DESIGN OF VISION CONCEPTS TO EXPLORE THE FUTURE: NATURE, CONTEXT AND DESIGN TECHNIQUES

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ABSTRACT

Industrial firms are facing a constant dilemma, to be ready for the future, have a vision, and at the same time act within the current situation, exploit current products efficiently. This research examines visions that embody future opportunities and ideas, "vision concepts" such as concept cars and concept kitchens. We studied five cases of vision concepts to unravel the nature of design techniques behind these vision concepts. Our findings present a comparison of similarities and differences on nature, organizational context and design techniques. The key contribution of the study centers on new understanding of how vision concepts explore the future though embodiment of ideas and how designers share and lead the concept visioning process in the organizational context. We propose an initial framework for the design of vision concepts with important implications for industrial firms

Keywords*: Product visioning, Concept cars, Concept kitchens, Concept products, Vision concepts, Sharing context, Design technique.*

1. INTRODUCTION

Industrial firms are forced to act according to the current situation and need to be ready for the future. According to Cornella (2013), organizations need to be efficient —productive— and different —innovative— in order to survive in complex contexts. He, as well as other authors like Schreyogg and Kliesch-Eberl (2007), claims that organizations have two main needs, *exploiting old ideas* —already converted in products and services— to make money today in order to survive in the present, and *exploring new ideas* to make money tomorrow to have opportunities in the future. It is a constant dilemma. In a way, the concept cars of automotive firms seem to be able to combine the two through showcasing future exploration in a "vision product" in today's market place. However, so far this phenomenon has not been studied in-depth. Moreover, although concept cars are in the automotive industry since 1938, only a few scholars have studied them (Styhre, Backman, and Börjesson, 2005; Backman and Börjesson, 2006; Backman, Börjesson, and Setterberg, 2007; and Buijs, 2012), and even less literature can be found with regards to the use of "concept products" or "vision products" in other branches of the industry (Ny and Thott, 2005; and Keinonen and Takala, 2010). On having a vision for future products, some more research has been executed in the area of innovation management. Results determined that product visions exert a large influence on a new product's success (Lynn and Akgun, 2001; O'Connor and Veryzer 2001; Reid and Brentani, 2012). Empirical evidence also suggests that a clear and shared product vision in the front end of innovation (FEI) can subsequently enhance and speed up new product development (NPD) (Tessarolo, 2007; Simonse and Perks, 2014). Yet, little is known about how product visions are conceived and shared in the organizational context that frames the product visioning.

In the area of design, scholarly work highlights the use of dedicated design techniques that provide opportunities to explore the future, offering designers a means to explore new ideas (Buijs, 1987; 2013; Hekkert, Van Dijk, and Lloyd, 2011). However, little is known about design techniques that lead to concept cars and the like. In particular regarding if they are conceived with general design methods or require dedicated design techniques; and, if the techniques to design concept cars are comparable and transferable, in a more generic sense, to vision concepts in other industries. Overall, there is a lack of understanding on how vision concepts explore the future though embodiment of ideas and how designers share and lead the concept visioning.
The aim of this paper is, to add to the initial scholarly work on product visioning, a theoretical contribution from a design perspective. We studied the way that industrial manufacturers, of automotive - and consumer lifestyle products, design vision concepts. We investigate the nature, the organizational context of sharing and the design techniques behind five cases of vision concepts that embody future opportunities and idea sharing. We carried out a qualitative inductive research, using a multiple case analysis method to investigate a rich collection of video and documented case material. To the initial scholarly work on product visioning, this paper makes three contributions. First, it provides a grounded definition for the *vision concept*. Second, it reveals characteristics on the sharing context that distinguish concept visioning from other types of concept - and new product development. Third, it lays out the groundwork for a concept visioning design technique by introducing a framework. Finally, this paper provides directions for further research to test the framework and extends the findings with additional exchanges between practitioners and scholars.

In the next section, the paper discusses the theoretical background in regards to product vision and vision concept; then, it provides the method of comparative case analysis of the five vision concepts; followed by the presentation of the results in a comprehensive table; and proposes an initial framework for a concept visioning design technique. Finally, directions for future research on vision concept are discussed.

2. THEORETICAL BACKGROUND

2.1 PRODUCT VISIONING – FUTURE EXPLORATION SHARED BETWEEN INDIVIDUAL AND ORGANIZATION

In general terms, *a vision* is described as "conditions as we would like them to be" (Stokes, 1991, pg. 118). Recent scholarly work in the stream of innovation management literature has further operationalized both market visioning (Reid and Brentani, 2015) and technology visioning (Reid, Roberts and Moore, 2014); hence product visioning has been relatively unexplored, apart from a prior study in which six patterns of product visioning were revealed (Simonse and Perks, 2014) and some earlier studies that mainly investigated the relation between product visioning and NPD-performance. Research results determined that product visions exert a large influence on a new product's success (Lynn and Akgun, 2001; O'Connor and Veryzer 2001; Reid and Brentani, 2012). Empirical evidence also suggests that a clear and shared product vision in the FEI can subsequently enhance and speed up functional integration during NPD (Tessarola, 2007), whereas a weak product vision can encompass time-consuming efforts to integrate disparate functions. Similarly, Kessler and Chakrabarti (1999) suggested that a lack of shared vision can lead to ambiguity and greater speculation among functions about what should be developed, often leading to conflict and delayed/unsuccessful new products. In investigating the product visioning activities,

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 potential future product/markets, before the NPD process itself starts. We are starting to know 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 that typically envision are designers and design techniques might facilitate the vision sharing. Yet, the study of product visioning, from an organizational context and designers' perspective, has been limited. There is a lack of in-depth knowledge on the complex interplay in how product visions are conceived and the organizational context that frames the product visioning. In this study, we elaborate on this and focus on *tangible product visions*, so called 'vision concepts'. We investigate the nature of the tangible vision concepts, the context of sharing and the design techniques behind cases of vision concepts that embody future opportunities and idea sharing.

