Ci2 R&D Director mentioned that "the analogy allows people to disengage a little [from] the issues [and then] has a slightly more playful approach to the subject," enriching the analysis of the company and subsequently the creation of the vision concepts. This disengagement makes it easier to deal with the fuzziness and complexity of the future since, as the Campo Real Design Manager mentioned, the analogy helps to structure and understand all these "loops of disorganization and organization," accompanying the participants during the creative process.

As part of DIVE's analogy, the most recognizable element is the comparison between the company and a fish, which according to one of the designers, "makes participants have a much greater clarity about what they are talking about because it is related with something common; to some extent, they all know something of the fishes." The Campo Real Managing Director also mentioned that the analogy of the fish allows people "to define the domain [...], to spread throughout the animal in their various areas, and then to create scenarios, which show how the fish would look in the future." Similarly, one of the professional designers claimed that the Strategic PES shows which parts of the fish are robust or fragile, if it swims fast or slow, and if it is smart or dumb. Subsequently, you can envision the future developments to strengthen the parts in which the fish is fragile". During the interviews, several company representatives referred to their enterprises as fishes. One example is the Ethos Customer Service Director who defined her company as "a big fish, [to which it is necessary] to strengthen the infrastructure, [...] to be a business, not robust, but strengthened."

With regard to the reflective distance from the everydayness, participants considered that DIVE is a refreshing exercise that allows both the company representatives and the designers to get out of the daily routine. The company representatives valued the chance to "get away from the company which allowed participants to reflect on the business and thus know it better" (Ethos customer service director). "Leave the office, where [they] always talk the same with the same" (Campo Real Design Manager) and take a distance from the monotony was also identified as a valuable creative exercise for the designers. One of them considered that "usually, [they] are fully immersed in the day-to-day dynamic, and this [referring to DIVE] allows [them] to take a break and leave a little of that bubble and do another kind of things." This inside out transition granted both company representatives and designers to take a reflective distance from the organization and from the everyday. According to the Managing Director of Campo Real, "the exercise enabled them to see the company from a different platform, in a different scenario, a future scenario, which is an exercise that they had not [...] had the opportunity to do". The company representatives referred to two different views achieved through this separation. First, when looking at the future from the world as it is, it is possible to "identify options and then create a vision" (Ci2 R&D Director). The vision "defines where we want to lead the service [...] and thus formulate a business model with good foundations, which brings us to

the right direction" (Ci2 Design Manager). Second, when looking at the world as it is from the future, recommendations can be made to strengthen some positions and adjust others, thus defining "the routes of how [the] company should be" (Campo Real Design Manager). These views help them with "being more creative, thus contributing to the improvement of the organization" (Ci2 R&D Director), "breaking paradigms" (Campo Real Design Manager).

Efficiency

In view of the participants, DIVE is an *efficient* technique that includes enough *time* and an appropriate *toolkit*. The Design Manager of Campo Real considered that "DIVE allows you, as an entrepreneur, to quickly envision the future, and you can do it yourself!".

Designers acknowledged the advantage of having just three days to make and share the vision concept; "the shorter the time, the better; it feels more like a design challenge, it will force the creativity more". Aligned with this view, another designer mentioned that "this feeling of being under time pressure, in an exploration as this one, is part of the game that forces you to quickly make something, helping you to invent something radical." According to the designers, another benefit of such a short exercise is the fact that "the information is fresh for the designer, constantly thinking about the next step". However, company representatives considered that these strategic exercises "deserve that companies dedicate more time" (Ethos customer service director), or, as suggested by the R&D Director of Ci2, "perhaps by doing an exercise that involves more time and resources, we can generate a greater impact." In this regards, Campo Real Managing Director mentioned that the exercise should be repeated throughout the year, "to allow the results to mature".

Participants also acknowledged the value of the *collaborative working* between designers and company representatives. One of the designers considered that through this collaboration "[participants] can share all the knowledge that each one has and thus learning-by-sharing". Another designer echoed this statement, saying that "this learning, including the designers' strengthening of creativity, is possible thanks to conversations with others". Participants found these conversations positive and refreshing. The Campo Real Design Manager considered that DIVE allowed him to "talk with guys [referring to the designers] who are, in one way or another, end-users, and to know what they think about Campo Real's products, or how the company should be." An element that makes these conversations even more special is "the confluence of diverse people from academia and industry" (Campo Real managing director) in an exercise in which "it is not just that they ask you to think differently! Indeed, here you work with young people who already think differently" (Ethos customer service director). In sum, as mentioned by the Ci2 R&D Director, DIVE's core is "linking people together, generating a co-design process between designers and managers to anticipate change." Even though these conversations were identified as positive,

the Ethos and Ci2 representatives suggested to pay more attention to the teams' composition to enrich the discussion even more. Ethos made explicit the importance of involving more than one company representative; its Customer Service Director mentioned that she "was alone in this case and it would have been super important that someone else had come from the company." In the instance of Ci2, an enterprise in which all participants were designers, its Design Manager pointed out the need to have an "interdisciplinary team, including managers, engineers, anthropologist, among others." From the same perspective, one of the designers mentioned that "it would be very interesting to bring someone completely oblivious to the context of design"; she felt that "when there are many designers together, their egos tend to complicate the situation. When there is a third party, it refreshes the dynamic of the exercise."

Participants found *DIVE 0.2*, the evolution of the toolkit based on the insights of the previous evaluation, to be useful and user-friendly. One of the designers mentioned that "all the materials they gave us, such as canvases and folders, make everything much clearer and more entertaining." Moreover, participants mentioned that this toolkit gave them detailed information on the two different parts of the context factors analysis, and the way to generate ideas and make these ideas tangible through the prototypes. However, they identified three main improvements. First, a designer suggested to revise the duplication between canvases and folders. In her opinion "there is much to write and even rewrite among formats, which is a bit time-consuming." Second, the Ci2 R&D Director advised to increase the font size of the canvas to facilitate its readability. Third, according to the Campo Real Design Manager, the material should include digital media to facilitate its use, particularly if the company is willing to repeat this exercise several times per year.

Satisfaction

Designers and company representatives were *satisfied* with using the technique. Several designers said that they felt satisfied using DIVE because it uses "a language for designers." According to one of them, "unlike other strategic techniques, which are often super-scientific –so much so that we (the designers) do not even understand very well what to do at each stage, DIVE is clear, didactic, dynamic, and fun." The tools they have used so far "end up being very administrative, like looking at companies from a management perspective, but DIVE brings us to different possibilities, and we all understand it as easier" (Designer 3-2). The designers' satisfaction is also related to the freedom allowed by the technique; one of the student designers mentioned that "DIVE allows [them] to be much more visionary, perhaps because one is not restrained or limited by technical factors and other requirements".

Nine months after finishing this evaluation, we found that although the companies "have not necessarily used the concepts developed in the cases literally" as the Ci2 R&D Director claimed, they got several benefits in the form of examples and

inspiration. Like the former, the Customer Service Director of Ethos mentioned that the vision concept made in this exercise "has been used as a reference in various work sessions with the company's managers [and the innovation team] to define new product requirements." Like the latter, the R&D Director of Ci2 declared that the enterprise "is already developing, partly thanks to the ideas collected in the exercise, new ways of using technology for the haptic control of what the user does on the stage, allowing a physical contact between the virtual objects and scenarios." He also mentioned that the "speculations about the future of virtual simulation allowed [them] to develop projects that are moving towards prototypes, applying particular knowledge of computer vision." Considering the time that has passed, the company representatives still recalled various benefits of the technique. Such as the Managing Director of Campo Real, who is categorical about the importance of "understanding the enterprise from a different perspective, including the strengths and opportunities, and thus be able to rethink [the] strategic plan to better define [the] proposed value." Similarly, the Customer Service Director of Ethos mentioned that the enterprise discovered through the exercise that they "can reach younger generations in a non-traditional form, using technology and also adapting the message". The R&D Director of Ci2 noted one of the intrinsic limitations that the technique faces when applied to SMEs. He mentioned that, "although Ci2 has established an R&D division, the enterprise is managed by an old habit related to the financial immediacy. For instance, the R&D projects are expected to have an immediate return on investment, so the speculations do not generate much enthusiasm from the board of directors." In this respect, the Customer Service Director of Ethos suggested to "include this exercise as part of the product improvement plan to force companies to takes these speculations seriously".

Discussion about Evaluation 2

Along the cases with the enterprises Campo Real, Ethos, and Ci2, we assessed the toolkit DIVE 0.2 throughout three days. The representatives from these enterprises worked together with student and professional designers to generate a debate around their present and future.

As in the previous evaluation, DIVE demonstrated its value as a clear, useful, and user-friendly technique. These cases proved that designers were able to make and share vision concepts with these SMEs in just 24 hours.

The success of these cases could be related to the participation of junior professionals who guided the designers with little experience. The professionals, who had previous experience using DIVE, were used to dealing with quick design exercises for clients. Moreover, this success also could be related to the fact that all participants used their mother tongue across the evaluation, which considerably improves their communication with others. Although the role of the professional designers was highly valued in this exploration, these junior designers as well as the student

designers, had complications making the prototypes, which is consistent with the previous evaluation. It can be linked with the fact that the participating designers had training as product designers and thus making prototypes of services, which involve time and activities, could be problematic for them.

Other reasons for the success of these cases could be related to the compact format of the exercise or the use of the improved toolkit. The three teams worked in parallel, which gave them the possibility to have group reunions, in which designers developed the activities with the company representatives, and plenary meetings, in which the instructions were explained by the researcher. This dynamic gave them the chance to clarify doubts and learn from the others.

The difficulties faced in the final conversation were related to the fact that the time originally planned for this conversation, four hours, could not be respected because some company representatives arrived considerably late. This delay forced the designers to modify the original agenda, accelerate the discussion, and reach conclusions hastily. In Case 4, this problem was made worse because the only company representative arrived late and during the activity she did not have opportunity to discuss with another colleague from the company. Another possible reason behind these difficulties were related to the lack of experience of the designers, including the professional designers, facilitating conversations. The curriculum of student designers and the experience of professional designers, part of this evaluation, does not include creative facilitation at any level; thus, they are not familiar with strategies, techniques, or tools to facilitate workshops.

Even though the analogy was recognized as beneficial by the participants and experts in the previous evaluation, we observed that its potential was much better exploited from the beginning to the end of this evaluation. DIVE 0.2, invited participants to document the process and outcomes using the language of the analogy, writing about the fish and the waves, which clearly strengthens the way the analogy connects all the activities and creates a credible story. However, the fish, as the most recognized component of this analogy, loses prominence in the final activity; the idea of the fish is not mentioned or used during the discussion or during the creation of the final roadmap.

Participants considered the toolkit DIVE 0.2 to be useful and user-friendly, but identified some duplication between the folders and canvases, and the need of a digital repository and an overview. Following the suggestion of the participants and to boost the use of the fish along all the activities, we simplified the folders and canvases and grouped them in 'DIVE logs' and we created 'DIVE plan', 'DIVE depth', and a web page, shown in Figure 6-25, 6-26, and 6-27, respectively.

Figure 6-25. DIVE 0.3 plan, a poster with an overview of the activities, designed to be printed in a large format (A1) and hung on the wall. The poster can be folded as an envelope to contain DIVE logs, which are the folders that include the canvases. Source: the author.

Figure 6-26. DIVE 0.3 depth, a rule with a slider to be located alongside DIVE plan. It helps participants indicate and keep in mind the time frame(s) of the exploration. Source: the author.
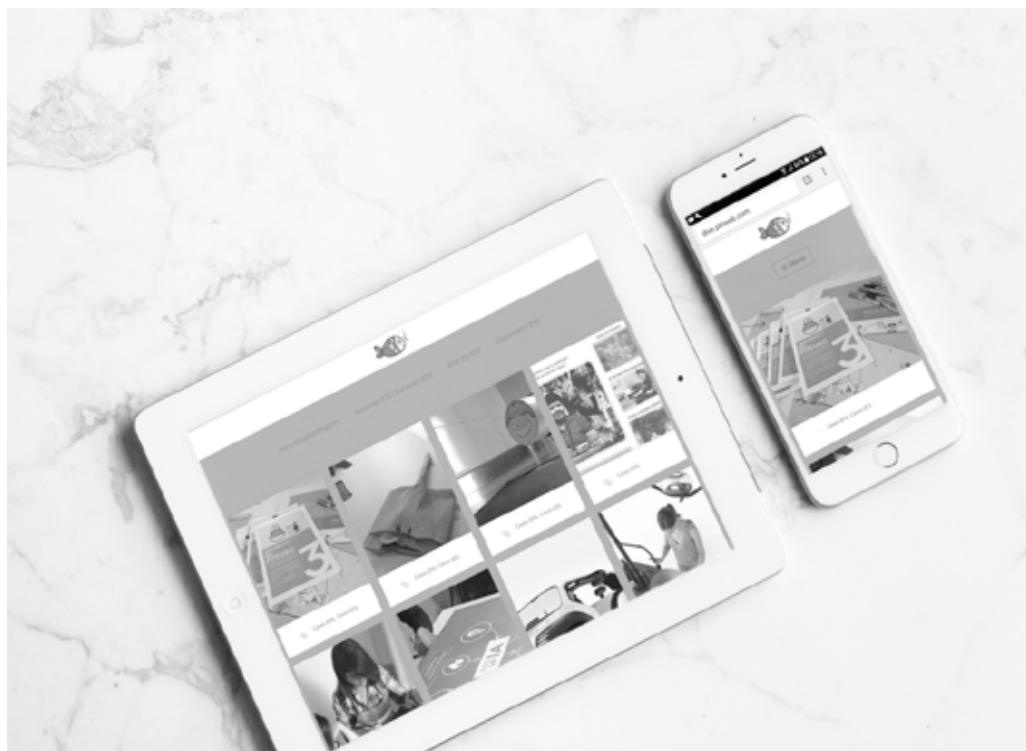
Figure 6-27. Overview of the webpage -http://dive.pktweb.com/-, a repository of all the relevant information to support the participants through all the activities. Source: the author.

The full version of the toolkit is available in Appendix Chapter 6 online http://dive.pktweb.com/

6.2.3. Evaluation 3

Evaluation 3 revolved around a case with Oceanco.

Case 6: Vision concept 'Heaven of the seas' for Oceanco

Figure 6-28 summarizes Evaluation 6 with Oceanco, a Dutch company that designs and produces large luxury boats over 80 meters in length. It incorporates design in two ways: on the one hand the design of the interior and exterior of the superyachts, and the other that develop the function and feasibility of the products.

	Enterprise	Oceanco
	Product	Superyachts for end-users
	Participants	
	Company representatives	R&D manager and Design manager
	Designers	5 professional designers
	External innovation experts	3 experts in futures studies, design, and innovation
	Tools	DIVE 0.3
	Duration	20 hrs. (60% of collaborative working)
	Location and date	The Netherlands, 2017
	Case web-page	http://pktweb.com/dive/

Figure 6-28. Summary of Evaluation 3.

As reported by the company representatives, Oceanco's marketing division regularly applies forecasting in which it analyzes global trends for the coming fifteen years to see "where the money will go in the future" (Design Manager). The R&D Manager, however, acknowledged that his division does not apply strategic foresight methods, "but we should and want to do it." He also mentioned that "because a superyacht should be built in five years, the R&D division looks at what is possible in a really short term. But, what this division wants to do instead is look for the step further, for example: what kind of superyacht we would make in 2030? We want to roadmap towards that step. However, this is something we do not have the time for yet." Company representatives identified that their competitors often share vision concepts that incorporate several technology innovations at events like the Monaco Yacht Show. They also mentioned that an important condition of these investigations in the maritime industry is the fact that "clients –billionaires– want to keep the superyachts' features secret" due to security reasons.

