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# Designing Co-Creation Platforms: The Case of Configurators Toolkits

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*With the emergence of new digital tools, and in a value co-creation perspective, companies are using internet tools and platforms in order to support interaction and design the attributes of the product. As it is assumed that the implementation and operationalization of co-creation platforms remains unexplored, the paper investigated the reasons why co-creation leads to reframing the development processes with the implications for learning processes. Results will detail the way development and learning loops occurred. Four main observations are proposed: a- Co-creation requires including new actors in the systems, resulting in organizational change b- Development processes are separated in two parts. c- The issue of product coherence and image is central to the elaboration of the interactive dispositions with the clients. d- The Design of co-creation platforms is not based on co-creation principles. Discussion follows on the way co-creation transforms existing « learning while innovating » frames.*

*Keywords: Co-creation, configurator toolkits, value creation, innovation, new service development, learning while innovating, organizational learning.*

*Dans une recherche constante d'amélioration de valeur, les entreprises ont adopté une approche en co-création, s'appuyant sur les outils digitaux permettant l'interaction avec les clients et la co-construction des attributs de l'offre. En l'absence de travaux portant sur la création et la mise en œuvre de ces outils, l'article explore la façon dont les logiques de co-creation amènent à transformer les processus habituels de développement de nouvelles offres. Il s'attache également à comprendre les implications de ces changements sur le processus d'apprentissage organisationnel, habituellement associé à la création de nouveaux produits. Quatre principaux constats émergent de l'étude exploratoire: a- L'adoption de logiques de co-création entraîne l'implication de nouveaux acteurs dans les processus de développement, ceci amenant un changement organisationnel notable ; b- L'étude des processus de développement fait apparaître deux phases très différenciées ; c- L'adoption d'une logique de co-création fait émerger la recherche d'une forte cohérence des produits et de leur image ; d- La création de plateformes informatiques destinées à la co-création n'est pas basée sur l'adoption des principes de co-création. La façon dont les principes de co-création transforment les logiques d'apprentissage est alors discutée et les voies de recherche futures sont proposées.*

*Mots clés: Co-création, outils de configuration, création de valeur, innovation, développement de nouveaux services, apprentissage par l'innovation, apprentissage organisationnel.*

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Learning while innovating has been extensively investigated over the past decades. While mainly focusing on the inside of the organization, the whole stream of research analysed the development processes under the perspective of social cognition, which considers how individual cognition and learning influence and is influenced by the social context in which the manager is immersed. In such a perspective, the contribution of customers to the development projects results from interpretations made by managers on needs and expectations gathered through tests and questionnaires (Ngo and O’Cass, 2013). By so doing, the only options offered to clients were to give opinions or react to proposals made.

With the emergence of new digital tools, and in a value co-creation perspective, companies may enlarge this approach and can propose to clients and stakeholders of all kinds to directly contribute in the design of the offering (Melton and Hartline, 2015).

Internet tools and platforms opened new opportunities to interact and design attributes, fine-tuned with expectations and use (Nambisan and Baron, 2007). The value co-creation approach transformed the way development is structured, since participation has to be included as new stages in the process.

Co-creation platforms, designed to enable the contributions of co-creators, have been extensively investigated by multiple research. Supporting the flow of interactions required to design the innovation (Ramaswamy and Ozcan, 2018), those tools enable stakeholders to share knowledge, experience and contributions. However, when most of the contributions focused on the factors which support stakeholder’s engagement (Loureiro, Romero and Bilro, 2019) and resulted into a whole stream of publications, many authors underlined that the way co-creation is implemented and operationalised remain unexplored (Barczak, 2012 ; Barczak and Kahn, 2012). More specifically, the inclusion of clients in the development process is due to transform the learning while innovating process for many reasons.

Due to this major change in the development process, it is likely that the learning loops and

mechanisms are transformed and deserve further analysis.

The paper is structured as follows. First, it will remind some significant contributions to the learning while innovating themes. Then the paper will explore the reasons why co-creation leads to reframing the development processes with the implications for learning processes. To do so, an empirical observation of the implementation of “configurators toolkits” is realized. By enabling client to create an individualised and by so innovative design, those tools allow to generate a co-created offering (Zwass, 2010). After having detailed the research methodology adopted, results will detail the way development and learning loops occurred. Discussion follows on the way co-creation transforms existing « learning while innovating » frames.

## Learning while innovating

Supported by the underlying assumption that innovating consists in learning to produce an offering never delivered before, a whole stream of research focused on development processes and more specifically on how learning processes contribute to the design of final outcomes. When looking at the five broad issues to be made along development (Krishnan and Ulrich, 2001), it is clear that answers based on existing or created knowledge are likely to lead to informed decisions (Chu, Li and Lin, 2011). Even though existing knowledge assets support development of the offerings, learning processes are required to solve questions never experienced before (Goffin and Koners, 2011).