2.2 DESIGNERS OF FUTURE EXPERIENCES – SHARING AND LEADING CONCEPT VISIONING

Design, as a discipline, is closely linked to the exploration of the future in different ways; whether just as designers acting as "futurists; futurologists in the field" (Evans, 2011), providing opportunities to explore "what is possible tomorrow" (Buijs, 1987) formulates a vision (Hekkert, Van Dijk, and Lloyd, 2011), or creating the future "when it anticipates experiences" (Morello, 2000). In the field of design, several design approaches are available. For instance, the *Vision in Product* (VIP) approach (Hekkert, Van Dijk, and Lloyd, 2011) that is context-based, and interaction-driven. It is based on an in-depth understanding of the needs of people, which is central to propose a vision of the future -product- that includes its reason for existence (*raison d'être)*. This approach is divided in two moments, the first is for preparations, the *I. deconstruction of the present*, and the second is the designing itself, the *II. design of the future*. Despite the future orientation in the design part, only the current experiences in the present are deconstruct in the first design research part. Design research techniques to explore future experiences are not an explicit part of the VIP approach. When we take a closer look at the design literature with this research and exploration focus on future situations, some attention has been drawn to the phenomenon of concept products. Ny and Thott's (2005) initial research described a concept product in relation to it's strategic context *'as located outside the ordinary product portfolio, and should express a certain competence* (e.g. the introduction of new design, new technology) *within the company'* (Ny, & Thott, 2005). Furthermore research investigations classified concept products in three categories (Keinonen, & Takala, 2010): (i) *product -development- concepts* that are used to unlock the problem in the NPD process as the basis for "the decision to go ahead with the detailed design"; designers use them to "define the design challenge and map the alternatives". (ii) *Emerging concepts* that support learning and decision-making process with regards future product generations within product portfolio, as a result of a research and prototyping project; and (iii) *vision concepts* used "to go a stage further", these are made to support company´s strategic decision-making beyond the range of product development. In this paper we focus in particular on the third category of vision concepts.

With respect to the organizational context of creating the vision concept in a team, Keinonen and Takala (2010) framed six roles that are important in a concept design team are: the *user expert*, who captures the users' needs; the *domain expert,* who knows about the existing products in the domain for which the concepts are being designed; the *design expert*, who facilitates the co-design with the team members; the *communication expert*, who produces the project deliverables; the *feasibility specialist*, who provides knowledge about the implementation options; and the *team leader*, who guide the team and network the project with other stakeholders. Thus, the creation of vision concepts is a resource intensive process that brings together a highly skilled group of specialists.

Concerning the design technique, Sanders and Stappers (2012) distinguish a technique from a tool that is "a physical thing that is used as a means to an end", and by a *technique* they refer to "the way in which this tool is employed". They describe a technique, on the way it is used by key characteristics of: objective, activities and deliverables.

Keinonen and Takala (2010) identified two main steps to design vision concepts: (1) *future description*, which includes the definition of change factors; and the (2) *conceptualization* that covers the generation and the dissemination of the concept.

However, no further details and explanation on this technique was provided. Designers and organizations, which are willing to use it, are in need of an in-depth description. As the users of this technique, they need to know more on the purpose the activities to conduct it, the expected deliverables, and the sharing strategies.

From the literature dedicated to automotive firms, the creation and use of concept cars, the vision concepts as artifacts, are, to some extent, related to the future strategy. Concerning the design technique of concept cars, different scholars express different views. Styhre, Backman, and Börjesson (2005) mention that concept cars are developed in a simplified NPD process that only differentiates in aspects for full-scale production; on the other hand Lv and Lu (2012) consider the use of a concept car an exploration: a "process of conceptual exploration that brings conceptual solutions". They locate the concept car exploration in the FEI.

Only two scholars present a design technique for concept cars. Table 1 below presents a comparison between the design activities proposed by Berlitz and Huhn (2005) and Santamala (2006).

Reference	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Berlitz and Huhn (2005)	*Product planning*	*Styling message*	*Model evaluation*	*Model manufacturing*	
	- Selection of the type of car and its main intention. - Definition of the motor-show to showcase the concept.	- Definition of the car message and the car sub-messages for details. - Definition of the general look of the car.	- Design of four proposals (presented as four 1:4 clay models). - Selection of one model based on a styling competition.	- Prototype manufactures that ends with the presentation.	
	Integration of innovations (including an innovation stock and technical inputs)				
Santamala (2006)	*Project decisions*	*User research*	*Vehicle design & body engineering*	*Chassis prototyping and final assembly.*	*Presentation*
	- Setup the project	- Research the users through background research, detailed polling, observation, benchmarking and interviews.	- Design the vehicle through sketching, dimensioning, and scale modeling (1:5). - Develop the 3D CAD drawing - Conduct CAD simulations.	- Make the prototype	- Present the prototype in an international motor show.

Table 1: Design activities for concepts cars

Berlitz and Huhn (2005) assert the product planning for showcasing and styling message as a distinctive start for concept cars versus the generic NPD – process start with user research of Santamala (2006). Quite similar are the stages in the middle with a combination between design and engineering methods. The end of the design techniques is somewhat different. Santamala adds a last stage of presentation at the motor show. Berlitz and Huhn end with the model manufacturing, with an implicit showcasing as planned for in the beginning.
The core of both techniques is the design phase (stage 3), which is preceded with stages that organize the project (stage 1) and define the product through the definition of the car message and users' information. The design phase includes the design of several alternatives, which are presented as scale models, and ends with the selection of a single proposal. The chosen proposal is prototyped in a final prototype (stage 4) that is presented in a motor show (stage 5). Overall, the framing of the activities differ on if concept cars are conceived with general design methods (Santamala's view) or require dedicated design techniques (Berlitz and Huhn's view). More in-depth research is required to solve the contradictory views and compare the activities to vision products in other industries.
In sum, the design techniques that explore the future and lead to concept cars, and the like in other industries, are contradictory and relatively unrevealed. In particular regarding if *vision concepts* are conceived with general design methods or require dedicated design techniques. And, if the techniques to design concept cars are comparable and transferable, in a more generic sense, to vision concepts in other industries. Overall, there is a lack of understanding on how vision concepts explore the future though embodiment of ideas and how designers share and lead the concept visioning.
Therefore, in this paper we investigate the following research questions:

- *What is the nature of a vision concept?*
- *How is the vision concept shared in the organization context?*
- *How is a vision concept designed - design technique?*

3. METHOD

Multiple case analysis
We chose to employ qualitative inductive research (Eisenhardt, 1989) to unravel the nature, organizational context and design techniques of the vision concepts. Five cases were analyzed with the aim of understanding the nature of vision concepts from the perspective of their producers, and thus, identify in which way companies design and shared them in the organizational context. We collected the cases from two economic sectors that have long tradition in using this kind of design technique to explore the future, which are the automotive industry (motor vehicles and passenger car bodies) and the home cooking -kitchen industry. The cases are a sample that includes concepts produced by different brands that were presented in different years and developed for diverse segments. To facilitate the comparison between the concept cars they are in a similar range and the concept -kitchens- products are designed for the same context, the kitchen, and with the same purpose, to cook food. All of these concepts are already finished internally and used in communications (exhibited) externally.
The multiple case analysis involved several steps. We began with the collection of qualitative data documented by videos and additional documentation from multiple sources. Then, we compared iteratively 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, 2009).

