



**HAL**  
open science

## Engage engineers as designers to generate new meanings in concept generation

Fabien Jean, Pascal Le Masson, Benoit Weil

### ► To cite this version:

Fabien Jean, Pascal Le Masson, Benoit Weil. Engage engineers as designers to generate new meanings in concept generation. R&D Management Conference 2015, Jun 2015, Pisa, Italy. hal-01148387

**HAL Id: hal-01148387**

**<https://hal.science/hal-01148387>**

Submitted on 20 Apr 2017

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# Engage engineers as designers to generate new meanings in concept generation

Fabien Jean<sup>1</sup>, Pascal Le Masson<sup>2</sup> and Benoit Weil<sup>3</sup>

<sup>1</sup>fabien.jean@mines-paristech.fr

<sup>2</sup>pascal.le\_masson@mines-paristech.fr

<sup>3</sup>benoit.weil@mines-paristech.fr

All at Centre de Gestion Scientifique MINES - ParisTech

**The meaning of a product is the profound psychological and cultural reasons people use the product (Verganti 2013). The original meaning resulting from such design-driven research is often compromised when handed-over during concept generation (Dell'Era et al. 2011). Literature gives three models of interactions between designers and their network, i.e. networkers use their knowledge as filter, provide designers with knowledge, or are willing to restructure their knowledge base. Our research question “What is an effective marker event of radical innovation of meaning in concept generation?” is investigated through a multiple case-study comparing 35 marker events in a single organisation.**

**The analysis confirms that meaning attributes are lost when networkers use their knowledge as filter, but surprisingly actors lose attributes even when they adopt methods to prevent it. We also found four main mechanisms for networkers to proactively hand a new meaning. Where the canonical model of gate meeting prevents hand-over to experts, our model of *Generative Gate Meetings* performs better. Finally engineers play a key role when they elaborate *Technology Pretexts* which are instrumental for exploring value propositions integrating new meanings. Lastly, we synthesise managerial implications in a process model of concept generation for radical innovation of meaning.**

## 1. Introduction

The meaning of a product is the profound psychological and cultural reasons people use the product (Verganti 2013). Rather than creativity, new meanings invention requires to capture knowledge on product languages by interacting with interpreters earlier than concept generation, i.e. in design-driven research (Verganti 2008). However the original meaning resulting from such researches is often compromised when handed-over during product development. As innovation processes should be characterised by their marker events (Yin 1978) – including hand-over-, and take into account network creation (Christiansen and Varnes 2007), we identify three types of marker events in literature on the criterion of knowledge exchanges with network. First, idea screening based on their assessment which uses networker’s knowledge as filter (Cooper 2008, Rothwell 1992). Second, providing designers with

knowledge from specific types of networkers such as users (Kristensson and Magnusson 2010, Piller and Walcher 2006, Von Hippel 1986), front-line employees (Gordon et al. 2008, Judson et al. 2009), interpreters (Verganti 2013). Third, jointly design with networkers willing to restructure their knowledge to adopt implementation ideas of radically new meanings (Loch et al. 2011, Magnusson et al. 2014, Le Masson et al. 2003). But these three models have never been provided with empirical data on the hand-over of new meanings. We then ask the research question: *What is an effective marker event of radical innovation of meaning in concept generation?* Our method of investigation is a longitudinal multiple case study analysis (Yin 2013) in a single organisation which conducted vast processes to generate new meanings and had to deal with the exploration of their implementation in products. The cases are analysed under three sets of criteria provided by our conceptual framework: *Is it marker event? How effective is it? For which reasons?* The analysis confirms that an

initial meaning gains attributes –notably at the same time than implementation solutions are generated- and loses attributes –when networkers use technical knowledge as filter- through concept generation, but surprisingly actors do not achieve to keep all attributes even when they adopt methods to do so. We also found four main mechanisms for networkers to proactively hand a new meaning. The canonical model of the gate meeting is a major obstacle when used by experts whereas hand-over are successful when decision makers involve in a design efforts, giving birth to the model of *Generative Gate Meetings*. Finally, following literature knowledge taxonomy –usage knowledge, technical knowledge, we found that engineers play a key role in both types of knowledge: they formulate *technological pretexts* which are lever for exploring new value models. This last finding is key for radical innovation of meaning because it is an enabler in providing new meanings with a sustainable value proposition. To summarise managerial implications of these findings, we propose a managerial model –a process- of concept generation for radical innovation of meaning. Finally discussion and perspectives are drawn.

## 2. Literature review and theoretical framework

### 2.1. *Handing-over the new meaning: a major hurdle in New Product Development (NPD)*

The meaning of a product is the profound psychological and cultural reasons people use the product ; it concerns symbols, identity and emotions that are suggested to users or result from their interactions with the product (Verganti 2013). Companies who embrace radical innovations of meanings achieve spectacular growth (Verganti 2006). Rather than creativity, new meanings invention requires to capture knowledge on product languages by interacting with a network of interpreters earlier than concept generation, i.e. in design-driven research (Verganti 2008). Where Cooper (2006) recommended to manage Technology Development in a different process than Product Development to leave more space for exploration, Verganti (2011) goes further and describes design-driven research, technology research and their entanglement to achieve Technology Epiphanies. However the original meaning resulting from such researches is often compromised when handed-over: from marketing to design (Bailetti and Litva 1995), from marketing to salespeople (Hultink and Atuahene-Gima 2000), from

