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CONCEPT CARS AS A DESIGN-LED FUTURES TECHNIQUE

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ABSTRACT

Innovation forces organizations to think about the future. The many techniques guiding these explorations are named *futures studies*, which are inquiries into images of the future and their surrounding elements. Although futures studies help organizations to change, their results are often difficult to interpret, and they frequently fail to involve middle-level managers or the public at large. As design is a future-oriented discipline, it is remarkable that the futures studies and innovation management literature do not cover *design-led techniques* to boost the innovation process. This paper fills a part of this gap in the extant literature by discussing *Concept Cars* in the automotive industry, a phenomenon in which design plays a prominent part. Since the first Concept Car, it has become clear that automakers do not make these tangible models to mass-produce and sell them, but they mainly view them as a brand builder.

Although Concept Cars are broadly recognized as an interesting phenomenon, little academic work has been conducted on them. This paper discusses Concept Cars as a design led futures technique, and aims to understand their purposes, outcomes, and development process. Our study used multiple methods, including ten interviews with design experts, observations on Concept Cars at a motor-show, and a review of three Concept Cars.

We find that Concept Cars help organizations to change through an inquiry into images of the future. Concept Cars offer a design-led approach of researching the future, where visual synthesis, prototyping, and storytelling play an important role. Concept Cars act as probes that simultaneously explore technologies and styling while also communicating a probable, plausible, and preferable future, in one time-horizon.

Unlike managerial futures techniques, Concept Cars provide tangible futures that people with different backgrounds can experience, influencing several parties involved in developing an innovation. A Concept Car has two main limitations. The development of a Concept Car is a resource intensive process and results in a single outcome. We conclude that Concept Cars or Concept Products can complement other futures techniques and may also be used by companies operating in other industries when looking for new ways to innovate.

INTRODUCTION

Organizations need to examine the future when they try to innovate. The techniques guiding those explorations are named *futures studies*, which Hines (2016) describes as modes of thinking, mapping and influencing the future. With these techniques, people gather information from the external context and interpret it, producing a range of alternative views of the future. These visions reveal opportunities that are vital to

making decisions in the present. But as most of these techniques rely on thinking-first approaches, the outcomes they generate are often complex, designed for specialized audiences, making its diffusion and implementation difficult.

It is surprising that, viewing these limitations while looking for ways to strengthen futures techniques, the innovation management and futures studies literatures have yet to address the role of *design-led techniques*. They are intrinsically future-oriented and, according to Cross (1982), have a strong emphasis on communication. He states that a design-led -or a “*designerly*”- way of knowing incorporate practicality and empathy focusing on pattern-forming, modeling, and synthesis. It allows developing skills in nonverbal thought and translates abstract requirements into concrete objects.

Two representative examples of design-led techniques that explore the future are the recent *Design Fictions* and the longer existing *Concept Cars*. The first one 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 researchers and design practitioners such as the Near Future Laboratory. The second one, *Concept Cars*, is a well-known “*designerly*” practice that since the late 1930s has been used in the automotive industry as a tool to explore the future and innovate.

Although *Concept Cars* have become a widespread practice –each year, more than 50 such concepts are presented at motor shows around the world-, little academic work has been done on them. This paper fills a part of the void in the extant futures studies and innovation management literature by discussing *Concept Cars* as a design-led futures technique. To do so, we used a mixed methods research approach that included interviews with experts, observations in a motor show, and a comparison of the development of three *Concept Cars*.

Our paper aims to identify and clarify the characteristics of *Concept Cars* as a design-led futures technique as well as to reflect on its value and managerial implications in automotive firms and beyond.

FUTURES STUDIES

Considering that *Concept Cars* are not explored yet in the fields of futures studies and innovation management, this section presents a literature synthesis about futures studies to frame the discussion of *Concept Cars*.

Studying the future is a common practice among organizations, especially when they aim to innovate. According to Van der Duin (2006), organizations examine the future because they need to be aware of the changes in the business environment and changes in the behaviors of customers, competitors, and suppliers. He states that these adjustments and attitudes consider a context that is dynamic and increasingly complex. Through these examinations, organizations expand the range of strategic options during the Strategic Thinking explorations (Voros, 2001), providing knowledge to support decision-making processes in innovation.

The futures studies and innovation management literatures show that the primary purpose of futures techniques is to sketch an innovation map within the company, which includes different projects related to radical and incremental innovation. Through futures techniques, companies “accomplish a common perspective, develop consensus, and obtain commitment in a unified approach” (Simonse, Buijs, & Hultink, 2015). Mannermaa (1986), Coates (2003), and Rohrbeck and Schwarz (2013) discuss how futures techniques are used to create a future vision. As a result of these techniques, managers can identify opportunities and risks, make plans, communicate

those plans to others, and learn from their experiences.

To better understand futures studies, we consider the (i) *time-horizons*, the (ii) *potential alternative futures*, and (iii) *futures techniques*. The first two are used to frame the exploration of the future, the former in terms of time, and the latter regarding probabilities of occurrence.

First, the *time-horizons* are time intervals that move from short to long-term. According to Eisenhardt and Brown (1998), these frames are defined by the 'time pacing strategy' that managers use to set the speed for competition in dynamic markets. They argue that defining time-horizons helps companies to anticipate and set the pace for change, preventing managers from “waiting too long, moving too slowly, and losing momentum”. If organizations consider time-horizons in their planning, they can schedule change at expected time intervals, create an impulse and maintain the organizational drive, which is essential for survival in a fast-changing business context. The kind of products and the market conditions are essential to define the appropriate time-horizons. Simonse, Buijs and Hultink (2015) use the example of the high-tech company Philips where the short-term refers to up to five years; medium-term, five to fifteen years; and long-term, more than fifteen years.