Data collection

A rich collection of video and documented case material provided the backbone for the extraction of qualitative data. Table 1 and 2 shows the characteristics of our sample, including video and concept documentation. The qualitative data analysis of these cases is based on internal information provided by the companies in their web pages and press releases, which includes text, images and videos; external reviews part of specialized magazines and blogs; and related research papers published in scientific journals. After selecting the cases, the companies´ web pages, the concept's press releases, the specialized magazines, and the papers were analyzed.

		Concept cars			Concept kitchens	
	Cases	**1. "YOUR CONCEPT CAR BY WOMEN FOR MODERN PEOPLE" 2004 BY VOLVO**	**2. CITRÖEN-LACOSTE 2010 BY CITRÖEN**	**3. F015 2015 BY MERCEDES-BENZ**	**4. CONCEPT KITCHEN 2025 BY IKEA**	**5. BIO-DIGESTER KITCHEN ISLAND AT MICROBIAL HOME 2011 BY PHILIPS**
VIDEO DOCUMENTATION	**NARRATIVE (VIDEO)**	Video: "Volvo YCC - Your concept car"	Video: "Citröen-Lacoste concept car"	Video: "World premier of the Mercedes-Benz F015"	The company produces a set of separated videos for each part of the system. This analysis is about "the table for living"	The company produced a general video with all the components of the Microbial Home
	Storyline	The video is a sequences of images of the car features and interviews with the designers about the user´s wishes and feelings	The video presents a group of young friends enjoying a sunny day at the beach.	The video shows a car that is on hold, till a businessman call it, then, the self-driving car drives the man through a road crossing a desert. During the drive, the man interacts with the car controlling some feautures. In some shots, four businessmen have a meeting within the car.	The video presents the interaction between a user and the table during the process to cook a recipe.	The video shows an overview of this research project with emphasis of Microbial Home as a potential solution. The Microbial Home is presented as a system including an overview of all the components and the interaction between the users and each component.
	Characters	Designers: the design team	Users: 2 young women and a young man	Users: 4 businessmen	Users: someone cooking and a child playing.	User: a group of people cooking
	Main messages in the story	(1) Design intentions explained through one by one interviews with the design team. (2) Product features described using shots of the car and some details. This is supported with a voiceover.	(1) The lifestyle of a group of young friends, who use the car -and other Lacoste products- to have fun in a day at the beach. (2) The interaction between people together sharing in the car, which is a mobile platform to enjoy life. (3) A place that is beautiful and enjoyable.	(1) The interaction between the user and the car (including props), between the car and pedestrians, and between several users within the car. (2) The car in movement externally over the road, and internally, where the interface is used. (3) Several images of the brand.	(1) The interaction between the user and the product, in some cases including a prop (cellphone and tablet).	(1) An overview of the system and the components, with a sequence of steps of the cooking process. (2) The interaction between the users and the components. (3) The research project context, problems and research question.
	Settings & background	Interior: studio	Exteriors: a beach	Exteriors: a road in the desert	Interior: several illustrations of the concepts and top views of the prototype	Interior: several illustration of the system and components to illustrate the sequence. The video is filmed in gallery where the prototypes were exhibited.
	Costumes	Does not apply	Lacost polos, sunglasses, jeans	Semi-formal dress	Does not apply	Does not apply
	Props	Does not apply	Camera and Lacoste accesories	Cellphone	Cellphone and tablet	Does not apply
	Soundtrack	Voiceover and direct voice during interviews	Music	Music: Empty beaches, night traffic	Voiceover	Music
	Film length	03:45	00:48	01:53	02:36	06:50
	SOURCE	Volvo (2006). YCC -Your Concept Car [Video]. Retrieved from: http://youtu.be/XX4xFjZPezA	Lacoste (2010) Citröen-Lacoste Concept Car [Video]. Retrieved from https://www.youtube.com/watch?v=iFbEeIEotyw&index=35&list=PL1Mmw93_pO4i5vuVHZdNwOogo6ODVePNj	Mercedes-Benz (2015). Mercedes-Benz TV: World premiere of the Mercedes-Benz F 015 Luxury in Motion research vehicle [Video].Retrieved from https://www.youtube.com/watch?v=DYTV4d-Gn0s	IKEA (2015) Concept Kitchen 2025 [Video]. Retrieved from https://youtu.be/qD60cBQOABY	Philips (2013). Microbial Home [Video].Retrieven from http://youtu.be/dM0WYdkKlu8

Table 2. Video documentation.

