Can strategic foresight and creativity tools be combined? Structuring a conceptual framework for collective exploration of the unknown

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CAN STRATEGIC FORESIGHT AND CREATIVITY TOOLS BE COMBINED? STRUCTURING A CONCEPTUAL FRAMEWORK FOR COLLECTIVE EXPLORATION OF THE UNKNOWN

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ABSTRACT
 This paper focuses on the first stages of the innovation process within the Fuzzy Front End activities and illustrates the contribution of creativity in strategic foresight activities through the analysis of a collaborative research led in partnership with the dedicated team of a global French carmaker. The paper investigates the findings of the literature to highlights the importance of the individual level toward the collective collaboration in futures studies and in particular in the strategic foresight activities. We shed light on the issue to build a conceptual collective framework that enables to explore the unknown. Main managerial implications of such framework are twofold: 1/ in structuring new and shared knowledge and 2/ in expliciting the benefits of joined creativity and strategic foresight.

Keywords: strategic foresight, conceptual framework, creativity, scenario building, cognition, C-K theory-based tools, TRIZ theory-based tools.

INTRODUCTION
 It is well known that in case of innovation process, it is almost a must to go through a stage of uncertainty, before reaching a structured and goal oriented process with a clear defined project plan usually called the NPD (New Product Development) or the Stage Gate process as defined by Robert G. Cooper (1990). Managing uncertainty is part of the Front-End activities, but well before going through this often chaotic, very risky and difficult to plan process (Koen et al. 2001), comes the activity of strategic foresight that is "*used for coping with environmental uncertainty and for handling increasing complexity and dynamism in the business environment of the firms*", (Vecchiato, 2012). Sometimes it is confused with a tool and thereby mostly referred to scenarios building method, which is almost likely a technology platform that "*brings together all interested stakeholders to develop a long-term vision to address a specific challenge and to create a coherent and a dynamic strategy to achieve that vision*", Wilkinson et al., 2005), whereas, strategic foresight activities appear as an upstream stage of the whole innovation process.
 Roy Amara (1981) divided the future representation into three categories: "*the preferred (value), the probable (scientifically predictable) and the possible (the range of structures that give us the possible*)". And Inayatullah (1993) interpreted that type of thinking by linking the probable to "*evoking history or deep structural patterns*", the preferred to" *the individual agency and growth*" and the possible to "*the unknown*". That means the term "*unknown*" is related to every possibility the future may turn to. In the same philosophy, Michel Foucault introduced in the mid-eighties a concept from the critical perspective of the future called the "*heterotopia*", defined as "*coexistence in "an impossible space" of a "large number of fragmentary possible*

worlds" (Foucault, 1986). That means that the question is no longer to reach understanding of the future in a preferred way or resolving the mystery of prediction. We can thus say that the term "unknown" in our paper is used to describe the foresight method that identify the possible that seek modeling the change, decreasing the uncertainty and creating alternative visions and scenarios.

Vecchiato (2012) talks about the importance of structuring a framework for strategic foresight to better detect the opportunities and threats in order to have a better and effective response. Our research considers the issue of structuring a framework both on an individual level to emphasize "*the key role of strategic management such as in the re-configuration of the organizational skills, resources towards the changing environment*" (Teece et al, 1997), and a collective level and align it within the explored strategic themes in order to "*understand the capability to generate products, services and processes that involve the long term firm performance*" (Rush et al., 2007).

This paper underlines the important role that strategic foresight activity can play in exploring disruptive concepts and structuring the knowledge through a collective conceptual framework, since this one can create a common vision and help agree on the likely trajectories of innovation (Wilkinson et al., 2005). We describe the contribution of creativity as an activity that can support uncertainty, and includes the ability to taking new perspectives on problems and exploring new cognitive pathways (Engen and Magnusson, 2012).

According to Dou (1997a), in the treatment of uncertain and fragmentary information, it is important to encourage imagination and creativity and not always adopt conventional systems of current thinking. Thus our research seeks new ways of increasing the knowledge and improving the collective exploration of the unknown, i.e. unconventional way of exploring strategic themes for the firm. The research considers the ways in which creativity may serve as an activity in support to strategic foresight, without excluding the other way around to highlight the potential dynamics between the two. Our ambition is to underline the key role that creativity can play within this framework in contribution to the structuring of the knowledge and exploring the unknown.

The paper is organized as follows. First, we introduce a literature analysis about the activity of strategic foresight and its different contributions to the unknown exploration, then we will introduce the notion of framework and discuss it on both levels -individually and collectively-, taking into account the cognitive and the organizational aspects, and in a third sub-section, the potential contribution of creativity to these issues. After that, we will introduce our research methodology experienced on the field of a French automotive firm and explicit the findings of the collaborative partnership we have led since January 2012. And finally, we will translate the critical approach on the activity of strategic foresight and creativity on the field.