With regards to this case, the R&D Manager would like to see "an external party research the company and explore its future" to learn about the technique, and the Design Manager wanted "to view both the concept, a superyacht in the long-term, and its context".

Using the Strategic PES, participants defined Oceanco as 'Luxus Streamliner' (see Figure 6-29), a medium-sized fish that dwells in exotic waters. In their opinion, to survive in this glamorous habitat, Luxus attracts the clientele, a niche market shaped by billionaires, using its tiny and flamboyant tail. To move this distinctive tail, "it has a muscular and compact body, surrounded by a large group of crabs, the subcontractors". Participants observed that although this very competitive specimen is part of an exclusive business, its behavior and personality are humble and reserved. They also identified that the Luxus' reproductive system is complex; it produces eggs, placed into shells carefully crafted by the crabs, only once per year. These eggs, which take at least five years to hatch, are a display of total luxury and thus are notably expensive. According to this analysis, participants described the domain for this exploration as "luxury on the water" and set the time frame for the vision

concept in 2033, the speculative future. During the analysis of the context factors, participants remarked the increase in the number of billionaires, the shifts in world wealth distribution, and the philanthropy as a fashion. They also noted that wealthy people desire to reach new destinations such the arctic or the moon, and technology moves towards the human-machine integration. Given these insights, participants defined the future vision as: "Oceanco wants to redefine the notion of Luxury on the water" (see Figure 6-30). After a long discussion, the designers brought sustainability as the most important value of this exploration, including questions such as: is luxury meant to be so extravagant?

Figure 6-29. On the left, a drawing of Luxus Streamliner; and in the center and on the right, participants using the canvases during the final conversation. Source: the author.

Figure 6-30. The collection of canvases used during this case: the Strategic PES with the domain and time frames, the context factors and the vision of the future, the description of the vision concept, and the roadmap with the three time frames. Source: the author.

In view of this vision statement and value, the designers made the vision concept 'Heaven of the seas.' It depicts a catastrophic 2033 when billionaires are worried about a potential crack-up of civilization. In this context, the superyacht is conceived more as a bunker alternative over the water; thus, it includes special features that make it self-sustainable, such as a greenhouse to harvest food, covers that collect and store solar and wind energy, and medical facilities with virtual connections to specialists all over the world. In this vision concept, designers consolidated ideas about the environmental awareness as a new fashion, one that is more appealing to wealthy people, targeting their narcissistic behavior. Accordingly, this proposal considers the superyacht also as a means to preserve ecosystems allowing partnerships with scientific institutions and researchers that may conduct projects on board. The designers made a video (see Figure 6-31) as media to communicate this vision concept to the company representatives. In this video, the designers acted in a role play, an informal conversation between two billionaires' wives, in which one of them is

showing off her superyacht and the particular features that makes it unique. As part of the conversation, they had the support of a device that through voice commands shows images of the superyacht and its features.

Figure 6-31. Frames of the video 'Heaven of the seas. Source: the author.

Considering this vision concept and to make the recommendations more actionable, the designers drew a roadmap that compresses several ideas for the medium- and short-term. As part of these ideas, they made two concept products: 'Oceanco future lab' for the year 2028 (see Figure 6-32), and 'Green luxury' for the year 2023 (see Figure 6-33).
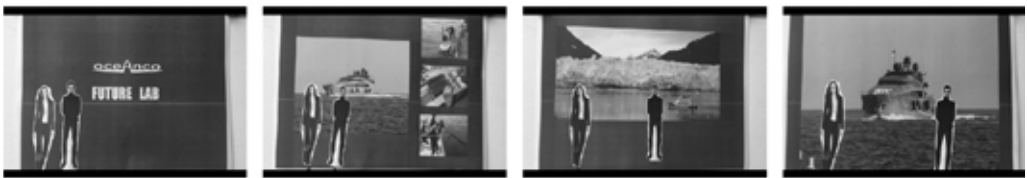

Figure 6-32. Frames of the video 'Oceanco future lab.' This animated video, which used puppets, staged a new brand strategy launch, presented by Bianca, a faithful customer, and Lion, the Oceanco's Product manager. It suggests transforming a superyacht into a mobile research facility to conduct research on maritime technology and shows users how to establish partnerships with scientists. This lab also invites billionaires to start "measuring their wealth by the number of Nobel prizewinners who do research on their superyachts, instead of the money they spend maintaining those luxury products. Source: the author.
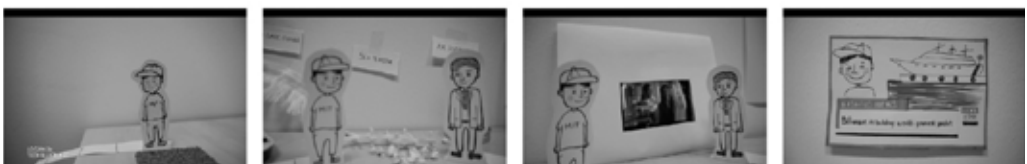

Figure 6-33. Frames of the video 'Green luxury'. This staging, which used puppets, music, and video, was created to target the new kind of billionaires, those who came from tech companies and have a different mindset regarding environmental and social responsibility. The concept product proposes the development of new eco-oriented features for superyachts, for instance, sea plastic cleaners, sea planters, and air purifiers. It also alludes to the integration of new technologies and the co-creation process of the product with the customer. Source: the author.

More information and the full videos of these vision concept and concept products in Appendix Chapter 6 online http://dive.pktweb.com/

DIVE's evaluation

According to one of the experts, DIVE answers "the challenge of SMEs to find a middle-way to think about the future in an understandable way". Participants and experts considered "DIVE [to] offer a simple way to think about the multiple, ambiguous, and complex futures". According to Expert 3-1, "this way of visioning starts with an idea instead of a deep analysis of the whole broader world", giving a different perspective to envision the future. A perspective that produces "more futuristic and more aggressive ideas" (Design Manager). In accordance with experts, DIVE "fits the SMEs' characteristics and therefore, with limited resources [and] limited time for your brain to think about the future." As part of that fit with SMEs, company representatives considered DIVE to encourage participants to 'thinking by doing' whilst they manage to find out what could be the future. Or as Expert 3-2 said about this hands-on technique, "you just keep doing and don't forget about the future".

Table 6-10 displays the summary of the grades of the final case's activities. The positive and negative grades are indicated in grey and white respectively. As in the previous tables, Appendix shows the detailed grades of the evaluation of the effectiveness of the activities and outcomes, the efficiency of the toolkits and time allocated per activity, and the satisfaction of the participants.

Table 6-10. Results of the final case in regards to effectiveness, efficiency, and satisfaction

		Effectiveness										Efficiency DIVE 0.1 Canvase Folders					Satisfaction
		Activities	Clearness	Usefulness	User-friendly	Outcomes	Plausible	Relevant	Inspiring	Human-scale	Time	Usefulness	User-friendly	Usefulness	User-friendly	
Ev. 3	Case 6	(1) Understanding the present				(a) Domains and time frames										
		(2) Approaching the future				(b) Vision statement										
		(3) Exploring the future				(c) Vision concept										
		(4) Communicating the future				(d) Prototype and video										
		(5) Looking back into the future				(e) Recommendations										

Effectiveness

DIVE proved its *efficacy* as a design-led futures technique. The technique supported participants in the exploration of Oceanco's preferable future. Designers and company representatives made and shared a vision concept and came up with a set of recommendations, including two concepts products for the world as it is and the near future.

According to the participants, DIVE's general process is understandable, fruitful, and convenient. However, *Activity 1* and *2*, in which designers analyzed the enterprise

and the context factors to form a vision of the future, were particularly difficult to follow.

We observed that when designers applied the Strategic PES in *Activity 1*, they focused mostly on the product losing the chance to have a comprehensive view of the company. This lack of focus led to a struggle during the final assembly, in which they glued all the parts together. Company representatives and experts also identified this issue. In their opinion, it was difficult for the designers to grasp such a specialized company, because the type of products that it develops and the niche market that it serves is far removed from their knowledge. Expert 3-2 claimed that "is tricky to get into a billionaire's shoes, their particular world and behaviour." Even though the activity was laborious, the definition of the *domain* and *time frames* was quite fluent and this outcome was positively assessed by the experts.

In *Activity 2*, designers managed to collect a significant number of relevant context factors, but they did not have enough time to properly cluster them. This did not stop the company representatives from thinking that this activity was useful to "transfer a lot of uncertainty into quite certain points where you are able to work" (R&D Manager). According to the R&D Manager, these certain points came together in a 'hypothesis about the future', which, in his opinion "was very specific and thus could be tested along the following activities proposed by DIVE." This *vision* of the future was identified as beneficial by the participants and experts in two distinctive contexts: inside and outside the company. The R&D and Design managers of Oceanco mentioned that this vision could help them decrease uncertainty through wider dialogs about the future inside the company. According to the R&D Manager, "communicating this hypothesis would help a lot with employees like engineers, who actually focus on eliminating uncertainty instead of handling it". Expert 3-1 considered that this vision makes it more likely to have "a wider dialog than they would have without it [...] You will get conversations about the meaning of many different topics, such as sustainable yachts and co-creation." According to the Design Manager, "based on the future context [participants] derived a vision and this is the one the company wants to communicate outside" to display a strategic direction and inspire the general audience.

According to the participants, *Activity 3, 4,* and *5* –in which they created the vision concept, made the prototype and video, and talked about the future and the present to produce recommendations for the company– were straightforward, beneficial, and easy to follow.

Having defined the domain, time frame, and vision, the designers quickly and easily self-organized in *Activity 3* to create several ideas about the *vision concept* and select them based on the vision statement. According to the experts, the selected vision concept, which is a new mindset of the notion of luxury for billionaires instead of a product or service for this market, is too radical for the time frame, 2033. Experts saw this proposal as not plausible considering the complexity of making a shift in the way billionaires think, and also because it is not clear how the company can

make its users think in that way. According to Expert 3-2, "even though the vision concept points to a desirable future in view of the designers and experts, in terms of Oceanco's business, it could be naive and idealistic". The R&D Manager echoed this opinion, saying that the vision concept was the result of "the designers' idealism, which is good because that's what they all are, they should be a bit idealistic".

Furthermore, the fact that this activity ends in just one image of the future, embodied in the vision concept, was acknowledged by the experts as positive. Expert 3-1 mentioned that "the multiplicity of the future is difficult to grasp if you're not trained to think about uncertainty. Usually people are trained to rule out uncertainty. So, you need to slowly make this cultural switch in people's minds. It is not just if you lack the time to talk about the future, it is about the ability to cope with uncertainty." With this regard, Expert 3-2 concluded that "SMEs lack the ability to handle the multiplicity of futures", therefore, offering them just one image of the future was perceived as positive. Otherwise, the expert also suggested that "if you want to have the multiplicity of futures that others futures techniques offer, such as scenario thinking, maybe you can make multiple superyachts [vision concepts] and then make one that's more research-oriented, and another that's more for the doomsday survivors thing".

Moreover, participants and experts also recognized the opportunity to share this vision concept externally to "set the brand image." According to the Design Manager, this artifact is beneficial to "attract and inspire new clients, displaying company's capabilities, showing that the company is ahead of its competitors."

Designers used different illustrations and mockups as part of the development of this vision concept in *Activity 4*. These ideas were subsequently refined to make a story, which was staged in a simple video. Although they identified their lack of experience in making videos, its development did not represent any inconvenience. Initially, the designers planned the story carefully using storyboards and scripts; later, they conducted several rehearsals; and finally, they made a single shot with high success. According to the experts, this *video* "had a great quality and comprehensively presented a story that actively encouraged the creation of new ideas for the company." Company representatives were also satisfied with the level of resolution of the videos, so much for the vision concept and the concept products. According to the Design Manager, "making the videos sketchier helps the discussion afterwards." He mentioned that "is easier to say something about it because is not a fixed future which apparently took a lot of time so it must be the true; if it is sketchy like this, I feel more open to give my comments on it".

The designers also planned and executed *Activity 5*, the final conversation with the company representatives and external innovation experts, very efficiently and without major inconveniences. They managed the time and the participants without any problem. Experts also acknowledged the value of the development of concept products as *recommendations*, which bring applicable insights to the company for the near future and the world as it is. They assessed positively the coherence of these

developments with the domain, the inclusion of human being as an essential element, and how these artifacts inspire the organization to explore new opportunities.

Even though the participants acknowledged the value of the analogy that drives DIVE, due to the complications in conducting Activity 1 and 2 mentioned earlier, the potential of the analogy could not be fully exploited.

Efficiency

With regards to the *efficiency*, the *toolkit* available for the designers were sufficient and appropriate to conduct this exploration but the *time* allocated for the first two activities was considered insufficient.

Designers positively assessed the value of the *toolkit DIVE 0.3*, in particular *DIVE logs*, the canvases and folders, and *DIVE plan*, the poster. The canvases were used extensively in the first two activities to map the company and context and to cluster the context factors when creating a vision. According to the Designer 6-2, "the canvases are good because they are large and you can hang them on the wall […], and then you can see the whole process." During the introduction of the final activity, the designers relied on the canvases to describe each activity and its outcomes. *DIVE plan*, the poster with the overview of the technique, was also highly valued by the participants. It was especially useful when the researchers explained the process to them, and when designers planned each activity. DIVE 0.3 was also useful to instruct designers in the way to facilitate the final conversation including some insights from previous experiences. At the end of the case, designers brought *DIVE logs*, including the folded canvases inside the folders, using *DIVE plan* as an envelope, to the company representatives, who highly appreciated it as the final deliverable of the exercise. However, *DIVE depth*, the rule to remind the time frame of the exploration, was not useful at all. Although this tool was available permanently to the participants, they did not even use it, and researchers did not find the proper moment to suggest its use.

Although company representatives and experts considered that it was "really impressive what designers have done during this short time" (Expert 3-1), participants mentioned that they did not have enough time to get familiar with the toolkit in Activities 1 and 2. With regards to the length of Activity 1, Expert 3-2 mentioned that "you don't have to be a billionaire to understand their behavior, but the complexity of these people requires some time to grasp their conduct"; therefore, adding time for exploration could have a positive effect. The R&D Manager echoed this opinion, saying that this activity should be stretched out. He proposed that, due to the complexity of the end-users in this case, before Activity 1, the designers should receive a package of information, or in general "you should do each activity and thus have some time to prepare for the next activity." The Design Manager suggested that this package could include different sources such as "industry reports from yachting competition, maybe visit a port where the yachts stand." In this regard, Expert 3-2 also suggested that "some parts of the exploration should be outsourced to other companies, for

instance the research of trends" for Activity 2. "If designers would have known more about the industry, the questions would have been more precise. The research should be there but it should be in advance of the process" (Design Manager). It seems that the preliminary activities deserve a whole day, and reducing Activities 1 and 2 from 4 hours in Case 5 to 2 hours in Case 6 was a step back. Participating designers appreciated the collaborative working with the company representatives, as designer 6-4 claimed: "working in close collaboration with the entrepreneurs was essential to fulfill the goal of the exercise. They support us with their business experience and extensive knowledge of the domain".

Satisfaction

In sum, designers expressed their enjoyment of working with DIVE which gave them the chance to work free from the restrictions common when designing commercial products. Even though they felt rushed at the start of the exercise due to the short time and different working style, with Activity 3 they took control over the project and felt more at ease. The R&D Manager was very satisfied with the exercise, mentioning that "the researcher planned to develop future concepts with a group of designers in just 2,5 days. I found this very short, but after the case the results were impressive. Although the designers were not familiar with our industry, they were able to analyze our company, work with the toolkit, and provide us with concepts for more than 15 years into the future".