		Concept cars			Concept kitchens	
	Cases	1. "YOUR CONCEPT CAR BY WOMEN FOR MODERN PEOPLE" 2004 BY VOLVO	2. CITRÖEN-LACOSTE 2010 BY CITRÖEN	3. F015 2015 BY MERCEDES-BENZ	4. CONCEPT KITCHEN 2025 BY IKEA	5. BIO-DIGESTER KITCHEN ISLAND AT MICROBIAL HOME 2011 BY PHILIPS
VISION CONCEPT DOCUMENTATION	CONCEPT SUPPORTING DOCUMENTATION	Volvo (2015). Concept Cars, This is Volvo. Retrieved from: http://www.volvocars.com/intl/cars/concept-cars Volvo Car Corporation (2004). Volvo Press Release. Volvo Communication Centre. Retrieved from: http://www.volvoclub.org.uk/press/pdf/presskits/YCC PressKit.pdf	Citroën (2015).Citroën Concept Cars. Retrieved from: http://www.citroen.co.uk/about-citroen/concept-cars Citroën Lacoste (2015). Citroën Lacoste - Spontaneous, laid-back and sophisticated . Retrieved from: http://www.citroen.co.uk/about-citroen/concept-cars/citroen-lacoste	Mercedes-Benz Cars Research & Development Communications Centre (2015). World premiere of the Mercedes-Benz F 015: Luxury in Motion at the CES. Retrieved from:http://media.daimler.com/dcmedia/0-921-1775416-1-1778134-1-0-1-0-0-1-12639-1549054-0-1-0-0-0-0.html?TS=1430124188873#	IKEA (2015). Concept Kitchen 2025 How will we behave around food in 2025? Retrieved from: http://www.conceptkitchen2025.com/index.html	Philips (2011). Bio-digester island. Retrieved from: http://www.design.philips.com/philips/sites/philipsdesign/about/design/designportfolio/design_futures/bio-digester_island.page"
	REVIEW DOCUMENTATION	Men and Motors (2013). Volvo YCC Concept Car [Video]. Retrieved from: https://www.youtube.com/watch?v=y-m3yjJTGa0	Lookcycle (2015). News: Look dedicates its expertise to the Lacoste Lab. Retrieved from: http://www.lookcycle.com/en/uk/look-cycle/actualites/look-dedicates-its-expertise-to-the-lacoste-lab.html?___from_store=en	Mercedes Benz (2015) F015 Luxury in Motion: design videos [Videos].Retrieved from:http://www.carbodydesign.com/2015/01/mercedes-benz-f-105-luxury-in-motion-design-videos/ Mercedes Benz (2015) F015 Luxury in Motion. Retrieved from: http://www.carbodydesign.com/2015/01/mercedes-benz-f-015-luxury-in-motion/ Mercedes Benz (2011). Mercedes-Benz F 125! Concept. Retrieved from: http://www.carbodydesign.com/2011/09/mercedes-benz-f-125-concept/ https://www.youtube.com/watch?v=4hVBBUljOts Mercedes Benz (2015). Design Process F 015 Luxury in Motion by Mercedes-Benz [Video].Retrieved from: https://www.youtube.com/watch?v=R8BwEmeSREk		
	PROCESS AND CONTEXT DOCUMENTATION	Volvo (2015). Concept Cars. Retrieved from: http://www.volvocars.com/uk/top/about/corporate/pages/default.aspx Volvo (2015). Concept Cars, This is Volvo XC60. Retrieved from: http://www.volvocars.com/intl/cars/new-models/xc60	Citroën UK (2015). Retrieved from: http://www.citroen.co.uk/home	Daimler (2015). Mercedes-Benz Concept Vehicles – The Shape of the Future. Retrieved from: http://www.daimler.com/dccom/0-5-1280234-1-1280303-1-0-0-1302140-0-0-135-0-0-0-0-0-0-0-0.html Daimler (2015). Innovations for the mobility of the future. Retrieved from: http://www.daimler.com/technology-and-innovation/insights-into-research-and-development	IKEA (2015). An exploration of life in and around the kitchen. Retrieved from:http://ikeatemporary.com/	Philips (2015). Philips Design. Retrieved from: http://www.design.philips.com/
	PROCESS AND CONTEXT RELATED RESEARCH	Backman, M., Börjesson, S., & Setterberg, S. (2007). Working with concepts in the fuzzy front end: exploring the context for innovation for different types of concepts at Volvo Cars. R&d Management, 37(1), 17-28.				
		Backman, M., & Börjesson, S. (2006). Vehicles for attention creation: the case of a concept car at Volvo Cars. European Journal of Innovation Management, 9(2), 149–160.				
		Styhre, A., Backman, M., & Börjesson, S. (2005). The gendered machine: concept car development at Volvo Car Corporation. Gender, Work & Organization, 12(6), 551–571.				

Table 3. Vision concept documentation sample

Data analysis

The data analysis included the coding of the texts and the audiovisual material as well. All the videos selected are part of the material used to share the concept products on the web pages of the companies. For the analysis of the videos the method of Garcez, Duarte, and Eisenberg (2011) was used. First, the videos, one for each concept product, were watched several times to analyze the general structure of the storyline; then it was divided in unites of analysis to code the narrative elements (locations, characters, storyline), which were identified and clustered in a time-line. We analyzed the similarities and differences of concept visioning in the web documentation along the three aspects of our research question, the nature of what a vision concept is, the organizational context of concept visioning, and the design technique of how concepts are envisioned. As a starting point we consult the available literature on product visioning and vision concepts for comparable findings. Then, we identify patterns throughout the cases and match them to the respective aspects of concept visioning. We tabulated these findings and formulated analytical statements, and illustrate them by the use of individual examples and data from the cases (Miles and Huberman, 1991). The results of the analysis of the text and the videos are arranged in the table in the result section, and the conclusions are reported per research question.

4. RESULTS

The table 4 presents the results of the multiple case analysis of the five vision concepts, three concept cars in the automotive industry (Your Concept Car 2004 by Volvo, Citröen-Lacoste 2010 by Citröen and Lacoste, and F015 2015 by Mercedes-Benz), and two Concept Kitchens/Products in the technology industry (Concept Kitchen 2025 by IKEA, and Bio-digester Kitchen Island at Microbial Home 2011 by Philips) which allows also to compare the way in which automotive and kitchen manufacturers design and shared vision concepts. The table shows five vision concepts, the organizational context, and the design technique of them.

4.1 THE NATURE OF VISION CONCEPTS

The names appeared to vary for these vision concept artifacts. Most of the automotive firms call “concept cars -of upcoming vehicles-” the *emerging concepts*; and the *visionary concepts* are named in diverse way, Mercedes-Benz called the concept car “research vehicles”, BMW uses the term “visionary models”, and Mitsubishi Motors Corporation among others, named “advanced concept cars”. The analysis reveals that the three concept cars are presented as vehicles (artifacts), different that the concept products that are presented as systems of products, which include several artifacts and the relationship between all the components that conform the system. For instance, the Concept Kitchen 2025 by Ikea that is a system of products for the kitchen (a dining table, a pantry, a waste system, and a sink). All of the vision concepts are deployed as prototypes, 1:1 models that present the main features of the concept. Most of them are representational, which are non functional prototypes, like the Concept Kitchen 2025, a set of full-size prototypes that describe the components of the system of products and demonstrate the key elements of the product-user interaction, like the system to recognize objects and their movement and to project a display through the camera and projector positioned above the table, but they are not suitable to cook. The F015 was presented through a fully working prototype, a prototype that was subject of a test drive.

