



HAL
open science

Customers' learning process during product customization: The case of online configuration tool kits

Eric Stevens, Elodie Jouny-Rivier

► **To cite this version:**

Eric Stevens, Elodie Jouny-Rivier. Customers' learning process during product customization: The case of on-line configuration tool kits. *Information and Management*, 2020, 57, pp.103347 -. <10.1016/j.im.2020.103347>. <hal-03491435>

HAL Id: hal-03491435

<https://hal.science/hal-03491435v1>

Submitted on 22 Aug 2022

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.



Distributed under a Creative Commons CC BY-NC 4.0 - Attribution - Non-commercial use - International License

Customers' Learning Process during Product Customization: The Case of Online Configuration Tool Kits

Eric Stevens*

ESSCA, School of Management,
1 rue Lakanal, 49000 Angers, France.
E-mail: eric.stevens@essca.fr

* Corresponding author

Elodie Jouny-Rivier

ESSCA, School of Management,
1 rue Lakanal, 49000 Angers, France.
E-mail : elodie.jouny-rivier@essca.fr

Abstract

Online configuration tool kits present attractive opportunities for creating customized offers. The purpose of this study is to analyze the relevance of both the TAM (Technology Acceptance Model) and the experiential learning theory to understand how configuration contributes to provide value for end users. The qualitative survey shows that the TAM needs to be adapted to the case of configurators by measuring both perceived usefulness (PU) of the configured product and PU and ease of use of the configurator itself. The study shows the relevance of experiential learning theory as an antecedent of the TAM. A model summarizing our observations is proposed and discussed.

Keywords

Product configurator; configuration tool kit; learning process; experiential learning theory; customization; technology acceptance model.

Customers' Learning Process during Product Customization: The Case of Online Configuration Tool Kits

Abstract

Online configuration tool kits present attractive opportunities for creating customized offers. The purpose of this study is to analyze the relevance of both the TAM (Technology Acceptance Model) and the experiential learning theory to understand how configuration contributes to provide value for end users. The qualitative survey shows that the TAM needs to be adapted to the case of configurators by measuring both perceived usefulness (PU) of the configured product and PU and ease of use of the configurator itself. The study shows the relevance of experiential learning theory as an antecedent of the TAM. A model summarizing our observations is proposed and discussed.

Keywords

Product configurator; configuration tool kit; learning process; experiential learning theory; customization; technology acceptance model.

Consumers' Learning Process during Product Customization: The Case of Online Configuration Tool kits

1. Introduction

In today's increasingly competitive business market, cocreating new products with consumers through product customization can give companies a real competitive edge [1]. Among the techniques used, product configurators (also called configuration tool kits) have emerged as a preeminent tool for streamlining company sales. Unsurprisingly, a large number of companies, such as Nike, Reebok, BMW, and Toyota, now propose online customization systems. First launched in the 1990s, product configurators enable consumers to easily and rapidly create their ideal product by selecting various options in terms of color, size, model, etc., before finally making their purchase. Highly skilled consumers are thus empowered in the sense that they are able to design their own personalized offering [2].

However, it is likely that consumers use configuration tool kits only when the time and effort spent on the configuration process is perceived to produce a worthwhile outcome. This perception can be measured using the technology acceptance model (TAM) of Davis *et al.* [3], regarded as a good theoretical framework to explain people's acceptance and the potential of users' behavioral intentions regarding information system tools. Based on the Reasoned Action theory, a social psychological theory that aims to explain a person's behavior, the TAM analyzes online shoppers' website acceptance and buying behavior through two constructs, PEOU (Perceived Ease of Use) and PU (Perceived Usefulness) [4]. As the value resulting from product customization may be analyzed with two higher-order dimensions (product value and experience value) [5], it is likely that measuring the two variables highlighted by the model, namely perceived ease of use (PEOU) and perceived usefulness (PU), should lead to a better understanding of the value created during the configuration experience.

Many studies have confirmed that the TAM may be viewed as robust and predictive, where the adoption of a new service supported by information technology is concerned [6, 7, 8, 9]. Yet, very few studies have investigated the antecedents of PU and PEOU. Among these, Oh *et al.* [10] showed the value of adding the concept of "flow experience" to the TAM, with "flow" being defined as an optimal challenge corresponding to a certain skill level. In terms of the present study, it is likely that PU is one of the outcomes of the configuration process and influences consumers' willingness to spend the time and energy required to complete the entire configuration process. Similarly, it is likely that the design of each stage of the configuration impacts the PEOU, as it has been observed that website complexity impacts on attention, attitude, and determination that lead to outcomes such as purchase behaviors [11].

However, the way in which customization is implemented and operationalized (i.e., the tools and processes enhancing customer participation before, during, and after the process) has

received little attention from an empirical standpoint [12, 13]. Most of the studies dealing with configuration tool kits focus on the benefits and challenges of implementing and using them from the firm's perspective [14, 15]. While it is assumed that tool kits help consumers to define their preferences [16, 17], there is no information to our knowledge about the antecedents of the TAM results.