Second, the *potential alternative futures* are related to the type of image of the future resulting from the futures techniques. Amara (1981) identifies alternative futures considering that futures techniques cannot predict and predetermine a single future. Figure 1 presents the four potential alternative futures that are classified by Voros (2001) as possible, plausible, probable, and preferable futures.

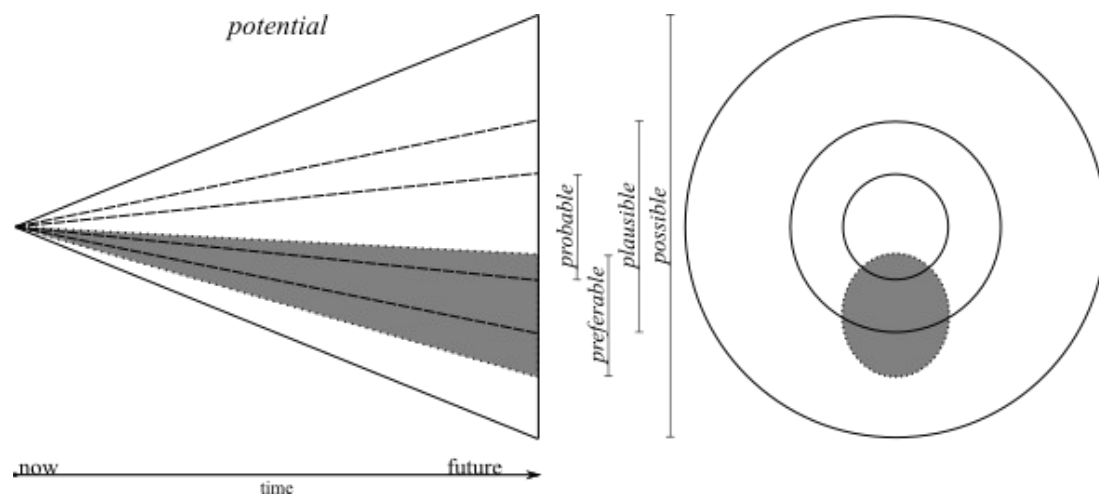


Figure 1 The future cone adapted by Voros (2001) from Henchey (1978). Notice how the preferable future lies in the other alternative futures.

The *possible futures* cover the entire base of the cone, representing all things that might happen, including “all the kinds of futures we can possibly imagine”. These prospects rely on “knowledge that we do not yet possess”. Second, a smaller concentric circle shows the *plausible futures* that include the things that could happen, depending on the current knowledge. Third, a tiny circle, right in the middle of the base of the cone, shows the *probable futures* limited by the things that are likely to happen as the continuation of the present. These prospects are linked to the current trends and the current knowledge. Finally, Voros identifies the *preferable futures* that someone wants to happen. Whereas the first three alternative futures are related to a rational strategy based on facts, the preferable futures are emotional, related to values, and thus subjective (Voros, 2003). Preferred, or desirable futures can be linked to

The third and last thing to consider to better understand futures studies is *futures techniques*. These techniques are organizational practices that help companies in the process to imagine the possible, assess the probable, and decide on the preferable future on a specific time-horizon. According to Voros (2007), these techniques are inquiries into images of the future and their surrounding elements, including their consequences in decision-making. Mintzberg and Westley (2001) suggest that different forms of decision-making should coexist in organizations. Those forms are the thinking-first, which is a verbal approach that relies on facts; the seeing-first that is visual and based on ideas; and the doing-first, which is visceral and based on previous experiences. Based on Voros (2007) and following the Three Approaches to Making Decisions proposed by Mintzberg and Westley (2001), we arrange the futures techniques in two groups: (i) *the managerial* and (ii) *the design-led*. Managerial futures techniques are thinking-first, whereas design-led embraces all three (Sanders & Stappers, 2012).

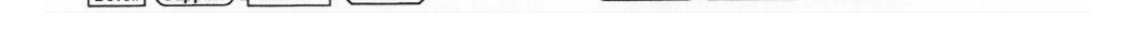


Figure 2 An example of a technology roadmap from Albright and Kappel (2003). Notice the position of the vision on the right hand just after the third time-horizon.

These managerial futures techniques have some limitations. First, they target a specialized audience and thereby lose the possibility to inform other decision-makers and people involved in innovation. As Coates (2003) and Lyons, Duxbury and Higgins (2006) claim, futures studies projects follow a top-down approach, which are designed by experts for experts. Second, they give the organization a set of complex outcomes available only to high-level managers (Wright & Cairns, 2011). Finally, they are often resource intensive and time-consuming (Coates, 2003).

Considering these limitations and to experience the benefits of experimenting and learning, organizations should embrace intuitive and action-oriented forms of decision-making (Mintzberg & Westley, 2001). Two examples of these design, intuitive, and action-oriented forms of futures explorations are Design Fictions and Concept Cars. The present study will focus on Concept Cars.

CONCEPT CARS

Although Concept Cars have been discussed in several literature streams (e.g. Engineering, R&D, and Innovation Management), they are mainly used to illustrate other topics. Previous work has failed to address how Concept Cars, as a technique for exploring the future, are related to innovation in the automotive industry.

The first Concept Car was the Buick Y-Job, designed in 1938 by Harley Earl. It represented an important milestone for General Motors. According to Edsall (2003), it turned the company from an engineering-oriented organization into a design-led one. He claims that the Y-Job represented the first time a designer took the lead in the design of a car, establishing an entirely new way of working within General Motors. As a result, the Styling Section of GM made a fully working prototype built on a production Buick chassis (shown in Figure 3). It was defined as “the first car built by a mass manufacturer for the sole purpose of determining the public's reaction to the new ideas”, and it was not intended for production. Times have changed since then and the role of Concept Cars has broadened considerably.