Seven months after finishing the evaluation the company representatives mention that "DIVE can guide Oceanco in defining a future based on a changing environment. Due to the compact and efficient approach, it can be easily implemented within the current company structure, producing valuable outcomes." They also claim that although the company is currently a product-based sales business, all the vision concepts, created as outcomes of the exercise, point towards a service-based one in which Oceanco will sell its know-how as the main product. It seems that in the future scenario envisioned by the participants, product-service systems have more meaning for customers and therefore will add more value to the business.

Discussion about Evaluation 3

During this case, a group of external designers and the company representatives of Oceanco evaluated DIVE 0.3. As detailed earlier, five professional designers and Oceanco's R&D and Design managers finished the activities of DIVE successfully, making applicable recommendations for this company.

Even though the designers faced some difficulties during the first two activities, they finished this futures exploration successfully. The complication conducting Activity 1 and 2 could be related to the lack of time that designers had to familiarize themselves with the toolkit, or the differences in working style between designers and researchers. Due to the reduction from 4 hours to 2 hours in both activities,

participants also did not have sufficient time to understand the toolkit. Moreover, whereas the participating designers were used to follow prescriptive techniques which allow precise control over the activities and outcomes from the beginning, the researchers proposed a more exploratory exercise. Activity 1 involves a high level of uncertainty in which the technique, company, and even the participants are unknown.

The achievements in the final three activities could be due to the designers' experience in dealing with this type of activities –designing products and services, making prototypes of services, and facilitating conversation– or due to the enhancement of the toolkit in view of the previous evaluations.

Participants and experts highly appreciated DIVE 0.3, in particular the combination of DIVE plan, the poster, and DIVE logs, the folders and canvases. This complete package was also useful as the final deliverable of this exploration. The webpage was also important as a way to keep all the information centralized. However, DIVE depth, the slide rule that help participants indicate the time frame(s) of the exploration was not useful, but perhaps another artifact that keeps company representatives in the future, might be of benefit for the technique. Chapter 7 presents the final version of the technique that incorporates these insights and opportunities.

6.3 Discussion

Through these cases, we identified the benefits and limitations of DIVE and thus its potential for improvement. We collected seven significant insights, which will be developed further in the coming chapters.

- *DIVE positions design as a strategic asset, instead of the operational problem-solving approach, which is very widespread among SMEs*. This difference in perception helps designers to position themselves as strategic advisers for SMEs and not just as creators of images, products, or services.

- *DIVE offers an alternative to learn by doing when it comes to new technologies for SMEs*. It is especially useful for SMEs, which rarely have specialized researchers or R&D departments with the facilities to conduct extensive investigations.

- *DIVE can be very helpful in identifying opportunities and risks when envisioning the SME's future, but designers need to push boundaries*. Even though DIVE can guide SMEs, which have an explicit commitment to their families and communities when thinking about the future, designers need to be aware that these companies may be short-sighted when making decisions. SMEs have constraints that determine their vision of the future, associated with the ambition of technical predictability that leads to an inability to make riskier future bets. Given this limitation, DIVE led to ideas for long- and short-term challenges, their timing, and the potential alliances and allies to develop

them. It is not a surprise that DIVE also led to distinguishing uncertainties. Participants used the company's values to make decisions through the activities; from defining the domain to selecting recommendations. They also incorporated the company's values into the futuristic artifacts, and they made decisions about desirable tomorrows, facing sensitive topics on how preferable one future is in comparison to another. Participants identified the conversations in which these topics emerged as most difficult. Even though the artifacts are valuable in contextualizing the debate about the future, the designers need strong skills for facilitating these sensitive conversations or even the support of other professionals in this work. In sum, when exploring the future, designers need to push boundaries to face the urgency of the present and reconnect enterprises with their values.

- *DIVE allows participants to distance themselves from the everyday and thus gain perspective to develop new ideas.* Participants can look at the future –from the present– to conjure up a vision, and look at the reality –from the future– to define the strategy to reach it. This perspective opens fictional worlds and suspends disbelieve about the possibilities in it.

- *DIVE's analogy, which is reinforced by the visuals, drives SMEs smoothly along the exploration of the future, but it needs to be strengthened at the end.* The scuba-diving analogy guides and supports designers and enterprises when dealing with the complexity of understanding the company's current situation and envisioning the business' future. In the beginning, the analogy is appropriate to attract participants' attention and they are enthusiastically involved in the experience of the exploration. Along the process, it helps participants to maintain distance from the urgency of the present, and gives structure to the analysis and sharing of the future. Even though the final activities already fit the analogy, to ensure their coherence with the whole technique, the role of the fish in the final activity still needs to be made more evident, and include more visuals or artefacts, which keep the participants immersed.

- *DIVE's toolkit brings SMEs visual memories of this exploration of the future.* By following the analogy and supported with the toolkit, designers approach this exploration of the futures as a visual exercise. This visual way brings clarity and coherence when documenting the sequence of activities and reporting their insights; it is easy to go back and check the consistency of the process.

- *An external design team gives a fresh view of the future, but it needs time to grasp the character of the SME.* This illustrates the importance of including foreign and 'uncontaminated' designers, who bring a new perspective and help in the identification of the undiscovered futures. However, it is vital to give them space to grasp enough insights about the company and its business context during the first two activities.

In addition to the values of this technique, these cases brought us two extra ideas to

further explore.

First, it seems that, when prototyping the future, the boundary between exploring and communicating is blurry. Prototypes and videos were vital to share the vision concept with the company representatives, but more important still to shape and detail those fictitious services into a tangible form. It appears that exploring and communicating the future falls on a continuum in which designers create the vision concepts and thus detailed them through the making of the prototypes and videos. Unlike the way automakers use videos at the end of the exploration to communicate the interaction between users and concept cars in future contexts, which was described in Chapter 3, SMEs can use simple videos as part of the exploration to create, mature, and share ideas, and produce new ideas alongside the discussion that it produces.

Second, although the majority of the SMEs of these evaluations exclusively focused on products, most vision concepts were futuristic systems of products and services –services that incorporate some products. It can be seen as part of the macro-trend of servitization in which manufacturers move towards delivering service propositions.

In conclusion, these evaluations demonstrated that the learnings that we obtained from the unique way in which automotive corporations apply concept cars, other corporations incorporate concept products, and designers use critical design and design fiction to envision the future were turned successfully into a technique for SMEs. All these evaluations serve as evidence that this technique is useful in supporting SMEs in the creation and sharing of vision concepts to receive some of design's benefits when exploring the future.

Recommendations
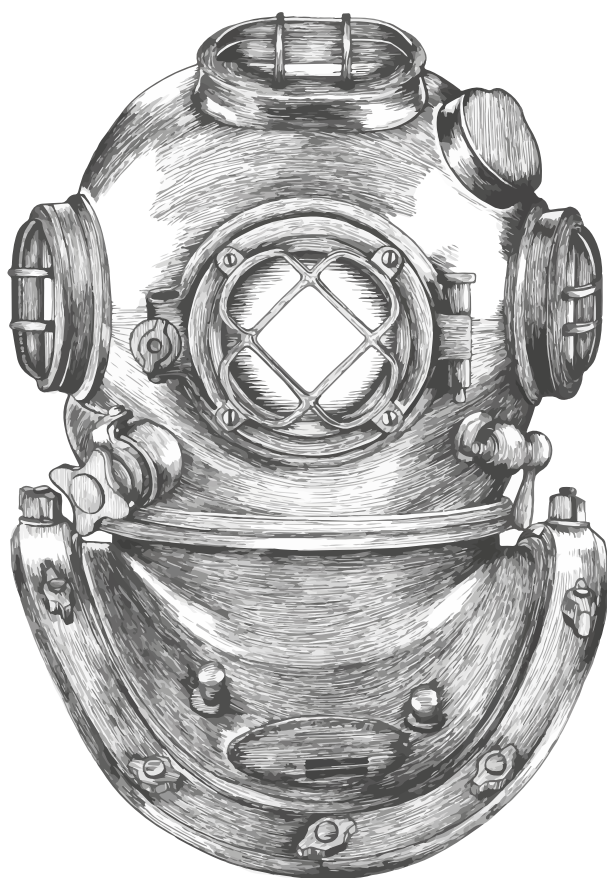
Aplication of DIVE in practice: recomendations and considerations

7.Aplication of DIVE in practice: recommendations and considerations

The previous chapters of this dissertation studied the way corporations use design to explore the future and then distilled this into DIVE, a design-led futures technique that helps SMEs think ahead and thus act in the present. After the development of this technique, these chapters also evaluated DIVE 0.1, 0.2, and 0.3. Three rounds of evaluations of DIVE with SMEs improved the technique and gathered the most relevant benefits and limitations of applying it with SMEs.

As mentioned in Chapter 1, this inquiry makes use of a research-through-design approach to address a design question, which contributes to solving a practical problem for SMEs, and several research questions, which reveal new knowledge on futures studies and design.

This chapter, which focuses on the practical part of this approach, aims to bring a solution for SMEs in the form of the final version of DIVE, DIVE 1.0, that answers the design question (G) of this scientific inquiry. In view of its practical character, the chapter takes the form of a handbook for practitioners describing the implications of the technique's activities and outcomes. Accordingly, it uses a straightforward structure and a less academic language to describe the lessons learned from previous iterations and cases in which DIVE was applied, and also includes some contributions from the professional experience of the author.

These guidelines can be used by designers and design students who want to apply DIVE with small businesses and are arranged in four sections: Section 7.1 describes the principles behind DIVE and Section 7.2 describes how to allocate the necessary resources. This section also explains how to conduct the activities and describes the expected outcomes of this technique. The closing Section 7.3 illustrates how to use DIVE's results.

7.1. DIVE's principles

DIVE is a strategic design technique for SMEs that creates ideas of the speculative future to shape actions in the world as it is, and thus, helps these companies innovate.

DIVE was developed for a range of enterprises from small- to medium-sized, which use its flexibility and flat structure to handle change as a competitive advantage. The technique could be applied to enterprises that offer products or services to other companies, business-to-business, or to end-users, business-to-consumer.

This technique works well with SMEs that already have experience with applying design and also could be used to introduce design into SMEs new to this practice. The advantage of using DIVE as a way to introduce design is that it helps designers position themselves as strategic advisers instead of product or service developers, entering into these enterprises at the top- and middle-levels of management.

DIVE can be used as *a design practice within the front-end of SMEs' innovation strategy* to identify opportunities and threats and to give a sense of direction when the company faces a significant change. It begins with setting a vision, embedded in an artifact, and then working back to map a path of ideas, connecting the future to the present. Through DIVE, managers develop a concrete vision, made tangible and evocative through the form of prototypes and videos. These outcomes help them in dealing internally with employees, or externally with —potential— users, allies, and investors. If used externally, to demonstrate the vision of the future, it requires a refined prototype and a more professional video. DIVE can also be used as *a research-through-design technique at the start of a new product's design process*, more precisely in the front-end exploration, before a concept is defined. In this role, it combines all the results of previous investigations on product, market, and technology to define a design brief and a set of criteria to select the most promising ideas.

In both cases, DIVE includes three principles:

1. *The importance of exploring speculative futures with people and for people.* DIVE considers that exploring the speculative future and choosing the preferable one is a shared task in which different people have something to say and make. Company representatives, who give a relevant and plausible business perspective to the future vision, and external designers, who make this vision tangible and accessible, are the core of this co-creation in which external experts also get involved. External experts bring their knowledge about the experience as users, or expertise in ethics, innovation, and sustainability. DIVE also creates desirable futures from the perspective of the people who will inhabit them. This human-scale perspective allows participants to explore possibilities and propose recommendations about the future and the present, based on the convergence of the people's and company's values. It

generates discussions about what is preferable for the people instead of just what is possible for the company.

2. *The power of making artifacts and sharing these through stories to keep the futures exploration concrete.* DIVE is a hands-on process in which participants make and share different types of prototypes, from scribbles to rough prototypes, to explore the speculative future. Along the exploration, participants create narratives that give user and context to these artefacts of the future and thus facilitate the sharing of them. These narratives initially take the form of role playing exercises that describe the company in the world as it is, and finally take the form of a simple video about the speculative future. These artifacts and stories focus the discussions on the relevant elements of the future that an SME can control.

3. *The potential of visuals to create memories of the futures' exploration.* DIVE provides a collection of visual forms to document the activities and outcomes. The designers' visualizations help participants make sense of complex matters at hand as part of a learning-by-doing process. They visualize matters such as the tensions between company' values and its product portfolio, and the company's vision and future context factors.

7.2. DIVE 1.0

The principles introduced in the previous section should be a constant along the activities presented in Chapter 5 and summarized in Table 7-1.

Table 7-1. Overview of DIVE 1.0

Activities	Activity 1	Activity 2	Activity 3	Activity 4	Activity 5
	Understanding the present	Approaching the future	Exploring the future	Communicating the future	Looking back into the future
Goal	Set a time frame and domain	Define a vision	Create a vision concept	Make a prototype and video	Map the company's future
Tools	Strategic PES	Desk research and eldwork	Prototyping	Prototyping and storytelling	Debating
Toolkit (visual tools)					

	Activity 1	Activity 2	Activity 3	Activity 4	Activity 5
DIVE plan	*Bring an overview of the technique*				
DIVE log	*Activity 1 log*	*Activity 2 log*			*Activity 5 log*
DIVE repository	*Provides instructions and background information*				
Participants and time					
Company representatives (12 hrs.)	*4 hours*	*4 hours*			*4 hours*
External designers (24 hrs.)	*4 hours*	*4 hours*	*4 hours*	*8 hours*	*4 hours*
Users (4 hrs.)		*4 hours*			
Ethics expert (2 hrs.)			*2 hours*		
Innovation expert (4 hrs.)					*4 hours*
Outcomes	*Time frame and domain*	*Vision*	*Vision concept*	*Prototype and video*	*Roadmap of the future*

7.2.1. Resources

The lessons from Chapter 5 and 6 taught us that the main resources needed are the *toolkit*, *people*, and *time, money and facilities*.

Toolkit

We incorporated the insights from Chapter 6 in the final version of the toolkit DIVE 1.0 taking advantage of 'the potential of visuals to create memories of the futures exploration'. DIVE 1.0 contains three visual tools: *DIVE plan, DIVE logs*, and *DIVE repository.*

DIVE plan (see Figure 7-1) is a brochure with an overview of the technique. It is designed to be printed in a medium-sized format (A3) and folded to serve as a folder and arrange the logs together.

Figure 7-1. DIVE plan. Its front cover includes a short presentation of the technique; its interior displays a blueprint of the activities and a table with the participants and the schedule of the activities; its back cover describes the toolkit and some information about its copyrights. DIVE logs include three large-sized (see Figure 7-2) canvases to help designers visually record the activities and outcomes of DIVE. Source: the author.
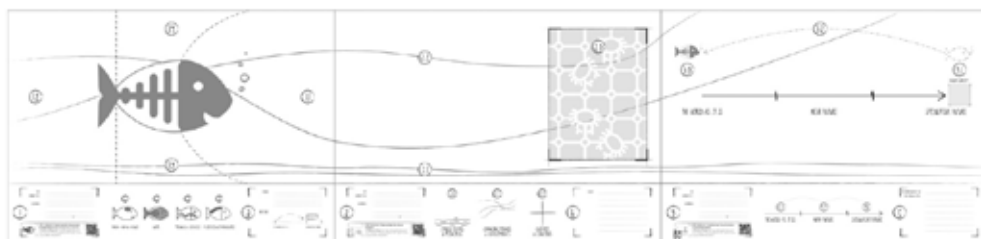

Figure 7-2. DIVE logs. As in the original version of the canvases introduced in Chapter 5, these forms have two strips: at the top, a diagram for comments during the workshops, and at the bottom, a tag to identify the canvas, the conventions of the diagram, and a form to fill in with the outcome. Notice the way the three canvases work as a tryptic. Source: the author.