More recently, Franke and Hader [18] assumed that configurators contribute to eliciting customers' preferences through a suggested trial-and-error learning process. Hence, they suggested that some dimensions of the experience, notably the users' learning process, may impact the two TAM dimensions, in other words, PU and PEOU. As it is unlikely that consumers would know the proposed interaction processes and final offers in advance, a fluid and efficient learning process should lead to positive ease of use and usefulness. Thus, as identifying the antecedents of PU and PEOU is expected to lead to an improved theoretical model for understanding the customer learning process during product configuration and to develop relevant managerial recommendations, the current lack of contributions constitutes a significant research gap. Empirical observation of users' behaviors and learning in terms of their potential impact on the TAM dimension is therefore required to explain how and why learning processes, made up of a combination of cognition, emotions, and behaviors may be considered as antecedents of TAM variables.

To validate the relevance of the TAM and the learning processes as antecedents of TAM variables, we asked a sample of respondents to take part in configuration processes. Because of the exploratory nature of this research, the selection of respondents (35 participants) and configurators (six configurators for different products) was expected to provide a broad range of situations and cases through maximum variation sampling [19]. Next, we collected in-depth data about the process that clients adopted to select, display, and use information to understand what they perceived, understood, and felt, and how they justified their navigation behaviors. Finally, we used the data collected to put forward a theoretical model, making a few adjustments to the TAM itself and assuming that learning processes are antecedents of the TAM variables. The results suggest that a configurator's efficiency is improved when it is supported by a design that facilitates the users' learning processes.

The paper is structured as follows. First, we recall the main definitions related to configuration tool kits and their value from a marketing perspective. Next, the TAM and experiential learning theory are presented to better understand the learning experience, and we discuss their potential to explain the value perceived by clients. The next section introduces the methodology adopted to follow users' navigation processes and associated perceptions, emotions, and behaviors. Based on the collected data, a model is developed and discussed, which is underpinned by theoretical recommendations. The impact of the learning process on satisfaction leads to managerial recommendations related to the design of product configurators, in particular by enhancing product-and brand-related knowledge. Finally, the value of the model and its potential contribution to managers is detailed, followed by suggestions for further research.

2. Literature review

2.1 The configurator as a tool kit for product customization

According to Kaplan and Haenlein [20, p.178], electronic mass customization is “a strategy that creates value by some form of company–customer interaction at the fabrication/assembly stage of the operations level to create customized products with production cost and monetary price similar to those of mass-produced products, where at least one of the three market dimensions–player, product, and process–is digital.” Interactions that occur between customers and companies involved in the customization process may be considered as a process of shared and mutual learning [21], achieved through the interactive and iterative learning of both the consumers and the suppliers [22]. Dellaert and Stremers [23] confirm that when customers have the feeling that services, products, or settings are personalized, they give them higher priority.

To achieve this, companies increasingly invest in a wide range of tools to improve value creation and facilitate product customization. Examples include virtual environments [24], online customer communities [25], or even product configurators. Configurators are software packages “composed of a knowledge base that stores the generic model of the product and a set of assistance tools that helps the user to find a solution” (26, p 179). Configurators are useful for customers to self-customize their products (e.g., clothes such as Spreadshirts or Shirtinator, shoes such as Reebok or Converse, automobiles such as BMW or Audi). They are seen as tool kits that help customers identify and define their preferences [27, 28] and develop greater understanding of their choices through information provided by the brand during the configuration process [16, 17].

According to Simonson [29], many studies have indicated that customization is a key determinant of online customer retention. The use of product configurators helps to refine the product offer, testing the set of options offered by the brand by combining them into a new offer, thereby facilitating consumer-defined preferences [16,17]. Later contributions demonstrate that customer value resulting from mass-customized products may be analyzed through two higher-order dimensions: product value and experience value [5]. This suggests that, based on PU and PEOU, the TAM may be a useful tool to measure the configurator’s value for its users. In the following section, we present the TAM as a relevant theory to explain the perceived value of the configuration process.

2.2 Relevance of the TAM

As configurators require individuals to interact with a production team through a technological interface, it is likely that the configurator, its design, and the interaction process triggered by its use will determine its perceived value by clients. In the information systems literature, the notion of technology acceptance is posited as a synopsis of the consequences resulting from the use of configuration tool kits.

The TAM proposed by Davis *et al.* [3] is identified as one of the most powerful and widely applied theoretical frameworks in the field of information systems [30]. The model was adopted from the theory of reasoned action [31]. The TAM explains online shoppers' website acceptance and buying behavior through two constructs: PEOU and PU. PU is defined by Davis (32, p.320) as "the degree to which a person believes that using a particular system would enhance his or her job performance" and PEOU as "the degree to which a person believes that using a particular system would be free of effort." According to this model, the system (i.e., the product configurator) is a response that can be explained or even predicted by customer behaviors influenced in turn by individual perceptions (PEOU and PU) and by the options and features of the system [3]. Many studies have confirmed the initial assumptions related to the relevance of the TAM [6, 7, 8, 9].