key account management to market analysis (Gordon et al. 2008), between any functions of the firm (Hart et al. 1999) or from the firm to the customer (Anderson et al. 2006). Perks et al. (2005) have reached a taxonomy of the role of design –functional specialism, part of multifunctional team or NPD process leader- and find that design as NPD process leaders –designers interact with all functions of the firm- is the more adequate for radical innovation. Dell'Era et al. (2011) have insisted on the importance of language brokering between external designers and managers to prevent the compromising of the original meaning. Verganti (2013) recommends an interface manager between interpreters who participate the design research and engineers and marketers involved during implementation. Attempting at a holistic understanding, Gopalakrishnan and Damanpour (1994) literature review has identified three approaches to define innovation sequential stages: departmental, activity and decisional. They should be characterised by their marker events (Yin 1978). In the departmental approach, marker events are a hand-over from a department to another. However in the activity approach and even more in the decision approach, marker events are less tangible and do not necessarily mean a change in the operational team and stakeholders of the project. Hence next sections will try to consolidate our theoretical understanding of marker events in the design of products with new meanings.

### 2.2. *From the idea-screening model to the network expansion model*

Marker events may be formalised at gate meetings where the decision to stop or keep on to the next stage of NPD is made, beginning with idea screening (Cooper 2008). In more parallel approaches of Innovation, efficient up-front screening of projects is still considered a critical factor (Rothwell 1992). Idea assessment is generally based on systematic criteria, but even when intuitive assessment is used for more holistic and quicker decision, most implicit criteria are identical to systematic criteria (Magnusson et al. 2014). Moreover depending on the idea, decision-makers may assess the idea or further elaborate it (Jean et al. 2014). Finally, the earlier stages of NPD, often referred to as the fuzzy front-end, require to merge environmental, individual and organisational approaches to be modelled as a decision-making process (Reid and De Brentani 2004). Other limits of sequential decision-making approaches include their unrealistic linearity, the few decisions actually taken at the gates leaving them as informative points for top managers and the heaviness of decision rules for decision makers ; hence the relevance of the network expansion approach (Christiansen and Varnes 2007).

The 1980's Actor Network Theory (ANT) detailed how innovators find a growing numbers of allies through the process of *intéressement* (Akrich et al. 2002a, Akrich et al. 2002b). ANT has inspired several Innovation processes based on network expansion (Christiansen and Varnes 2007, Koch and Leitner 2008). Are all allies as useful? Next section reviews researches which provide innovators with an accurate answer for certain network actors.

### *2.3. Network expansion to provide designers with knowledge*

At a certain stage of the process, the network around the idea includes professional developers who will implement it on the market (Kristensson and Magnusson 2010). Literature has distinguished R&D and marketing actors among them and discussed the flexibility of their role (Jin 2001). It is generally mistakenly assumed that these professional developers know what consumers want, consequently a stream of research has segregated user experience knowledge (held by ordinary users) from technical knowledge (held by professional developers). Firms can involve lead-users who provide ideas with both knowledge types (Von Hippel 1986). They may also shift the locus of innovation (Thomke 2003). The firm provides initial knowledge such as libraries of existing components and an interface so that the customer uses its own knowledge to enrich the meaning of the product through customisation. These toolkits enable more customers to obtain their need faster, increasing the opportunities for firms if they deal with the shift in business model. In late stages, users have the possibility to customise their products through toolkits, integrating their very own knowledge to professional developers' (Piller and Walcher 2006). If users are not reachable, front-line employees (salespeople) might be an alternative. They can provide input ideas to NPD -which is easier in organisations with key accounting managers (Judson et al. 2009)- and feedbacks to professional developers (Judson et al. 2006). Difficulties include short-terms objectives priority on customer knowledge acquisition, lack of transmission mechanism to R&D, and salespeople lack of appropriate skills (Gordon et al. 2008). Through the KCP process, network expansion may provide any type of knowledge from inside or outside the firm to transform an unknown initial concept into a structured design strategy (Ollila et al. 2013, Elmquist and Segrestin 2009, Le Masson et al. 2009). However a specific type of knowledge enables to radically innovate product meanings, it is product languages

obtained by interacting with a network of interpreters (Krippendorff 1989, Verganti 2008). To summarise we see that the network around a new meaning expands to provide it with knowledge. But it may be necessary to modify knowledge structures of the networkers so that they value it as reviewed in next section.

### *2.4. Network creation to design jointly*

Ordinary users provide innovators with more radically new ideas of services than lead-users and need not to be forced to integrate technical knowledge to do so (Kristensson and Magnusson 2010). Hence ordinary users' ideas embedding new meaning should not be screened but transformed into implementable ideas by professional developers such as the famous newspaper boy case (Le Masson et al. 2003, Magnusson 2003). The case of the Flying Car illustrates also this phenomenon (Loch et al. 2011). From a few initial drawings of a flying car, an innovation manager defines the meaning of flying freely over traffic jams and involves two other skilled actors, and so on the network expands until three concepts clearly arise: LeMans' "DuoSport" three wheeled vehicule, Ardeche's "FlyBike" and Breton's "SkyScooter" foldable wing motorbike. According to section 2.2, they should have eliminated two concepts based on pre-established or intuitive criteria. The model in section 2.3 matches the innovation manager's reaction. Consider another marker event, when Breton reshapes Ardeche's idea of flying motorcycle into a concept achievable with parts from a previous exploratory prototype. This is of different nature because he opens new potential ends for implementation of the initial meaning. One end cannot be assessed against the two other with available knowledge. By building the three prototypes within three separate organisations, they decide to acquire knowledge on each concept as well as knowledge on criteria to screen them. This management practice -where explorations run in parallel are expected of much greater value than sequentially- has been called concurrent exploration (Lenfle 2008, Gastaldi and Midler 2005). If prototyping is not available, to conduct holistic intuitive assessment of ideas, assessors need to generate mini-scenarios of implementation of the idea in order to make use of their experience (Magnusson et al. 2014). This is strong evidence that the network can generate several paths to implement a new meaning, each path adopting different criteria or different weighing of the same criteria.