LITERATURE REVIEW

It is difficult to evaluate the quality, validity and credibility of futures studies without knowing the nature of knowledge about the future and futures exploration methodology (Piirainen et al. 2012). Since the futures studies are conducted in an uncertain environment, it is clear that one of the most dealt issues is the exploration of the unexpected, unpredictable and unanticipated situations, which necessary underlines the importance to be equipped with the right tools to contribute to the exploration of the unknown and help spread and share the knowledge attained. Plus,

the "*multidimensionality and disciplinarity*" of futures research calls for a "*systemic or holistic evaluation perspective*" (*Ibid*). That is the reason why many attempts have been done to build a conceptual framework to evaluate these kinds of studies and help them succeed, providing a better understanding of their activities and their main resources, and extend their potential according to the need of exploring the unknown.

Generally speaking, the term "framework" refers to the understanding and the communication of structures and relationships within a system for a defined purpose, (Cetindamar et al., 2009). In the context of future studies, Gofmann defines the "frame" as a "schemata" of interpretation of experience, and explains that it allow individuals "*to recognize events and build meaningful perception of what they capture*", (in Rossel, 2012).

In the case of foresight, the activity becomes a strategic issue for the organizations as it helps to renew in an uncertain environment and to be able to adapt to the changing environment (Ringland, 2010). The main objective is to extend the traditional planning horizons to deal with the unexpected and to understand the implication of the unanticipated situation (Coates, 2010). That means, the framework should enable to "*create a strong link with the environmental monitoring, strategic planning and long range planning technology*" (Pope, 1992). In futures studies, multiple stakeholders are consequently involved (Piirainen et al. 2012), and the strategic foresight usually goes as a collective exploration in order to reach understanding of the future through plausible reasoning, which means sharing the knowledge by putting together what the collective knows to create a path leading to one or several new situations at a temporal distance (Coates, 2010). In practices, foresight has been separated into two main aspects. First, the foresight as an activity that involves a collective process with several actors and a learning interaction. This part refers to the collective level. And secondly, the foresight as an attitude that refers to the "*cognitive dimensions of anticipation and to individual learning*" (Bootz, 2010) more likely integrated in the individual level.

In the next chapters, we will discuss the implication of the collective into the exploration of the unknown and the scenarios building activities that are both high in creativity and intensity, (MacKay and McKiernan, 2010). We will introduce the collective level where these activities force the participants to evaluate the history (past and current trends, social progress) and to give intelligence to information. And more from an individual perspective, we will discuss how these activities force to deal with complexity and uncertainties, extending the thinking that is not usually part of the daily work of the participants, taking into account the dominant aspects caused by the cognition and the organizational learning. After that, the creativity contribution is discussed through the projection into the future and the limits of trend extrapolation.

Theoretical background on conceptual framework for collective exploration of the unknown

Strategic foresight seeks to gain insight and to make sense of the environment by exploring the external environment and anticipating changes through horizon scanning, competitor and technology analysis and foresight, through a mental model and by understanding the internal capability (Ringland, 2010). One of the famous tool and mental model used to help organization progress toward strategic foresight is scenarios building method, because it "*provides analysis, communication, education of the organization and the stakeholders in both possibilities and ways of thinking*" (*ibid*). It also "*provides a common frame of reference*" where individuals develop

together a "*constitutional consciousness*" gained from the common language that simplifies the exchange between them (Bootz, 2010).

In fact, scenarios building are considered as "*a conceptual model for futures and analysis of the borders and plausibility*" (Piirainen et al. 2012). Since knowledge acquisition is shared easily from informal networks than from rigidly formal networks (Major et al. 2001), it also provides a "*framework for discussion and painless critique in which idea can be explored without excessive commitment*" (Ringland, 2010), engaging actively strategic foresight actors and Fuzzy Front End stakeholders in a strong process to enable them "*to think about complexity and uncertainty and how they may shape the external environment to contribute to their strategic ends*" (MacKay and McKiernan, 2010).

The importance of the collective implication resides in the rich dialogue between participants in the exploration stage (*ibid*) to identify, represent, create "*a consensual model of what constitutes valid or reliable knowledge*" (Inayatullah, 1993) and then distribute it for reuse, awareness and learning. What David Harvey calls the "*interpretive community*" (*Ibid*). In order to achieve this strategic and structural collaborative work it requires to link the intelligence and make it accessible through sharing information from horizon scanning, forecasting and scenario exercises "*with the eyes and ears of the organization*" (Ringland, 2010). Performance in work practices has a lot to do whit the capacity of learning quickly and then to innovate (Easrterby-Smith and Lyles, 2003). Thus, learning is an important indicator of the capacity to produce results (Hebbewaite, 1996). This means that there is a need to have sufficient knowledge of the world (the reality) and enough awareness of the limits of the knowledge that the collective may have and the credibility of the "*predictions*" they could build together (Piirainen et al. 2012). Nevertheless, the advantage of scenarios is that through its "*educational and playful dimensions*" it offers an institutional learning (Bootz, 2010).