For our study, we assume that both PU and PEOU influence the time and energy required to lead the entire configuration. This assumption is in line with the demonstration by Franke and Hader [18] that the use of tool kits results in the emergence of customers' preferences, achieved by a suggested trial and error learning process. As a result, we may hypothesize that the experiential learning process is a relevant antecedent of the two dimensions of the TAM. However, given the lack of empirical investigation into the way users actually manage the configuration process, this issue constitutes a research gap and requires a more detailed approach to the learning theories that we examine hereafter.

2.3 Learning during the configuration experience

Research on customization has focused on consumers' experiences when configuring a product [16, 17, 18, 33], with little information about the process of using configurators. Most studies indicate that configurators offer a journey made up of successive steps whereby customers need to make one or several choices from among the multiple options offered. Every choice results in the selection of one or several attributes that ostensibly correspond to their preferences. The sum of all choices then constitutes the final offer that is assumed to match the customers' expectations with regard to the product or services.

When entering such a process, customers confront two areas of uncertainty. First, the final outcome of the process is unknown, because the configurator is designed to select the attributes to be configured.¹ Second, the process whereby all the attributes may be selected, its main steps, and the way preferences may be expressed is not known either. In other words, when starting the configuration process, configurator users face a high level of uncertainty regarding the outcome of the process, its main stages, and its duration. This means that the outcome of every stage and of each learning loop will determine the continuation or abandonment of the process. Understanding the factors that facilitate or prevent learning is therefore crucial in designing successful configurators.

¹ This may be different in the case of repeated visits. In this case, what customers learnt during the first visit or another visit with similar tools may be used to enhance efficiency.

Learning is an enduring concern in the marketing literature [34; 35]. Anderson (36, p.4) defines it as: “the process by which long lasting changes occur in behavioral potential as a result of experience.” Given the level of uncertainty related to the exploration of unknown processes, it is likely that the use of configurators will renew the perceptions—defined as “the entire process by which an individual becomes aware of the environment and interprets it so that it will fit into his or her frame of reference” (37, p.333)—and the emotions—defined as “the mental state of readiness that arises from cognitive appraisals of events or thoughts” (38, p.184)—associated with the brand or product. In addition, according to Kim *et al.* [39], emotions are considered as key dimensions of customer value and influence the intention to purchase digital items. Thus, it is important to consider emotions in the customer learning process of a product configuration. Finally, giving sense to the learning process is also an important variable, leading to customer satisfaction with regard to the customized product. We define sensemaking as “meaning creation based on current and prior interpretations of thoughts generated from three sources: external stimuli, focused retrieval from internal memory, and seemingly random foci in working memory” (40, p.416). To fully understand the notion of learning, many authors put forward models that split the experience into broad dimensions. These different dimensions are summarized in the experiential learning model proposed by Kolb [41].

Inspired by Dewey, Lewin, and even Piaget, Kolb [41] proposes the experiential learning theory, which adds affects and subjective experience to the cognitive and behavioral learning theories previously mentioned. In this perspective: “knowledge results from the combination of grasping and transforming experience” [41, p.41], which is achieved by four kinds of actions. In a given situation, “a person continually cycles through a process of having a concrete experience, making observations and reflections on that experience, forming abstract concepts and generalization based on those reflections, and testing those ideas in a new situation, which leads to another concrete experience” (42). To summarize this process, Kolb proposes a model made up of four broad stages: concrete experience, reflective observations, abstract conceptualization, and active experimentation. This model offers a way of understanding individual learning styles and experiential learning applied to all learners.

Considering configurators from the experiential learning theory perspective, it is likely that the tool kits engage learning through three effects. First, the opportunity to try different solutions involves enriching the declarative knowledge associated with the product or the brand. The number of possible attributes, their nature, and contribution modify representations and generate a renewed vision of the final potential product by developing new associations (shapes, models, colors, etc.). Second, configurators can foster new practices associated with the tool kit itself. Rather than displaying a single list of predetermined brand features, the configurators may associate a repertory of potential behaviors with the existing brand identity, each of which gives access to specific solutions or features. Third, while the use of information technology has become more common in recent decades, it is likely that the use of the tool kit itself will require several learning cycles. People with no experience of a specific configurator know little about the potential benefits of the configuration process, the outcome resulting from each stage, the behaviors required to obtain results, the overall duration of the entire process, and the cognitive load required to use the tool. In other words, the tool kit design has to be

learned through a process informed by previous experience—as learning is based on prior experiences [43]—and by actions taken throughout the navigation path. Hence, our study considers all aspects of the customer learning processes described in Kolb’s [41] model and attempts to establish links with the TAM dimensions.

The literature review aimed to show the importance of identifying the antecedents of PU and PEOU to understand the consumer learning process during product configuration. The next section details the methodology used for this qualitative study.

3. Methodology

3.1 Research setting

Given the fact that the interaction processes during customization have not been investigated to date, we selected an exploratory methodology to do just that. The research protocol was set up between September 2016 and June 2017. We provided French adults with instruction sheets before starting the configuration process (see Table 1 and Appendix A), using homogeneous sampling to recruit 35 participants who shared similar characteristics in terms of internet navigation experience. Participants were recruited on a voluntary basis using the snowball sampling research method, whereby one subject gives the name of another subject until desired sampling is reached [44]. Following a presentation of the purpose of the research, the people contacted accepted (or not) to test the configuration process and answer our questions. No reward was offered apart from the opportunity to access the results of the study once it was completed.