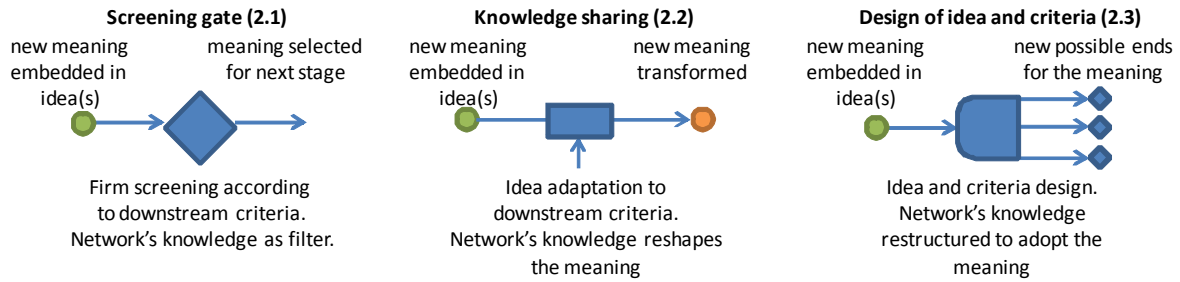


Figure 1: Our conceptual framework: three types of marker events in radical innovation of meaning

## 2.5. Summary of the propositions and research question

Our general purpose is to help managers in shaping marker events in their NPD process which favour radical innovation of meaning. Thanks to previous researches, we have reached three theoretical models depicted in Figure 1. They should be matched with dedicated experimentation by asking the following research question:

*What is an effective marker event of radical innovation of meaning in concept generation?*

We formulate the following propositions to investigate the question:

*P1: At a gate meeting (idea screening, go/no-go), the newest meaning is handed over to next stage,*

*P2: When new knowledge is explored, the meaning acquires more novelty through enrichment,*

*P3: When external knowledge is modified, implementation ends for the new meaning are identified.*

## 3. Research design and method

### 3.1. Overall design

This research is a longitudinal multiple case study analysis (Yin 2013). This method of inquiry is relevant to our research question because, at this stage of theoretical understanding, construct validity requires qualitative investigation rather than statistical validation. Moreover, “the conduct of a multiple-case study can require extensive resources and time beyond the means of a single student or independent research investigator” (ibid) and our research question requires the finest granularity of data collection. Consequently we focus on a single organisation with the aim to provide with data on every potential marker event of the explorations. For this, a first period of 12 months entailed discussions with the

selected organisation and attending few KCP workshops however crucial for a continuous understanding of the cases. In a second period one author had access to previously edited documents and attended all the meetings potentially marker events with allowance to take notes and audio recording during 20 months, plus interviews were conducted within the firm to grasp individual interpretations when needed. The organisation has been chosen of peculiar relevance to our research question. SAFRAN is a corporate conglomerate compound of 12 technology intensive companies. Each company (i.e. business unit) is highly specialised in space, aeronautics, defence or security. Such industries put severe constraints on products so that when a new meaning emerges it has a long way to go before implementation. Plus it is of peculiar interest to draw bridges between radical innovation of meaning and technological innovation (Verganti 2008) as technological differentiation is the main focus of SAFRAN strategy, most managers at SAFRAN have an engineering background, but aeronautics is under pressure for a deep change of meaning. Traditional airlines have acknowledged great economical difficulties while low cost airlines go beyond expected limits in service impoverishment (Chen 2013). European Commission has underlined nowadays weak points and renewed objectives for a sustainable civil aviation. Electrical aircrafts, Personal Aerial Vehicules (PAV), drones... the industry is preparing if not already experiencing huge transformations.

### 3.2. Emergence and selection of the cases

In 2012, few months before this research started, two vast processes to renew SAFRAN products meanings were launched. They followed the KCP method as summarised in Table 1. These processes had a double outcome: new meanings and new ideas of products. Each idea was provided with a leader. The 5 cases analysed in this paper are explorations of these ideas. 2 of them stopped early, 2 of them grew in official projects which were still going on at time of writing.

	KCP 1	KCP 2
Initial theme	Energy Breakthrough for Airships	Physical link with ground
Participants	Among a total of 38, 30 engineers with various management responsibilities	Among a total of 31, 13 engineers
Common external knowledge explored (based on reports)	Energy now and in the future, Business models, Platforms for collaborative design	
Specific knowledge explored (based on reports)	Innovative projects within SAFRAN, Energy at stake in other industries, Potential breakthrough technologies, Biomimetics, Design strategy and tools, Energy systems architecture and control, Services	Airport ecosystem analysis, Airport operations, SAFRAN at the airport, Airport environment issues, Take-off and landing strategies
Synthesis of new meanings finally proposed for further exploration (reports translation)	<i>Smart, Flexible, Generic, Autonomous and Augmented resilient energetic ecosystem of aerial mobility</i>	<i>Connected and multimode passenger, adaptable &amp; autonomous aircraft, door-to-door airport</i>
Ideas selected to investigate meanings (including our cases)	A, D, E among 10	B and C among 6

Table 1: Origin of the cases - two parallel KCP processes

Case reference	Meaning from KCPs	Final Meaning	Time length	Marker events
A	Zero-energy-waste landing	Simple and low consumption landing	4 months	3
B	Ground energy smart grid and energy local reuse	Energy local reuse and auto-maintenance	2 months	3
C	Low energy and all-airports aircraft	All-airports aircraft	5 months	6
D	Energy harvesting gear	Autonomous gear	20 months	15
E	Aircraft energy smart-grid	Low consumption aircraft	15 months	8
TOTAL				35