Figure 3 Prototype of the Buick Y-Job. The Y-job included novel characteristics such as “hidden headlamps, electrically operated windows, flush door handles and a power-operated convertible top” (Dream Car 1938, 2012). Image by <http://www.buick.com/experience/heritage.html>

The main purposes of Concept Cars, according to the literature, are well balanced between two areas, *innovation* and *branding*. For instance, Styhre, Backman and Börjesson (2005) identify innovation and the symbolic importance of Concept Cars in the material culture of our society, while Backman and Börjesson (2006) added

branding and marketing, including image building, and internal and external communications. Evans (2011) claims that innovation is the primary purpose of Concept Cars.

The benefits Concept Cars offer, when it comes to *innovation*, are linked to the outcome as an “experimental artifact” (Styhre, Backman & Börjesson, 2005) but no clear guidelines or details are proposed. Santamala (2006), Backman and Börjesson (2006), Evans (2011), and Lv and Lu (2012) propose that these artifacts stimulate imagination, define new creative limits, and break boundaries regarding product design.

On *branding*, the literature is more prolific, but it does not identify clear differences between communication for innovation and communication for branding. According to Roscam Abbing (2010), Concept Cars visualize future directions affecting the company from inside and outside. Within the company, Concept Cars create brand identity, and outside, they enhance the brand image of the products¹. According to Backman and Börjesson (2006), one of the main aims of a Concept Car is to present and visualize the company’s “visions of future design and technology trends”. Internally, this visualization of the future creates guidelines for different functions within the organization, and externally, the vision is communicated. However, Evans (2011) suggests that Concept Cars incorporate trend reports, increasing an organization’s trend knowledge and their consumer foresight, establishing coherent and unified design outputs of the different ideas and products lines.

In regards to the process, Concept Cars are developed as R&D projects, through a series of techniques explored in our previous research. According to Styhre, Backman and Börjesson (2005), Concept Cars offer a “freedom to experiment without being too constrained by existing platforms, regulations or industry standards”. These projects serve as a laboratory for new product development, stimulating experimental thinking and allowing a more freely creative exercise than a typical development project (Backman & Börjesson, 2006). Chris Bangle, former BMW’s head of design, says that GINA (a BMW Concept Car) allowed his team to “challenge existing principles and conventional processes opening possibilities to be more creative” (Squatriglia, 2008). The process of building a Concept Car is also much shorter. Berlitz and Huhn (2005), Styhre, Backman, and Börjesson (2005), and Backman and Börjesson (2006) all claim that the design and development process of a Concept Car varies from six to fifteen months. This in contrast to the development of a production car which can take up to 60 months. The average of ten months to develop a Concept Car includes a final step related to communication, in which the company presents the Concept Car at a motor show to the media: newspapers, TV, and radio (Lv & Lu, 2012), experts and customers (Berlitz & Huhn, 2005), and the general public.

Although the literature has looked into the process of building a Concept Car, a relatively unexplored area is the Concept Car as the outcome of a process. Santamala (2006) alone remarks that Concept Cars are artifacts that are presented as full-scale prototypes. More recently, Buijs (2012) has pointed out that “not all Concept Cars are able to be driven, but they look as realistic as possible”.

This paper aims to add to the literature on Concept Cars by uncovering the key features that distinguish them as a futures technique. This examination includes inquiries into the reasons behind this practice, and the study of the different forms in which companies develop and use Concept Cars.

1 The “brand image is understood as the perception users have of the products or the enterprise, contrasted with the brand identity that is the basic enterprise promise and its future objectives as an organization” (De Chernatony, Dall’Olmo, 1998).

METHOD

We employed a *mixed methods research* approach to investigate Concept Cars as a design-led futures technique, and to identify and clarify the purposes and characteristics of these artifacts within the futures studies field. According to Creswell (2009) collecting multiple forms of data should help the researcher explore different types of questions through the comparison and combination of several databases.

Using the mixed methods research approach, *three studies* were conducted to identify what automakers *say*, *do*, and *make* while designing Concept Cars. According to Sanders (1999), listening to what people say provides explicit knowledge, observing what people do gives observable knowledge, and analyzing what people make supplies tacit knowledge. She also states that through the study of these three levels -say, do, and make- researchers can collect different pieces of knowledge simultaneously to gain a clear understanding of a certain phenomenon.

Following Sanders' three levels, we chose one research method per study: Study 1, *interviews* to hear what automakers (car designers) say about designing Concept Cars; for Study 2, (ii) *observations* to see what automakers do with them in a motor-show; and for Study 3, (iii) a *multiple-case analysis* to understand what automakers make while designing Concept Cars. To categorize the results from the three studies, we selected the *POP model*, which stands for Purpose, Outcome, and Process. We used this model, developed by Jaffe and Alford (2013), as a useful way to understand the reason behind a phenomenon and its results. Table 1 presents how we collected our data, following the Sander's levels, and organized by the POP model. The 'X' shows the emphasis of each method, e.g. the observations were developed to analyze the way automakers use/show Concept Cars in motor-shows.

Table 1 Data collection using the three different methods of research

		Study 1	Study 2	Study 3
	Method	Interviews	Observations	Multiple-case analysis
Sanders' levels	What automakers	Say	Do	Make
	Knowledge	Explicit	Observable	Tacit
POP	Purpose	X		X
	Outcomes	X	X	X
	Process	X		X

Method of the Study 1: Interviews

Ten semi-structured interviews were conducted with experts in -automotive- design to unravel Concept Cars as a design-led futures technique. As Sanders (1999) suggests, interviews focus on what people say and think about an experience, collecting explicit knowledge. We used interviews in this study to discover what experts say about the reasons and ways automakers design and use Concept Cars.

The interviewees were selected based on their experience with Concept Cars as part of design, R&D, branding, marketing, or sales departments. These professionals work with different companies such as automakers (Aprilia, Ford Motor Company, Nissan Motor Company, Sherco, and Tesla Motors); suppliers (Edag Engineering AG); and car-design agencies (Vercarmodel Saro). We approached the interviewees at several locations and using different ways due to their time limitations. Six interviews were

conducted face-to-face, four in their offices and two at the Geneva Motor Show; and four interviews were via video calls. Two languages were used in the interviews to facilitate the communication; four interviews in Spanish and six in English. Table 2 presents the sample, including their area of interest and their years of experience in the field.