In the broader issue of learning, the “exploration” and “exploitation” concepts, initially coined by March (March, 1991), were applied to the new product development (here abridged NPD) contexts (Atuahene-Gima and Murray, 2007). When “exploitative” learning refers to the design of technological and market solutions already experienced by companies and managers, “exploratory learning” activities refer to the invention of technological uncertain solutions resulting from ill-defined problems. “Exploratory learning” is by far beyond the existing repertoires of knowledge

and requires different levels and natures of activities. Even though in both cases learning activities may be similar, notably information search, experimentation, prototyping, “exploratory learning” requires in depth interpretations and sensemaking to explore unknown problems whilst “exploitative learning” adapt existing knowledge repertoires to design new solutions (Cheng and Van de Ven, 1996). Even though both activities are due to take place during NPD, it is likely that the “explorative learning” approach may fit environments with high level of uncertainty, requiring the emergence of new combinations of solutions never experienced before. However, given the level of risk and uncertainty generated in such a perspective, “the refinement and extension of existing competences, technologies, and paradigms” assumed by March (1991) may lead to more efficiency and short-term results.

Whatever learning may be exploitative or explorative, the focus on the learning process itself revealed that the major factor for NPD is when knowledge acquired by an individual during the project may be made available and used for the rest of the team and the organization (Adams, Day and Dougherty, 1998; Madhavan and Grover, 1998; Nonaka and Takeuchi, 1986; Ramesh and Tiwana, 1999).

Considered as a mechanism of information processing, organizational learning has been developed under a cognition perspective. Achieved through information acquisition, sense making, implementation, test and adjustment of mental frames, the individual learning influences and is influenced by the social group in which each individual is immersed (Kim, 1993). Resulting organizational learning, as a social cognition (Gioia and Sims, 1986) may be operationalized by considering each step of the information processing.

When learning is anchored in organizations, it was observed that the way groups and organizations are able to reframe their perceptions, to reinterpret their environment, to reconsider what was learned in the past, may be crucial for innovation (Dougherty, Borrelli, Munir and O’Sullivan, 2000). Testing quantitatively the effect of cognitive capabilities and information processing on development projects,

surveys demonstrated that sub-processes such as information acquisition, information dissemination, information implementation, thinking, sense-making, and memory have major influence on the final success (Akgün, Lynn and Yilmaz, 2006; Lynn, Akgun and Keskin, 2003). Those observations confirm the relevance of an organizational learning framework, as being one of the determinant leverages for designing new offerings.

However, within this framework focused on organizations, the way customers may contribute to the development process remain vague or unknown. Coined at a period where information technologies didn’t allow direct contributions, a client is perceived through market studies or direct observations. Learning loops occurred following the observations of clients who innovate for their own purpose, but which remain out of the development process.

### **Co-creation and new products/ service development**

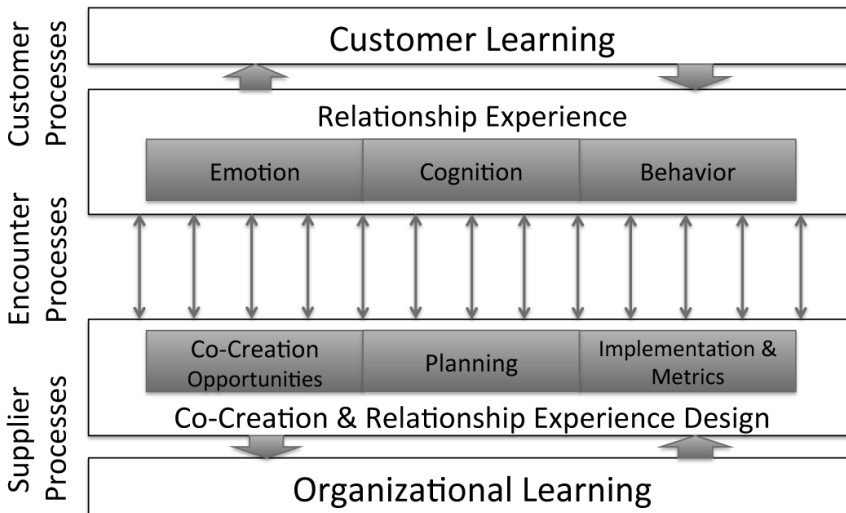
Supported by an uninterrupted development of information technologies, rich and direct interaction systems allow to interface companies, stakeholders and multiple customers. Parallel to this, in the environment of services which represent the biggest part of the developed economies, advances in theory demonstrated that value results from consumption or use of a product or service by a customer and not necessarily due to the design or choices of the innovative attributes (Vargo and Lusch, 2004). The value of the co-creation concept offers the opportunity of finding new means to get differentiation and competitive advantages (Prahalad and Ramaswamy, 2004).