Log of Activity 1 (see Figure 7-3) sketches the insights of the analysis —Strategic PES— that contains the company's (1.1) know-how and values, (1.2) users, (1.3) products and services, (1.4) facilities and stakeholders, to end in a *(a) time frame and domain.*
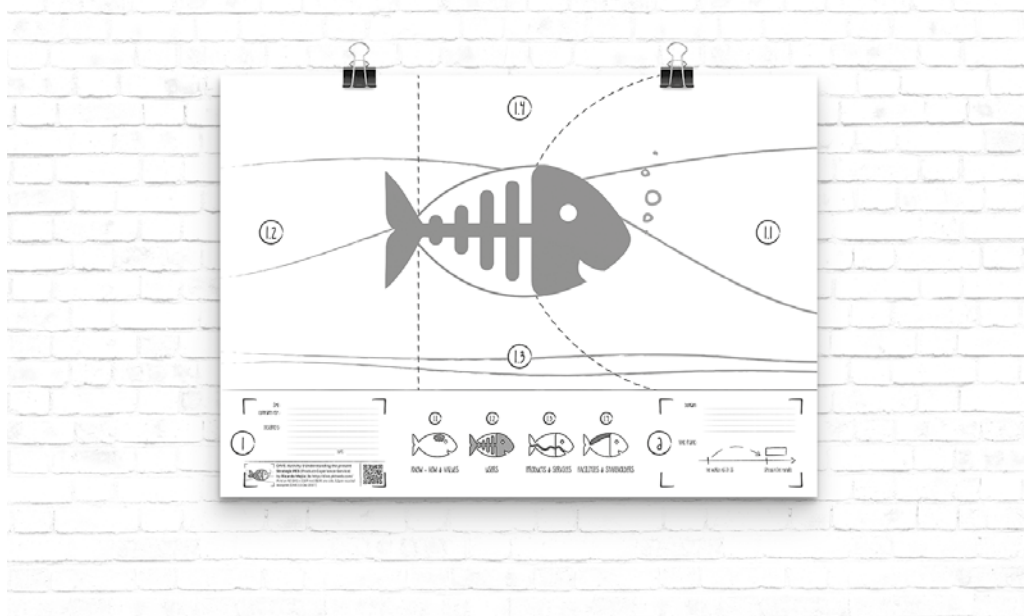
Figure 7-3. Log of Activity 1. Source: the author.

Log of Activity 2 (see Figure 7-4) reports the research that gathers the (2.1) stable states and principles, and (2.2) changing trends and developments, to (2.3) cluster it and identify its potential concerns. This analysis results in a *(b) vision*.
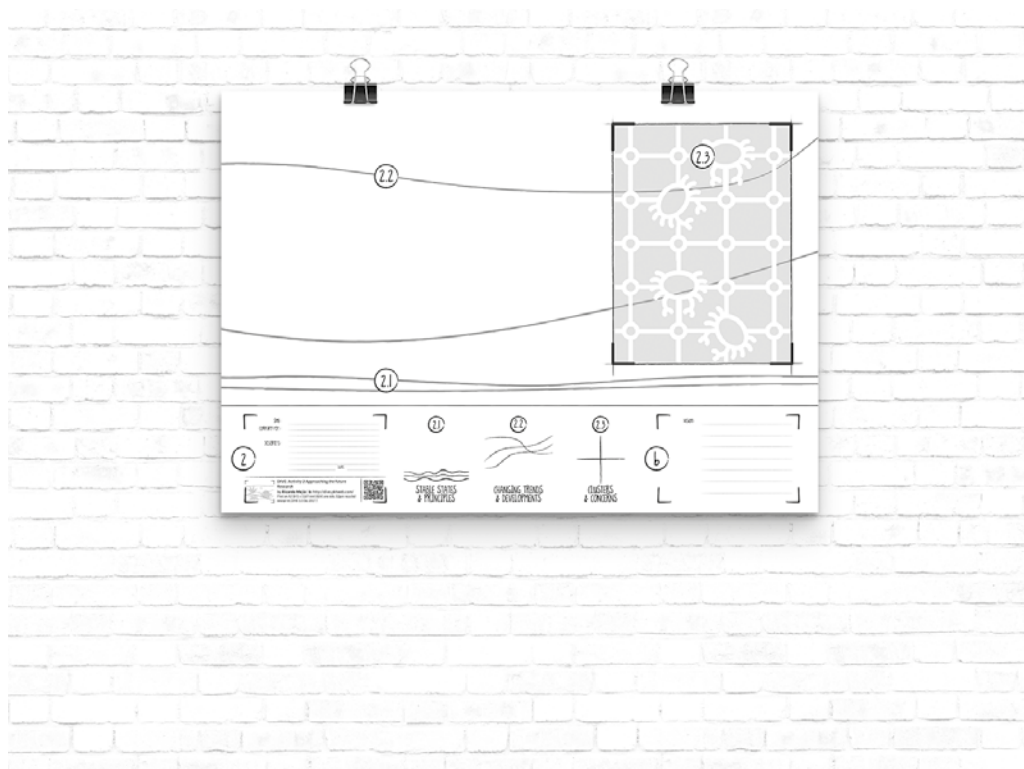
Figure 7-4. Log of Activity 2. Source: the author.

Log of Activity 5 (see Figure 7-5) supports participants in making the roadmap from the *(e) recommendations* for the (5.1) speculative future (where the vision concept is located), the (5.2) near future, and the (5.3) world as it is.
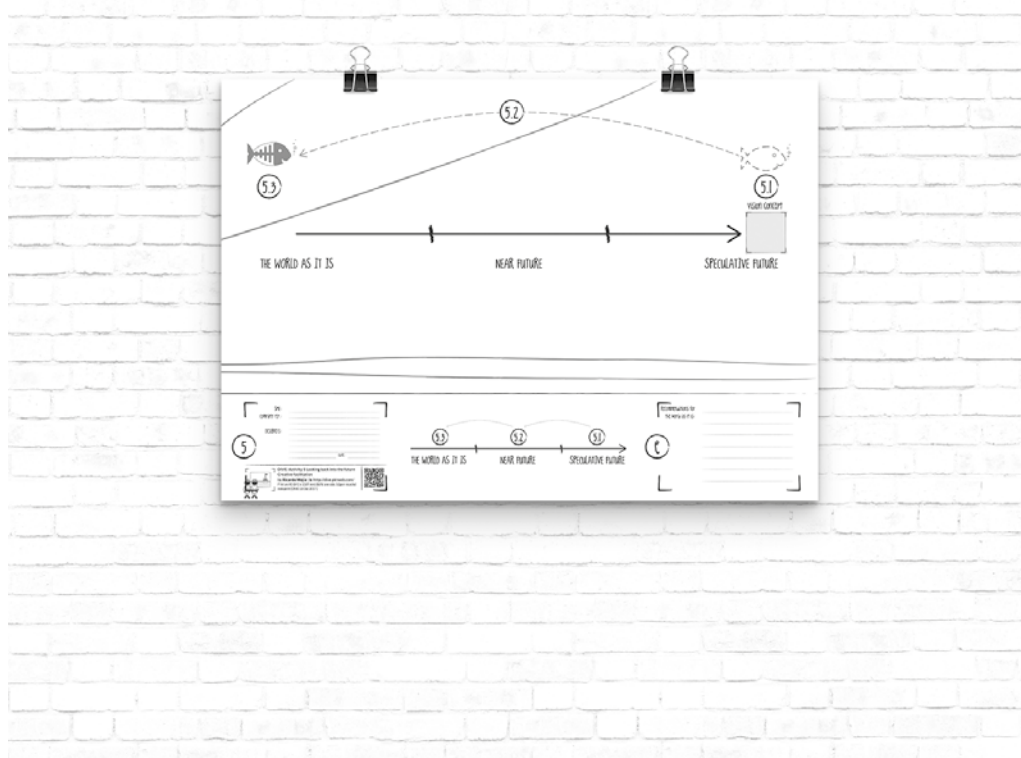
Figure 7-5. Log of Activity 5. Source: the author.

In view of the evaluation of DIVE with SMEs, Activities 3 and 4 do not need canvases because these activities deal with three dimensional artefacts and visual narratives.

DIVE repository (see Figure 7-6) is a website in two languages, English and Spanish, which gives designers the necessary instructions to conduct the future exploration. It also includes some background information.
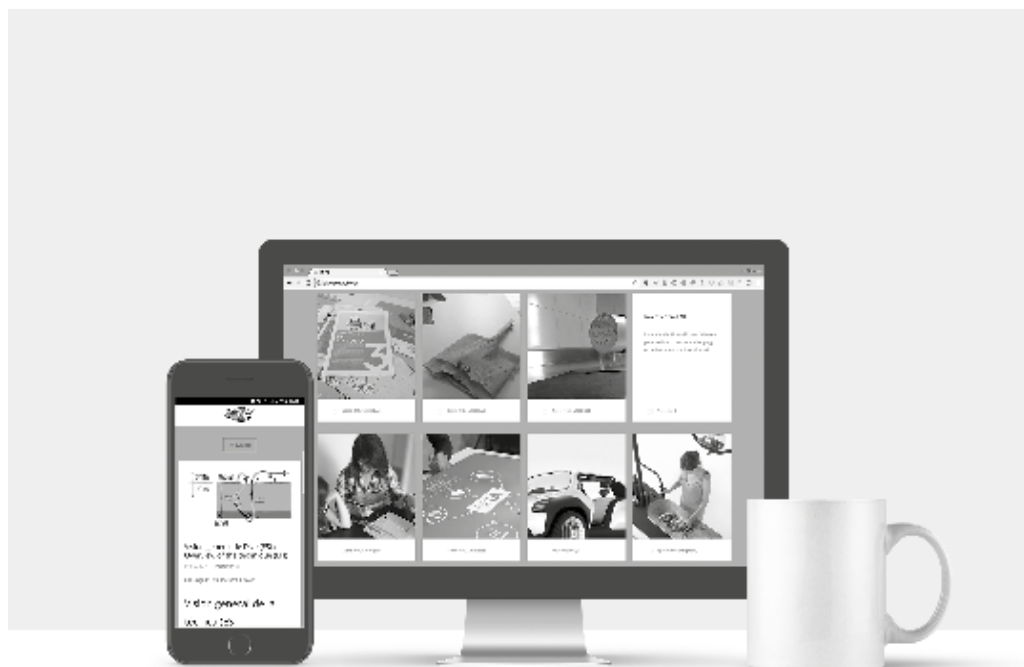
Figure 7-6. Screenshots of the DIVE repository. Source: the author.

At a practical level, designers should translate the toolkit to the participants' mother tongue or a shared language. They should also print the DIVE logs early, considering that this can be time consuming, and follow the instructions to avoid wasting time and money.

People

DIVE includes a core team that consists of two or three *company representatives* and up to five external designers to develop these activities. In addition to them, DIVE includes complementary experts, if possible: several *users*, an *ethics expert*, and two *innovation experts* at critical moments during the process. Although they are not indispensable to develop the exercise, the evaluations showed that they can boost the quality of the application of DIVE and its outcomes. Table 7-2 describes an optimal team composition to apply this technique including the core and complementary team.

Table 7-2. Examples of an optimal team to apply DIVE

Core team

Company representatives	
Role	*Problem owners who benefits from the insights of this exploration.*
Suggested number	*Between two to three company representatives.*
Level and experience	- *Top- and middle-level managers positions, including ideally some of the founders and owners of the company.* - *Managers who represent at least two different functions in the company, such as management, R&D and innovation, design, and marketing, to bring knowledge about the company` trajectory, a clear overview of its current situation, and enough influence to define actions for its future.*
Considerations	- *With only one company representative it is impossible to have a complete perspectives of the company.* - *With more than three representatives time management becomes complex, especially in the final conversation that also includes external experts.*
Practicalities	- *Designers should block the company representatives` agenda early to be sure that they can attend each and every one of the activities in which they should be present.* - *They should try to initiate the activities in which company representatives participate once everyone is present, to avoid misunderstandings and to prevent waste of time recapitulating aspects already discussed.* - *When planning the agenda with company representatives, designers should be sure to include a time buffer of between thirty minutes and one hour for the final activity.*
External designers	
Role	*Process owners who facilitate the process.*
Suggested number	*Up to five external designers.*

Level and experience	-	Designers with balanced expertise among researching, prototyping, and facilitating: they should be able to conduct a simple business analysis, and undertake a basic desk research and fieldwork to gather the context factors. They should be also capable of making rough prototypes and simple videos, and above all, they must be able to facilitate a series of conversations with company representatives and experts.
	-	External designers bring a refreshing perspective about the time to come. They invigorate the application of DIVE with different views that help open new opportunities and discover new risks.
	-	Consider mixing senior and junior designers, as this combines skeptical and pragmatic seniors with idealistic and naive juniors, providing an interesting balance for the application of DIVE.
Considerations	-	A large group of designers will hinder the flow of activities, including the conversations. It can also result in participants losing the notion of time pressure that turned out to be positive at the time of development of DIVE.
Practicalities	-	Senior designers could lead the juniors during the conversations, ensuring the efficient use of time with company representatives and external guests; juniors could have room to explore during the other activities.

Complementary experts

SMEs' users

Role	Experts who support the core team with their experience with the company and its products, services, or businesses.
Suggested number	Two users.

Level and experience	-	Enough experience to bring first-hand insights about triggers, latent context factors, and context factors that are increasing or decreasing.
Practicalities	-	Ideally, they should be approached by the core team in their context as part of the fieldwork of Activity 2, but if this is not possible, the core team should invite them to talk as part of this activity.

Ethics expert

Role	Experts who help the core team with their expertise in applied ethics or philosophy.
Suggested number	An ethics expert.

Level and experience	-	Experience dealing with sensitive topics, such as consumerism, extravagant luxury, social inequality, and sustainability.
Practicalities	-	This expert could be present at the transition between Activity 2 and Activity 3 in which the core team consolidates a vision of the future that incorporates the values of the company, the external designers, and the users.

Innovation expert

Role	Experts who help the core team with their expertise in futures studies and innovation.	
Suggested number	Two innovation experts.	
Level and experience	-	People with knowledge about the innovation system and experience in dealing with innovation projects.
Practicalities	-	These experts could support the core team along the final conversation in Activity 5, boosting the collection of ideas for the different time frames and its distribution in a roadmap that includes: the appropriate actors, the right duration, and accurate budget to fulfill the vision concept.

Time, money and facilities

Figure 7-7 displays the way to allocate the time for DIVE, including twelve hours of the company representatives, twenty-four hours of the external designers, four hours of the users and innovation experts, and two hours of the ethics expert. After a *preparation*, external designers develop all the *activities* along three consecutive days including a day and a half with the company representatives for Activity 1, 2, and 5.
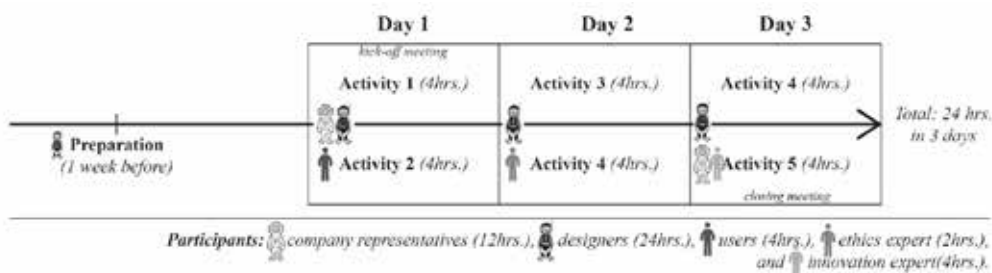

Figure 7-7. Timeline of DIVE`s application. In addition to the company representatives and the external designers, if possible, the users are present in Activity 2, the ethics expert participates in the first half of Activity 3, and the innovation experts are present along Activity 5. Preparation is useful for designers to get familiar with the toolkit and the company. Source: the author.