But, as the intelligence about the perception of the world may go through a biased perception, and thus may transform the reality into a pattern that is acceptable and common to the collective beliefs, this can be quite difficult to change since it resides in a comfort zone that developed powerful defensive routines sometimes reinforced by past success (Grinyer, 2001). Such bias is a case usually seen in decision-making process (Janis et al. 1977). This phenomena has been termed as "*theories in action*" (Argyris and Schon 1978), "*dominant logic*" (Prahald and Bettis, 1986), "*interpretative schema*" (Bartunek, 1988 in MacKay and McKiernan, 2010), and foresight approaches may lead to inquiring "*dominant representations*" (Bootz, 2010).

On the other hand, the existence of different learning styles of individuals emphasizes the fact that the manner of each individual learns differs from one to another. In practice, the way the information is absorbed is divided in learning styles with different approaches of learning that Kolb (1984) divided in four: accommodator, diverger, converger and assimilator. This means there is an educational work to provide new frames of analysis of the future different from the familiar mental model (Bootz, 2010) and this issue introduces the talk about the contribution of the individual level toward the collective.

Conceptual Framework at the individual level

From Popper's point of view there are three existing world, one that is real and independent of the observer, another one that is a mental representation from the human observations and emotions from the real world, and the last one contains the human mind such as language, theories and foresight (Popper, 1978).

The strategic foresight has specific principles to attain such as the ability to anticipate and to influence the desirable and undesirable future through a constant use of the plausible reasoning (Coates, 2010). Scenarios building provides context for this kind of dialogue and debate - e.g. desirable or undesirable futures, manners of expanding the circle of influence -, and provides also a bridge between cultures that need to work together (Ringland, 2010). Futures work describes a range of specific human capacities and perceptions as tools to develop new concepts and methodologies to study the continuity and change in the environment (Slaughter, 1993) and research shows that the cognitive diversity of the involved group can have a strong influence on the potential success of this intervention. This means that the effectiveness of scenarios building is determined by the participants, or rather by their cognitive styles, meaning their different ways of perceiving and judging (Franco et al., 2012).

When evaluating a future study, various criteria are taken into consideration such as comprehensibility, truth, rightness and sincerity, meaning that there should be acceptable communicative action in terms of facts of the real world, and acceptance according to social norms and personal beliefs (Popper, 1978). Thus, the first place to begin with is the individual human capacities. The human mind system is not only provided with the capacity to see what leans on the primary consciousness through the senses, but is also provided with a higher-order consciousness that empowers it with the ability to remember and to learn, to wonder consciously and speculate on futures throughout a rich, complex, extended present (*ibid*). This capacity is usually called "*cognition*". More specifically, the cognition is the capacity within the mind that is responsible of the ability to absorb new knowledge, through connections between the tacit and explicit knowledge (Brennan and Dooley, 2005; Nonaka and Takeuchi, 1996, Desouza, 2005). These connections are referred to the individual actions meant to bring interpretation to a situation, such as selecting, manipulating, and transforming the information into meanings, (Daniels et al., 1997; West, 2004).

The contribution of such individual frameworks toward the collective structuration of unknown exploration can be effective if some criteria are attained such as practice, trust and personal contribution. Indeed, some personal routines such as routine searches, conversations in individual and group interviews can provide a good amount of data collection (MacKay and McKiernan, 2010), and with practice, it becomes easier to increase competence at finding, identifying, developing and interpreting the trends areas (Coates, 2010). Trust between the stakeholders involved in the exploration of the unknown is also an important ingredient. Thus, according to Selin (2006) the participants of scenarios building method need to trust each other to share their expert knowledge. Slaughter (1996) highlights the individual level to the collective one through different stages starting from a: "*unreflective use of forward thinking in daily life of individual*" through "*raw capacities and perceptions of the human brain-mind system*", to a "*long term thinking*" that is transformed to a "*social norm*" of social capacity for foresight using the futures tools and methodologies that increase the "*analytic power*".

The cognitive style is not always easy to share as it is specific to every individual and defined as a personal way of processing information, using the cognitive brain-based mechanisms and structures involving thinking, knowing and processing information (Franco et al. 2012). Sometimes when exploring the unknown the individual may experiment a cognitive freezing on particular ways of doing things, and may have difficulty reaching the dormant side of their brain that has been sleeping for a long period due to their daily routines (MacKay and McKiernan, 2010).

This case is usually prevented when using scenario building method, because it usually helps readjust their cognition to learn how to deal with complex process in short time. In practice, the foresight attitude is based on the cognitive dimensions of anticipation (questioning and enrichment of representation) that focuses on the "*act of self of a mental creation in the future*" (Ingvar, 1985), a "*reform of thought*" and thus the modification of individual representations by building new frames of analysis to allow the individual "*to see far and wide*", and help to get unstuck from the familiar patterns of social standards (Bootz, 2010).