By organising and supporting value co-creation processes, companies are due to propose extreme personalization, hence avoiding all possible direct competition, and to be able to benefit from the cognition capacity of the crowd. Every time a consumer is engaged in an interaction with a company during the different stages of development, the dialog may be seen as a process of learning together (Balantyne, 2004).

The conceptual framework leads one to focus more on processes - tasks, mechanisms, activities and interactions - by which value is generated (Payne, Storbacka and Frow, 2008). In particular, three main processes, related

to customers, to encounter and to suppliers, should be considered in order to understand how co-created value is produced. The authors proposed the overall framework of interaction as developed in figure 1.

Figure 1  
Conceptual Framework for value creation



When customer and supplier value-creating processes include resources, interactions and practices by which the actors co-design the offerings, the encounter processes refer to touchpoints or contact flows and practices, which support the emergence of opportunities and the mutual adjustments. In this perspective which differs fundamentally from the traditional 'engineering' perspective (Füller, Mühlbacher, Matzler and Jaweck, 2009; Tuli, Kohli and Bharadwaj, 2007), suppliers have to design and implement the means by which interaction flows and customer experience will generate co-created offerings.

From learning perspectives, co-creation processes raise important issues (Caputo, Garcia Perez, Cillo and Giacosa, 2019). First, under-

standing how customers learn and the factors which support learning loops became significant issues as it is observed that customers do produce novel and relevant knowledge. For example, it is observed that co-creation is most successful for highly relevant but moderately novel knowledge (Mahr, Lievens and Blazevic, 2014).

As result, designing encounters systems, which support both engagement and experience, became a major issue for companies willing to implement co-creation practices. For example, they can invest in virtual environments (Nambisan and Baron 2009) or online customer communities (Füller, 2010) to support co-creation. These virtual environment platforms generate fruitful exchanges

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between customers and companies as for learning opportunities (Verleye, 2015).

Among the different tools, “configurator toolkits” are software packages “composed of a knowledge base that stores the generic model of the product (or service) and a set of assistance tools that helps the user finding a solution” (Aldanondo, Moynard, Hadj Hamou and Lamothe, 2003, p. 179).

These co-creation platforms offer the possibility of measuring and analyzing real-time customer behaviors and preferences (Zwass, 2010). Configurators are useful for customers to self-customize their products. They are considered as toolkits that help customers to identify and define their preferences and to develop a better understanding of their choices thanks to information provided by the brand during the configuration process (Randall, Terwiesch and Ulrich, 2005; Payne, Storbacka and Frow, 2008). Interactions that occur between customers and companies involved in the customization process may be considered as a process of common and mutual learning (Ballantyne, 2004) through the interactive and iterative learning parts of both the customer and the supplier (Mahr, Lievens and Blazevic, 2013). Through the customization, the customer has the possibility of a) modifying some features of a product within a set of predefined brand attributes, and b) buying the co-created product (Merle, Chandon, Roux et Alizon, 2010).

Designed to be the interface in between customers and companies, configurator toolkits support the encounter process. By so, their implementation requires ideally to integrate knowledge related to the firm, its clients and its environment. As for the company, they should embed and display all combination of product attributes that may be potentially proposed.

As for clients, the firm must design an interface which should fit with preference in navigation through the configurator, as well as with the potential combination of attributes which may be preferred. Understanding the implementation issues of designing such a co-creation interface is the purpose of this research.

## Research questions

First investigations on co-creation displayed promising results. However, as most of the papers focus on theory, or on the criteria which are due to generate stakeholder engagement, empirical evidence is required to better understand how organizations implement co-creation systems (Barczak, 2012; Osborne and Strokosch, 2013). More specifically, understanding the way interaction flows are designed deserves in-depth examination. Then, as it is identified that co-creation requires creating attractive experience, which includes both cognitive and emotional activities, analysing the way current implementation of co-creation systems integrate those dimensions may lead to a better understanding of the leverages which may contribute to support customer’s contributions.

## Research methods

It is likely that encounter systems may be very diverse in both interaction capacity, engagement features and sophistication. Given the overall concern of this research, it was decided to focus on “configurators toolkits”. Usually associated to existing web sites, their purpose is to provide customers with the possibility of personalizing the information and final offerings through the choices of desired attributes. As the result may be a very unique product, they may be considered as a co-creation platform.

Usually, personalization is offered through a set of menus, each of them leading to adapting a specific attribute of the offering. The more menus proposed, the richer the ‘configurator’. By analogy with product assortment, we suggest calling the number of different menus the “width” of the ‘configurators’. As an example, on the web site of the car maker Volvo UK, the customer is offered five main menus for the V40 model: the engine and transmission, trim level, packages and options, external design, internal design. Within each menu, different options are offered. The highest number of options offers possibilities to cover the broadest number of customers’ preferences. We suggest naming the number of options proposed per menu the “depth” of

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the 'configurators'. Regarding the Volvo V40 example, it is possible to configure the colours of the external design from 14 possibilities.