Reducing the diversity of participants enabled us to enlarge the set of situations explored while developing a coherent analysis [44]. According to Onwuegbuzie and Leech (45, p. 242), “In general, sample sizes in qualitative research should not be too large that it is difficult to extract thick, rich data.” Data saturation (i.e., when further data collection is not necessary as the data collected begin showing redundancies) cannot be quantified and is reached when researchers have obtained what they need [45]. Hence, it is not an issue of numbers (thickness) but an issue of quality (richness) [46]. We stopped our interviews when we reached the point where no new data and no new themes emerged. Guest *et al.* [47] argue that data saturation can be reached with just six cases. In our study, data saturation was reached with 35 participants.

At the same time, six online configurators from three categories of goods (sports shoes, automotive industries, and luxury accessories) were chosen with the purpose of generating a wide range of navigation processes, situations, and types of product. This selection introduced a variation in the complexity of the choices made by the customers and produced a richer set of verbatim statements and interpretations. A higher number of decisions are required for automobiles to be finalized, while shoe design relies more on creativity and people’s artistic sense of harmonious colors. With luxury accessories, participants are more sensitive to aesthetics and price.

We selected two different brands from each sector so as to observe differences in the method used to design the final products, as the options proposed, the contents, and the order of the main steps of the process can differ significantly. In the current economic and environmental context, hybrid engines are particularly attractive and popular in France.¹ That is why we chose Audi (the e-Tron model) and Toyota (the Auris Hybrid model) for the automotive brands. For the sports shoe brands, we selected Adidas and Nike as they are, respectively, the first and second most popular sports brands in France [48] apart from Decathlon, a generalist French sports items supplier. Finally, for the luxury products, we chose Longchamp (fashion bags), one of the most popular luxury brands with French women² and Lucrin (high-end leather goods), which targets men. For the Nike and Adidas configurators, young French adults (from 18 to 25 years old) were recruited, as they are the primary target of this type of product (sneakers). For the Audi, Toyota, Longchamp, and Lucrin configurators, the participants were French adults over 25 years old with senior managerial and professional jobs.

None of the participants had any previous experience of using configurators. They just needed to be familiar with the internet and to make regular online purchases. We provided the participants with an instruction sheet explaining that they had to start the process from the very beginning (i.e., accessing the configurator's website) and to make notes on a few issues (e.g., time spent on each step) on a separate sheet of paper (see Appendix A). The number of steps before stopping the process and the time spent on configuration provide important sources of information; first, they indicate whether the participants spent (roughly) the same amount of time on the process, and second, whether the process differs depending on the type of product. For Lucrin and Longchamp, we counted five steps (instead of six steps reported for the other configurators) as the respondents declared that they did not navigate on the homepage before starting the configuration process. Table 1 summarizes the users' processing details.

¹ <https://lejournaldeleco.fr/les-voitures-hybrides-et-electriques-ont-la-cote/#.XBd7WVVKjcs> / Accessed 16 July 2019.

² <https://www.capital.fr/entreprises-marches/longchamp-fait-mieux-que-ses-pairs-avec-une-croissance-de-10-1101930>/Accessed 16 July 2019)

Configurator	Number of participants and gender	Average time spent on configuration	Average number of steps before stopping	Type of steps
Adidas	4 women	12 min	6	<ol style="list-style-type: none"> 1. Explore the homepage/pictures 2. Learn about and view the choices for customization 3. Choose the model 4. Start the configuration process (colors/back/sole/printed text/size) and understand terminology through trial and error 5. Save the shoes 6. Order the shoes
Nike	3 men, 2 women	8.5 min	5	
Audi (e-Tron model)	3 women, 2 men	10 min	5	<ol style="list-style-type: none"> 1. Discover the homepage by viewing the customization choices 2. Start the configuration process 3. Define the options proposed for each step: engines/colors, etc. 4. Summarize the choices made. 5. Save the product 6. Contact a car dealer
Toyota (Auris Hybrid model)	2 women, 2 men	19 min	5	
Longchamp	9 women	22 min	7	<ol style="list-style-type: none"> 1. Observe the different customization options 2. Select the model 3. Select the size/color/flaps/headsets/handles/lining, etc. 4. Save the product 5. Order
Lucrin	7 men	10 min		

Table 1: Configuration consultation process

3.2 Data collection and analysis

The research material was sent to the participants who then followed the instructions at home. They only needed an internet connection. The purpose was to place the participants in real online shopping experience conditions. First, the configurator's web address was indicated so that all the participants could start from the same point. The participants were then free to determine their own preferences and to use the configurator in the way they felt appropriate. However, they were asked to record their step-by-step experience in a structured diary by giving precise details about what was done, which emotions and perceptions were felt, what was learned, why the decision to go from one stage to the next was taken, and finally, how long

each stage lasted. Participants could withdraw from the process before the end but were required to explain the reason for doing so.