The practical difficulty relies on making new links of causality and anticipating the radical changes by small facts usually called "*weak signals*". This concept developed in the mid-seventies by Ansoff is usually captured by an individual that tries to make sense of it. This can cause biases resulting from the unique and personal perspective of each mind, according to the individual own criteria such as for example socio-cultural practices (Rossel, 2011). Biases can also come from different factors: blind spots (Gilad, 2003), tacit knowledge, power shortcuts, influence of normative intention (Georghiou et al., 2008), mechanisms that ignore vital information (Wissema, 2002) be it from their cognitive freezing or absence of the criteria to evaluate the pertinent information.

The mental model of an individual may miss the unexpected due to current mind-set and attitudes (Rossel, 2012). These kinds of forecast difficulties are usually referred to problems of blind spots, the differences between passive and active vision, the peripheral and central vision, the ability of noticing weak signals to prevent strategic surprises (Neugarten, 2006). Neugarten, (ibid.) explains that "*the awareness regarding strategic foresight is an issue between "scanning" and "noticing" a particular pattern, moving from a "comfort zone" to a "discomfort zone"*", and because a conceptual framework can be used to form a world-view that differs from one person to another (Rhodes, 1991), creativity has a great role to play in the transition between the two zones and help expanding the vision of the individual framework.

Creativity contribution

According to Ketonen (2009), future knowledge is true as long as it is based on existing knowledge and human action. That means that future, is built on extrapolation of the present, through sufficient knowledge of the world and the knowledge shared by the collective part and especially from the boundaries. Nevertheless, it has been underlined that the extrapolation is not good enough to determining specific trends (Piirainen et al. 2012), even though O'Brien (2004) points out that scenarios building tool fails to explore the possible instead of the probable, and stresses this point because the probable considers the present as unchanging and thus failing to anticipate radical changes. At the opposite of Ketonen's approach, his work support that "*the convenient and obvious truth*" is not the target of foresight activity. This leads to conclude that it could be an efficient initial point to exploring scenarios and advising possible ways of action (Piirainen et al. 2012), but in order to extend the vision within an unknown exploration there is a need to include other tools.

A wide range of different tools and methods are used for studying the future and few authors gave extended list: we classified in the table 1 below the cartographies of such four extensive studies (Mackay and McKiernan, 2010; Coates; 2010; Godet, 2010; Slaughter, 1996).

The difficulty in strategic foresight resides in the uncertain environment that needs to be interpreted. Indeed, "*uncertainty comprehension requires more intuition, imagination and creativity than the understanding needed for variables with pre-determined outcome*", which helps generating new ideas and innovation (MacKay and McKiernan, 2010). As Slaughter (1993) said "*creating futures essentially means 'acting creatively'*". And then, with creativity involved, "*the innovative atmosphere helps thinking outside the box and nuances give depth to the story*" (Piirainen et al. 2012). But since foresight is attached to a certain agendas and multiple stakeholders with expectations regarding the results and their usability, (ibid.), the risk with integrating creativity into strategic foresight activity is to fall into pure imagination and thus disappointing these expectations, which may affect the credibility of the process. According to Slaughter (1993) applying creativity to futures is three elements process. First of all, it is important to understand the situation and the problems that have arisen. Second, creativity must be integrated in the response to that. And third, the creative response should relate to "*a vision or view of possible alternatives*".

One of the most known creative tool in strategic foresight is the scenario building method, which is considered as a creative process of Poincaré through the interaction of convergence (diagnosis and analysis) and divergence (exploration, scenarios building and writing) and also because it embraces novelty and utility (MacKay and McKiernan, 2010). Thus, creativity does contribute to future studies as the very core target of the activity of strategic foresight is "*to change the user's mind and stimulate his or her creative imagination*" (Coates, 2010) or "*to have them reveal to themselves their tacit assumptions about the future*" and change them (Godet, 2010). More explicitly, after the system to be studied is defined and the trends in driving forces are defined as well, the next step would be to identify images of alternatives and desirable futures which inevitably leads to creativity tools support, such as: future workshop, brainstorming, scenarios building, trend extrapolation, environmental scanning, etc. (ibid.). Table 1 summarizes all of tools for future studies, according the tool includes or not creativity mechanisms.