Increasing the number of choices raises the question of the ergonomics of the system. Proposing a huge number of possibilities may require long exploration and by so result in the abandon of the 'configurator'. More specifically, information may be organized hierarchically into menus, sub-menus and sub-sub-menus, each of them being part of a specific "level" in the 'configurator'. In the V40 Volvo example, the menu packages and options are divided into three branches: package, option and accessories. The Menu Option itself is then divided into three sub menus: exterior & interior, safety and security. We suggest using an "ergonomic index" based on the number of clicks required to obtain the final offering.

Lastly, 'configurator toolkit' may propose graphics, animations, short videos which will display the final aspect of the personalized solution, resulting from customers' choices. Having real time aspects of the product enables to see the consequences of every choice, both in terms of design and price, and in giving the opportunity to maintain some coherence between different choices. In the Volvo V40 example, the consumer may try every colour in real time and see the resulting design. In some other examples, the product is displayed in three dimensions, making the result even closer to reality.

Along-with some video game systems, where it is possible to personalize the character chosen, the real time vision of the choice may provide amusement. Furthermore, it may also provide functional benefits, such as harmonizing the colours for exteriors and interiors. Displaying the aspect of the product by real life and "in situation" representations of the final offering may increase customers'

interest in the personalized product. The visual and animated elements constitute the hedonic dimensions of the 'configurator'. It is likely that this dimension refers to customer's engagement, providing and close to reality experience of the product in its environment.

As a summary, the development teams in charge of the design of new offerings will have to decide on "width" and "depth" of the offerings as well as for the "ergonomic" and "hedonic" aspects of the configurators. This has to be done in close cooperation with production constraints so that the different options proposed may be industrialised at low costs by adapting production lines.

Investigation on 'configurators' present multiple interests. As many brands propose such systems, opportunities are offered to compare different development strategies and options adopted. Further, as 'configurators' represent a market, different providers of pre-designed technical solutions may contribute to explore the different design, opportunities and problems encountered during development and implementation. Third, even though systems are still in infancy, it is likely that the development of systems supporting virtual reality will lead to more sophisticated and promising tools.

Given the lack of literature on those topics and the nature of the research questions, a qualitative methodology will be adopted. The case study analysis and comparison are relevant for exploration, especially when questions related to "why" and "how" are at the core of the investigations (Yin, 1994). We interviewed five companies, involved in different sectors (Automotive industry, Fashion, Watches, Industrial Products) in order to create diversity and contrast in the situations (Eisenhardt, 1989).



**Table 1**  
**Presentation of the companies selected for interviews**

<b>Company</b>	<b>Sector</b>	<b>Type of Configurator</b>
Firm K	<p>B2B. 'K' is a 100-year-old industrial company that elaborates and creates traceable equipment for agricultural and BT purposes. The products are made by assembling modules that can be personalized according to distributors' requirements.</p> <p>The company makes everything on the premises except for some lesser or highly specialized modules.</p> <p>K's model of distribution of product goes through multi-brand agricultural distributors. The latter propose a range of complementary products from various other brands that are just as competitive.</p>	<p>'K' proposes two types of configurators:</p> <ul style="list-style-type: none"> <li>- the first one was made for the production service in order to avoid mistakes made on the module assembling line by production, then use was extended to the distributors to enable them to finalize perfect agricultural tools for clients. For some years, this has been proposed to distributors of the brand and allows them the configuration with the clients, of their agricultural machines.</li> </ul> <p>This is organized in a rolling multi-choice menu starting with selecting a line, then a model of a product in the simplest way called initial platform product, with a defined number of options. The process is made in steps on the main platform with the options. At each step, the 'configurator' presents a product, a photo, rolling menus with represented options. The latter can represent several varied possibilities of customization.</p> <ul style="list-style-type: none"> <li>- The second is for end agricultural clients. and proposes a service of customization for machines on mobile applications downloaded by the farmers. K presents 5 applications for mobiles so as to help fix in real time machines for weed removal etc. The choice is in two or three steps with two or three possibilities per step.</li> </ul>
Firm B	<p>B is a French watchmaker and makes everything on the premises except for the inside which is from ETA (Swatch group) specialized in manufacturing high quality sports type watches.</p> <p>B is a small, less than ten employee company. The watches are sports-car type with an obvious recognizable visual. Clients can have their watch tailor-made since 2006 by ordering directly from the brand or its assistants, or by post.</p>	<p>The idea of this Web configuration saw the day two years later by the founder of the brand in order to make automatic customization for at least two reasons: to gain time on the conception while also giving to clients the possibility to design their watch themselves. From an industrial point of view, the production of modules through assembling became easy enough.</p> <p>The 'configurator' is for B2C clients and makes room for selecting, step by step, from a large choice of options. The steps begin with the choice of module (there are two), then with the presentation base of all the elements, the watch: (the watchcase, the dial, the hands and the strap). At each step the consumer can select the color and/or the features. Once chosen, the quote is established, and paid before making, then sent to the retailer closest to the client.</p>
Firm D	<p>D is a German company that recently became part of a multinational. It creates configurations for its clients. and used to be in the automobile sector. Its quick</p>	<p>The principle of 'configurators' proposed by the 'D' company is to offer clients the choice of main components for their vehicles from the company's web site. Then, they can get their vehicle at the sales point when ordering. Their particularity is to show their offers in three</p>