Bringing together all the activities over three successive days with a total duration of twenty-four hours strikes a happy medium when it makes the most of the advantage of the pressure to work against the clock and the suitable outcomes' resolution, both being appropriate for the needs and characteristics of the SMEs.

This time allocation is considered for the internal application of vision concepts in SMEs, thus sparking conversations with different employees about the vision of the future of these enterprises. If the enterprise would like to use the vision concept externally with —potential— users, allies, and investors in events such as in industrial fairs or business networking events, Activity 4 should be extended as necessary to fulfill the required prototype and video resolution. Another option would be to hire

third parties for the development of these outcomes.

When calculating the costs of this futures exploration, the salaries of the external designers and complementary experts in accordance to their level of experience and time involved, and the costs associate with the printing of the toolkit, and the making of the prototypes and videos should be included. If applicable, the costs of the venue and amenities also should be considered. In Case 2 with Solutions Group company representatives spent only 1.000 EUR, the maximum cost associate with the making of the prototypes and videos along the iterations and cases of this inquiry.

With regard to the facilities, the location of the exploration should be determined in view of the opportunities. A neutral location, neither the SME's or designers' offices, offers a refreshing and inspiring place to conduct this type of futures explorations in view of the iterations and cases of this inquiry.

7.2.2. Process

While Chapter 5 included a basic explanation of each activity proposed by DIVE and its intended outcomes, this section summarizes a set of guidelines to conduct the activity based on the evaluation of DIVE with SMEs.

When the *lead designer*, one of the external designers in control of this exploration, arranges the application of DIVE with the SME, it is important to clarify the goals of this futures exploration and thus the type of outcomes expected. Defining these matters is crucial to establish the evaluation methods and to adjust the criteria of assessment for the outcomes. For instance, deciding if the vision concept will be shared internally or externally must be considered to evaluate the type and quality of the prototype and video result of Activity 4. These methods and criteria should be incorporated in DIVE's application plan and need to be understood by the designers.

Having clarified the goals and type of outcomes, the lead designer must manage the expectations of all the participants —the core team and the complementary experts, if applicable— by presenting the approach, the roles and characteristics of the participants, and the investment of time and other resources. Moreover, the lead designer should discuss issues related to confidentiality in the management of information.

As part of the *preparation*, the lead designer should also provide the other external designers with the toolkit, a brief description of the enterprise, and a trend report or an equivalent document about the industry's context factors one week before starting the activities to give them the chance to get familiar with it.

Table 7-3 displays the description of the activities, including its resources, tasks, expected outcomes, and some practicalities, including tips and tricks on how to evaluate the activity and its outcome. This evaluation goes along the whole exercise. Designers must constantly observe the dynamic of the exercise while collaborating

with the other participants in an active manner, facilitating the activities. As part of this observation, designers should pay special attention to the *outcomes* at the end of each activity, and to the *activities* at the end of each day. With regard to the *outcomes*, designers can invite participants to informally assess the outcomes based on the criteria defined earlier (Table 6-7, Chapter 6). The criteria could be adapted according to the special conditions of the exercise. It is important to keep the evaluations of the outcomes at the end of each activity as informal as possible, without obstructing the flow of the exercise. A short and simple meeting among the designers at the end of each day is also useful to reflect on the dynamic of the activities, the way participants follow DIVE's instructions to make the outcomes, and how they interact with each other. These meetings are beneficial to identify problems and propose solutions in regard to the fluency of the activities and the team work. Ideally, the conclusions of these meetings should be documented in a notebook to keep the memories of the exercise and express it during the closing meeting.

Table 7-3. Description of the activities of DIVE 1.0.

Kick off meeting

During this meeting, the lead designer presents DIVE to the participants and introduces the participants to each other.

Participants: Three company representatives and five designers.

Resources: The full toolkit DIVE 1.0 (DIVE plan, DIVE logs, and DIVE repository).

Tasks and considerations:

A simple and short explanation about DIVE by the lead designer

Although some theory about futures studies is important, it is important to use examples of different design-led futures techniques and the variety of possible outcomes —from the refined prototypes and sophisticated videos of the concept cars to the rough prototypes and simple videos of design fiction— to illustrate the space of possibilities of these type of futures explorations.

Giving the participants the toolkit and explain how it works

If possible, this explanation should include a case that illustrate the making and sharing of a vision concept for an SME.

Practicalities:

- *Make sure to provide sufficient time for participants to become familiar with the toolkit.*

- *Use an ice breaker activity to finish this meeting, one in which participants have the chance to present to each other. Bearing in mind that this is the first time company representatives meet the external designers, make sure that during this activity they introduce themselves in the most simple and playful way to generate an informal atmosphere. This informal atmosphere, in which the hierarchies —due to differences of experience and education— are diminished, brings participants together and thus encourages more fluid and animated conversations. The ice breaker makes it easier for participants to talk and be at ease with the others, functioning as a transition to Activity 1.*

Activity 1 Understanding the present

It positions participants in the world as it is to understand the company by analogy with a fish. In analyzing the parts of the fish, its head, tail, belly, and back, participants understand the company's know-how and values, users, products and services, and infrastructure respectively.

Participants: Three company representatives and five designers.

Resources: Log of Activity 1.

Tasks and considerations:

Company analysis using the Strategic PES

The lead designer should have special attention for, and give careful instructions and sufficient time to, the participants when analyzing the head of the fish. Frequently, participants find it difficult to identify a company's know-how and values. In our experience, at first, they easily confuse what the company knows —the know-how at the head— with what the company makes —the products and services at the belly— until they clearly elaborate about the difference between the two.

- *Example: At first, the R&D and Design managers of Oceanco, a superyacht builder, claim that the company knows how to make superyachts. However, after a while they realized that the company knows how to translate billionaire's desires into luxury —maritime— solutions, which are currently being applied to superyachts, but in the future this knowledge could be applied to other solutions, whether at sea or on land.*

Another complicated notion for participants appears to be the values, which often seems to be oversimplified by the company's slogan and hardly internalized by the company representatives. It is meaningful to discuss these beliefs that guide company's behavior to establish the pillars of these future explorations including the motivation behind the founders of the business.

Consolidation to set a domain and a time frame.

When all the parts of the fish are analyzed, participants should identify the parts that are too big, too small, disconnected with the other parts. These anomalies represent the gaps and inconsistencies within the company.

- *Example: A big-head fish, a company with a well-developed know-how such as Solutions Group, transform its knowledge into point-of-purchase material for consumer goods corporations, but the company has a limited understanding of its clients.*

Once the analysis is consolidated, it is valuable to motivate participants to sketch the definitive fish, including to name it and describe its habitat, which represents the current situation of the organization in its context. In our experience, this task finalizes the analysis and gives a clearer idea of the company's diagnosis.

Practicalities:

- *If time allows, it is also valuable to present the analysis using a role play exercise which introduces the fish. This makes it easier for people to remember the company`s characteristics.*
  - *Example: In Oceanco`s case, we mimicked an oceanographic conference in which the external designers, playing the role of scientists, presented the `Luxurarious Piscis Directus` a new species of fish also known as `Luxus Streamliner` (see Chapter 6) to the company representatives, who pretended to be academic juries. The name of the fish was used along the final discussion to create ideas on how `Luxus` must change to face the future business` context.*

Expected outcome: a domain and a time frame.

In view of the abstraction of these outcomes, it is useful to follow the analogy to define them. If the company is a fish, the domain is the habitat in which the fish lives and wants to continue living, unless it wants or needs to change this habitat, and the time frame is the distance in the future that the fish will explore. In our view:

- A domain, the area of business where the context factors are explored, is based on the intentions, desires, plans, or dreams of the company instead of just the reality. If participants push the boundaries of the business when defining the domain, the futures exploration could open new opportunities for the business.
  - Example: participants of Case 6 set the domain "luxury on the water" for the company Oceanco.
- The time frame, how far in the future the context factors are explored, motivates participants to find, as mentioned in Chapter 2, a happy medium between the near and the speculative future. In our experience, choosing a time frame that has a specific meaning for the company, or the company representatives, makes it easier to internalize the images of the future on a concrete level (human- or company-scale) instead of at an abstract level.
  - Example: Ci2, an engineering company, set a time frame between the present and when the company will celebrate its twenty-fifth birthdays, or the case of Solutions Group that set the time frame that fit with the planned retirement of one of the owners.

Activity 2 Approaching the future

It positions participants in the world as it is to look at the speculative future and thus gather context factors. This exploration of the future is limited by the domain (in which area) and the time frame (how far ahead), defined in the previous activity.

Participants: Three company representatives, five designers, and two users.

Resources: Log of Activity 2.

Tasks and considerations:

Desk research and field work to collect context factors

Designers should motivate company representatives to lead the deconstruction of the domain and thus define the topics included. Using these topics, the participants, split into two teams, simultaneously conduct desk research and field work to collect relevant and inspiring context factors. Participants should have access to specialized trend reports or databases from the company as part of the desk research, and they should have contact with the company's users in the real context as part of the field work. These documents and people bring valuable context factors that would otherwise remain unnoticed in this exploration. Taking into account the large variety of context factors, we simplify its classification into two and use the analogy to explain it:

- *The calm waters represent those context factors that remain stable, which seems to be the states and principles that are easier to identify by the company representatives.*

- *The troubled waters illustrate the trends and developments that signal change and are less familiar for them. Trends changing is a basic reality, but some trends necessitate that you change along with it.*

Consolidation to define a vision

Once the context factors are collected, participants must cluster them thematically. Considering that this task merits time and help from the lead designer, it is important to motivate participants to use a diagram to make sense of these clusters.

- *Examples: The Venn, quadrants, and spider web diagrams used by the participants along the evaluation of DIVE with SMEs.*

These diagrams help participants tell simple stories of the future that create a notion of a future context, where this exploration is located.

- *Example: the story developed by participants for Solutions Group describes ¨a future in which large retail stores will disappear as the majority of shopping will take place online¨. This straightforward description presents some context factors in a plausible future scenario, which is framed by the domain of the futures exploration.*

Practicalities:

- *When conducting desk research and field work, each study should include at least one company representative. They could learn how to conduct these two inquiries and give business context to the research.*

- *Although this is not an exhaustive trend analysis and therefore many areas will remain unexplored, ideally the context factors should be distributed evenly among the topics defined earlier.*

- *Consolidating these findings into a vision requires several iterations that gradually incorporate the company's values, and then the user's values, which are finally met to the external designer's values.*

Expected outcome: vision.

A vision statement should merge the company`s and user`s values creating a new —or strengthening the existent— relationship between them in this future context. This statement should describe this relationship, including the enterprise in front, as the provider of the future product or service, and the users, as the people who will interact with this future product or service to have an experience with it. The vision should also provide a set of principles that help participants to suggest a specific direction that the business is going to follow in the speculative future.

- *Example: The vision for Case 3, in which "Campo Real wants to offer to end-users, who are identi ed with the purpose of care -as one of the company`s values-, the possibility of participating in the creation of new experiences of sustainable consumption, which connect them to their origin and the inheritance of the countryside." This vision focuses on keeping track of the type of experiences that the user wants in accordance with the corporate val-ues, instead of just the business interests.*

Activity 3 Exploring the future

It places participants in the speculative future to create the vision concepts.

Participants: Four designers and an ethics expert.

Resources: Materials to sketch and make rough prototypes such as cardboard, masking tape, markers, and foam.

Tasks and considerations:

Consolidating the vision statement

It is recommended to reflect on the vision defined in the previous activity with the guidance of the ethics expert. Along with this reflection, designers and the ethics expert could formulate critical ques-tions in regard to the image of the future that the vision statement envisions.

- *Example: Case 1 and 2 addressed questions related to the responsibility that companies in the retail business, such as Solutions Group, have in regard to consumerism. Case 4 with Ethos discussed how people could spend their money in a more rational way, being aware of the impact of these expenses. Moreover, Case 6 with Oceanco touched matters related to the extravagant luxury and the way the company could change it to a more sustainable notion that is aware of the social inequality and environmental impact.*

Prototyping

The lead designer should encourage the participants to be guided by the vision created previously. This statement, which is located in the speculative future, creates its own particular limits that com-mand what participants create. The lead designer should constantly remind participants to think as if they were in the speculative future, motivating them to push boundaries, considering that they used to design by always thinking about the constraints of the world as it is instead of the possibilities of the future.

Practicalities:

- Along this activity, the lead designer should provide participants with a clear deadline and the materials and facilities needed to make the prototypes and also encourage them to explore different types of prototypes that represents their ideas in the most accurate way.

Expected outcome: vision concept.

In view of the criteria defined earlier (Table 6-7, Chapter 6), the vision concept must:

- *seem possible in the speculative future selected as time frame*
- *give a clear sense of direction to that destination, which is coherent with the vision statement and thus with the de ned domain*
- *open up new opportunities for the company at different levels, not just in new product development*
- *consider people in its definition*

Activity 4 Communicating the future

Activity 4 falls on a continuum with Activity 3, in which participants are placed in the speculative future to detail the vision concept through the making of prototypes and videos.

Participants: Four designers.

Resources: Materials to sketch and make a rough prototype such as cardboard, masking tape, markers, foam, and a cellphone with camera to film the video.

Tasks and considerations:

Prototyping and storytelling

It is important to encourage participants as soon as possible, ideally in the earliest stage of Activity 3 or at the latest in Activity 4, to materialize their ideas through prototypes -sketches, diagrams, and mockups-, and keep iterating these ideas using these artifacts. From the very start, these artifacts should be accompanied as much as possible by short and simple stories, presenting the ideas with users and context, ideally in the form of simple videos recorded with cell phones, for instance. Shooting video in this early stage allows participants to become familiar with video as a way of prototyping and also removes the idea that these videos must be professionally edited with specialized software along complex post-production processes. It is important to make clear that prototypes, including the videos, do not have to be perfect or polished, and that this technique considers these artifacts part of the process, a way to think about the future, rather than results.

Practicalities:

- *Take into consideration that some participants need time to plan the prototype in advance and others improvise when making it. In the case of the videos, while some participants make a script and storyboard, have several rehearsals, and end with one shoot, others define a general story and then improvise along several shoots till they feel it is finished.*

- *As in the previous activity, in Activity 4, the role of the lead designer is to keep an eye on the time and provide the resources needed to make the prototypes and the video.*

Expected outcome: prototype(s) and video of the vision concept.

The prototypes and videos should not be too polished and professional-looking, nor too rough and unfinished. While these artifacts must be well made, allowing participants to feel like the artifact is real, they also should look sketchy enough that participants are willing to throw them away. The prototypes -and videos- used by the participants along the evaluation of DIVE with SMEs include, among others:

- *Two-dimensional:*
  - o *mind maps*
  - o *sketches*
  - o *diagrams*
  - o *photomontages*
- *Three-dimensional mockups that does not work:*
  - o *using disposable cups, paper, and masking tape*
  - o *applying stationery supplies, such as cardboard and acetate sheets*
  - o *using printed transparencies and materials that require a workshop such as wood and acrylic*
- *Three-dimensional mockups with functional components*
- *Narratives:*
  - o *Videos:*
    - ▪ *cut-out animation using at props and backgrounds cut from paper and cardboard*
    - ▪ *stop-motion animation using pictures*
    - ▪ *including shooting characters, most of the time participants playing the role of users*
  - o *Others:*
    - ▪ *role-playing exercises*
    - ▪ *screenshots of a Twitter account*

Activity 5 Looking back into the future

It places participants in the speculative future, looking at the world as it is to reflect on this futures exploration and thus recommend actions to modify the present situation of the enterprise.