The reports provided by the participants were coded and analyzed in two stages through thematic coding and analytical coding, as recommended by Richards [49]. For the thematic coding, defined as “a method for identifying, analyzing, and reporting patterns (themes) within data” [50, p.6], the analysis first focused on the configuration process itself: the number of steps from the start to the finish, the duration of the process, and the nature of the progression, particularly the number of backward steps. For each brand, we calculated the average time spent on the configurator and the number of steps taken before ending the configuration process (see Table 1).

Analytical coding is defined as a method that combines the data and themes with a code label to make them easily identifiable for comparison and to make the analyses useful for future investigation [51]. At this stage, our purpose was to understand, at individual level, the causal factors or variables that induce, influence, and determine people’s behaviors through the different configuration stages. With regard to the identification of learning, there is consensus in the literature that two kinds of knowledge occur during the learning process: i.e., declarative knowledge is knowing “that” (e.g., that the capital of England is London), whereas procedural knowledge is knowing “how” (e.g., how to ride a bike) [52]. Declarative knowledge includes semantic memory and episodic memory, establishing facts and experiences/episodes, respectively. Procedural knowledge is made up of production rules, formalized as “If-Then” rules, and generally stored as tacit routines. It refers to the capacity to perform various tasks such as searching on the web or processing an order.

Analytical coding was structured in specific tables that brought together observations and verbatim statements. The reasons that people went forward, backwards, or stopped were analyzed by the two researchers independently using a double-blind analysis. We then met to compare our codes, with a comparison made at the end of each analysis. When convergence was reached before or after discussion, the reasons were recorded. When some divergence remained after discussion, it was decided that the reason would not be reported in the paper. In the end, the analyses provided three categories linked to the experiential dimension of the offer and the configurator: learning from the offer, perceptions of satisfaction/dissatisfaction, and the emotions perceived. Appendix B indicates the thematic coding with definitions and provides a few examples of the verbatim statements.

In addition to the data analysis, we observed that some variables, linked to the way configurators were designed, had a determinant effect on learning, such as inducing an end to the configuration process or provoking a high level of positive or negative emotions. Even though it was not included in the initial research question, and due to the specific aim of this exploratory study, we decided to observe, define, and include these variables as independent variables. To this end, we adopted an abductive approach. Abduction involves searching for meaningful rules and drawing theoretical propositions from empirical data [53, 54]. In this method, the data are used to explore a phenomenon and patterns, and to help generate or modify

theories [55]. As researchers need to constantly assess theories, this method enables them to revise, update, or even abandon theories and hypotheses.

At this stage of our research, we believed that understanding how the design of configurators, including the main features, processes, and brands, influences the learning processes could be relevant. Based on our observations, we made plausible propositions, detailed in section 4.1 of the paper.

4. Results

In this section, we provide details of the results of both thematic and analytical coding. The first conclusions resulting from the analysis of verbatim statements enabled us to identify the three facets of the learning process during configuration, the importance of emotions resulting from the configuration experience, and the main stages of the learning process. After making observations related to these three areas, we developed research propositions by examining the impact of the learning process on the TAM. The propositions are summarized in the customer learning process for the product configuration model shown in Figure 1.

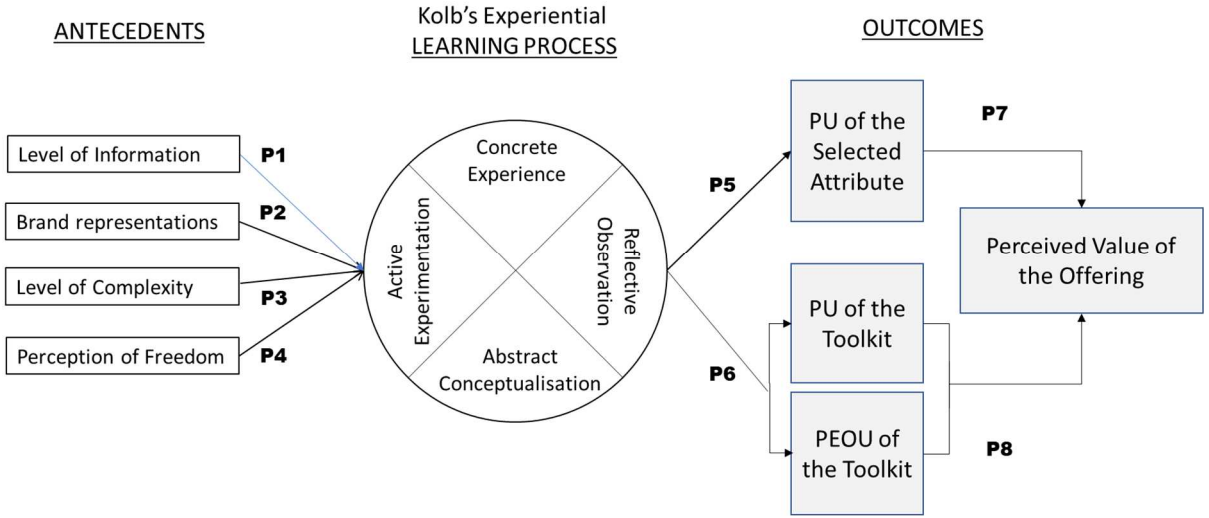


Figure 1: Model of the customer learning process for product configuration

4.1 Antecedents of the learning process

While our initial intention was to focus on the relevance of the TAM and the experiential learning model, our observations reveal that some variables may be identified as having considerable influence on the learning process itself. These variables are indicated in Figure 1.