Cartographies of futures studies toolbox			State of the Art references
Tools without Creativity	**Tools with creativity**		
Delphi	Trend extrapolations trees Cross-impact analysis Horizon scanning	Weak signal analysis Future workshops Workshop dialogue	Mackay and McKiernan (2010)
Delphi Economic projections Surveys Causal models Correlation Precursor events Historical analogy	Cross impact analysis Trend extrapolation trees Morphological box Systems analysis Simulation Modeling Scenarios building	Games Brainstorming	Coates (2010)
Literature review Expert panels Interviews Questionnaires and surveys Delphi Essays Key technologies	Scenarios Trend extrapolation Future workshops Brainstorming SWOT analysis Environmental scanning Technology road mapping Modeling and simulation		Godet (2010)

Delphi	Backcasting	Exploring the extended	Slaughter
Surveys	Cross-Impact matrices	present	(1996)
Assessing global	Environmental scanning	Futures wheels	
'health'	Forecasting	Imaging workshops	
Simple cross-impact	Scenario-building	The loop of futures	
matrices	Strategic management	scanning	
Simple technology-	Trend analysis	Questions about futures	
assessment	Brainstorming	Simple scenarios	
Values clarification	The critique of images of	Simple trend analysis	
	futures	Social innovations process	
	"Dealing with young people's	Time capsules	
	fears"	Time lines	

Table.1. Tools and methods used in futures studies.

From innovative and engineering design fields, other potentially creative and innovative tools can be integrated in the strategic foresight activities to help represent and illustrate various alternative futures and to generate ideas and concepts.

C-K theory based tool

The C-K theory is a "*recent theory of design reasoning to obtain a rigorous observation instrument to follow the cognitive process of innovation and knowledge production*", (LeMasson et al., 2012). Particularly, the C-K theory based-tool offers a framework based on interactions between two spaces: a Concept space and a Knowledge space. The aim of the design is to expand both spaces starting from a first concept with an undecidable position and gradually structuring the tree by adding new criteria in each level to the concepts and translate them into the knowledge space, which can also lead to create and produce new knowledge. This tool helps identifying the process of learning used in the organization to develop new products and also identifying the missing knowledge to radical innovation, overcoming the fixation effect and stimulating the creation of new knowledge and concepts (*ibid*).

TRIZ tools: "S-curve" and "Nine windows" tools

Fey and Rivin, (1999) defined TRIZ as "*a powerful structured methodology for a directed development of new products/processes*". TRIZ theory offers a broad range of tools and rules that have been used in the case of technology forecasting activities and are considered as alternatives to approaches like trend extrapolation, morphological analyses and Delphi methods.

Most famous tools from TRIZ are: S-curve, System operator (mostly called "Nine-windows"), law of technical systems evolution and lines of evolution (trends) (Cascini at al., 2011). For most authors, these tools were preferable to the probabilistic modeling of future because they lack reliability in the long term, which is the case of extrapolation trends for example, and because they does not support the "*outliers' opinions that might represent the ideas of the real visionaries*" and is limited to a number of parameters without considering higher rank in the analysis, which is the case of Delphi method for example (Boris et al., 2011). The evolution laws revealed by Altshuller are considered as logical trends and patterns that govern the development of a system (Cavallucci and Roland, 2001). The case of the S-curve is specific application because it highlights and defines through stages the complexity and the temporal dynamics of the system studied (Boris et al., 2011). By contrast, the "nine-windows" tool is a framework where the system is analyzed by decomposition from its component elements to subsystem (the environment) to identify in different screens the different functions. Thus, the analysis is conducted at "*different detail*

levels with a proper hierarchical classification of system elements" (Cascini *et al*., 2011).

Relying on a collaborative partnership with a team of strategic foresight, the next chapter of this paper seeks to contribute to this issue and evaluate the potential contribution of creativity to the activity of strategic foresight in rather the structuring of knowledge and thus the organizational learning process and to shed light on how it could contribute to the management of upstream activities of NPD.

METHODOLOGY

Research context

The research has been conducted in collaborative partnership with the Research department of the Automotive Company Renault since January 2012, specifically with the unit of "Strategic Foresight & Documentation". This unit consists of eight individuals in charge of nine specific strategic themes that they explore on a daily basis, using different tools and perceptions to collect, analyze and communicate the information, and a documentary center, designed more like a library, where documentalists are responsible of ordering and subscribing to specific journals and books from different types.

The aim of the collaborative research is to understand how the individual in charge of a number of specific strategic themes contributes to the collective level and thus helps developing the conceptual framework of exploring the unknown collectively. The partnership with this unit of Renault was also an opportunity for our research as some of the individuals wanted to test the potential of creativity tools to develop both levels of frameworks.

On one hand, the individual level we studied used to be characterized by practitioners as the different tools and manners of exploring the themes from different angles of perception, taking into account different contexts of interpreting, selecting and analyzing uncertain data, and sharing or creating knowledge. And on the other hand, the collective level consists on shared representations by a certain number of stakeholders which may range from fifteen to twenty people that activities are related to the strategic themes, through being experts in the topic or involved for example into projects or have duty to present and give feedback to a decision-making level. Their participation helped to complete the strategic foresight activity by joining the exploration of the unknown, the structuring of the knowledge and the different tools used to increase the collective learning.

Regarding the person in charge of a strategic theme, we propose during this research the term "knowledge gatekeeper".