Participants: Three company representatives, five designers, and two innovation experts.

Resources: Log of Activity 5.

Tasks and considerations:

Discussing about the future and the present of the company

This discussion begins with a short presentation that should include at least:

- Presentation of the activity's goal

- Brief description of the process supported by the visuals -toolkit- participants made during the activities

- Introduction of the vision concept through the video -and prototype- made in the previous activity

Once the video has been presented, the external designers should facilitate this conversation, moving from the speculative future to the world as it is. In the view of DIVE, good facilitators use the visual forms, artifacts, and stories, created earlier in the process, to ask the appropriate questions at the right time to spark lively conversations. It is recommended to keep these questions simple and intimate, ideally linked to the meaning of the time frame defined in Activity 1, such as "what do you want to leave to your family and business partner when you retire?" The facilitators also engage in searching for more questions to help stimulate the conversation, but they can also limit the discussion to the domain due to time pressure. The facilitators can also manage dissent without pushing too much towards consensus, and leave the group feeling satisfied with the final decision about the matters they discussed.

During the activity, the facilitator should collect recommendations and then distribute these -homogeneously- in a roadmap, moving from one time frame to another when it is complete. When the full spectrum of recommendations, properly distributed from end to end on the roadmap, are gathered, the facilitator allows participants to find paths that connects the world as it is to the speculative future. Those paths, chains of recommendations related to each other and distributed across the roadmap, should be elaborated, trying to find ideas about the allies and resources needed to plan these projects for the company.

When the roadmap is sufficiently detailed and the projects are properly sketched, the facilitator should return to the analogy and thereby close the circle. The facilitator should formulate questions related to the changes that the company needs to carry out to achieve the speculative future, listing the changes that the fish of today requires to survive in the waters of the speculative future.

Practicalities:

- The lead designer should give participants some room to plan this nal conversation.

Expected outcome: Roadmap of the future.

A roadmap in which several recommendations -ideas of developments- are plotted in the three time frames: the world as it is, the near, and the speculative future.

Closing meeting

A way to collect the final reflections and thoughts concluding the futures exploration.

Participants: Three company representatives, five designers, and two innovation experts.

Resources: The full toolkit DIVE 1.0 (DIVE plan, DIVE logs, and DIVE repository).

Tasks and considerations:

Designers should encourage innovation experts and company representatives to take the lead in this meeting to evaluate this futures exploration. The former gives an external perspective about the outcomes and the latter a knowledgeable opinion about the activities and outcomes. This evaluation is useful to collect insights on how to improve the technique and how it is applied.

Practicalities:

- *If possible, offer some drinks and snacks to the participants as part of this meeting, as a way to recognize their work and effort. In our experience, this meeting and drinks give the feeling that the futures exploration is finished. It also creates some time so that the external designers can consolidate the toolkit and give it to the company representatives as a final deliverable.*

7.3. Follow up

As mentioned in Chapter 5 and 6, through the application of DIVE, SMEs can learn-by-doing about different topics and, at the end of this exploration of the future, keep memories of these lessons in the form of the outcomes.

It is expected that the company representatives use the *roadmap of the future*, obtained as the main outcome of DIVE's application, to strengthen the existing 'strategic and innovation plan' in different ways. The company can also use the roadmap to formulate a new plan if it does not already have one.

The existing or new plan could incorporate images of the *prototype of the vision concept* or its *video* as the destination in the long-term frame to keep the strategic and innovation plan concrete, allowing people to experience it. As already mentioned, these manifestations could also be shared with different people inside and outside the company to show the image of the future that the company wants to achieve in the time frame and spark even more discussions about it. Allowing employees at the company to see these outcomes makes it easier for them to understand and adopt this

future vision.

The *vision* defined by DIVE, which differs from the business vision, could also be folded into the business vision, bringing a human dimension to the strategy. The vision helps define the goals of the programs and projects, as part of the strategic and innovation plan.

Moreover, the *time frame and domain* set using DIVE are also useful to the plan. The former outcome is useful to enlarge the strategic horizon of the plan with a long-term perspective that means something for the people within the company. The latter outcome helps define a business area in which the company is moving, looking at the users instead of just the business.

Discussion

8
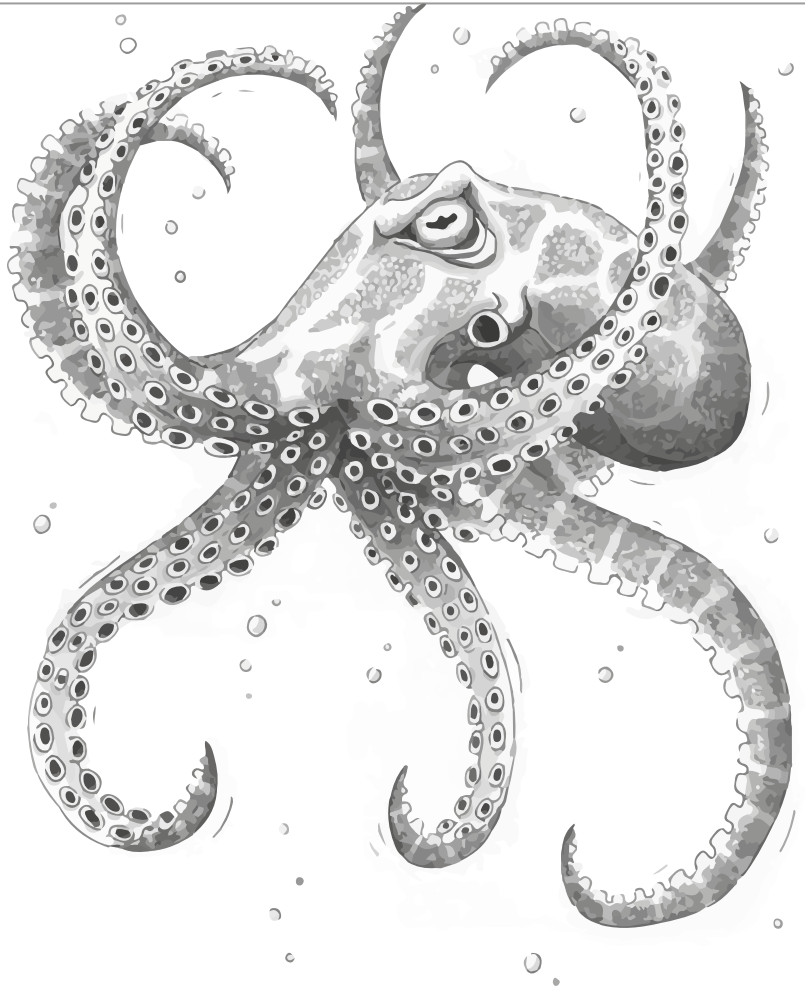
General
discussion

8. General discussion

The aim of this dissertation was to bring the benefits of using design-led futures techniques, such as concept cars from large-scale corporations and critical design and design fiction from scholars, as an approach to supporting innovation in SMEs. We understand now how these techniques are used in practice and, through the development and evaluation of DIVE, explored the potential to apply them within SMEs. In this final chapter, we present a general discussion of the value of our findings, of general limitations, as well as suggestions for further research.

We discuss this value in the three areas of interest to which this dissertation contributes. Initially, Section 8.1 reflects on the theoretical contribution to the confluence of futures studies and design. Subsequently, Section 8.2 takes a look at the practical contribution in which this confluence can serve enterprises. Finally, Section 8.3 discusses the way these theoretical and practical contributions add to design education. Section 8.4 ends this chapter with a summary of the limitations of the studies of this research and some opportunities for further, more detailed research.

8.1. Design is a strategic asset that adds to futures studies a practical way to make tangible images of the future

This section reflects on the confluence of *design* and *futures studies.* Initially, as part of the domain of *design –research–*, it discusses design as a strategic asset that connects the present with the future and support this discussion with two instances: concept cars and vision concepts. Finally, on the domain of *futures studies,* it deliberates about the particular values of the design-led futures techniques: a practical approach that produces tangible outcomes that can critically reflect on the future.

8.1.1. Design is the strategy that connects the present with the future

Design used to be seen as an operational tool to support private companies solving current issues. For the majority of the large, medium and small-sized enterprises, design was an exercise that, among others, improves the efficiency and appearance of their products. Examples are industrial and graphic design, such as the design of structural packaging and its labels or the design of an electronic gadget and its instructions. In both cases, the packaging and the electronic gadget are an integral part of the current product portfolio. More recently design is seen as a particular way of thinking, doing, and making, that could help private, third sector (solidarity), and public organizations make strategic decisions. The transition between the design of a

thing made, such as a product or an image, to the design of an idea, such as a strategy or service, becomes evident in the business environment with the boom of designers in more strategic levels and consulting firms' buying of design agencies. Although design has managed to expand to various organizations, scale in its structure, and address the intangible, it is still tied to the present. In accordance with this situation, most of the literature on strategic design moves around *design –thinking–*, as a creative way to solve the current problems, leaving aside the fact that a strategy that does not contemplate the future is useless.

In view of this gap in the literature, this dissertation considers design as a strategic asset only when it is able to support organizations solving current problems and critically explore the possibilities of the future, therefore when truly making use of the capabilities of design. While clarifying the tension between *design thinking* and *design-led futures techniques,* this inquiry adds to the research of authors such as Verganti (2009) and Calabretta, Gemser, and Karpen (2016), who study design from a strategic perspective.

This dissertation shows that design-led futures techniques complements design thinking techniques to advance the strategic relevance of designers' roles by offering them ways to transition from the operational to the strategic levels of organizations. The findings of our studies suggest that design-led futures techniques help designers move from the bottom of the company to a position that transversely links the top with the bottom. In all the design-led futures techniques we investigated, from concept cars to design fiction, designers look at the speculative future, from the world as it is, to set a *vision* and look at the world as it is, from the speculative future, to make *decisions* to get to that world. The *innovation strategy*, which covers what happens between those two ends, maps up the different time frames: for the speculative future, a *vision*, a dream based on company's values; for the near future, a *plan*, in which the opportunities and risks are considered; and for the world as it is, a set of *decisions* including new ideas based on the reality. It seems as if the ideas part of this innovation strategy affects different levels of the organization, from the company's strategy to its products.

This dissertation shows that at the corporate level, the vision of the future strengthens the company's vision with a new perspective that focuses more on the users and the intersection of their values and the values of the company. The cases discussed also demonstrate that these futures explorations also open a space of discussion in which the core values of the enterprise could be reinvigorated, defining a clearer mission and set of strategic goals and objectives.

Although both, design thinking and design-led futures techniques, use a human-centered perspective, design-led futures techniques are much more holistic. Along the futures exploration, design-led futures techniques include the political, economic, socio-cultural and technological context factors and their intertwined nature to build plausible ideas of the future. Our findings suggest that, at the business level, these design-led futures techniques support companies in discovering strengths,

weaknesses, opportunities, and threats that allow companies to reinforce their existing business or even create new ones. At the functional level, these speculative design explorations allow companies to gather ideas of new products, services, or processes. These ideas, inspired by the vision, are plotted along the time frames. In sum, it became clear that design is an effective approach to lead companies –from large-scale corporations to small and medium-sized enterprises– and other organizations to reflect on their future allowing them to make more educated decisions about the present.

As part of this contribution, this thesis investigates the case of *concept cars* that exemplifies the strategic value of design in the automotive sector and subsequently *vision concepts* in other economic sectors.

Concept cars are strategic 'vehicles' to innovate and share innovation with a large audience

Although concept cars are broadly recognized as an interesting phenomenon, it has seen little academic interest. This dissertation illustrates that concept cars have long been successfully applied in the automotive industry as a speculative design practice to envisioning the future, thus building on the work of Backman and Börjesson, and other authors who worked with them (2005; 2006; 2007) in the field of strategic design and innovation.

This dissertation identified the way automotive corporations use concept cars as 'vehicles' to innovate and share this innovation with a large audience. It also distinguished between using concept cars as an end and as a means for driving innovation. As an *end*, concept cars are experimental artifacts of the future, unrestricted by constraints imposed by the present conditions, such as production capabilities and market regulations. They can be envisioned for different time frames, from the world as it is, in which they propose modifications for existing vehicles, to the speculative future, in which they define new ways of transporting people. In view of the design perspective, this dissertation found that concept cars incorporate avant-garde style and cutting-edge technology, proposing new interactions between users and vehicles, different users, and vehicles and their context. We also observed that these fictional vehicles are embodied by refined –even fully working– prototypes, which allow people to experience the concept car as close to reality as possible, and sophisticated videos, which complement the experience and integrate users and future context. As a *means*, concept cars follow a hands-on process that uses visual synthesis and prototyping to explore and communicate images of the future. During this process, companies can learn-by-doing about different context factors, including among others changes in the behavior of –potential– users, new technologies, and relevant political shifts. This process also helps organizations collect insights about future's directions and its potential impact on technology and the environment.

In sum, within the domain of –strategic– design, concept cars represent one of the

design-led futures techniques that materialize the visions of the future in tangible prototypes and narratives which call the attention of many people. These allow automakers to share their vision of the future internally and externally which improve the perception of the brand and embrace people to feel aligned with the –future– values of the company.

An important insight from our research was that the term concept cars is also used outside the automotive sector, regardless whether it is applied to the software or technology industry. It refers to an experimental approach that generate concepts of new products or services in the form of prototypes, instead of concrete ideas that give directions on the future of the business.

Vision concepts explore material scenarios, in which people interact with futuristic product service system

We grouped together concept cars, products, and services, defining them as *vision concepts*. Although the notion of vision concepts was developed by Keinonen and Takala (2005; 2006), the insights of the empirical studies in this dissertation went a step further by describing in a more precise way the purpose, process, and outcomes of these techniques that serve businesses. The perspective on futures studies and the focus on the technique makes the contribution of this dissertation to their work more valuable.

We identified that while concept cars focus on just the car, vision concepts explore material scenarios, in which people interact with futuristic product service system, to see the way in which these systems and interactions affect the business. Both concept cars and vision concepts present the vision of the future through prototypes of the product –service system– and videos of the interaction between people with innovation team players, and specialized and general public. As process, making a vision concept is an exploration, which is guided by a research question, that yields a conceptual outcome, instead of a practical solution, and has a strong focus on communication.

This inquiry, which involved a more pragmatic aim, also contributed to the research of Bleecker (2009), Auger (2012), and Dunne and Raby (2013), comparing the more practical futures explorations –vision concepts– with the more academic ones –critical design and design fiction–. Considering that vision concepts, critical design, and design fiction are design research practices, guided by research questions and ending in concepts, the comparison of these business- and non-business-oriented design-led futures techniques also gave us the opportunity to map them into the landscape of design research proposed by Sanders (2006). As part of this landscape, the speculative design practices hold a spot where design explores different time frames, from the world as it is to the speculative future, to find a mid-way between engaging and provoking people to unlock imagination, escape the constraints of the market, and gain a fresh perspective on reality.

8.1.2. Design produces tangible outcomes that can critically anticipate the future

With regards to the domain of *futures studies*, this dissertation fills a gap in the literature adding to the research of authors such as Voros (2001, 2003, 2007), van der Duin (2006, 2007), and Popper (2008), who study different techniques to envision the future. As part of this contribution, we positioned design-led futures techniques as a valuable way to anticipate the possible and probable and map the preferable –future– helping companies be aware of change and thus make informed decisions about the present to guide its innovation strategy. We included design practices as an integral part of the inventory of futures techniques in addition to management-led futures techniques, which are traditionally considered as proper ways to explore the future. Beyond extending the inventory of futures techniques, this dissertation identifies the particular values of the design-led futures techniques: a practical approach that produces tangible outcomes and critically reflect on the future.