<i>Company</i>	<i>Sector</i>	<i>Type of Configurator</i>
	benefiting from sophisticated I.T. tools for a genuine real vision, and great flexibility for integrating client information.	proposed can be integrated on the web site and also presented at the sales points of the brand. The excellent quality of the visuals displayed high-sized on a wall of pictures. The sales point user eases the work of Up-sell of the sales teams.
Firm W	W is an automotive company for the French Subsidiary.	<p>Principle of configurator is to help potential users to define all the main attributes and options. To do this, a configurator is designed in Germany for all the countries. All elements of the cars are transferred from the production lines and incorporated in the configurator. Every country has the choices of the desired options. Once the choice is made, it is entered in the configurator that will be delivered from the central system. Configurators are designed like a show room in the concessions.</p> <p>Out of the use of configurator, consumer behavior is analyzed, notably for abandon. To some extent loyal users may be incentivized by the company. The choice of options is based on internal choices more than on customer surveys. The duration of the client's experience as well as ergonomy (number of clicks to get the final model) appear to be crucial.</p>
Firm A	A is a firm specialized in the design and implementation of the configurators for clients.	<p>Some elements of the configurators are based on similar coding tools and lines. This leads the A company to select proposals made to firms according to existing computing frames and coding lines to limit development costs in some kind of standardization.</p> <p>Customer experience remains to be investigated as no formal customer surveys are proposed.</p>
Firm P	P is one of the leading companies in the automotive industry.	<p>The configurator brings to clients the possibility to design a model of their choice, including core features (such as motors), as well as design options (Color, Alloy Wheels, Colors of Upholstery, ...), options and financing plans.</p> <p>Configuration is obtained through six main stages, displaying eight choices maximum for each of them. At the end of the process, it is possible to save the model. Suggestions of where similar cars may be tried are proposed.</p>

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Methodology aims at comparing the processes by which configurators are designed and implemented in the aim of identifying emerging patterns. A specific focus is put on two areas. First, investigations focused on the course of the development projects, specifically on the main decisions and stages observed and on the identification of events that managers identified as resulting from learning actions. The main topics covered are:

- a. The main sequences and decisions of the development, how the alternatives were identified, selected and designed, how many changes occurred since the first version and how the use of configurators and of customer's satisfaction are measured, which actors contributed to the development.
- b. How encounter process is designed? Which principles or vision are guiding the design of the encounter process? Which decisions are related to the fourth dimensions of the design of the encounter process? How customers are associated or contribute to the design?

For each project, we selected the manager in charge of the configurator, and when possible, we interviewed the people involved in the development of the project. The interviews were transcribed, and the findings were coded by connecting patterns emerging from the data (Miles, Huberman and Saldana, 2018).

First, we attempted to identify main decisions taken all along the development process of the configurators as they were described by the managers involved in the projects. Then an identification of the main elements contributing to the final decision was made. Once the development process and decisions had been clearly identified, a comparison of the processes between different cases was produced to analyse similarities and differences, following the recommendations of Eisenhardt (1989).

Second, we coded the variables related to learning behaviour so that a typology of learning actions implemented could be formalized. We used a grid already adopted in previous research on innovation (Stevens and Dimitriadis, 2004) and an integrative grid of codes was produced.

## Results

Rich and detailed information gathered all along the interviews and data processing led to the following assumptions.

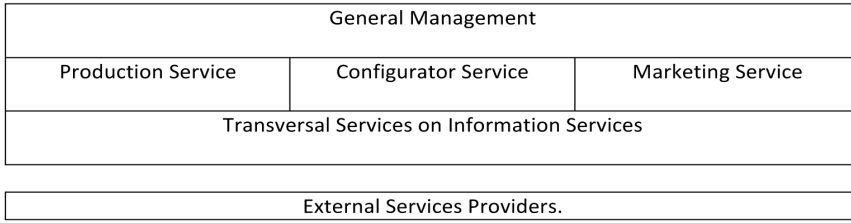
### Co-creation requires including new actors in the systems, resulting in organizational change

The initial vision of co-creation refers to two main actors, the customers and the firm. Our observations revealed that the design of configurators requires competences and skills which are provided by external companies. The company does not actually have all of the necessary resources internally to allow for the creation of interface. Designing the interface, implementing it in the existing information systems requires very specific skills, linked to programming, to the management of web design, to the way customers are used to behave in a virtual world. Notably, developers are selected according to their experience as video gamers, which gives them experience of the users of web interface. In interaction with the others (companies and clients) the configurators elaborate scenarios and tools of co-creation through experiences, discussions and mutual adjustments with the producers of the offer.