		Concept Cars			Concept Kitchens	
	CASE	**1. "YOUR CONCEPT CAR BY WOMEN FOR MODERN PEOPLE" 2004 BY VOLVO**	**2. CITRÖEN-LACOSTE 2010 BY CITRÖEN AND LACOSTE**	**3. F015 2015 BY MERCEDES-BENZ**	**4. CONCEPT KITCHEN 2025 BY IKEA**	**5. BIO-DIGESTER KITCHEN ISLAND AT MICROBIAL HOME 2011 BY PHILIPS**
VISION CONCEPT	**DESCRIPTION OF THE VISION CONCEPT**	It is a four seat coupé CC "targeting the most demanding premium customer: the independent, professional woman".	It is a crossroad super-mini SUV with an off-beat sporty design "where the car meets fashion and sports".	It is a self-driving luxury saloon car "designed for the far future".	It is a system of products for the kitchen, including 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 about how to use water.	It is 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".
	ARTEFACT					
	OUTPUT	A representational (non-working) prototype.	A representational (non-working) prototype.	A fully working prototype.	A representational (non-working) prototype.	A representational (non-working) prototype.
	FUTURE EXPLORATION (Question?)	In Volvo "concept cars function as a test bed for new ideas and thereby also as a means for experimentation" (Backman, Börjesson, and Settenberg, 2007).	Citroën states that concept cars are "laboratories for new ideas, which [they] share with the public at major international motor shows". Concept cars reflect their "ambitions, values and imagination". According to Lacoste the "Lacoste Lab -concept-products" represent the future of the brand, "giving it a head start by identifying tomorrow's products".	The F015 is presented as a "research vehicle" with the question: "how to enable people to do what they want or need to do?" Daimler defines four different kind of concept cars: research vehicles, technology demonstrators, experimental vehicles, and design studies. Research vehicles "combine a variety of boldly innovative technologies in a form which can be visualised, driven and readily evaluated".	IKEA and the external stakeholders have developed this "investigation" around the question "how will 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".
DESIGN TECHNIQUE	**ACTIVITIES**	According to Backman, Börjesson, and Setterberg (2007) the concept phase includes a (i) pre-program planning phase; the (ii) market, trend and competitor analysis; (iii) development and manufacturing constrains; and the (iv) design of two competing design models. During the concept stage the team (v) select and (vi) refine one design model based on: the attribute documents and the conceptual prerequisites.	According to Christophe Pillet, Lacoste's Design Manager and head of Lacoste Lab, the design of this concept car was approached as the design of a pair of shoes, which he summarises in three steps: (i) look, observing the trends; (ii) ask, inquiring the users about their dreams in regards to their lifestyle; and (iii) solve, designing de concept with special attention to the colour and trim development.	The process, described in the video, starts with the (i) definition of a design brief and the (ii) design of a future scenario, both documents provide information to (iii) design 3 alternatives through sketches (exterior and interior) and exterior scale models. Then, the team (iv) selects one alternative and (v) develops it through detailed sketches (e.g. 1:1 sketchs) and CAD modeling. In parallel the design team (vi) selects the materials and (vii) design the interface. When all the details are defined they (viii) produces the final prototype and (ix) exhibit it.	The project includes five phases, described in the video as: (i) the research and exploration phase that address the question: what will life around food look like in 2025?, to find opportunity areas and emerging themes; (ii) the idea generation phase, to find new ideas ; (iii) the prototyping phase, iterating through prototypes to develop the concepts; (iv) the exhibition phase, to showcase the high-resolution prototypes in Ikea Temporary; and (v) the future developments phase "to take forward these ideas into a product development for the future" and inspire the developers. The last phase is still in progress.	The project includes six phases, described in an interview with the design leader as: (i) the definition of a general terrain to explore, based on a constant monitoring process; (ii) the research of a chosen area, to identify potential problems and position this problem in context; simultaneously (iii) narrow-down the problem and (iv) look for disruptive narratives that connect the issues; (v) produce a provocation in a form of "a video and a physical materialization"; and the (vi) exhibition that stimulates debates and generate ideas. (vii) Workshops with managers.
	DELIVERABLES	A prototype and a press kit (18 pages long document, six pictures, and a video).	A representational (non-working) prototype and a press kit, which includes a video, several pictures, and sketches.	A fully working prototype and a press kit (text, 31 pictures, and two videos).	A representational (non-working) prototype and supporting material for the exhibition (videos, images, text, and posters).	A representational (non-working) prototype and supporting material for the exhibition (a video, images, and text).
	ROLE OF THE DESIGNER	Five of the nine team members are designers, a design manager with a design team that includes an exterior, interior and color and trim designers.	The project was headed by the director of the design division of Citroën and the Lacoste's Design Manager (responsible for the Lacoste Lab), both designers.	The project was lead by the head of the Advanced Design Department.	All the team members were designers, including design students.	All the team members were designers.