Data collection

Data were collected through three main research methods that allowed us an efficient triangulation process (Eisenhardt, 1989): interviews, observations and participations. The research combined a total of thirty interviews conducted on different departments of the firm, directly or indirectly tied to the activity of strategic foresight, and consist mainly on cells of prospective and customer studies, competitor analysis and Benchmarking, design perspective, Business Intelligence and product development. A first round of interviews was directed to understand the organizational process and the culture of the firm on future studies in general, and the activities related to anticipation, exploration, evaluation of the competitive environment and uncertainty

management in particular. Through a second round of interviews, we asked for more details about the tools used in the exploration, the collection processes and the analysis of information, including the identification and the analysis of weak signals, the interpretation of uncertain information, the coordination of the teams and the difficulties they faced in.

Observations were used to gather data from collective works of exploration of the unknown. The first observed activity was **i) the "strategic foresight meetings"**, which are a dynamic process animated by the "knowledge gatekeeper", involving a small group voluntarily participating in the exchange and the analysis of information that are formerly processed by the "knowledge gatekeeper". The meetings are attended once a month and takes two to three hours, depending on the availability of the participants. That said participants' group is not static and can change over time. The group consists on individuals working on a context that includes the strategic theme and the meetings provide an opportunity for them to discover and learn about the environmental changes evolving around it. It is thus a mutual interest shared between the participants and the "knowledge gatekeeper", where the information confronted to different background, competencies, experiences and expertise is interpreted and given intelligence to, which improves the understanding of the environmental changes and enhance the knowledge of the participants including the "knowledge gatekeeper". The second collective work we observed is: **ii) the "strategic foresight morning conferences"**. This event is held twice a year and takes half a day. It is programmed by a "knowledge gatekeeper" who receives propositions and appreciations from people who want to attend or participate. After that the animator who is the "knowledge gatekeeper" decides which themes to choose, builds a program of four presentations leaving place to questions and debates, and then launches the invitations. Presentations are given by the volunteers or the people requested, if possible, from different departments of the firm to present their activities and share the good practices of their own way of doing strategic foresight. The feedbacks we got from this event were quite positive when participants filled out the evaluation surveys anonymously, on a voluntary basis. People appreciated the fact that they could "*open to the other activities of the firm most of the time unknown*", "*develop their personal network*", "*learn new tools and methods and their implementation in the strategic foresight*", "*create a new vision and discover new opportunities*", "*enhance knowledge on both learning and sharing*", "*understand the activity of strategic foresight and its different aspects*" and "*enjoy the experience of each and exchange of good practices*". And finally, we observed and participated to six sessions of **iii) the "creativity workshops"** where the purpose was to understand the proceeding of the collective actions and their interactions through different creativity tools that were sequentially used such as: the "C-K theory-based tools", the "S-curve" and the "Nine windows tool" inspired from the law evolution and TRIZ theory, "the scenarios building" and the "narrative activity". These workshops were experiencing new tools of exploring the unknown and developing new concepts of innovative services and HMI new concepts.

First, the workshop started with a two days session of C-K theory based-tool. The purpose was to use C-K modeling structure as a tool to explore new concepts in the service innovation. The first day was dedicated to introducing the activities of the main actors involved in the research of innovative services to around fifteen participants and to introduce them to C-K theory approach, in order to enable the participants to use it. The next day was intensively dedicated to practicing the C-K tool on the design of services. The innovative design tool supported participants into

digging-in the knowledge space and deepening the conceptual space through a growing tree structure. After that, the workshop went on a one single session of half a day where the group experienced a "narrative approach". The purpose was to identify and describe the potential actors of the concepts developed from the C-K tool sessions. Later on, the workshop ended with two consecutive mornings where participants experienced the "Nine-window" tool. The purpose was to assess the development and evolution of multimodal services with experts and managers of projects in the same thematic. Afterwards, a first session of scenarios building have been held to experience a strategic thematic with the "knowledge gatekeepers" and develop three scenarios from three separated group.

These experiences helped to discuss and analyze how creativity tools could be useful to expand the information gathered by the knowledge gatekeepers combined to specific competencies and expertise of the wide range of stakeholders involved. It also gives us rich data on the creation of collective conceptual frameworks that set discussions and analysis of the findings and how group could elaborate a shared interpretation of potential future diversity using creativity as a support activity.

Data analysis

From the interviews conducted with the knowledge gatekeepers, we revealed that different tools are used to explore their strategic themes.

A summary of interviews that highlight the various tools used by the knowledge gatekeepers in different stages of the strategic foresight activity is provided on Table.2.