To set up their configurators, the observed companies established an organizational process relying on four internal parts and one external part. The internal parts that were involved are made up of production services, marketing, management services (respectively) of the configurator, guaranteeing the components of the offer and of the correct working system of the platform of co-creation and of a system of information service that is organized like a transvers service for the first three (see figure 2). In this situation, it is obvious that the management service of the configurator covers the adjustments between production and marketing. Surprisingly, this service could be given from the DSI service or could be independent. Given its position, the configurator system will use available information from the information systems, but the choice of the offer components and their presentation come from production and marketing. The whole set makes up an ecosystem which interacts within a mutual adjusting on the offer components and the working of the configurator.

Figure 2

**The actors of the conception and components of the configurator's offer**



Consequently, co-creation shouldn't be considered as a pure dual play established between firms and clients, but as a process which associates at least three actors enrolled in the design of encounter processes: the company or several services can be interacting and solicited for the management and the conception of the configurator, the client and/or the providers, external companies working for the company.

By providing specific development skills, by interacting and learning from experience at different levels, they elaborate the tools through discussions and mutual adjustments. Doing this induces noticeable transformation of the processes and tools related to the production as well as the information systems.

Designing encounter tools that support co-creation requires a redesign of competencies and expertise, as well as the processes by which each of the main functions are usually producing and delivering the final offering.

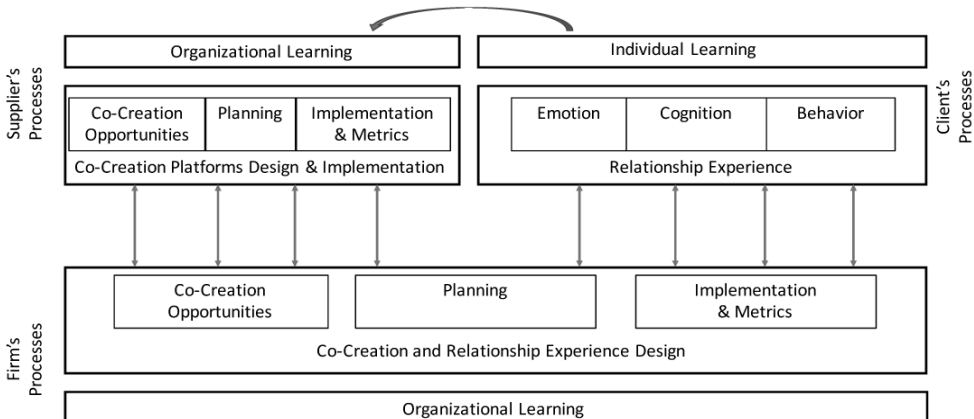
The development of co-creation systems appears to be very close to the new service development process identified by multiple researchers (Santamaría, Jesús Nieto and Miles, 2012; Stevens and Dimitriadis, 2002). Notably, the capacity to adjust internal and external competencies in a way that support the encounter process looks determinant as suggested more generally for service innovation (Eisingerich, Rubera and Seifert, 2009). Thus, co-creation is achieved through both the actor's disposition to engage, and the activity of engaging in an interactive process of resource integration within an eco-system service (Storbacka, Brodie, Böhmman, Maglio and Nenonen, 2016).

**A design process separated into two different sequences**

Including new agents in the purpose of designing and implementing the co-creation systems makes the development process more complex. Figure 3 summarises the observations.

Figure 3

**Summary of the development process**



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Co-creation is not achieved by a dual relationship but by the creation of an eco-system made up of three or more actors who interact in a given process. Resulting from interviews, the overall process is made in two steps and parts. First, the firms establish a relationship with suppliers in order to get the competencies and skills required to develop the configurators. Through a flow of interaction, a first version of the co-creation platform is designed. At this stage, suppliers do not interact with final users and configurators are designed based on existing repertory of knowledge of both firms and suppliers.

The design and implementation require that both firms and suppliers establish detailed interactions resulting into in-depth organizational changes, such as redesigning production and supply chain processes or transforming the information systems used to implement the platform. In return, suppliers modify their own predefined platforms so that they may fit firms' expectations. This validates the adoption of organizational learning perspective to understand the successful implementation of the co-creation systems.

In a second stage, once the co-creation platform is made available to customers, interaction flows occurred resulting into the creation and purchase of co-created offerings. At this point in time, there are three distinct learning processes that occur.

Firstly, the first process of learning is carried out on the ergonomic factor of the configurator. Firms are able, thanks to clients' behaviour observation, to understand which are the options and possibilities adopted by customers. This results into refinement of the configurators. Menus and options are designed by deleting the less used. In the same approach, the simplification of the purchasing process is achieved by establishing short cuts in the purchasing process.