Table 2: Summary of the cases

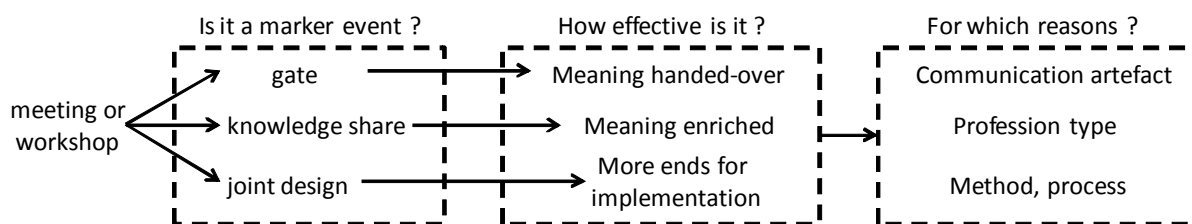


Figure 2: Our process for data analysis

These cases are of great relevance to our research question because their detailed understanding allows tracing the evolution along the explorations and developments of meanings generated within the KCPs.

Following the KCPs, all these cases started by the redaction of an idea file by experts in Business Units who participated the KCPs. The model was provided by the Innovation Head so as to initiate explorations. However once the files were edited by experts and handed back to the Innovation Head, they were too fuzzy to launch NPD and yet experts had stopped explorations. The following analysis starts from this point where the Innovation Head uses its own human resources to push and steer explorations.

### 3.3. Data analysis

Our goal is to compare the marker events of the cases with respect to our conceptual framework here upon. Our process for data analysis consists of the three steps depicted in Figure 2.

#### *Is it a marker event?*

The first criterion analysed is quantitative network expansion.

The second criterion is knowledge expansion. We distinguish two types of knowledge: usage knowledge and technical knowledge. Such taxonomy has proved to be fruitful previously (Gillier and Piat 2011, Von Hippel 1986) and was being implemented at SAFRAN during the research period –actors commonly referred to “value model” and “technical feasibility” notably because they are separate assessments both required at gate meetings. If the analysis were lead for each event separately, they have been grouped for presentation purposes in next sections. According to our conceptual framework we distinguish three types of knowledge expansion provided by the network to the idea leader: network’s knowledge as filter for the idea leader, network’s knowledge shared to the idea leader, and network’s knowledge structure modified to envisage the leader’s idea.

#### *How effective is it?*

It should be noted that our three models are not used exclusively – for instance if the marker event is an official gate meeting we do not exclude meaning enrichment through knowledge sharing from the analysis. This is important so as to allow improvement of these models built from literature.

In accordance with our research question and the propositions presented in section 2.5, our first criterion is the idea leader either complete –one of the networker becomes the leader-, limited –in time or level of involvement-, or null hand-over of the

exploration of the original meaning. The second criterion concerns evolution of the meaning through the marker event we code as enriched –new strong attributes are added to the original meaning-, impoverished –some attributes or discarded- or unchanged. The third criterion is whether the network helps the leader by identifying new potential implementations –ideas of products, technical solutions, customer value...- of the meaning.

#### *For which reasons?*

For this question, our conceptual framework gives more space. In the network, we distinguish experts at a business unit –engineer if not stated-, coordinators who will support the process with managerial skills rather than technical knowledge and decion-makers whose sponsorship is critical to continue the exploration. However we previously pointed out that literature which has the most holistic approach of network mixes convincement to select the idea and commitment to further elaborate it, that the network should apply the right logic for the right idea, and that some artifacts induce a logic (Jean et al. 2014). We would like to precise these results which have an original approach regarding our present literature review. Hence we believe that the method and artifact of exploration are relevant keys of understanding.

The detailed analysis is provided in appendix.

## 4. Findings

### 4.1. Evolution of an original meaning through network expansion

There are various processes to jeopardise the new meaning. In our cases, decision meetings organised as canonical gates had no influence on the meaning of the object (D4, D11). The analysis confirms that technical knowledge may be used as a filter and restrain the initial meaning in different situations (A1, B1, E5). But a striking finding is that when the network tries to preserve all attributes of a new meaning –typically a C-K concept tree enables to represent various alternatives at the most abstract levels- a focus on one dimension of the meaning is adopted (C1, E8). Consequently, the richness –the multiplicity of the attributes of a new meaning- is a major hurdle at handing it over entirely.

The cases provide also strong elements on meaning enrichment. New meaning attributes (sometimes radically new) are generated at the same time than implementation solutions. To do so actors need to induce a design effort to their network either by

- conducting decision meetings with a C-K

- diagram (A3, B3 in contrast with D4, D11),
- presenting their exploration to engineers of various technical fields and various business units (D2, D3, D6 part 1, D8, E2, E3),
- conducting two steps workshops –knowledge sharing and design (D6, E4).

Specifically, we found evidence that engineers enrich meanings when they work at the value model more than when they work at technical solutions (D2, D3, D6, D8 on value, E9).

In summary the original meanings freshly generated during KCPs gain attributes during concept generation, but slowly the newer attributes replace the older (A, B, E). Explorations which adopt tools and methods dedicated to handle a broad value model are not at rest with this issue (D, E).