Designers use a visual, hands-on and human-centered approach to make the images of the future visual and tangible

Our findings show that where managers use a data-driven and textual approach to produce verbal and abstract outcomes, designers use an intuitive, experiential way that results in visual and tangible futures. The insights of this inquiry on the difference between analytical and inspirational approaches contributes to the discourse of Candy (2016) adding details on the benefits of transiting from the use of words, images, and artifacts when exploring the future.

With regards to the *approach*, designers analyze context factors using secondary and primary sources, iterate different ideas of the future by prototyping and storytelling, and then share these images of the future through generative workshops. In each activity, designers make use of their capabilities, such as empathetic analysis, visual synthesis, making prototypes and stories for evaluation and communication, and creative facilitation. When collecting context factors within a specific domain, designers do not only study reports with past, current, and future trends, but also observe people and contexts with empathy, to collect impressions on how the context might or might not change during a particular time frame. In some cases, designers even conduct compressed ethnographies, describing the culture of a society to uncover emerging trends. These professionals also synthesize the context factors in a more visual-oriented way, using timelines, collages, cards, and Venn diagrams, among others. Additionally, in each iteration, they make diverse prototypes, such as sketches, diagrams, illustrations, pictures, or mockups, to get ideas out of their heads and make them visual and tangible, and also create stories in the form of storyboards, scrips, and videos, to give their ideas a context. Throughout these iterations, the definition of the ideas increases in accordance with the level of resolution and fidelity of the prototypes and visual narratives. When concluding these explorations,

designers make use of their skills to facilitate conversations about the future and the present. Along these conversations, they use prototypes and narratives, supported by key questions, and diverse techniques to collect the insights of these talks.

With regards to the *outcomes*, designers use their specific knowledge, skills, and expertise to translate the abstraction of the future into the concrete form of prototypes and visual narratives that suspend disbelief about possibilities in the future contexts. In line with Candy (2010; 2016), this dissertation established that these tangible artifacts, which exist in a form that can actually be experienced, allow people to be subjected to a glimpse of the future using their full body instead of only their minds. Therefore, these visual, tangible, and experiential outcomes, which can easily be shared, allow companies to trigger thoughtful discussions with employees, external allies, and –potential– users about the company's future and present. While managers focus on the strategic level producing pages of text, at best profusely illustrated with histograms, designers center their attention on people and contexts, generating prototypes and narratives, supported by visuals. We argue that while most of the outcomes of the management-led futures techniques can only be shared internally with high-level managers due to their abstract character, the concrete artifacts produced by the design-led futures techniques can involve more people in the discussion about the future. The design outcomes can be shared through workshops and exhibitions at team, in-company, and general public levels. At the team level, participants of these explorations can understand new technologies and trends by making, sharing, and feeling these artifacts of the future, learning-by-doing. At the in-company and the public level, different employees of the company, or the general public, can develop a clear image of the future by seeing and feeling the artifacts. Making the future experiential provides everyone, including employees, users, advisors, and possible allies, among others, a common language that is more intimate and thus easy to understand and remember. A language that allows them to collect ideas, identify opportunities and risks in different time frames, and align agendas for implementing their future ideas.

By using design, the futures techniques could also be compact, critical, and low- , truly involving people in the making of stories about the speculative future and the world as it is

In analyzing the design-led futures techniques used in practice, this dissertation understood that *critical design* and *design fiction* can generate more challenging and disruptive future scenarios than those developed by large corporations through vision concepts, addressing issues from different viewpoints not bound by market restrictions. Both critical design and design fiction taught us that there are ways to use less money and time than concept cars, products and services, using a more compact format and collaborative setup, which results in rough prototypes and simple videos. These inexpensive, brief activities, and their straightforward outcomes turned

out to be even more effective in triggering reactions and sparking conversations; creating more radical ideas, which challenge the present situation, and proposing a large change for a broad range of topics, including political, economic, socio-cultural, environmental, and technological issues.

One of the key elements of the design-led futures techniques outside the automotive industry is the use of storytelling. This is a tool that not only helps create an artifact, the key character of the story, but more importantly, a future context in which certain people interact with the artifact. While writing this dissertation, we discovered that designers could help company representatives in the process to detail these futures through making coherent and well-structured stories. Storytelling impacts beyond futures studies and affects more than just SMEs. Entrepreneurs in the early stages of a start-up could also use stories about the future to communicate their aspirations and values; likewise, consolidated companies can use narratives to approach new markets. Currently, narratives are key to approach the right people at the right moment and the capability to create those stories is a critical business skill to endure in time. It seems like design can bring to private companies and public organizations visual memories of the speculative future supported by fluid narratives that guide them when making decisions about the world as it is. These practices move from concept cars made by large-scale automotive corporations to vision concepts applied by SMEs through DIVE. It also includes critical design and design fiction used by independent designers for communities, governments or businesses.

8.2. SMEs could apply design futures to navigate towards the future, taking advantage of their resilience and compact architecture to leave a personal legacy

A key aspect to mention about the value this dissertation contributes to the confluence of *design* and *futures studies* is its application in SMEs. While most of the investigations about design have been conducted in the context of large corporations, the use of design in SMEs has not been researched extensively, and even less on issues related to futures studies. This dissertation shows how design, as a strategic asset, can help SMEs in general and in particular in the form of futures speculations. SMEs not only need solutions for current problems, they also need support to move towards the future. This is especially important as these enterprises are responsible for a large majority of the productive sector and thus contribute critically to society's development.

During this research, we identified that SMEs navigate towards the future, taking advantage of their resilience and compact architecture to leave a personal legacy. The iterations and cases with SMEs taught us that these enterprises, which are compact, flexible and flat organizations, reflect on the future in a more intimate way. Company

owners and managers blend their concerns about the future of the company with their anxiety about their own future, such as their expected retirement and how they will leave the company for their business partners, family, and community. However, they don't have the appropriate knowledge, resources, and techniques to apply traditional futures techniques. Throughout the development and evaluation of DIVE, a design-led futures technique tailored for them, it became clear that it should not only be compact in terms of time and resources, but above all should suit the characteristics and culture of this particular type of enterprise. In sum, this dissertation clarified how SMEs are not just companies with fewer employees and resources; they think, talk, and behave toward the future in a different way. This dissertation understood this different way along the application of design futures, and the next section reflects on it in two parts: (i) the level of resolution of the future's image for SMEs and (ii) the ethical dilemmas that the future represents for SMEs

Although the image of the future may be blurred, it can guide SMEs

The design-led futures techniques present a single outcome, an image of the future, that works as a case-based analysis. Instead of seeing it as a limitation, the impossibility of seeing the opportunities offered by multiple long-term scenarios, common on the management-led futures techniques, we recognized it as a benefit, the possibility to focus on just one domain. The iterations and cases of this dissertation demonstrate that focusing on just one area of interest and producing just one image of the future decreases the level of uncertainty about the future. This is a positive aspect for SMEs, which often struggle with this fuzziness.

We proposed that the resolution of the images of the future that result from the design-led futures techniques, which are to a certain extent, different among them, is not an impediment to anticipate the future. For each case, the purpose and type of sharing determines the level of detail of the prototypes and visual narratives that provide a more or less vivid image of the future in the mind. On the one hand, you have the showy, glossy, and even fully working prototypes of concept cars, supported by professional commercials, which are both made for motor shows and describe high resolution images of the future of the automotive brands. On the other hand, there are the basic mockups of design fiction in combination with simple videos that focus on the user's experience, which are used at the core of compact workshops, in which entrepreneurs explore opportunities. In view of the SMEs' characteristics, we uncovered that that these enterprises are more prone to use an unfinished image of the future than corporations that share finalized visions. Therefore, we propose that the outcomes' resolution of DIVE should be in between the vivid concept cars and fuzzy design fiction. The different cases developed through this dissertation showed that the low level of resolution of these artefacts and narratives, which seem unfinished, invite participants and other stakeholders to have an informal, lively, and open conversation without imposing views of the future. It seems as if these unfinished images of the future are more coherent with SMEs due to the small difference

between employees, which is related to their more horizontal and participative structure. Consequently, SMEs need down-to-earth artifacts and simple narratives that make it easier for participants to understand and adopt a realistic future vision that fulfills their expectations, rather than just sketches or storyboards. Apparently, large companies require finished visions because the much larger distance between the workers and the highest-level executives in senior management, who are the only ones that have the chance to decide on the further plans.

The ethical dilemmas that the future represents for SMEs

It is not surprising that DIVE also led to distinguish between uncertainties and ethical dilemmas for SMEs, such as how an advertising company could encourage consumerism in Cases 1 (Vision concepts 'The Real Experience' and 'The Experience Box' for Solutions Group), or how to make the notion of luxury sustainable in Case 6 (Vision concept 'Heaven of the seas' for Oceanco). It seems related to the idea that designers and company representatives used the company's values to make decisions through the activities; from defining the domain to selecting recommendations. During this process, they incorporated the company's values into the futuristic artifacts, made decisions about desirable tomorrows, and faced sensitive topics on how preferable one future is compared to others. Designers described the conversations in which these uncertainties and ethical dilemmas emerged as the most difficult. A more humanistic point of view was needed to help designers to get more out of each case and deal with the ethical dilemmas in a more competent way. One factor that could exacerbate this condition is that the research was done at a technical university, at a faculty where these points of view are just starting to be implemented in research projects. In sum, even though artifacts are valuable in contextualizing the debate about the future, designers need strong skills, or even the support of other professionals, to facilitate these sensitive conversations.

In regard to the use of design in SMEs, the design-led futures techniques allow, thanks to the intuitive, visual, and trial and error approach, a creative look at the future that opens fictional worlds, which would not be discovered otherwise. In this dissertation, we argue that this creative look, which creates fictions distant to the reality of the world as it is, focuses on the human and context perspective. This perspective understands the user as part of a context in which it is possible to develop innovation strategies driven by the integration of people's needs, desires and expectations, and political, economic, socio-cultural and technological context factors. According to this dissertation, only if these factors are incorporated, the speculations about the future can result in feasible plans to develop new products, services, and businesses closer to the users. Incorporating this human and context-centered perspective along the innovation strategy helps companies fill the gap between the organization and its users. This action is particularly important in SMEs that normally do not have a clear understanding of their users, clients, and business context.

In addition to this reflection, with this dissertation, we help design practitioners by offering them: (i) DIVE, a design-led futures technique specially developed for SMEs, and (ii) an overview of different design-led futures techniques for other problem owners.

The main value that this dissertation brings to the design practice is DIVE, the design-led futures technique for SMEs, which can be seen as one of the few *design-erly* (design-led) tools to develop a strategy. DIVE, which is fully guided by design's principles, helps SMEs make a plan of actions over a period of time to achieve the strategic position that they want, improving their location in the business context. Currently, the technique is part of the service portfolio of my entrepreneurship *rrebrand* (https://rrebrand.com/en/), a strategic design consultancy that helps organizations innovate in a meaningful way, in which it is made available for testing by other designers and SMEs. DIVE transfers the benefits that this study identified on design practices from large corporations and academia, such as concept cars, vision concepts, critical design, and design fiction, to supporting innovation in SMEs. As a design-led futures technique, DIVE suits the SME's preferences and idiosyncrasies due to its compact and inexpensive activities which emphasize visual synthesis, making and storytelling. Although the results of these activities might be less flashy than concept cars and other design-led futures technique used by large corporations, these simple prototypes and videos help SMEs internalize and share a clear image of a preferable future, a vision. Developing DIVE thus helped us explore how design can support SMEs in envisioning the future in the context of innovation. Chapter 7 has extensively discussed the recommendations for the design practitioners in view of the way to plan, conduct –including activities and outcomes–, and evaluate DIVE.

This dissertation also includes a detailed description of different business-oriented and non-business-oriented design-led futures techniques that can be applied in different circumstances. Examples of the former are vision concepts –concept cars, products and services– that can be used to explore the future of large corporations (Chapter 3 and 4), and DIVE, the design-led futures technique developed along with this dissertation, that can be used for SMEs (Chapter 5 and 6). It also sketched two techniques of the latter category, critical design and design fiction, which can be useful when approaching projects that need a design-led futures technique but have open briefs, including ill-defined problems and projects without problem owners (Chapter 4). In view of these techniques, design practitioners can select the most appropriate way to explore the future, from concept cars for business-oriented challenges in large corporations to critical design for non-business-oriented assignments.

8.3. Teaching designers design-led futures techniques will give them non-existent added value in -traditional- business consulting

Even though the aim of this dissertation is not explicitly related to design education, we found that DIVE, as well as other design-led futures techniques, could be used as an effective way to educate design students and update professional designers about strategic design.

Developing the cases discussed in this dissertation, we worked with students at bachelor and master level. What we found is that students should acquire, to a certain extent, knowledge on futures studies, more specifically, skills on design-led futures techniques. In general, most of the –strategic– design programs teach students diverse management-led futures techniques, such as scenario thinking and trend analysis. The findings of this dissertation suggest that these techniques are far removed from how design students learn –think and make– and are thus difficult for them to internalize. Although the design-led futures techniques described in this dissertation are closer to design students' way of working, they are not covered by academic design programs. This dissertation introduced a set of design-led futures techniques that could be part of the –strategic– design programs and used when teaching design students topics related to futures studies and strategic design. Here, too, DIVE can be used as a technique for compact workshops in which design students can learn about strategic design, particularly speculative design, along with exercises with SMEs. These exercises should also teach students about how to deal with this type of enterprises. A demonstration of the value of teaching design futures is the contribution of this inquiry to the content and structure of the courses: Design Driven Innovation, part of the Bachelor of Industrial Design Engineering, and Design Roadmapping, part of the Strategic Product Design master program, both at Delft University of Technology. Currently, this investigation is also the main input to support a permanent workshop and an elective course, both part of the curriculum of the Master of Design at University of Los Andes in Bogotá, Colombia.

Similar to the case of the students, DIVE can also be used to update professional designers in topics as strategic and speculative design. Professionals with strong emphasis on product or graphic design could receive new skills and knowledge on how to position themselves in a strategic role by using DIVE along with a practical exercise with an SME. DIVE can teach them how design is not just a problem-solving approach, and how this discipline could be a way to anticipate the future. An important example of this type of benefit is the case of the Master Class in Strategic Forecast offered by the Faculty of Administration at University of Los Andes to the middle managers of Ecopetrol, the largest and primary petroleum company in Colombia. The final module on design futures of this master class is entirely based on this inquiry.

The technique is also being incorporated as part of the portfolio of strategic design courses for senior managers of my entrepreneurship *rrebrand.*

Concluding, in working with students and professional designers, we learned that, instead of futures techniques from other disciplines, which can be better applied by other professionals, design-led futures techniques could benefit from design students and professional designers. Design-led futures techniques offer an approach to explore the future that is closer to the discipline, which gives a different way of working on strategic assignments.

As mentioned earlier, the companies that incorporate design applied it initially as an operational asset and finally as a strategic value. This is even more critical in SMEs, as not all of them recognize design as a driver of innovation. They can learn about the strategic value of design by using this design-led futures technique. DIVE uses a hands-on approach in which company representatives can learn –by doing– about the way design can help them understand the current situation of the company by applying an analogy; how designers investigate with an empathetical approach; and how this discipline makes artifacts to support making strategic decisions. This practical knowledge does not pretend to turn entrepreneurs into designers; instead it tries to give them an overview of the way these professionals works. It is useful to open up further opportunities for designers as external or in-house strategic advisors.