SHARING CONTEXT	**PURPOSE**	YCC main focus is communication (Styhre, Backman, & Börjesson, 2005). The YCC concept was developed to communicate that the company has a special consideration for women as employees and customers. The company states that "the female perspective was at the core of the YCC project from the outset and that was exactly the way Volvo Car Corporation wanted it to be. A concept car project started, inspired and managed by women. One in which women always had the final say".	Citroën is "exploring the future of driving" through concept cars, and Lacoste Lab, which is based on co-creation between Lacoste and several partners, use -concept- products to "hold shares, exchange of ideas and talent and brings together expertise in design and technological innovation". The Citroën-Lacoste concept car was communicated as an "alternative option" with strong emphasis on the lifestyle.	The main purpose of this concept is to declare that Daimler is innovating about autonomous-drive cars. Daimler says that concept cars feature innovative technology that "sets industry trends, in some cases preparing the way for market adoption of novel vehicle concepts", and "enter into a dialog with customers", giving inspiration to the market and sound out customer interest.	According to Gerry Dufresne, Range Manager, Kitchen and Dining, IKEA of Sweden, the main purpose of this project is "to inspire ourselves and inspire people around us" through "a tangible communication of what are the behaviours of the future and what is the kitchen looks like in 2025".	This concept is intended "to stimulate discussion around waste and how we deal with it", the concept is "testing a possible future – not prescribing one". Philips states that "it is not intended as a production prototype nor will it be sold as a Philips product". Probes projects "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". Insights gained from debate around the concepts feed into future innovation for the company, "improving the innovation hit rate".
	LEAD OWNER	Volvo Car Corporation that is a Swedish premium automobile manufacturer.	This project is a co-branding experiment between two French companies, the automobile manufacturer Citroën and the apparel corporation Lacoste.	Mercedes is the luxury division of the German manufacturer Daimler AG.	IKEA is a multinational group of companies that design and sell ready-to-assemble furniture, appliances, motor vehicles and home accessories.	Philips is a technology company focused in the areas of electronics, healthcare and lighting.
	UNIT OF MANAGEMENT (in-company sharing)	Volvo has a specialised division called Volvo Monitoring and Concept Centre, which creates concept cars and acts as a monitoring centre as well. "Its explicit objective is to carry out concept development, and it has an internal reputation based on creativity, design skills and holds a sort of flashy image" (Backman, Börjesson, and Settenberg, 2007).	The Automotive Design Network, a Citroën division, which is responsible to design concept cars and commercial vehicles, joint the "Lacoste Lab, innovation and reinvention" program. It is a special program responsible to arrange "collaborations between Lacoste and different partners with which design department shared ideas and talents".	Mercedes has a division responsible to design concept cars and commercial vehicles named Advanced Design Department.	The project was a collaboration between Kitchen and Dining, a division of IKEA of Sweden, and external partners: IDEO, a global design company, and two universities (Eindhoven University of Technology and Lund University).	The company developed the "Philips Design Probes Program" from 1996 till 2012. This program "creates concepts based on research into emerging 'societal signals' and technologies" looking far into the future.
	PORTFOLIO STRATEGY	Concept cars are in a separate portfolio, which is part of the cars division, under the motto "show, don't tell…".	Due to the special condition of this concept car, it is part of two portfolios: the Citroën separated portfolio of concept cars, which includes twelve concepts; and the special portfolio of Lacoste Lab's -concept- products, which includes a bicycle, a motorcycle helmet, a surfboard, among others.	Concept cars are in a -research- portfolio named "Mercedes-Benz Concept Vehicles – the Shape of the Future". The "F Series research vehicles" are part of this portfolio since 1991 with the F100.	Concept products are special projects under the supervision of specific departments. IKEA only has a commercial product portfolio.	Thirteen projects (Design Probes) are arranged in a specialized portfolio called Design Futures. These "far-future concepts explored what could potentially shape our lives in years to come".
	TEAM (sharing in co-creation)	A team of nine women, two managing the team as project managers, supported by an extra technical project manager, and a design team.	A joint between the Citroën design team and the Lacoste Lab was responsible to design this concept.	A special team arranged between the Advanced Design Department and the Engineering and Construction Department composed by "designers, engineers and marketing experts jointly draw up the technical specifications for [this] new research car".	Depending on the stage of the project special teams were arranged including -senior- designers from IDEO and design students. In total 54 students and professional designers were working together in 27 sub-projects.	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".
	EXHIBITION EVENT(S) DEMONSTRATION (Public sharing)	It was presented in 2004 in the Geneva International Motor-Show and within the company through several presentations.	It was unveiled before the Paris Motor-Show in 2010.	It was presented in the International Consumer Electronics Show in 2015.	It was exhibited at IKEA Temporary at Milan in 2015.	It was exhibited at the Dutch Design Week in 2011. Additional to the exhibition the Philips foresight initiative was developed through the webpage http://designprobes.ning.com/.
	DEMONSTRATION	The prototype was showcased externally to specialised journalists in a press conference and to the general public in the motor-show. It was included in 272 articles and press clipping in more than 20 countries (Backman & Börjesson, 2006) representing more than 2.5 millions of euros in advertising.	The prototype was unveiled in the show to specialised journalist and the general public.	The fully working prototype was presented by the CEO in a press conference to specialised journalists, and it was subject to a test drive. It was showcased to the general public during the exhibition.	The prototype, which is non functional, describes the main components of the product. It was presented to the general public in the show through demonstrations, where people could interact with it directly, and identify the key elements of the product interaction but not cook. Several activities, including workshops, were arranged during the exhibition.	The prototype was exhibite in the show to the general public.
	COMPANY EVENTS (in company sharing)	Additionally, it was used internally in 50 presentations to Volvo employees.			During the process several presentations were arranged with different employees of IKEA.	Additional to the exhibition and the webpage a comprehensive report that "captures all the concepts, though processes and intellectual property ideas", was used as the input of several workshops within the company.

Table 4. The vision concepts, the sharing context, and the design technique of the cases

Companies describe vision concepts as a way to test and present new ideas (e.g. Volvo says that "concept cars function as a test bed for new ideas", Citroën states that concept cars are "laboratories for new ideas", and Mercedes-Benz claims that through concept cars they have a "dialog with customers"). The vision concept artifacts are outputs of research projects that explore -research- questions, e.g. how will we behave around food in 2025? by Ikea, how to enable people to do what they want or need to do? by Mercedes-Benz, or to ask questions about the viability of biological processes in our home and places of work by Philips. Concerning the nature of the vision concept, a research question of exploring the future seems to be inherently related to what a vision concept distinguishes from NPD-prototypes. The embodiment in a 1:1 model prototype can be similar but the future narrative about envisioned interactions with the product in the future is different.

4.2 ORGANIZATIONAL AND SHARING CONTEXT IN CONCEPT VISIONING

Concerning how the vision concept is shared in the organization context our analysis reveals three types of sharing (in-company, team, and public) with the public sharing and in-company sharing of the final tangible prototype as distinctive and typical for concept visioning in comparison to common prototypes used in FEI or NPD projects that are kept confidential for the outside world. Quite striking, Philips explicitly want to make clear that the tangible vision concept "is not intended as a production prototype nor will it be sold as a Philips product". All of the studied concept cars and concept kitchens are demonstrated on an international event. Interestingly the F015 Mercedes Benz was presented on the Consumer Electronics Show (CES) exhibition 2015 in Las Vegas instead of a motor show. It was a working prototype and interactively presented, used and tested with the public and a selected audience of journalist and special relations with test-drives. The other two concept cars were exhibited on international motor shows, the Volvo in Geneva and the Citroen-Lacoste in Paris, although both concept cars were only presented, no test-drives were included in these cases. The concept kitchens were demonstrated on international events, the Ikea concept kitchen on an independent exhibition (#IKEAtemporary) in Milan including several workshops and the Bio-digester of Philips was presented on the Dutch design week in Eindhoven in alignment with demonstration workshops but interestingly also with a dedicated foresighting initiative, a so-called 'far-future research dialogue by Philips Design- to tracks emerging developments in politics, economics, environment, technology and culture'. In company sharing Volvo, Ikea and Philips use the vision concept in several internal workshops and presentations. Philips includes a report that "captures all the concepts, though processes and intellectual property ideas". Concerning the organizational context the purpose of concept visioning is quite clear with respect to the communication message aimed at a global public. The main purpose of this project is "to inspire ourselves and inspire people around us" through "a tangible communication of what are the behaviors of the future and what is the kitchen looks like in 2025" as the Ikea manager explains the vision story, or in the case of Mercedes-Benz to "enter into a dialog with customers". In addition, vision concepts stimulate the creation and exchange of new ideas based on the understanding of future changes. The concept cars are part of a dedicated vision concepts portfolio (e.g. the Mercedes-Benz Concept Vehicles portfolio established since 1991) and the concept kitchens are part of special innovation programs, which is the case of the Philips Design Probes Program from 1996 till 2012. Only Citröen-Lacoste differences a bit by positioning the concept car as an alternative option, a strategy alternative instead of the main strategic vision direction. The in-company and team sharing is only exclusive in the Volvo case were a dedicated (future)

monitoring and concept center unit is established. In all other cases a joined management of tangible vision concepts and commercial prototypes is practiced across different departments. In most cases special teams co-created the vision concept. In the case of Ikea and Citröen external designers were members of the team.