#### *4.2. Decision-making and design reunited in Generative Gate Meeting*

In our cases, the initial purpose of gate meetings is not to hand the exploration to a new department. However, when the Innovation Head leads the exploration until it is mature enough to be funded, a planned gate or the perspective of a gate are instrumental in handing back the exploration to business units (C6, D3, D10, E5). But this is not the exclusive mechanism of hand-over; we found it is often the result of actors' proactive attitude:

- coordinators at Innovation Head work themselves to push the exploration because resources are too few in Business Units regarding stakes (A2, B1, C1, D1),
- coordinators at Innovation Head steer the exploration so that it matches its own expectations by starting documents to be jointly elaborated with the engineers (A3, B2, B3, C5, D3, D15, E8),
- experts proactively involve or even take the lead of the project as they expect it to create value in their business units (B1, C4, C6, D10, E5),
- suppliers or research-centre involve as they expect it to create value in their organisation (D10, D13).

What is problematic with the canonical model of the gate is its model of knowledge usage at such early stages. Unfortunately, leaders fail at handing over their exploration to new experts when the latter use their knowledge as filter, acting like if there were asking to take a decision whereas little knowledge shared can be of great importance at this stage (A1, D12, E7). During canonical gate meetings, actors present alternatives of implementations which they identified too late to provide decision-makers with enough information (D10). Such alternatives have a

chance when decision makers themselves identify alternatives during the gate meeting (D11, D15); i.e. when they use their knowledge as designers. We found evidence that meetings planned to make a Go/No-go decision can significantly contribute to the exploration by using C-K diagrams (A3, B3 which refocused coordinators on C). C-K diagrams happen to avoid this trap by enabling networkers to switch their type of use of knowledge in a single meeting (A3, B3, C2, E8). In fact they react differently to each concept. They can complete the knowledge base, screen alternatives, suggest new ones, or even restructure them. The analysis suggests that the design of value model is more effective than the design of technical solutions as a mechanism to hand-over the exploration of meaning (A2, B2, C6, D15, E5).

#### *4.3. Engineers involvement in value model as critical for radical innovation of meaning*

Engineers may either enrich or impoverish a new meaning produced essentially (but not exclusively) by commercials or other non technical functions (B and C came from KCP 2). Still it is relevant to notice that no idea file was handled to employees with a non technical function and that the network expanded prior with engineers even if the Innovation Head puts emphasis on value model requirements. Specifically we observed the following paradox: the value model needs strong technical inputs from the future Environments –customer, specific department, technological system...- of the object being designed – product, technology...- but the knowledge keepers of these Environments are reluctant to give –or seek-information without a new technology that they could benefit from. Consequently a technological pretext is required to pursue value model exploration and may be provided by a different project team (A1), a supplier (D6) or another business unit (E2). This pretext includes a performance which will either allow value model exploration (D6, E2) or reinforce actors' reluctance (A2, E8). In case of a new technology, the nature of the performance (weight, power...) will have to be designed prior (D6). Hence the role of engineers is fundamental in meaning enrichment along concept generation. Technologies engineers provide with the technological pretext to trigger explorations of various Environments, Environments engineers provide marketers with inputs to value model quantification, and these operations add and remove attributes to the initial meaning being explored.



## 5. Proposition of managerial model to implement our findings

We propose to summarise managerial implications of our findings in the model depicted Figure 3. This model is driven by network expansion as depicted in few approaches for innovation. The exploration is steered by a leader who interacts with various actors to enrich his knowledge base until a networker involves in a joint design effort, i.e. he/she is inclined to restructure its own knowledge base –architecture of the product, specifications, plan of experimentation, supplier choices etc. We might also say he/she becomes a stakeholder but in the sense of an individual who accepts to become a design resource in a new project, i.e. the hand-over. This often requires the sponsorship of its manager, hence the role of decision-making in our model. Every leader – designer- adopts a design focus. Based on our multiple-case study analysis, we propose the following design focus for radical innovation of meaning:

### *New Meaning*

The leader steers design-driven research, eventually by embracing the KCP method as in our cases, in order to reach radically new meanings (see examples Table 1). Existing literature provides great explanations for this.

### *Technology Pretext*

In some cases the new meaning will be defined by learning on new technologies. If it is not the case, the leader should seek for technologies that translate the new meaning into artefacts. In both cases, we propose a generic requirement for such a technology which will minimise learning efforts: (1) the phenomenon which is at the interface with adopting Environments –eventually found in hard sciences such as electro-

magnetism, semi-conductors, thermodynamics...-, (2) the nature and level of the performance which makes it valuable at a theoretical level –amount of weight, power, efficiency...-.

### *Value Model*

The first requirement allows identifying numerous Environments and engaging a dialogue; however we observed that they will not provide designers with enough knowledge until they cope with the second requirement. Hence if the second requirement is not known ex ante, nor can be deduced from existing criteria as it is often the case in established value chains such as aeronautics, joint design iterations are needed.

### *Opportunities*

Then we recommend to step-back at the overall exploration, eventually by editing its C-K diagram (section 4.2) and presenting it at a “Generative Gate Meeting” which will recombine the previously acquired knowledge into alternative opportunities. We call an opportunity the combination of meaning attributes –either created in New Meaning exploration or generated in next stages (section 4.1)-, a technology and a value model. The advantage of Generative Gate Meeting on a canonical screening gate meeting is that the less mature opportunities will benefit from feedbacks instead of being erased from the port-folio.