		Tools
Main Strategic Foresight Stages	Exploration & Information Gathering	Digimind, KeyWatch, Google Reader, Yahoo Pipes, Google Alert, RSS, Twitter, Scientific Books and Articles, Google Search, Conferences, External Network
	Information Selection	Digimind, KeyWatch, Google Reader, Google Alert, Twitter, "Strategic Foresight Meetings", RSS, Internal and External Network, Cognition
	Information Analysis	"Strategic Foresight Meetings", Cognition, "Nine windows tool", "C-K theory based-tool", Physical support, Collective Intelligence: Collective synthesis; Ideas confrontation.

Table.2. Tools used by the knowledge gatekeepers in different stages of the strategic foresight activity.

From creativity workshops, we studied the impact of the four main tools of creativity experienced on the structuring of conceptual frameworks collectively, the nature and role of the actors involved in their use and the type of framework achieved. Table 3 presents the various roles of participants in the use of each tool.

	C-K theory-based tool	Narrative approach	Nine windows tool	Scenarios building
Actors roles	-Creation of new concepts -Interactions on the different branches of the C-K tree -Sharing information/ knowledge	Imagining different actors with different profiles	-Sharing, exchange, classification of Information/Expert knowledge -Expand the future view of different possibilities	Provide the needed knowledge during the on-going process

Table.3. Creativity tools used in the structuring of conceptual frameworks collectively and the actors' roles

RESULTS: DESIGNING COLLECTIVE CONCEPTUAL FRAMEWORKS WITH CREATIVITY TOOLS

At the individual level, interviews showed that the Renault's unit shares common tools in the phase of the information gathering and selection, but they also underlined some differences in the phase of information analysis using a different process, with heterogeneous level uses of collective tools. Some knowledge gatekeepers depend on their own capacities to collect, select and evaluate the information based on a privileged access to certain sources of information, creating their own qualification system of the pertinent sources of information. While others, use a special network called "strategic foresight meetings". These meetings are a collective and dynamic process used to analyze more deeply the information by confronting the information to the opinion of experts and specialists, creating a pertinent dialogue from the information selected. The aim of these meetings is to make a selection of strategic information and to give meaning or reframe the uncertain information which generally makes the individual interpretation more effective to the group, since it challenges the limited cognitive capacities of individuals and thus reduces the risks of biases, enhancing the aspect of collective intelligence underlined in the literature. At the end of the meeting, the knowledge gatekeeper keeps a track of the dense communication and debate of the selected information. Strategic foresight meetings are a rich example of the contribution of the individuals, with different background, competencies, experiences and expertise, toward a collective level through the creation of a collective learning and a primary knowledge management all in a conceptual framework that enables a discussion by confronting the different interpretations and sharing the knowledge.

At the collective level, through Creativity workshops, some knowledge gatekeepers explore their strategic themes by experiencing creativity tools to expand the information they gather and select. They involve in the process a wide range of stakeholders, with specific competencies and expertise, to set, discuss and analyze the findings. Such a collective process of exploring the unknown allowed the knowledge gatekeepers and the stakeholders involved in the session to elaborate together the interpretation, the perspectives and future potential of the information using creativity as a support activity.

One of the most interesting results from the "strategic foresight morning conferences" is the sharing and implement of a new strategic foresight tool called Digimind. Moreover, the four experienced tools - C-K theory based tool, the narrative approach, the nine-windows tool and scenarios building method - gave rich and various results on how creativity tools could be used to explore strategic themes and heterogeneous feedbacks on how it enabled a good interaction between the actors in

order to create new concepts and knowledge. When asking to knowledge gatekeepers about how C-K and TRIZ theory-based tools tools contributed to their activities, we received important feedbacks on the beneficits they perceived, that we refered on the table below.

Creative tools referred	Verbatim
C-K theory based tools	- "It helps get around blind spots and not get stuck into buzz effect and explores the creation of new pockets of knowledge", -"Using creativity helps starting from a blank sheet of paper to release industrial constraints based on tracks that have not been explored, and enables people to gather around away from their small areas, personal bubbles and frames, to share the knowledge and develop new concepts (…) it broke the conventional reflection toward optimization and help sitting relaxed brain to think the unthinkable", -"Using C-K theory was an interesting experience where the pure exploration led to a rich debate and to new concepts, the method highlighted the way of thinking and forced identifying the distinguished concepts from the competitors"
TRIZ theory based tools	-"Using the nine-windows tool was an interesting method to structure the knowledge about our studied system and to position the different actors and the market which led to a SWOT analysis", -"to ensure that creativity contributes to the strategic foresight we need to find open minded people and to make it clear that we do not aim for a forecast but rather to structure and organize the knowledge and make a good analysis of the system studied", -"it could be a good advantage of forming the strategic foresight to creativity tools and integrate them between the selection and analysis sequences".

Table 4. Verbatim of the knowledge gatekeepers on the contribution of the creativity tools in their activities.