Table 2 Sample description

Codes	Age group	Areas of professional interest			Experience on that area (years)
R1	50 – 59	-automotive- design			>20
R2	50 – 59	-automotive- design			>20
R3	60 – 69	design	innovation	strategy	>20
R4	30 – 39	-automotive- design	clay modeling		10-15
R5	60 – 69	design	aesthetics		>20
R6	30 – 39	-automotive- design			>5
R7	30 – 39	-bike- design			10-15
R8	60 – 69	-automotive- design			>20
R9	50 – 59	-automotive- design	innovation		>20
R10	60 – 69	-automotive- design	innovation	management	>20

The interviews included open-ended questions grouped into the categories of the POP model. The interviews took, on average, one hour; they were digitally recorded and were transcribed for analysis. Based on a quick browse through all transcripts, several codes were noticed related to previous studies and repetition. Then, through a detailed reading of the transcripts all the codes were collected. After that, the codes were organized in labels arranged in the categories of the POP model. One example is the category ‘outcome’ that contains the label ‘prototypes’ which includes the codes ‘models’ or ‘mock-ups’.

Method of the Study 2: Observations

We observed how Concept Cars were staged at the 85th International Motor-Show and Accessories in Geneva. This study adds to the previous one by examining the outcomes of the technique, to understand what automakers do with Concept Cars at a motor-show, including the way in which they use -or exhibit- them.

According to Creswell (2009), one of the advantages of observation is that “the researcher can record information as it occurs”, having the possibility to make a detailed list of all the things in a place. This inventory proved helpful when we sought to identify the outcomes of this type of speculative design technique and the way that companies use them at the show.

We conducted several observations over a period of three days. First, a general observation that gave us an overview of the motor show, as well as an inventory of the brands that exhibited Concept Cars. Next, we selected a sample of ten Concept Cars. We chose concepts that were presented for the first time (world premiere) and represented the three type of Concept Cars based on the time-horizons (short-, medium-, and long-term Concept Cars). For the short-term, we chose the Nissan Sway and the Infinity QX30 and QX60. The medium-term cars were the Lexus LF-SA and LEC2, and the Peugeot Quartz, Exalt and Onyz. We chose the long-term EDA6YO and ED Torq. Finally, during the following days, we conducted a two

hours-long observation per brand. The qualitative data was collected in a notebook and supported through videos and pictures of the Concept Cars and the stages. The qualitative data analysis of the observation is based on the data collected in the notebook, which is mainly a set of diagrams including a list of the components of the exhibition, the videos, and the pictures. To report the analysis, we document all the characteristics of the Concept Car and their exhibition at a motor show.

Method of the Study 3: Multiple-case analysis

We chose to employ a multiple-case analysis to compare three prototypical examples of the different types of Concept Cars (short-, medium-, and long-term) as defined and observed in the previous studies. With this third study, we aimed to understand how automakers share Concept Cars as a futures-studies technique, in regards to its purposes, outcomes, and design process.

According to Yin (2009), this multiple-case analysis method is appropriate to answer how questions and also as Gerring (2004) appoints, identify variations among single cases to form a frame. The cases were examined following Yin's six-stage case study process (Yin, 2003) to examine differences with the aim to replicate findings across cases.

First, at the *planning stage*, the form in which automakers present Concept Cars was chosen as the unit of analysis. Second, the POP model, mentioned earlier, was used to develop the *design stage*. Third, as part of the *preparation stage*, data from several existing Concept Cars was collected using different sources to get familiar with the way automakers share those artifacts. Fourth, as part of the *collecting stage*, one example of each category of Concept Cars was selected. These three examples are prototypical cases (Flyvbjerg, 2001) that help us obtain comparable results.

- A short-term Concept Car: The *Your Concept Car* that is “a –not too futuristic– four-seat coupe for the independent professional woman”, developed by Volvo in 2004.

- A medium-term Concept Car: The crossroad mini SUV *Citröen-Lacoste Concept Car* that targets young people. It was designed in 2010 by the two French companies, the automaker Citroën and the apparel company Lacoste as “another step towards the car of the future”.

- A long-term Concept Car: The Mercedes-Benz *F 015 Luxury in Motion*, which is a self-driving luxury sedan with a futuristic appearance. It was developed “fifteen years ahead of current developments” for the efficient professional of tomorrow in 2015 by Daimler AG.

The data from the examples were gathered from the web pages and press kits of the automakers. Fifth, as part of the *analyze stage*, the three Concept Cars were analyzed. Finally, in the context of the *sharing stage* the data was arranged in a table that is presented in the results section.

RESULTS

In this section, we present the results of the three studies in the form of three tables with the insights of the (i) *interviews*; the findings of the (ii) *observations*; and a summary of each of the three Concept Cars from the (iii) *multiple-case analysis*. At the end of the second part, we explain how the data from the observations is related to the insights of the interviews. In a similar way, at the end of the third part, we cross-examine the results of all studies.

Results of the Study 1

Tables 3, 4, and 5 present the results of the coding of the interviews, including the labels and a selection of direct quotes.

Purpose of Concept Cars

Table 3 shows the results of the interviews with regards to the purpose of Concept Cars.