Secondly, the second process of learning is made by the clients. The latter must learn, through trial and error, how to use the systems, the time required to get the final offering and the benefit of using configurators. Through individual learning process made of trial, errors, abandons, clients finalized the

desired offering. This stage looks critical as abandon rates are very high. The meeting point between the options offered by the company and the clients' choice are genuinely present but it is impossible, at this point of the study to certify exactly that the offers correspond to clients' expectations given that the latter does not enter the process of interaction company/supplier during the conception platform of the client offer.

Thirdly, the third learning process is internal to the company. The elaboration of a co-creation platform gives the actors who are responsible for this, the role of adjusting the constraints of production and the marketing expectations that can sometimes be antagonistic. Without hierarchical power, one can see that as soon as conciliation of constraints is not possible, the configurator service must use the hierarchical arbitration power of the organization. The latter will intervene to define the choice that allows adjustment (see figure 1). The learning cycle is thus conditioned by the contribution of the actors who are directly involved in the platform but also by the support of other services, mainly general management. Looking for an analytical approach relying on organizational learning hence seems to be able to understand the dynamics and the process of the development of the co-creation platform.

It is astonishing to see that in this two-step process, there is no interaction between the company, the external suppliers and the final client within the co-creation offer. This only interaction between the marketing, configuration, production and external suppliers' services does not consider clients' expectations in the rising of the co-creation process. Actually, the taking into account of the client only takes place during the on-going process of co-creation, through the observation of the client in the configuration working of the rising offer. Only two types of users' feedback are observed: firstly, the configurator's feedback which allow for platform adjustment. Secondly, indirect feedback based on video gamers from external suppliers. Consequently, the companies in charge of meeting flows, even when they have a good experience of the interface and the setting up of information systems, obtained a relatively low level

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of information on how the tools and the process offered to clients were perceived, thus showing that creating learning cycles is not possible.

### **A co-creation made up to manage the coherence of the production and the brand image**

The question of coherence and product image are at the heart of the elaboration of interactive dispositions with the clients. The possibilities of co-creation and the options are restrained to preserve the coherence between the final offer and the company's brand image. For this, five criteria of compatibility have been used by the heads of projects: country/cultural compatibility, technical compatibility, image position compatibility, semantic compatibility and the SI structural compatibility.

During interviews, the heads of the configurators' projects consider the idea of product coherence and brand identity, as a guide for the design of interactive options and menus, as the huge number of combinations proposed can endanger these two ideas. A random combination of options offered to the client could degrade product coherence and the brand image through models associating contradictory attributes.

Further and regarding legal systems, the multiplicity of customized possibilities could lead to the creation of illegal product, depending on the country (E.U. or not).

a. Country/Cultural compatibility indicates that the 'configurator' must integrate the features (cultural, geographical, morphology...) of each country or region, while maintaining the heart of the basic product, identifiable world-wide.

b. Technical compatibility of modularization involves maintaining overall general compatibility between product components. Modularization of the production increases the need for compatibility according to the number of options available. Effectively, the more options available, the more the need for complex modules and sub-modules will rise. The risk of incompatibility will increase

per number of options offered to the point that human intervention will be required to support the client in the appropriate use of configurator.

c. The image position compatibility aims at maintaining coherent visual products, regarding the choice of the colour, the shape and the materials. It is true that the idea of aesthetics or actually 'good taste' can differ from one client to another and can give rise to creating products that are visually not aesthetic. The range of possibilities offered can have a bad effect on brand identity. If the process of customization is badly set up, the very elements of the identity of the brand and/or its psychological representation for clients could disappear. For potential or loyal clients of the brand, a lack of aesthetic elements for products like cars or watches may lead to brand weakening.

Thus, possible combinations are pre-determined by considering brand image and product coherence. Those choices are formalized in series of "rules" formalized in tables or matrix. All models are listed in columns and all options (engines, colours, design of the interior, etc...) are listed in lines. Then for each model, possible combinations are formalized and introduced in the configurator as rules for potential displays. This perspective leads to the concept that co-creation must be guided in some sort of "framed co-creation" concept, so that final outcomes may fit with the firm's capacity.

This study has highlighted the problematics of denomination of products as stopping the development of a certain number of choices for the consumers. An identical denomination of different products, which comes from a default in structural conception of the information system, perturbs the organization of the offer made to the clients and mainly the structure of the overall filters of selection.

### **The Design of co-creation encounter is not based on co-creation principles**

The conception of the encounter of co-creation is thus not based in principles of co-creation. The creation of value results from

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the experience of the user of the co-creation systems. Observations revealed that customers were not associated in the design of the encounter processes. Even though the development is triggered when the assumption that Generation Y, (as digital natives used online games), expects interactive systems when browsing the web sites, the design of the systems of interaction do not associate them. However, knowledge related to the expectation of the target is acquired by recruiting developers who belong to the target and consequently have similar experience, expectations and culture.