4.1.1 Level of information

Comparing the diverse configurators at different stages, the quantity and quality of information vary for each attribute and for each configurator. Information refers to the description of every attribute, the pictures describing the attribute (notably the overall aspect of the product when a color is chosen), and the benefits of choosing a specific attribute. All these elements constitute the basic information that customers have to learn before a decision can be taken: *“I understood that my personal design of the shoe lay in the multiple options proposed. I tried all the colors and chose pink.”* It is important to know that the outcomes of the choices or benefits are usually displayed for the various aspects of the product (car or handbag design), but not for its final price. Hence, the level of information provided to realize the product configuration supports or limits the learning process and, as a consequence, leads to the perception of the configurator’s usefulness and acceptance of the system’s tool [3]. If the information provided is insufficient, unclear, or too complex, customers may get the impression that the configurator is not properly designed and is a waste of time, encouraging them to stop the process. We therefore make the following proposition:

Proposition 1. The level of information provided for each choice influences the customers’ learning process.

4.1.2 Pre-existing representations related to brands and/or product categories

The choice that users have to make at each stage of the process is a combination of previous experiences and the information provided by the configurator. This information appears to influence the learning process by inducing specific behaviors associated with the type of product or brand. *“A lot of options should be proposed in the basic offer and not as options. Some options don't correspond to Toyota’s brand image”*; *“I don’t understand why changing options affects overall colors.”* Depending on the selected brands, in the course of the navigation process, people had the opportunity to compare what is displayed with their knowledge of the product or brand as a result of past experiences. This stage offers users the possibility to define their preferences using the tool kit provided [14, 15]. Therefore, the use of the configurator, the navigation process, and the final choices, including the decision to continue or stop the process, may be strongly influenced by existing representations associated with the type of product or existing representations associated with the brand: *“The limited number of colors is linked to the price premium.”* Therefore, we can make the following proposition:

Proposition 2. Preexisting representations of the brand and of the product category influence the learning process resulting from the use of the configurator.

4.1.3 Level of complexity

Overall, the participants appreciated product customization because it enables specific and personal product attributes to be created to match their own preferences. In this way, the participants discovered options and functions they did not know before: “*Surprised by the huge number of possible combinations;*” “*I have the feeling there are infinite combinations/plenty of choices.*” Thus, the way the customization process is designed, the ergonomics of the computer interface, including the visualization of the results, the intricacy of the decisions, and the impact of decisions taken downstream on choices previously made upstream, all make the configurator relatively complex. Prior research has suggested that the measurement of website complexity should cover three main dimensions [56, 57, 58]:

- . The “perceived component complexity” refers to the users’ perceptions of the density and dissimilarity of information cues in the task stimulus.
- . The “perceived coordinative complexity” describes users’ perceptions of the range of interdependencies among the different information sources during the browsing process.
- . Perceived dynamic complexity refers to the ambiguity (number of potential interpretations of the same bit of information) and uncertainty (clarity of action–outcome relationships) that individuals face in performing a task.

Based on these dimensions and examining the participants’ navigation process, we suggest that the complexity of the customization process be measured through three indicators:

- First, the “perceived component complexity” includes the impact of the configurator design, notably the density and dissimilarity of information as perceived by the respondents.
- Second, the “perceived dynamic complexity” refers to the ambiguity and uncertainty perceived while customizing, and which results from the coherence and consistency of information and instructions delivered throughout the configuration process.
- Third, the “intrinsic customization complexity,” which covers the total number of possible options for configuration (multiplying the number of stages to reach the final result by the number of options proposed for each step).

As it is likely that high intrinsic and perceived complexity will have an impact on learning processes, we make the following proposition:

Proposition 3. The level of complexity of the customization process influences the learning process resulting from the use of the configurator.

4.1.4 Perception of freedom

The fourth variable observed in the reports provided by the participants is related to the users’ perception that their choices are not constrained. We observed that limiting people’s freedom to navigate or make choices may reduce the users’ interest in the configuration process:

“Irritation when all restrictions in choices became clear”; *“Deception due to a limited number of choices.”* When playing with the configuration tool kits, one participant had the *“impression of not just being a customer.”* This variable influences the PU of the configurator itself as compulsory choices make the effort spent on customization a loss of time and energy. The perception of freedom also refers to the possibilities of a trial and error process [16] by testing different solutions for one model and going back to a previous model if necessary. We thus make the following proposition:

Proposition 4. The perception of freedom in the choices available influences the learning process resulting from the use of the configurator.

The four dimensions (i.e., the level of information, preexisting representations, level of complexity and perceptions of freedom) alter the learning process positively or negatively, notably by influencing the level of information used to learn, its interpretation, associated emotions, and the duration of the process.

4.2 The learning process

With respect to the nature of the learning process, it appears that the learning loop is achieved through a very complex set of actions related either to the selection of attributes or to the use of the tool kit. As a learning process is expected to change both declarative and procedural knowledge, we identified the related modifications throughout the configuration process. We then classified configuration actions and declarations according to the broad categories of Kolb’s [41] experiential learning theory: concrete experience, reflective observation, abstract conceptualization, and active experimentation.