Table 3 Results of the category purpose

Purpose of Concept Cars		
Definition	Automakers design and use Concept Cars to innovate and share this innovation with others. Through Concept Cars, automotive companies foresee the future by (i) experimenting with technologies and (ii) exploring design languages.	
Label	Innovation	
Evidence quotes	<i>“The Gina model 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”.</i>	R4
	<i>“...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 lots of thinking in future design, so a concept like that [...] pushes the boundaries of design and engineering”.</i>	R5
	<i>“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...”.</i>	R10
Link to the literature	Like Evans (2011), the interviewees point out that innovation is the primary purpose of Concept Cars. Just as Santamala (2006), Backman and Börjesson (2006), Evans (2011), and Lv and Lu (2012), the participants consider Concept Cars as a way to strengthen creativity and design capabilities. In the same way that the respondents, Styhre, Backman, and Börjesson (2005) claim Concept Cars are experimental artifacts that support innovation.	
Differentiation from the literature	Unlike Styhre, Backman, and Börjesson (2005) and Roscam Abbing (2010), the interviewees perceive branding as a byproduct of Concept Cars.	

The interviews revealed that different companies, such as automobile manufacturers, part suppliers, and automobile design studios, design and use Concept Cars. According to the interviewees, these organizations develop between six to ten Concept Cars per year, and only 20% of them are presented at motor shows. Respondent 8 states that “when I was in Nissan, the production of Concept Cars was very high; the design department was a real Concept Car factory” and Respondent 3 says that “at Audi, we created an experimental car every three months, whether it is just for the lighting, or for the suspension...”. Aligned with this proportion, the respondents claim that all of these Concept Cars contribute to innovation and only a few to branding. As Table 3 shows, through Concept Cars, car companies can foresee the future, by experimenting with technologies and exploring design languages. From the innovation point of view, “Concept Cars act as a probe or sounding balloon that sees a particular sector that is new to the company” (R3). The purpose of this probe is to explore the unexplored territories -the futures- to discover opportunities. Based on these opportunities, the company develops “an advanced vision of what the company

intended for near future” (R9). Most of the respondents claim that “they are technology-push products” that introduce a novel set of ideas to the audience. Supporting this innovation purpose, we found that Concept Cars are also means of communication, which are 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” (R9). Externally, it is presented to “the general public, journalists and the other car companies” (R4) in “motor shows like those in Frankfurt, Geneva, and in the United States, the Detroit auto show” (R6). In addition to the innovation end, interviews state that the concepts that companies present at motor shows are also ways to “show-off” (R1) the capabilities of the company (R1, R4, and R7). 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” (R1). Respondent 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 do things”.

Concept Cars as outcomes

Table 4 shows the results of the interviews in regards Concept Cars as outcomes.

Table 4 Results of the category outcome

Concept Cars as outcomes		
Definition	A Concept Car is a fake -futuristic- vehicle, which is designed to attract and evoke emotions in diverse people.	
Label	Emotional artifact	
Evidence quotes	<i>“I think a Concept Car has an important attribute that is to provoke and draw attention”</i>	R10
	<i>“...when 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...”</i>	R4
	<i>“...basically a Concept Car is an element to provoke emotions; basically, they used at motor shows to display the potential of the company creating expectations about the brand”</i>	R7
Link to the literature	In the same way that the respondents, Santamala (2006) and Buijs (2012) state that Concept Cars are full-scale prototypes that look like a production car.	
Differentiation from the literature	In contrast to the literature that study Concept Cars, interviewees emphasis in the emotional content of Concept Cars.	

Based on the interviews, we would argue that experts use the notion ‘Concept Car’ as an umbrella term that covers artifacts with similar attributes. The artifacts mentioned includes: ‘Show Cars’, which, according to the respondents, are the Concept Cars exhibited in motor shows. Moreover, ‘Experimental Vehicles’ and ‘Technology Demonstrators’ “test technology to see if companies can put it into production cars” (R7). Also, ‘Research Vehicles’ and ‘Design Studios’ that are “just for seeing” (R3), they are “workshops of ideas about styling” (R10) that examine the appearance of the interior and the exterior of the vehicle.

According to the interviewees, all these artifacts are materialized through a variety of prototypes that moves from working prototypes to representational models, in which “pretty much everything is fake” (R3). As the Respondent 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” (R9). 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” (R4).

These prototypes are used to draw the attention of people. Respondent 10 states “as designers, we know which key elements make a car 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”.

The process of designing a Concept Car

Table 5 shows the results of the interviews in regards to the process to design a Concept Car.

Table 5 Results of the category process

The process to design a Concept Car		
Definition	Concept Cars are part of confidential and expensive projects, developed by a separate multidisciplinary team. The team explores different time-horizons, making sketches, prototypes, and narratives.	
	<i>“You have a team that launch products within the product portfolio and another group 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”</i>	R9
Link to the literature	Like Berlitz and Huhn (2005); Styhre, Backman, and Börjesson (2005); and Backman and Börjesson (2006); the respondents mention that Concept Cars are part of expensive and short projects.	
Differentiation from the literature	Unlike the literature that study Concept Cars, the interviewees relate Concept Cars with three time-horizons.	

According to the interviewees, Concept Cars are developed through confidential projects that last up to 15 months. The interviewees report that the final cost varies between 200.000 and two million Euros because of the special facilities needed and the profile of the team. Most of the time, the team is an in-house unit where multiple professionals from marketing, engineering, and design (interior, exterior and color and trim) work together. Respondent 1 says that “this is a separate unit to avoid contamination regarding the daily work in projects that are part of the commercial portfolio”.

According to the interviewees, automakers explore the three time-horizons through Concept Cars. First, the 'Visionary Models' that explores more than fifteen years ahead and “will never be in production” (R7). Respondent 9 states that “these concepts allow you to explore more radical situations, for instance, what will a car look like if there are no streets? In these kind of projects, you have a team that includes engineers, anthropologists, and sociologists. These kind of concepts end in radically new vehicles that companies present at shows”.

Second, the Concept Cars that explore new types of vehicles for the brand, “in explorations of up to 15 years [...] companies design concepts that are close to the market, new categories of products or new lines for the existing products” (R8).

Third, the Concept Cars of upcoming vehicles are in a range of five to ten years. These are “concepts developed using existing technologies and normally are built on existing platforms” (R7). Respondent 2 says that “these concepts aim to mark the territory, exaggerating some features of the car to verify it on the market [...] in a certain way, these concepts are the projection of the expected production cars”.