This results in a development process made of two distinct stages. The first stage involves the firms and companies which bring competencies in the development of the co-creation systems. During this stage, interactions and learning loops result into a system where the adjustment between production, information systems, supply chains are achieved. The second stage occurs when customers start co-creating by using proposed systems. During this stage, observed behaviours may result in learning loops. Choices in the preferred options, selected menus, time spent on each stage, number of purchase or abandon may result into refinement of the possibilities offered to customers.

Theoretical developments highlighted that value creation processes occur when the customers consume or use a product or a service, rather than when the output is manufactured (Vargo and Lusch, 2004) (Ngo and O’Cass, 2013). In this perspective, it may be said that configurators offer possibilities to start creating value before purchase is made. This underlines that to the function of co-creation, interaction systems should aim at providing a rich and distinctive experience, generating as much value as the result itself. However, given the very weak rate of transformation of configuration into purchase, we can conclude that the internet-surfers use the configurator as a discovery of a product rather than for a final purchase.

Regarding the companies, they use the configurator like a ‘digital orientated tool’; that is to say as a tool that orientates the internet-surfers in function of their choice of products

that already exist and correspond to their expectations. Rather than being used as co-creation tools, configurators appeared to be used as a way to offer to the internet-surfers a product straight from a marketing program of the company, based on classic studies of the product/market segmentation. The personalisation of the configurator is thus only a marketing argument to comfort the client in the unicity research of a product.

## Discussion and Research Opportunities

While involving customers in value co-creation processes makes sense (Hoyer, Chandy, Dorotic, Krafft & Singh, 2010; Lehoux, 2013), it is clear that the effective implementation of a co-creation perspective results in major changes in the design and delivery of the new offerings. Knowledge management approach revealed to be able to address important issues in the process as noticed in previous research (Park and Lee, 2015). Co-creation of value requires designing platforms, made of both humans and machines, and which may support development of co-created offerings through the engagement of actors. As new competencies are required to design and implement the co-creation systems, it is likely that the development process must associate new entities, establish heedful interaction processes with them into some kind of ecosystem. Adopting a stakeholder perspective which settle in detail, roles and information flows between all the actors of the system should lead to significant improvement in the design by supporting knowledge transfer, re-organization of the core functions which are required to allow customers’ contribution to the design of final offerings (Kazadi, Lievens and Mahr, 2016). Experience from other sectors may appear as being relevant in the field of configurators (Suh, Jung and Smith, 2012). Associated to the co-creation process, the individual learning of customers must be emphasized. Described as a process of trial and error through browsing and exploring menus and offered choices, the co-creation induces individual learning. As a high level of clients’ abandon has been identified, it is suggested that the encounter process must be care-



fully designed to facilitate exploration and create involvement. In this perspective, the “ergonomic” and “hedonic” dimensions of the configurators should be emphasized. As current expertise of the companies looks low due to the newness of co-creation systems, further research on attributes of the configurators which may lead to clients’ involvement in co-creation processes is due to contribute to improve current systems (Storbacka *et al.*, 2016).

Further, the development process is divided into two parts, one where the co-creation platform is developed and the other where the clients finalized the offerings. This divide in the development process creates knowledge gap as there are no concerns of establishing integrative vision of the overall process. A first knowledge gap exists in between firms and the company in charge of the development. Competencies related to interaction possibilities and tools to manage them are outsourced, resulting in adjustment issues which are observed along the development. As already developed by Durmuşoğlu and Barczak (2011), it is likely that information systems may be designed in the purpose of generating data and measurements all along the development (Durmuşoğlu and Barczak, 2011). Using the large stream of literature on knowledge transfer (Bouncken and Teichert, 2013; Kang, Rhee and Kang, 2010; Kit Fai and Marcia, 2011; Letmathe, Schweitzer and Zielinski, 2012; Storey and Kelly, 2002) may lead to detailed recommendation on the way information flow should be managed to support the design and improvement of co-creation systems.

A second knowledge gap results from the fact that very little is known about the way customers interact once the encounter process is implemented. Specifically, the way consumers learn to interact and factors which facilitate or prevent learning is not well documented. Lessons from other sectors may be used to lead further research on configurators (Shamim and Ghazali, 2014). As high abandon rates are observed and any clear objectives to improve the situation, it is likely that customer’s knowledge remain tacit. Further investigation on this side of the configurators may help to better understand how co-creation generates

value as already investigated in new product development (Goffin and Koners, 2011). The third knowledge gap is because the designers of encounter process have no access to customer data, making difficult the transfer of previous experience on new systems. As already mentioned, the adoption of stakeholder perspective in the development process is due to lead to fruitful managerial results.

Regarding the conclusion, it makes no doubt that sophisticated interface human/machines are due to contribute to client’s co-creation processes. Detailed analysis on how knowledge is generated along the encounter flow and among the stakeholders should lead to a better understanding of the variables which lead to clients’ satisfaction.

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