4.2.1 Declarative and procedural knowledge

The first and easiest dimension of learning concerns knowledge related to the attributes of the product on offer. Verbatim statements showed that a new representation of the potential attributes of the product was formulated through the trial process: *“I understood that my personal design of the shoe lay in the multiple options proposed. I tried all the colors and chose pink.”* Furthermore, there is a real learning curve related to the acquisition of product-specific terminology and understanding the features of the product itself. By customizing the “upper” of a shoe, the “flaps” or the “headset” of a bag, “the roof rails” or “upholstery” of an automobile, customers increase their knowledge of the product’s features and components. Thus, learning through configurators clearly transforms the declarative knowledge related to the product as customers exposed to new information select what has the most value for them: *“I’m happy to have a handmade bag”*; *“I’m more interested in the product than before as I played about with the colors and the models.”* As for the selection of attributes, when customers selected the attributes which made sense to them, PU was clearly the reason for their choices. “By

personalizing my bag, I had the feeling I was designing a unique product.” They sometimes had a sense of pride: *“Proud of the result”*; *“Proud and satisfied with the model I’ve designed by myself.”*

In addition, experimentation relates to the knowledge required to use the configurator. It is important to consider the knowledge capacity of respondents to navigate and take control of the configurator. PEOU, clearly expressed as *“easy access,” “easy use,”* or the perception of the configurator as *“very accessible, understandable and easy to use,”* determines the respondents’ ability to access the attributes and so to customize the product. To move from one stage to the next, users typically require “If-Then” competencies that need to be learned: *“I learned about the configuration process, but didn’t understand the logic of the progression.”* Poor design and unclear guidance show the importance of the knowledge used for navigation: *“Some options are incompatible, which is difficult to understand.”* Hence, it is likely that the way the learning process is supported by the configurator influences the resulting PU and PEOU.

We can thus confirm that the configuration process transforms both declarative and procedural knowledge. Appendix C shows the main steps of the process through which new knowledge is produced. The columns correspond to the different stages of the learning process as described in Kolb’s Experiential Learning Model, while the lines display learning actions related to the product or to the use of the tool kit. Each part of the table provides an illustration of what was mentioned in the reports compiled by the participants in the course of the configuration process. We categorized the observations according to the main learning stages defined in Kolb’s experiential theory. The first line describes the learning loop related to the product attributes. The second line displays learning actions linked to the use of the tool kit. Comparison between the two lines reveals that learning actions related to the product or the tool kit clearly differ, demonstrating that both learning processes occur in parallel with the configuration. Observations suggest that the configuration may be abandoned either when the learning loop produces deceptive results (product fails to meet expectations) or when the learning process is made difficult or even impossible due to the design or the process generated by the tool kit.

4.2.2 Concrete experience

In the case of configurators, concrete experience is comprised of the process of exploring the configurator: *“During the configuration of the shoe’s sole, I discovered that only seven colors were possible”*; *“I discovered some potential color options for the shoelaces.”* According to Kim [42] and Kolb [41], concrete experience means that learners are physically engaged in a new experience. This concrete experience involves moving from one stage to another, selecting from possible options and deciding on the final outcome through successive stages (*“I tried different colors and made a choice after several trials. Learnt vocabulary by looking at the pictures”*; *“I discovered the different colors available and made a choice”*). The overall navigation process appears long, with navigation periods from 8 to 22 min (see Table 1). Within

each configuration, we observed variations in the duration of navigation, indicating that the experience varies from one individual to another.

4.2.3 Observations and reflections on the experience

The detailed analysis demonstrates the importance of the observation and stages of reflection in the process. Exposed to new sets of information, the participants tried to accommodate these into preexisting representations to make a choice from many options: *“I tried some combinations [...]. I think that my choices correspond to what I’ve purchased before.”* Hence, it is possible to hypothesize that transforming the representations related to a product is achieved only after a sensemaking stage that makes the transformation of existing knowledge in the repertory possible. As Woodside explains [40], the sensemaking process involves collecting new information through different stimuli that provide new interpretations. From this perspective, reflection, in the form of making sense of the information discovered, is a stage in which new sets of information are analyzed through the filters of existing knowledge to determine their potential contribution: *“I felt frustrated as the options displayed in stores are not available online, and the back of the shoe is not visible”; “I don’t like the fact that there are too many options, and some of them are ‘cheap’... It doesn’t correspond to the Nike positioning.”* What has been learnt from previous experience determines how information is assessed, leading to a decision to pursue or end the configuration. Thus, the way people make sense of the information provided appears to be a key issue in designing configurator tool kits.