4.3 DESIGN TECHNIQUES OF CONCEPT VISIONING

In table 4, the analysis reveals how vision concepts are designed with regard to the methods applied, the staging of activities, the deliverable, and the role of the designer. Concerning the methods of user research Volvo uses interviews and focus group, and Ikea chooses observation to gain insights from the users versus expert research used by Philips who arranged interviews with experts. Both, Volvo and Philips monitor trends as a way to understand external factors where Mercedes-Benz uses future scenarios. All the cases refer to sketching and prototyping as the method of design the concepts. CAD modeling, photo-shoots and rendering are mentioned as methods of present the concept. The cases analysis results in the identification of five activities to design a vision concept: the research *project set-up*, the future *exploration*, the vision concept *design*, the vision concept *making*, and the future message on the *exhibition*. The analysis shows that, in most of the cases, to setup the project the team defines a -research- question and the domain, which is an area of interest and the users who are linked with this area. Philips starts with the "definition of a general terrain to explore"; Ikea formulates a research question for the research and exploration phase, what will life around food look like in 2025? Then, the team conducts activities to explore the domain identifying problems, opportunity areas, and trends. In the exploration they define the vision of the future through a future scenario, for instance Mercedes-Benz defines the City of the Future 2030+ and Philips "researches the chosen area, to position this problem in context". In general all the companies use an iterative way to design the vision concept though the generation, selection, and depuration of ideas. To generate and select ideas the three automakers use sketches of the exterior and the interior and scale models of the exterior. The other companies mention prototyping, as a sequence of sketches and mock-ups as a result of several creative sessions. Additionally, Philips "looks for disruptive narratives that connect the issues" and Ikea use storytelling "to turn stories into concepts". At the end of this activity the final concept is selected and the prototype is made. Different than others companies, Philips says that they "produce a provocation in a form of a video and a physical materialization". All the vision concepts are presented in external show to the general public and some of them in internal workshops and presentations. According to Philips it is possible "in an exhibition that stimulates debates and generate ideas". Ikea is the only company that mentions an extra phase where they "take forward these ideas into a product development for the future".

5. DISCUSSION

5.1 THEORETICAL CONTRIBUTION

In correspondence to Ny and Thott (2005) our findings confirm that vision concepts are part of a dedicated portfolio outside of the ordinary portfolio. In addition our findings suggest that vision concepts are tangible prototypes used by organizations to explore and present new ideas of the interplay between -system of- products and users in the future. In addition to Keinonen and Takala's work (2010) these vision concept artifacts support the company´s strategic decision-making beyond the range of product development aimed to customer's decision-making.

Vision concepts are shared in the organization context in three different levels, in-company, team, and public. Different than commercial products, which are part of a NPD projects that are kept confidential for the public, the tangible prototypes of vision concepts are sharing in-company and public.

Concerning the purpose of the vision concepts the findings suggest that vision concepts are a way to stimulate the creation and exchange of ideas with diverse people inside and outside the company, which adds to the initial identification by Stacey (2001) and Reid and Brentani (2012) in regards the importance of sharing visions.

Grounded in our evidence we suggest that the design of a concept vision is not a simplified NPD process for full-scale production, as Styhre, Backman and Börjesson (2005) and Santamala (2006) suggested. Instead, this appeared to be part of a special exploration project that brings a conceptual solution, as Lv and Lu (2012) and Berlitz and Huhn (2005) stated, and has a strong focus on communication. As an exploration, it is led by a -research- question (e.g. how will we behave around food in 2025? by IKEA) and is developed by a highly skilled team. According to our evidence the team includes designers with a wide range of design competencies, as Keinonen and Takala (2010) enclosed. Among others: the ability to research about the users and the context, the ability to communicate through prototypes and videos, and, specially, the ability to foresight.

As a first guiding principle for the design of vision concepts we suggest dividing the process in two moments, the *present* and the *future*, and two transitions, the *forward loop* and the *backward loop*. In extension to add the organization-interaction context to the product-interaction context in such a way that each time situation, moments and transitions, is divided in four different levels, the organization and product level, which are internal; and the user and business context levels that are external to the organization. VIP (Hekkert, Van Dijk, and Lloyd, 2011) instead is divided in three levels (context level, interaction level, and product level) that are just focus on the product, not the organization context.