The respondents state that the design of a Concept Car starts with an open design

brief, formulated by the marketing department and a chief designer. In parallel, the chief designer selects a team including professionals from different departments. Subsequently, the team members sketch ideas based on that design brief. According to Respondent 6, “the team makes some 400 or 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, this lead designer coordinates the detailing part, which includes comprehensive sketches and illustrations of the interior and the exterior of the concept. Next, the team makes a 1:4 scale model and in some cases a 1:1 tape drawing on the wall. When the board of directors approves the scale model, an external professional modeler makes a 1:1 model in clay and puts several finishes on it. The interviewees indicate that depending on the way that the company will use the concept, the type of finishes or even the kind of prototype changes, but “the show cars use detailed finishes” (R1). Finally, the team defines a story to showcase the prototype, which is presented internally through different workshops and externally at motor shows.

Early discussion of the Study 1

Comparing the results of this study with the literature, we identify that:

- In addition to automakers, mentioned by other researchers, car-design agencies and part suppliers also make Concept Cars.
- Innovation is the principal purpose of Concept Cars; branding is seen as a valuable byproduct.
- Whereas managerial futures techniques provide complicated outcomes to a specialized audience, Concept Cars are tangible futures communicated through prototypes that are easy to understand and evoke emotions in a broad audience.
- Unlike the managerial futures techniques, Concept Cars are developed through a design-oriented process that includes sketching, prototyping, and storytelling.
- As a technology road mapping, Concept Cars can be placed in one of three time-horizons.

Results of the Study 2

We present the results of the Study 2, the observations, which include the characteristics of Concept Cars as outcomes and the way automakers present them in motor shows.

The ‘85th International Motor-Show & Accessories’ has two main moments, a media event, in which automakers invite journalists to attend presentations, and the exhibition, which is mainly for the general public. For the media event, companies prepare a set of images, videos, and texts arranged in press kits that are available for the journalists via the web. In regards to the exhibition, most of its area is covered by automotive manufacturers, which showcase up to three Concept Cars and no more than ten production cars.

Concept Cars are presented through prototypes in the most visible spot of a company’s stand. The majority of the prototypes are representational natural-scale mockups, which have a detailed and glossy finish on the exterior. The interiors, on the other hand, are just basic volumes, to the audience a general idea about the colors and trims.

The Concept Cars are exhibited on elevated platforms that highlight the prototype as Figure 4 shows. Most of the platforms rotate, showing an overview of the exterior, and some of the prototypes have open doors to also reveal the interior. They are presented in front of a panel that acts as a background and shows several videos, on a loop. In our observation, we identified three main parts in those videos. The first part is a branding introduction, which connects the Concept Car to the brand; 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 features of the Concept Car.

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 4. Image of two kids who were posing for a picture with the prototype of the Infiniti QX30 as a background. The stage includes a rotational platform that supports the prototype, a bar that keeps the prototype far from people, and a background to projects the videos in a loop and displays the brand image.

While several staff members promote the production cars, answering questions and distributing brochures, no one is in charge to inform the audience in regards Concept Cars. Nobody collects information from the general public during the motor show, and no other means of communication are available to gather information about Concept Cars.

We observed that only one brand had a Concept Car available for the public with an open door. It allowed people to slide into the car, open the trunk and mimic driving. The other brands restricted the interaction between the audience and the prototype through barriers and elevated platforms. Regardless of these constraints, car-enthusiast were anxious to experience the Concept Car, to try and touch it, as Figure 5 shows. We observed people settling for a selfie with the prototype as the background as a generalized action.

Early discussion of the Study 2

Comparing the results of this study with the data from the interviews and the literature, we recognize that:

- Car-design agencies and part suppliers are also present in motor shows.
- Automotive companies share Concept Cars in two ways, the staging of the Concept Car as the central character at motor-shows and the distribution of press releases, as was already identified by Santamala (2006) and Buijs

(2012).

- The exhibition approaches a wide audience composed of the specialized media, already identified by the literature, the car enthusiasts, and the general public.
- No matter the type of Concept Car (short-, medium-, long-term), they are exhibited in the same way.
- People are emotionally attached to the artifact.






Figure 5 Car-enthusiast experiencing the prototype and another one trying to touch the prototype.

Results of the Study 3

Table 6 presents the results of the multiple-case analysis.

Table 6 Results of the comparison between three prototypical examples of Concept Cars

Your Concept Car (YCC) 2004 by Volvo	Citröen-Lacoste (C-L) Concept Car 2010 by Citröen and Lacoste	Mercedes-Benz F 015 Luxury in Motion by Daimler AG, 2015
		
<i>Time-horizons</i>		
Short-term (undefined)	Medium-term (five years)	Long-term (15 years)
PURPOSE		
<i>Innovation and Branding</i>		
A branding and innovation exercise that explores different design solutions focussing on one particular market segment.	A co-branding project that focuses on the user's lifestyle, incorporating some innovations in the design language.	An innovation project that focuses on the application of new technology.
<i>Communication</i>		
Shown at the Geneva International Motor-Show in 2004.	Shown at the Paris Motor-Show in 2010.	Shown at the International Consumer Electronics Show, Las Vegas, in 2015.
OUTCOME		
<i>Different kind of prototypes</i>		

A functional prototype.	A full-size mockup.	A fully working prototype that was subject to a test drive.
<i>Press releases</i>		
An 18 pages-long press kit (document, six pictures, and a video)	A set of photorealistic renders and videos combined in a press kit.	A press kit that includes 31 images, two videos, and a text, available on the web page of the division “R&D Communications”.
PROCESS		
<i>Duration</i>		
One year, three months.	Nine months.	Less than two years.
<i>Team</i>		
2 project managers, 1 technical project manager, 1 deputy technical project manager, 1 design supervisor, 1 communications director, 1 exterior designer, 1 interior designer, and 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 Department and the Engineering and Construction Department.
<i>Design process</i>		
No specific information.	Look + ask + solve.	No specific information.