8.4 General limitations and further research

This section discusses some limitations of the research and ends with an inventory of planned inquiries.

With regards to the research approach, we used a *research through design* approach, which turned out to be appropriate to gain new understandings for the confluence of futures studies with design and transfers this knowledge to SMEs in the form of a design-led futures technique, a useful solution for the design practice. The core of this approach is to make iterations of the technique to improve it and to develop new knowledge. To a certain extend, this approach can be seen as an agile method that results in a technique and that can be applied to other –business– projects. Considering the limited time and resources of this dissertation, we made DIVE 1.0, a beta version of the technique with potential to be a final product and collect a comprehensive list of benefits and limitations for SMEs.

Concerning the research method used to build a theoretical framework, the set of studies on futures techniques, concept cars, and related design practices outside the automotive industry were enough and suitable to collect the ingredients to develop a design-led futures technique for SMEs. However, considering the fact that this dissertation is the only one that study concept cars as a design-led futures technique, other explorations are desirable to understand this subject more thoroughly. An example could be the development of an in-depth case study along with the making and sharing of several concept cars –of different brands– if more particular findings

are expected, such as details on how the team makes decisions or what the role of the prototypes within the design process is.

In view of the restricted budget and length of this inquiry, the two iterations and six cases used to develop and evaluate DIVE 0.1 and then debug it until DIVE 1.0 were (i) sufficient and (ii) appropriate.

These studies were sufficient in number because in the collection of findings, the final cases reached a point of saturation in which they only confirmed the initial findings without adding new ones.

These iterations and cases were also appropriate, while the companies represented a reasonable mix of enterprises. Since the beginning of the development of DIVE, we involved SMEs that allowed us to tune this technique to practice in view of the real needs of these companies and consolidate a set of activities and the preliminary forms to collect the information along the exploration. The seven SMEs that were part of the studies represent a well-balanced number of small-sized enterprises and medium-sized enterprises, three and four respectively. These companies cover a wide variety of products and services. Some of these products are developed for end-users, such as superyachts, dairy products, and hair care products, others for businesses, including steam boilers, hot water and heat exchangers, and point-of-purchase-material. End-users include wealthy and poor people, and businesses cover services, production of goods and basic production. Services also include services for end-users, such as engineering projects, and services for businesses, which is the case of software. The former is offered to maritime and security corporations and the latter to financial institutions. Even though this sample, which corresponded to the opportunities of the author and the supervisory team, covers a large variety of companies, it could be more diverse to acquire a broader perspective of the benefits of DIVE. An example is the fact that this dissertation does not study enterprises in a very specialized economic sector, such as the primary sector including energy or mining, which could have a different behavior with regards to futures explorations. In general, this research part of the fact that, most of the public, third sector (solidarity), and private organizations need to think systematically about the future.

Adding to this limitation and also related to the opportunities of the author and the supervisory team, all the companies' part of the studies had previous experience with applying design. In some cases, such as Campo Real and Ethos, as an operational tool and in other cases, such as Solutions Group, Ci2 and Oceanco, as a strategic asset. These enterprises already knew how design works, either from the operational or the strategic level, therefore their level of resistance to the application of the design is minimal. Even though it is not possible to know the behavior of an SME that has not had contact with the design prior to the implementation of DIVE, it is possible to assume that DIVE can be applied to most SMEs. And in the case that those enterprises are not familiar with design, as mentioned earlier, DIVE can be used to teach them the strategic value of this discipline.

With regard to the research method, observations, interviews, and questionnaires were conducted during the evaluation. Combining these methods allowed us to collect both qualitative and quantitative data, thus enriching our findings. Although the quantitative data was not conclusive, due to its small sample size, its use was meaningful considering the selection of participants –companies and designers– and external innovation experts. Another limitation of these cases could be the duration of each study. This research could include longer and simultaneous cases, which provide the opportunity to spend more time in the follow-up of the cases, in the hope of findings that measure the impact in a more precise way. Considering this limitation, further projects must study the implications and impact of these exercises more carefully.

A final note about the main goal of this dissertation. It showed how speculative design practices used in large corporations can be scaled down to boost the capabilities of SMEs to think ahead, which is especially important due to the relevance of SMEs as actors that can change our society. While people can use design to identify opportunities and risks when envisioning the company's future, special consideration is needed when it comes to SMEs: designers need to push boundaries to face the urgency of the present and reconnect enterprises with their values. Even though a design-led futures technique such as DIVE can guide these enterprises, which have an explicit commitment to their families and communities when thinking about the future, designers need to be aware that these companies may be short-sighted when making decisions. SMEs have constraints that determine their vision of the future, associated with the ambition of technical predictability that can lead to a paralysis when it comes to making riskier future bets. Given this limitation, DIVE led to ideas for long- and short-term challenges, their timing, and the potential alliances and allies to develop them.

Further research

With regards to further research and in line with the purpose to democratize these speculative design practices, two possible next steps are: (i) to scale down these practices to support even smaller players, and (ii) to scale up these design-led futures techniques to assist even bigger players, such as local or national governments.

First, a new stage of this investigation could gather the benefits and limitations of applying vision concepts for individuals in key moments of their lives. Examples of these individuals and moments move from self-employed workers planning their retirement to patients making decisions about medical treatments. Presumably, these people, who have a different scale than the businesses and distinctive characteristics, do not have a structured way to plan ahead. Therefore, the application of DIVE, or an adapted version of it, could provide them with a more long-term-oriented vision to support them in making more effective decisions about their everyday lives. This advanced investigation can contribute to the understanding of the differences and similarities between individuals and organizations, such as SMEs, in regard to their

expectations and attitude about the future. An investigation like this could follow a similar –research through design– approach in which the author or other researchers could develop different cases that contribute to the understanding of the benefits of this technique at a more personal scale and the variation of the technique to the needs of these users.

Second, moving from the private to the public sector is a way to contribute to local, regional, or national governments, which have a profound effect on the life of the majority of people. Their decisions affect thousands or even millions of citizens, thus they need to have well-defined instruments to look at the future. In my experience working with public and third sector (solidarity) institutions, they extensively apply management-led futures techniques, and thus face the same problems as large corporations when dealing with the implementation of the abstract outcomes. In these cases, the problem of communicating these visions of the future are even bigger due to the size and diversity of the audience. While companies deal with different segments of thousand or million users, governments approach millions of diverse citizens, who are –arguably– more heterogynous than users. We assume that this investigation can contribute to the development of a more collaborative form to create concrete images of the future that help governors to calibrate their plans and socialize them.

Along these scaling down and up, these new studies could extend the preliminary findings of this dissertation on how sensitive topics emerge when thinking about the future. As mentioned before, these explorations of the future can uncover critical issues, where an ethics advisor would be key along most of the cases. In view of this reflection, further investigations should include a co-researcher with expertise in ethics. These investigations could focus on the way in which individuals or different stakeholders of the government deal with these ethical dilemmas along the discussion about the future, and the role designers and ethics experts play in these moments of the discussions. This focus on the sensitive topics could bring a new dimension to these inquiries, one that can contribute to the nascent research area in design ethics.

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About the author

Ricardo Mejia (February 4, 1975) is an industrial designer (1994 - 1999) and engineer (1992 - 2002). He earned a Master of Science in Strategic Product Design (2007 - 2009) from Delft University of Technology in the Netherlands with distinction (*cum laude*) founded by the scholarship AlBan from the European Union. He is an advisor and consultant on design-driven innovation with over fifteen years of experience working with private companies, local and national governments, non-profit organizations, solidarity institutions, and communities across Europe and Latin America and the Caribbean.

Ricardo led the National Design Program within the Ministry of Commerce, Industry and Tourism in Colombia. This included the development of a strategic plan to create a "design culture" in Colombia that would help bridge the gap between professional designers and the productive sector. He helped define policies for the design and implementation of "design thinking" in SMEs.

He also has experience as an educator at different universities, a lecturer in more than fifty places around the world, and an author of several publications, including several books and articles about design and innovation.

As a doctoral fellow of the ID·Studio·Lab at the Delft University of Technology, supported by a full scholarship from Colciencias (the Administrative Department of Science, Technology and Innovation of Colombia), he experimented with how to make and share vision concepts, commonly known as concept cars in the automotive industry, to explore and communicate the future of smaller players —http://dive.pktweb.com/—.

Ricardo understands design to be a powerful mechanism to help people dream and build their own future. He firmly believes in design as a driver of change, one that leads to a free and fair society. Full profile https://www.linkedin.com/in/ricardomejia/

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Acknowledgements

Summary (ENGLISH - NEDERLANDS - ESPAŃOL)

Vision Concepts for Small- and Medium-Sized Enterprises: Developing a Design-Led Futures Technique to Boost Innovation

By Javier Ricardo Mejía

ENGLISH

Concept cars have long been successfully applied in the automotive industry as a design-led way to envisioning the future. While automotive corporations use this futures technique as a driver for innovation, small- and medium-sized enterprises (SMEs) in other industries have not had the benefit of such explorations, largely because concept cars are too resource-intensive and poorly suited to the SMEs' needs and idiosyncrasies.

To democratize this design practice and help SMEs, which are essential to social and economic prosperity, we have developed DIVE: Design, Innovation, Vision, and Exploration. It is a design-led futures technique that assists designers in making and using concept cars –as experimental artefacts that act as visions which embody ideas about the future– as 'vehicles' for innovation in SMEs, no longer confined to the automotive sector.

Its development began with an inquiry into concept cars in the automotive industry and concept products and services in other industries. We then combined the insights derived from these design practices with elements of the existing techniques of critical design and design fiction into the creation of DIVE's preliminary first version. This was then applied and evaluated in seven iterations with SMEs, resulting in DIVE's alpha version. All iterations of DIVE in context show that SMEs can make and use concept cars, tailored to their own domain, to receive some of the benefits of exploring the future using design within the front-end of their innovation strategy. These companies can make concept cars to identify opportunities and threats and to give a sense of direction when they face a significant change.

DIVE begins with setting a vision, embedded in an artifact, and then working backward to map a path of ideas, connecting the future to the present. Although the results of these activities might be less flashy than concept cars, these simple prototypes and videos help SMEs internalize and share a clear and concrete image of a preferable future for employees, allies, and investors. Concept cars, prototypes of the future, can also be used at the start of a new product's design process to

combine all the results of investigations on product, market, and technology. Subsequently, it is used to define a design brief and as a criterion to select the most promising ideas.

NEDERLANDS

Sinds een lange tijd worden conceptauto's gebruikt in de automotive industrie als een design-gedreven methode om de toekomst te beschouwen. Waar grote automotive bedrijven deze toekomsttechniek gebruiken als een verkenningsmiddel voor innovatie, heeft het midden- en kleinbedrijf (MKB) geen toegang gehad tot zulke verkenningen, voornamelijk omdat conceptauto's te hoge investeringen vereisen en slecht passen bij de behoeften en eigenaardigheden van MKB's.

Om deze techniek te democratiseren en het MKB te helpen, een bedrijfssector die essentieel is voor de sociale en economische welvaart, hebben wij DIVE ontwikkeld, wat staat voor Design, Innovation, Vision, en Exploration. Het is een design-gedreven toekomsttechniek die ontwerpers ondersteunt bij het maken en gebruiken van conceptauto's–experimentele artefacten die een belichaming zijn van een toekomstvisie–als drager voor innovatie in het MKB, niet langer enkel voor de automotive industrie.

De ontwikkeling van DIVE begon met een onderzoek naar conceptauto's in de automotive industrie en naar concept producten en diensten in andere industrieën. Vervolgens hebben we de inzichten die hieruit naar voren kwamen gecombineerd met elementen uit de huidige technieken voor critical design en design fictie, wat samenkwam in een voorlopig eerste versie van DIVE. Deze techniek is vervolgens toegepast en geëvalueerd in zeven iteraties met MKB's wat resulteerde in DIVE's alpha versie.

Alle iteraties van DIVE in hun context demonstreren dat MKB's conceptauto's kunnen maken en gebruiken, op maat gemaakt voor hun eigen domein. Daarmee zullen ze waarde halen uit het verkennen van de toekomst middels design. Ze kunnen conceptauto's maken als een ontwerpoefening, als eerste onderdeel van hun innovatiestrategie, als een middel om kansen en bedreigingen te identificeren, en om hun koers te bepalen wanneer zij voor een grote verandering staan. DIVE begint met het bepalen van een visie, in een artefact belichaamd, om vervolgens daarmee een pad van ideeën uit te zetten dat de toekomst aan het heden koppelt. Hoewel de resultaten van deze technieken misschien minder indrukwekkend zijn dan traditionele conceptauto's, kunnen deze simpele prototypes en video's MKB's helpen om een duidelijk en concreet beeld van een voorkeursscenario te internaliseren en te delen met werknemers, partners, en investeerders. Conceptauto's, als prototypes van de toekomst, kunnen ook aan het begin van een nieuw productontwikkelingsproces ingezet worden om alle inzichten over het product, de markt, en de techniek in te combineren. Vervolgens kan het gebruikt worden om een ontwerpopdracht te definiëren en als maatstaf om de meest veelbelovende ideeën te selecteren.

ESPAÑOL

Los automóviles concepto (concept cars) han sido usados exitosamente en el sector automotriz como una forma de diseño orientada hacia el futuro. Mientras que las corporaciones automotrices utilizan esta técnica de anticipación de futuros como un motor para la innovación, las pequeñas y medianas empresas (PYME) en otras industrias no se han beneficiado de este tipo de exploraciones, en gran parte porque requieren demasiados recursos y son poco adecuadas para las necesidades e idiosincrasia de este tipo de empresas.

Para democratizar esta práctica de diseño y ayudar a las PYME, que son esenciales para la prosperidad social y económica, hemos desarrollado DIVE: diseño, innovación, visión y exploración. Es una técnica de futuro dirigida por el diseño, que ayuda a los diseñadores a fabricar y utilizar automóviles concepto como artefactos experimentales para visualizar el futuro. Estos artefactos actúan como vehículos para la innovación en este tipo de compañías, no limitadas al sector automotriz.

El desarrollo de DIVE comenzó con una investigación sobre los automóviles concepto en la industria automotriz y los productos y servicios concepto en otras industrias. Luego, se combinaron los conocimientos derivados de estas prácticas con elementos del diseño crítico (critical design) y del diseño de ficción (design fiction), en la creación de la primera versión de DIVE, que luego se aplicó y evaluó en siete iteraciones con PYME, lo que dio como resultado la versión final de esta técnica.

Todas las iteraciones de DIVE evidencian que las PYME pueden hacer y usar automóviles concepto, aplicados a su propio contexto de negocio, para recibir algunos de los beneficios del diseño cuando exploran el futuro. Así, estas compañías pueden convertir a los automóviles concepto en una práctica de diseño dentro de su estrategia de innovación para identificar oportunidades y amenazas, y dar un sentido de dirección cuando se enfrentan a un cambio significativo. Esta técnica comienza planteando una visión de futuro, materializada en un artefacto, y luego, desde esa proyección, mira hacia atrás para trazar un camino de ideas, conectando el futuro con el presente. Si bien los resultados de estas actividades pueden ser menos llamativos que los automóviles concepto tradicionales, estos prototipos y videos simples ayudan a las PYME a interiorizar y compartir una imagen clara y concreta de un futuro preferible para los empleados, aliados e inversionistas. Los automóviles concepto, como prototipos del futuro, también pueden usarse al comienzo del proceso de diseño de un nuevo producto, ya que combinan todos los resultados de las investigaciones sobre el producto, el mercado y la tecnología. Posteriormente, se utiliza para definir un brief de diseño y como criterio para seleccionar las ideas más prometedoras.

Appendices

All the appendices online: http://pktweb.com/dive/phd-dissertation/