First, C-K theory-based tool helped not only in structuring the existing knowledge on services developed by competitors in the same industry and other sectors, but also on existing expertise inside Renault, and helped the participants analyze the level of maturity and therefore the success of competitors services and potential innovative services. In addition, from the usual returns between the concepts and the knowledge research connected, the C-K tools theory enabled to identify collectively areas that are not explored yet in the market, and which are likely to be a path to the discovery of new disruptive innovations and thus innovative services. And finally, after reaching a well-developed level in concepts and knowledge, from the arborescence built in the Concept space of C-K tools, three innovative service concepts offering a promising potential have been selected to be the subject of further study. In the case of C-K theory based-tool, the conceptual arborescence appears as a shared conceptual framework within the group and has been reused as a platform for the development of a first-time narrative activity. The intention behind this activity was to raise reflection on the conditions of acceptability of innovative services. The impact on the collective conceptual framework was that through the exploration of new concepts nourished by the knowledge shared between the participants, they were somehow forced to go beyond their conventional thinking and practiced new way of formulating the services using different assumptions developing new concepts and accepting the uncertainty and complexity that evolve around this strategic theme.

Later the narrative approach where the method consisted on tracing a story of a future consumer of the innovative service by focusing primarily on the imagined

character, his needs and the obstacles that he may be confronted to, and thereby, creating the map of the future (short, medium and long term). This approach helped expanding the conceptual framework from the customers profiles created to analyze their needs and expectations.

In a different way, the experience of the evolution law was used in a "9 windows tool" that structures the knowledge more like an interpretive framework, through temporal evolution of the system, the sub-systems and their components from past, present and future. It provides also an exploratory phase and during the sessions, the method had help reorganizing knowledge in the form of square knowledge, according to the phases of product development of the "S" curve, thus causing a first step into exploring past, existing and future services. These exercises provided a basis for understanding and anticipating the evolution of the system and providing some criteria for trend analysis. The tool helped expand the conceptual framework and shared a read gate later that helped gaining a holistic view of the complexity of system studied, its interaction and relationships between the environment and the components based on the rich discussion between the participants, creating a common analysis language.

The scenarios building tool, as a first experience for the knowledge gatekeepers, offered an open environment to share and discuss the findings of their daily activities and thus promoted the combination from different strategic themes to enhance the understanding and enrich the vision of one specific thematic. This exercise enabled a deep different view of the knowledge gatekeepers' competences and possibilities of expanding their daily work on the strategic themes through creative and new ways of thinking. The conceptual framework was thus provided creatively with a common basis as a starting point that has developed into many exploratory alternatives.

The contribution of these creativity tools was summed up in the table 4 below to highlight the impact on the conceptual framework.

	Impact on the conceptual framework	Framework resulting
C-K theory-based tool	-Trusty and creative environment -Surprise Effect -Positive misalignment of habits -Exploration in uncertain and complex environment	-New analysis angles -Encourage new ways of analyzing beyond conventional thinking -Reflection path transcribed - Improve the creative and conceptual thinking - Breaking the dominant resistant views of the future
Narrative approach	-Creative approach involving new actors	-New way of analyzing the customers behavior and expectations -Break the dominant view of one particular customer.
TRIZ tools	-Enlargement of the sources circle -Progressive development of common shared vision -Pragmatic analysis of system thinking through law evolution -Analysis of a much bigger and complex system	-Creation of a new grid-read -Creation of a common analysis language -Deep understanding of the subject studied - Development of range of possible futures
Scenarios building	-Open environment for discussion -Think outside and new boxes -Stimulate creative thinking.	-Alternative scenarios for the future

Table.4. Impact of creativity tools on the structuring of conceptual frameworks collectively

LIMITATIONS AND FURTHER RESEARCH

The comparative analysis of the tree parallel processes used by Renault "Knowledge Gatekeepers" in the analysis of information on unknown underlines the potential benefit that strategic foresight activity could gain from creativity tools support. Nevertheless, consulting firms specialized in creativity and innovation management were needed to trained people to the tools manipulation and to facilitate the sessions of creativity. This external support emphasized the importance to deploy a certain "expertise" to join creativity tools to strategic foresight activity.

In addition, the formation of the groups for the strategic foresight meetings and the creativity workshops is still a research issue. The need of finding the right people to participate to the sessions of creativity was highlighted enough to enrich the debate and to contribute with their expertise and knowledge. Hence the question is: should we introduce a new actor and develop new competencies in the firm?

The other limitation deducted is that, since the aim of strategic foresight is also to facilitate the transfer of knowledge to other actors, there is a still a need to work on the graphic representation of the collective conceptual frameworks. It has been noted that for people who didn't participate to the sessions and did not have a formation on the creativity tools used, had difficulties to understand the deliverables. They needed a hand over with explanation of some choices made through the exploration and the analysis. Consequently, there is a need to develop a process for facilitating the understanding of the development and evolution of the exploration process. Especially, it is a strong issue concerning decisions makers' interactions with such frameworks.

Another perspective, challenging for research is to turn the problematic around and study how the strategic foresight activities can contribute to creativity and on which level.

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