The three brands communicate Concept Cars as innovation exercises, including details about technology and styling in the press kits. For instance, Volvo says that the YCC developed the Ergovision system, a new technology that combines ergonomics and the adjustment of the line of vision to ensure good visibility in “a car that is easy to park”. The company also explores the design of gull-wing doors to guarantee “a car that is easy to get in and out of”. The C-L instead focuses on styling with “traditional colors like white and dark blue, with touches of bright yellow”. The F015 mixes self-driving technologies and a luxury style in a car that, according to Dieter Zetsche, Head of Mercedes-Benz Cars, represents “an exclusive cocoon on wheels that enable people to do what they want to do”. According to the web page, Daimler wants “to contribute to the discussion about the self-driving cars and their impact on the society”.

The analysis reveals that the companies display different kinds of prototypes and extra materials to share Concept Cars at commercial shows. The prototypes range from fully working vehicles (the YCC and the F015) to full-size mockups (the C-L). These models are showcased at international shows. Surprisingly, the long-term F015 is a working prototype, which was displayed at a consumer electronics show to emphasize the interaction between the car and its users. Besides prototypes, each company also created press kits to support the introduction of the concept. The kits include images, videos, and texts. For instance, Volvo presented the YCC in an 18 pages-long press kit named “YCC, by women for modern people”. The document includes an introduction of the initiative “all decisions made by women” and a detailed explanation of the main features of the YCC.

The three companies present the Concept Cars as part of a separate and specialized portfolio of research projects. Mercedes-Benz, for instance, has a particular portfolio with a total of 24 Concept Cars developed between 1993 and 2012. Moreover, Citroën

states that its portfolio “cultivates boldness, creativity, and optimism [...] exploring the future of driving”.

With regards to the design process, the cases reveal that these research projects last less than two years, and are developed by a specialized team. The teams, lead by designers, integrate people from different departments, for instance, the Advanced Design Department and the Engineering and Construction Department in the case of the F015, or even from two different companies as with the C-L. According to the press kit, Volvo Cars organized a team of nine women, four in managerial positions, one expert in communications, and four designers. In the F015, the team included “designers, engineers, and marketing experts jointly draw up the technical specifications for [this] new research car” that was built to order. The project was led by the head of the Advanced Design Department.

The only company that shares details about the design process is Lacoste. According to Christophe Pillet, Lacoste's Design Manager and head of Lacoste Lab, the design of the C-L was approached as the design of a pair of shoes. He summarizes the process as (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 particular attention to the color and trim development.

Early discussion from the Study 3

Comparing the results of this study with the data from the interviews, the observations, and the literature, we recognize that:

- The different kinds of Concept Cars (short-, medium-, and long-term) can target objectives related to innovation and (or) branding.
- Some Concept Cars are exhibited at consumer shows, not just at motor shows.
- Most of the information that companies provide about Concept Cars relate to technology and styling.
- No matter the time-horizons that the Concept Cars explore, automakers present them through prototypes and some extra material.
- These research projects are developed by multidisciplinary teams led by a designer and last, on average, nine months.

DISCUSSION

Our findings show that just like the futures techniques defined by Voros (2007) and Hines (2016), Concept Cars are used to study, map, and envision -an image of- the future. This vision moves from the future back to the present and supports companies in making decisions and mapping innovation. However, while managerial futures techniques are confidential maps for the future of innovation, which follow a thinking-first process and end in sophisticated outcome that targets specialized audience, Concept Cars focus on (i) *innovation* and *communication*, following (ii) a *design-led process* and ending in (ii) an *open, striking* and *experienceable outcome*.

Concept Cars are vehicles to innovate and to share this innovation with others instead of merely being aesthetic artifacts exhibited at motor shows to build brands. Our findings suggest that most of the Concept Cars developed by automakers are used for innovation, as Evans (2011) suggested, and not just for branding.

There are two major benefits of using Concept Cars in *innovation*. The first is related to their strong emphasis on communication. With a Concept Car, companies share a concrete image of the future that is easy for a broad audience to understand, for people inside the company as well as outside. Presenting this vision to diverse

stakeholders stimulates conversations that generate numerous ideas and opportunities concerning the company's future at different levels, from a company's strategy to its products. Through the design of Concept Cars different people, inside and outside the company, align their agendas.

The other benefit of Concept Cars is that they effectively increase the innovation capabilities. By developing Concept Cars, companies learn-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.

According to our evidence, Concept Cars follow a *design-led futures technique* that is a hands-on way of researching the future where visual synthesis, prototyping, and storytelling play a significant role. It is a process lead and conducted by designers, who blend the three approaches of making decisions proposed by Mintzberg and Westley (2001). First, as part of seeing, designers make numerous sketches, illustrations, and diagrams to produce ideas about the concept and the context; then, in the context of doing, they make prototypes at different scales and resolutions, sharing the concept with others. Finally, as part of thinking, they create a narrative to communicate the artifact through videos and other materials. All these activities are necessary to simultaneously experiment with technology and styling.

This simultaneous exploration is another feature that distinguishes Concept Cars as a process. Other explorations within the automotive industry experiment either only with technology, as is the case with technology demonstrators or experimental vehicles, or only with styling, as is the case with the research vehicles or the design studies. Concept Cars, on the other hand, consider both components at the same time, acting as probes that incorporate technology and styling, experimenting with the interaction between the users and the vehicles.

But not all the processes to develop Concept Cars cover the same elements; these explorations play out on three different time-horizons and end in one of the different potential alternative futures: the probable, the plausible, and the preferable future. Based on the combination of time-horizon proposed by Eisenhardt and Brown (1998) and the potential alternative futures (Voros 2001), we classify Concept Cars into three different groups.