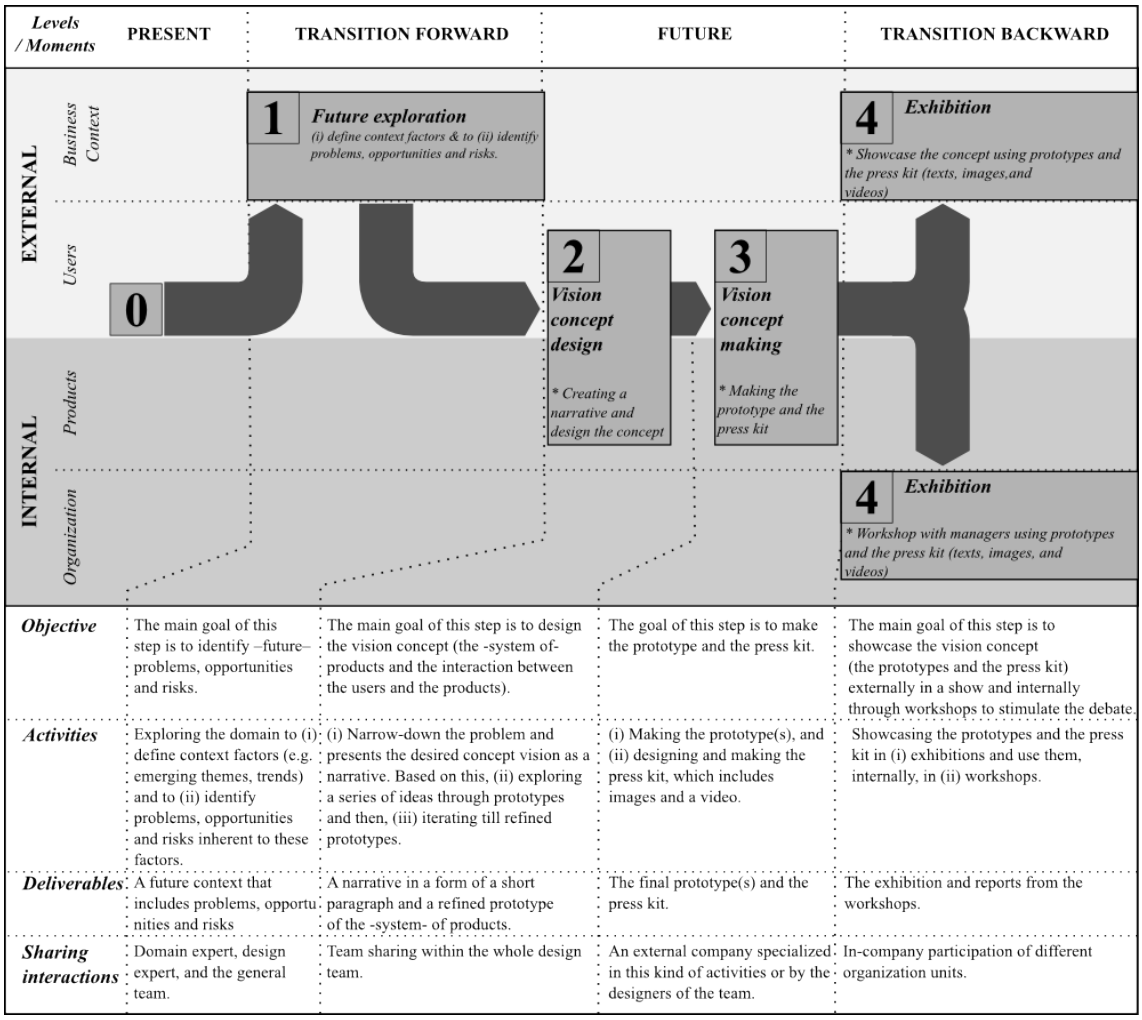
The first moment, the *present*, includes a common first step in a generic design process, the research *project setup* that comprises an analysis of the present, the formulation of the –research– question, and the definition of the domain. The –internal & external– analysis is based on the characterization of the users through interviews, focus group and observations. The VIP method starts establishing the domain and time frame that are just part of the external analysis.

In the *forward loop*, the team conducts a future exploration, which is similar to the *future description* defined by Keinonen and Takala (2010). This second step includes the identification of –future– problems, opportunities and risks, and corresponds to the business context level that is external to the organization.

In the second moment, the *future*, the vision concept design is conducted. The design of the narrative is somewhat distinctive white respect that 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 statement* proposed by Hekkert, Van Dijk, and Lloyd (2011). The statement is a storyline that explains the desired relation between the product(s), people (including users and other stakeholders), and their context.

In the *backward loop*, the vision concept making and the exhibition, are conducted. These steps correspond to the external business context level and internal organizational level.

The diagram below presents the distribution of the steps of the design of vision concepts including the objective, activities, deliverables, and sharing interactions of each step.



Levels / Moments	PRESENT	TRANSITION FORWARD	FUTURE	TRANSITION BACKWARD
Objective	The main goal of this step is to identify –future– problems, opportunities and risks.	The main goal of this step is to design the vision concept (the -system of- products and the interaction between the users and the products).	The goal of this step is to make the prototype and the press kit.	The main goal of this step is to showcase the vision concept (the prototypes and the press kit) externally in a show and internally through workshops to stimulate the debate.
Activities	Exploring the domain to (i) define context factors (e.g. emerging themes, trends) and to (ii) identify problems, opportunities and risks inherent to these factors.	(i) Narrow-down the problem and presents the desired concept vision as a narrative. Based on this, (ii) exploring a series of ideas through prototypes and then, (iii) iterating till refined prototypes.	(i) Making the prototype(s), and (ii) designing and making the press kit, which includes images and a video.	Showcasing the prototypes and the press kit in (i) exhibitions and use them, internally, in (ii) workshops.
Deliverables	A future context that includes problems, opportu nities and risks	A narrative in a form of a short paragraph and a refined prototype of the -system- of products.	The final prototype(s) and the press kit.	The exhibition and reports from the workshops.
Sharing interactions	Domain expert, design expert, and the general team.	Team sharing within the whole design team.	An external company specialized in this kind of activities or by the designers of the team.	In-company participation of different organization units.

Figure 1: Framework of the design -process- of vision concepts

As a second guiding principle for the design of vision concepts we advise that it is a process that close the loop between two moments in time by two transitions. The moments add a backward equivalent of future exploration activities to the VIP (Hekkert, Van Dijk, and Lloyd, 2011).

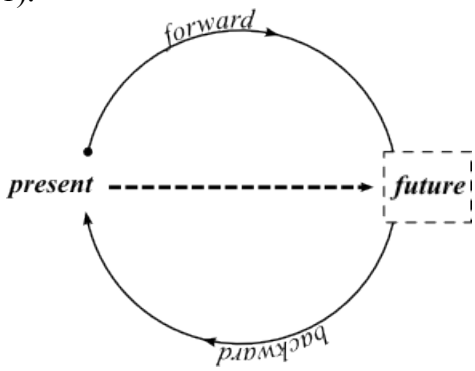


Figure 2. Design principle of vision concepts, future exploration by forward loop and vision concept creation by backward loop

5.2 LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This study was limited to five cases in two economic sectors through information collected online. Additional information, through interviews with the designers or an observation in shows, is required to understand in depth the phenomenon of vision concepts. Organizations in different economic sectors and with different conditions face similar challenges than automotive - and consumer lifestyle companies. One critical example is the case of small and medium-sized enterprises (SMEs) that are essential for the economic and social development in several regions (De Lille, 2014). SMEs have less potential for innovation and competitiveness because they are concentrated on short-term problems (French and Bell, 1990), and they do not have enough skills to explore the future (French and Bell, 1990; Cornella, 2013). SMEs can have a profound boost in their innovation through the use of vision concepts as a way to generate and share ideas of new –system of – products.

6. CONCLUSION

To the initial scholarly work on product visioning, this paper makes three contributions. First, it provides a grounded definition for the *vision concept*. Second, it reveals characteristics on the sharing context that distinguish concept visioning from other types of concept - and new product development. Third, it lays out the groundwork for a concept visioning design technique by introducing a framework. Finally, this paper provides directions for further research to test the framework and extends the findings with additional exchanges between practitioners and scholars.

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