## 6. Discussion and perspectives

Our research external validity could be improved by reproducing the experiment in various organisations. Notably our findings on the value model could differ in B-to-C organisations (Only B-to-B at SAFRAN

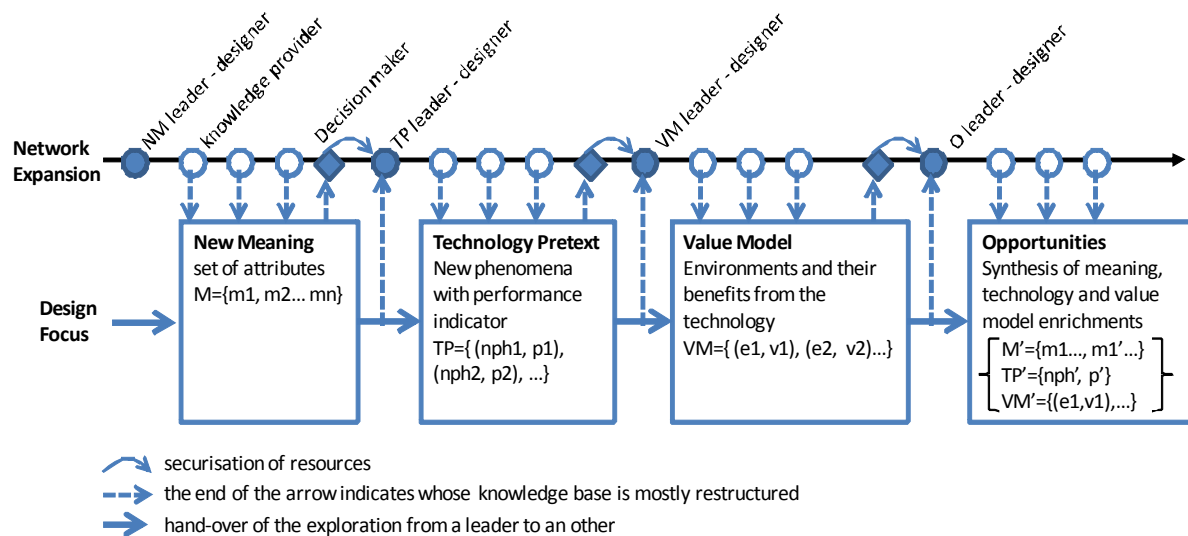


Figure 3: Our managerial model of concept generation for radical innovation of meaning

companies).

Usage knowledge is not satisfying because it mixes knowledge on functions (or uses) of an object and knowledge of the user independently of the object. Such confusion takes roots in the most fundamental understanding of design and formal theories are working on it (Jean et al. 2015). The present paper suggests two minimal requirements on knowledge of a Technology to explore potential adopting Environments prior defining a value proposition, but we believe there is still a lot of work for scholars. As such, we have pointed at the negotiation on who should provide knowledge first. This could draw bridges between design management and open innovation, trust/contract management...

## 7. References

- Akrich, M., Callon, M., Latour, B. and MONAGHAN, A. (2002a) 'The key to success in innovation part I: The art of interesement', *International Journal of Innovation Management*, 6(02), 187-206.
- Akrich, M., Callon, M., Latour, B. and MONAGHAN, A. (2002b) 'The key to success in innovation part II: The art of choosing good spokespersons', *International Journal of Innovation Management*, 6(02), 207-225.
- Anderson, J. C., Narus, J. A. and Van Rossum, W. (2006) 'Customer value propositions in business markets', *Harvard business review*, 84(3), 90.
- Bailetti, A. J. and Litva, P. F. (1995) 'Integrating Customer Requirements into Product Designs', *Journal of product innovation management*, 12(1), 3-15.
- Chen, M. K. (2013) *The Two Models Behind Low Cost Products*, translated by 16.
- Christiansen, J. K. and Varnes, C. J. (2007) 'Making Decisions on Innovation: Meetings or Networks?', *Creativity and Innovation Management*, 16(3), 282-298.
- Cooper, R. G. (2006) 'Managing technology development projects', *Research-Technology Management*, 49(6), 23-31.
- Cooper, R. G. (2008) 'Perspective: The Stage-Gate® Idea-to-Launch Process—Update, What's New, and NexGen Systems\*', *Journal of product innovation management*, 25(3), 213-232.
- Dell'Era, C., Buganza, T., Fecchio, C. and Verganti, R. (2011) 'Language Brokering: stimulating creativity during the concept development phase', *Creativity and Innovation Management*, 20(1), 36-48.
- Elmqvist, M. and Segrestin, B. (2009) 'Sustainable development through innovative design: lessons from the KCP method experimented with an automotive firm', *International Journal of Automotive technology and management*, 9(2), 229-244.
- Gastaldi, L. and Midler, C. (2005) 'Exploration concurrente et pilotage de la recherche', *Revue française de gestion*, 155(2), 173-189.
- Gillier, T. and Piat, G. (2011) 'Exploring over: the presumed identity of emerging technology', *Creativity and Innovation Management*, 20(4), 238-252.
- Gopalakrishnan, S. and Damanpour, F. (1994) 'Patterns of generation and adoption of innovation in organizations: Contingency models of innovation attributes', *Journal of engineering and technology management*, 11(2), 95-116.
- Gordon, G. L., Weilbaker, D. C., Ridnour, R. E. and Judson, K. (2008) 'The idea generation stage of the new product development process: Can key account management systems help', *Journal of Selling and Major Account Management*, 8(2), 26-42.
- Hart, S., Tzokas, N. and Saren, M. (1999) 'The effectiveness of market information in enhancing new product success rates', *European Journal of Innovation Management*, 2(1), 20-35.
- Hultink, E. J. and Atuahene-Gima, K. (2000) 'The Effect of Sales Force Adoption on New Product Selling Performance', *Journal of product innovation management*, 17(6), 435-450.
- Jean, F., Le Masson, P. and Weil, B. (2014) 'Convince me or commit me? Avoid the cognitive trap induced by non-human actors in early stages of NPD', in *21st International Product Development Management Conference, Limerick: Irlande (2014)*,
- Jean, F., Le Masson, P. and Weil, B. (2015) 'Inverse Technology C-K in Environment C-K to overcome design fixation', in *International Conference on Engineering Design ICED 2015, Milan*,