First, a *short-term Concept Car* or Concept Car of upcoming vehicles is the projection of an expected production car. It is made to incorporate and announce modifications into a particular commercial vehicle, which is launched one year after the concept was presented. This artifact extrapolates current knowledge about technology and visible trends into a new car model, which is typically built on an existing platform. The concept examines probable futures, with a strong emphasis on branding.

Second, a *medium-term Concept Car* envisions a new type of vehicle for the brand. It is produced to inspire the design of a new category of vehicles, which could be developed between five to ten years after the concept has been showcased. It incorporates current knowledge and ongoing and new trends. The concept pushes the boundaries between the probable and plausible futures and combines branding with innovation.

Third, a *long-term Concept Car*, 'Vision Concept', or 'Visionary Model' envisions an entirely new concept, which explores, at least, fifteen years into the future. It is a vehicle built from scratch that proposes new styling, ahead of the lines of the current production vehicles, and explores novel technologies, even some that have not necessarily been proven. This kind of concept is the representative example of an innovation exercise: it is not ever going to be produced, it is connected to the

preferable futures, and it is selected based on the values of the brand and its strategic projections. Figure 7 shows the different type of Concept Cars along the time-horizons.

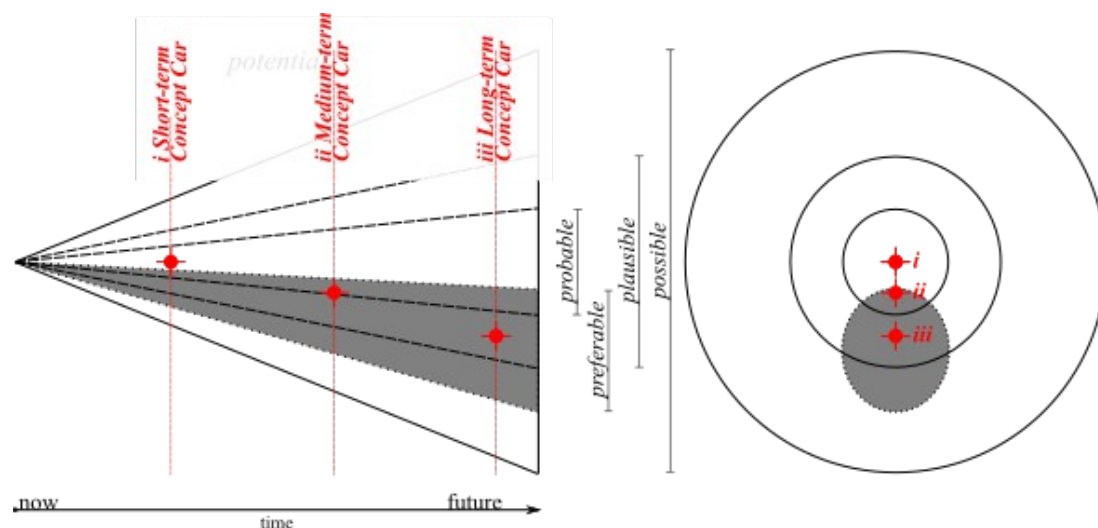


Figure 7 The position of the three type of Concept Cars in the Futures Cones

Concerning the *outcomes* of this design-led futures technique, the findings suggest that Concept Cars are easy to understand for the majority of people. This characteristic is related to two properties. First, most of the Concept Cars are artifacts -future cars- that diverse audiences quickly recognize as possible solutions of the private mobility. Second, the artifacts are embodied by full-size prototypes and a set of supporting materials (texts, visuals, and videos). The 1:1 scale models enable people to experience the car as real as possible, and the supporting materials reinforce this, presenting the ideas of the interaction between users and the car in a particular -future- contexts. The combination of the physical and narrative manifestations -prototype, video, visuals, and text- of a recognizable car allow automakers to use this image of the future in diverse places and conditions, ensuring that the message is clear for everyone.

Moreover, we indicate that the manifestations constitute an *open, striking* and *experienceable* image of the future that can draw people's attention and then influence a large number of parties involved in innovation. Concept Cars are available or 'open' to diverse employees at different levels through workshops and internal presentations and, in some cases, to the media and the general public at commercial shows.

Designers use several tricks to attract people's attention through the artifact itself -exaggerated proportions, bright colors, and fluid lines- and the way it is exhibited -platforms, flashing lights, and charming models. The individuals who feel excited by these exhibitions can experience or, at least, grasp the experience through the combination of the prototype and videos. As a result of the prototypes attributes, the video, and the staging, Concept Cars evoke strong emotions in people, motivating them to get involved in innovation in diverse ways.

Although the features described here present Concept Cars as an attractive futures technique, they have two main limitations. One is its resource intensive design. Another limitation of Concept Cars is that they present a singular outcome, hiding the opportunities offered by other futures.

Overall, we found that designing and using Concept Cars as a futures technique is a frequent and shared practice in the automotive industry, including companies that sell

products or services to consumers (B2C) or other businesses (B2B). These different firms make better decisions based on learning from a hands-on process, which combines various design tools, such as visual synthesis, prototyping, and storytelling. Moreover, these companies use the results of this process, a tangible image of the future, to share with and motivate a broad audience. Considering the benefits and limitations of Concept Cars, we propose that -innovation managers can use them as an alternative futures technique or as a 'vehicle' to complement other futures method. In both cases, Concept Cars can strengthen the innovation in diverse companies regardless of whether they are in other branches of the industry or whether they are in B2B or B2C businesses.

For our future research on long-term Concept Cars -or Vision Concepts- as a futures technique, we will further investigate their design process to explore the way to use them in other branches of the industry. An interesting direction could be an inquiry on how to implement Concept Cars from the current niche of large businesses to the area of small and medium-sized enterprises. Besides this investigation, we will compare Concept Cars with other design-led futures techniques.

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