- Jin, Z. (2001) 'The nature of NPD and role flexibility of R&D/marketing in a fast growing high-tech setting', *R&D Management*, 31(3), 275-285.
- Judson, K., Schoenbachler, D. D., Gordon, G. L., Ridnour, R. E. and Weilbaker, D. C. (2006) 'The new product development process: let the voice of the salesperson be heard', *Journal of Product & Brand Management*, 15(3), 194-202.
- Judson, K. M., Gordon, G. L., Ridnour, R. E. and Weilbaker, D. (2009) 'Key account vs. other sales management systems: is there a difference in providing customer input during the new product development process?', *Marketing Management Journal*, 19(2), 1-17.
- Koch, R. and Leitner, K.-H. (2008) 'The Dynamics and Functions of Self-Organization in the Fuzzy Front End: Empirical Evidence from the Austrian Semiconductor Industry', *Creativity and Innovation Management*, 17(3), 216-226.
- Krippendorff, K. (1989) 'On the essential contexts of artifacts or on the proposition that " design is making sense (of things)"', *Design Issues*, 9-39.
- Kristensson, P. and Magnusson, P. R. (2010) 'Tuning users' innovativeness during ideation', *Creativity and Innovation Management*, 19(2), 147-159.
- Le Masson, P., Hatchuel, A. and Weil, B. (2009) *Design theory and collective creativity: a theoretical framework to evaluate KCP process*, translated by.
- Le Masson, P., Magnusson, P. and AB, T. S. (2003) *User involvement: From ideas collection towards a new technique for innovative service design*, translated by 23.
- Lenfle, S. (2008) 'Exploration and project management', *International Journal of Project Management*, 26(5), 469-478.
- Loch, C. H., DeMeyer, A. and Pich, M. (2011) *Managing the unknown: A new approach to managing high uncertainty and risk in projects*, John Wiley & Sons.
- Magnusson, P. R. (2003) 'Benefits of involving users in service innovation', *European Journal of Innovation Management*, 6(4), 228-238.
- Magnusson, P. R., Netz, J. and Wästlund, E. (2014) 'Exploring holistic intuitive idea screening in the light of formal criteria', *Technovation*, 34(5), 315-326.
- Ollila, S., Yström, A. and Agogué, M. (2013) 'Stepping out of the zone of territorial protection enables open innovation collaboration', in *20th IPDM conference.*, Paris, France, 2013-06,
- Perks, H., Cooper, R. and Jones, C. (2005) 'Characterizing the Role of Design in New Product Development: An Empirically Derived Taxonomy\*', *Journal of product innovation management*, 22(2), 111-127.
- Piller, F. T. and Walcher, D. (2006) 'Toolkits for idea competitions: a novel method to integrate users in new product development', *R&D Management*, 36(3), 307-318.
- Reid, S. E. and De Brentani, U. (2004) 'The Fuzzy Front End of New Product Development for Discontinuous Innovations: A Theoretical Model', *Journal of product innovation management*, 21(3), 170-184.
- Rothwell, R. (1992) 'Successful industrial innovation: critical factors for the 1990s', *R&D Management*, 22(3), 221-240.
- Thomke, S. H. (2003) *Experimentation matters: unlocking the potential of new technologies for innovation*, Harvard Business Press.
- Verganti, R. (2006) 'Innovating through design', *Harvard business review*, 84(12), 114.
- Verganti, R. (2008) 'Design, Meanings, and Radical Innovation: A Metamodel and a Research Agenda\*', *Journal of product innovation management*, 25(5), 436-456.
- Verganti, R. (2011) 'Radical design and technology epiphanies: A new focus for research on design management', *Journal of product innovation management*, 28(3), 384-388.
- Verganti, R. (2013) *Design driven innovation: changing the rules of competition by radically innovating what things mean*, Harvard Business Press.
- Von Hippel, E. (1986) 'Lead users: a source of novel product concepts', *Management science*, 32(7), 791-805.
- Yin, R. K. (1978) 'Changing Urban Bureaucracies: How New Practices Become Routinized'.
- Yin, R. K. (2013) *Case study research: Design and methods*, Sage publications.

	Is it a marker-event?			How effective is it?			For which reasons?	
Case number	Network expansion (+N Expert/Coordinator/Decision-Maker)	Usage knowledge expansion (Filter, Sharing, Joint Design, Null)	Technology knowledge expansion (Filter, Sharing, Joint Design, Null)	Hand-over from one actor to another (Complete, Limited, None)	Variation of the meaning (Enrichment, Impoverishment, Unchanged)	New ends for implementation on identified (N)	Method (description)	Artifacts (description)
A1	+1 E	N	F	N	I (lesser-waste landing)	1	Technical discussion	Idea file resulting from KCP
A2	+2 C	JD	N	C	U	3	Network (Innovation Head) prompts phone calls on the idea file to push the exploration then processes calculation, idea assessment and C-K	Idea file resulting from KCP, calculation sheet, assessment tool based on predefined-criteria, and C-K diagram
A3	+1 DM	F + JD	S + JD	N	E (simple and low consumption landing)	3	Decision meeting with a design effort	C-K diagram and radar charts of the assessment,
B1	+2 C +1 DM	N	F	L	I (energy local reuse)	0	Network (Innovation Head) prompts phone calls on the idea file	Idea file resulting from KCP
B2	0	JD (hypotheses are required to assess the idea)	JD	L	U	1	Simulation ; network prompts phone calls to process idea assessment and C-K,	Simulation tool, assessment based on predefined-criteria, C-K
B3	+1 DM	F + S + JD	F + S + JD	N	E (energy local reuse and auto-maintenance)	7	Decision meeting with a design effort	C-K diagram and radar charts of the assessment,
C1	+2 C	JD	JD	C	I (all-airports aircraft)	5	C-K started by the network (Innovation Head) to structure propositions in idea file and complete them	Idea file resulting from KCP, C-K diagram, web searches
C2	+2 E	S	S	N	U	4	Exploration through meeting with experts	C-K diagram edition but not used in meetings
C3	+2 E	S	F + S	N	U	6	Presentation of the C-K and experts' feedbacks	C-K diagram

C4	+4 E +1 C	S	N	L	U	0	Discussion on each other projects, the network starts simulation to refine value model	Simulation software, emails with results,
C5	0	S	N	L	U	0	Delegation of researches through network	Web, email with results
C6	+1 E (operational marketing)	JD	N	C (exploration handed to marketers)	U	0 (on going at time of witting)	Quantification of the value model by marketers at BU	Calculation
D1	+1 C	F	N	N	U	0 (but asked for more)	Network (Innovation Head) prompts phone calls on the idea file and idea assessment based	Idea file resulting from KCP, Assessment table on predefined-criteria,
D2	+1 E	JD	N	N	E (+ autonomous)	1	Presentation of the exploration to let the network identify value	A few drawings while discussing
D3	+1 E +1 C	JD	JD	C	E (+ heat management)	5 (majors among other)	Joint edition of a new idea file	Idea file with a structure specific to this idea
D4	+3 E +1 DM	F	F	N	U	0	Defense of the idea at the official technology portfolio review	Powerpoint summarizing the idea file
D5	+2 E	S	F + S	N	U	2	Phone calls - one simple and one with feedbacks on idea file	Idea file
D6	+2 E	JD (new criteria)	S	N	E (+ reliability enhancer) I (- heat management)	2	Workshop - Part 1 sharing problems, Part 2 supplier presentation of the technological solution, Part 3 debriefing on the solution (supplier out)	Powerpoint from idea file and supplier's powerpoint of the technology
D7	+1 E	JD	S	N	U	3 (major among other)	Joint elaboration of the C-tree initiated by Innovation Head (leader)	C-K Concept-tree of the value proposition
D8	+4 E	JD	S / JD	C (they become stakeholder, no immediate need	E (noise reducer)	6 U 2 T	Four interviews in two parts, first "value" then "demonstration" of the technology	Basic phone call

fiche bien rédigée

fiche bien rédigée

				for their work)				
D9	0	N	JD	N	U	1	Several conference calls with screen sharing to elaborate the table	Table summarizing feasibility work package
D10	+1 E	N	JD	C	U	1	Following gate requirements	Gate meeting model of powerpoint
D11	+2 E +1 DM	F	F	N	U	1	Innovation Head official gate meeting	Powerpoint
D12	+1 E +1 C +1 DM	F	F	N	U	0	Conference call with screen sharing	Powerpoint used at previous gate meeting
D13	+1 E +1 DM	N	S	C	U	3 T	Presentation of expectations to a research center	Extracts from powerpoints,
D14	+1 DM	JD	S	N	U	0	Presentation of simulation results by the supplier, feedbacks from SAFRAN	Powerpoint of simulation results
D15	+3 E (Operational marketing)	S + JD	N	C	U	2 (at time of writing)	Presentation of the explored value model by engineers to hand-over its quantification	Powerpoint of value added for customers (Environments of the Technology)
E1	+1 C	F	F	C	U	0	Network (Innovation Head) prompts phone calls on the idea file	Idea file resulting from KCP
E2	+1 E +1 DM	JD	S	N	E (low consumption)	1	Presentation of each other's explorations, technical discussion and synthesis of expectations	Conference calls without visual supports, emails to prepare a table in which should fit future ideas
E3	+3 E	S	JD	N	E (heat management)	4	Presentation of the overall exploration, joint definition of expectations	Conference call with table edition through screen sharing
E4	+5 E	S then JD	S then JD	N	E (adaptability)	Meaning from KCP 4 Meaning enrichments 10+	Workshop - Part 1 two presentations of product problems and one of technologies, Part 2 brainstorming on innovation opportunities	Powerpoints, post-its board and markers

E5	0 (same actors than at the workshop)	N (BU 1,2) JD (BU 4) N (BU 3)	F (BU 1,2,3) JD (BU 3)	C (BU 4 takes the lead)	I (priority given to meaning attributes built after KCP)	3 (precised from previous workshop)	Priorisation of concepts of implementation ends with each business unit (3) separately	Conference call with the report of the workshop
E6	+3 E	N	S	N	U	0	Presentation of each other's explorations, technical discussion	Ppt of the project by BU1+BU2, ppt of BU3 road-maps
E7	+4 E	N	F	N	U	4 (2 at BU3, 1 a Research Manager at SAFRAN)	Presentation of the exploration to gather feedbacks	Powerpoint
E8	+2 C	N F + S + JD	F + S + JD F	<b>L</b>	I (low consumption, despite efforts)	1 (major among other)	Part 1 -joint elaboration of the demonstration project. Part 2 -Joint elaboration of the value proposition through elaboration of the C-tree initiated at the Innovation Head	1/ Presentation of stage-gate process embraced at SAFRAN Innovation, 2/ C-K concept-tree of the value proposition