4.2.4 Abstract conceptualization

During the configuration process, we observed that abstract conceptualization was achieved through the emergence of expectations related to the way the configurator works. The series of actions made available through the tool kit design is intended to generate the display of appropriate information and to support the decision-making processes related to specific attributes: *“Half sizes are available. This increases the brand’s quality image.”* In turn, the knowledge generated during a specific stage results in expectations about how the configurator works: *“I learnt about the possibility to personalize, and about how to navigate the configurator.”* Cause and effect assumptions (i.e., if the action produces the intended result, then the configurator functions this way) are used to trigger further interactions or actions supported by the tool kit. One participant made the following comment: *“I selected the two options that matter (to me). I tried to bypass the choice of engines, but I had to select one of them. I couldn’t move on to the next session without configuring the second car in the options. But in this case, the option linked to engines wasn’t available.”* The perception of failure shows that the participant expected the tool kit to work in a certain way according to expectations built on previous experience. Based on the observations of the way people experience tool kits, we can assume that abstract conceptualization involves tacit assumptions of how the system works.

4.2.5 Active experimentation: Testing the ideas in a situation

Throughout the configuration process, users practiced active experimentation in the form of trials. *“I got a final price in two minutes but was tempted to look at the second car proposed in the comparator.”* Active trial behavior is mostly guided by emotions emerging from the completion of each stage. In a similar vein to video games [59], configurators tend to produce a flow of emotions that individuals cognitively interpret according to the situations they are experiencing [37]. In the customization context, these emotions impact on the PEOU and then on the PU of the configuration process. Whether positive or negative, emotions have a major impact on the decision to pursue or end the customization process: *“It’s a great feeling to see the result of our way of thinking.”* When finalizing the last stage is defined as an achievement (*“I like the very creative possibilities”*), each step of the process generates emotions. Both positive (good surprise, happiness, etc.) and negative (frustration, irritation, etc.) emotions are directly linked to the match between outcomes and expectations: *“I felt irritated when I saw all the choice restrictions”* [editors’ note: referring to the configuration process]; *“I was frustrated because the options displayed in stores are not available online.”* The process needs to be fun and to offer a great, memorable experience for customers when it comes to continuing the configuration. Users will continue the active experimentation when some kind of reward results from a specific sequence of actions.

4.2.6 Failure in the learning process leads to abandonment

The capacity to navigate through the entire process relies on a set of “If-Then” rules that are learned through experimentation. When an action leads to unexpected outcomes, or when the way to obtain a result is not clear enough, negative emotions may lead people to stop the configuration process: *“I felt frustrated as the options displayed in stores are not available online and the back of the shoe is not visible.”* For reasons that may be related to production processes or costs, the entire brand offer is not available for customization. A restricted number of alternatives may lead to frustration (*“Still only seven colors, which is disappointing”*), generate negative emotions (*“Frustration because the brand doesn’t have my size”*), and eventually lead people to abandon the learning process. At the other end of the spectrum, a large number of options tends to make the selection process too complex, leading to a similar outcome. The perception of a long or confusing learning loop prompts people to shorten or stop navigation due to negative emotions: *“Disappointment, as too many possibilities are proposed but nothing corresponds to my expectations in terms of design”*; *“Disappointment over the lack of emoticons (only one)”*; *“I found the process boring as there was no added value from the selection of colors.”* A poorly designed progression or a process perceived as too complex to be fully explored leads to cognitive dissonance, in other words, the feeling of discomfort perceived in a situation involving conflicting beliefs and inciting individuals to try to reduce the discomfort and restore balance [60].

Therefore, we can make the following propositions:

Proposition 5. The PU of the selected attributes is influenced by the way the configurator supports consumers' experiential learning stages.

Proposition 6. The PU and the PEOU of the configurator are influenced by the way the configurator supports consumers' experiential learning stages.

4.3 The learning process and the TAM

There is little doubt that the customization of product attributes is associated with their PU. When looking at the information displayed, making choices, discovering the effects of their decisions, and building interpretations of the outcomes, customers gradually discover their preferences and the attributes available: *"I learnt about the customizing options, which model can be customized... I learnt what my own preference could be"*; *"Learning about technical components of the car proposed, especially the CO2."* However, the interviews confirmed that the process of using the configurator as a technological artifact leads to changes in its PU and PEOU. This finding is congruent with Franke and Hader's [18] assumption that the users' learning process may impact the two TAM dimensions (PU and PEOU). We observed that representations associated with the product attributes and the configurators differed, particularly when configurators were difficult to use because of their complexity. Reduced support for learning due to limitations in one or several of the dimensions identified above raises issues about the usefulness of the device itself, independent of the value of the product attributes. Similarly, a poor fit with existing representations or a complex navigation process results in the reduced perception of the PEOU. In other words, the final perception of the customized offer is a combination of the PU of the selected attributes with the PU and the PEOU of the configurator, as shown in the refined TAM presented in the discussion section.

Therefore, we can formulate the following propositions:

Proposition 7. The PU of the attributes selected at each stage of the configuration process determines the perceived value of the final offer.

Proposition 8. The perceived PU and PEOU of the learning process determine the continuation or abandonment of the configuration process and therefore the perceived value of the final offer.

4.3 Toward a dual learning model

Our observations indicate that two learning processes inform the customization process. The first relates to the attributes selected to finalize the product. The second has to do with understanding how to use the configuration tool kit to obtain a result. Kolb's [41] experiential

learning theory posits that the four learning loops occurring during the configuration process (concrete experience, reflective observation, abstract conceptualization, and active experimentation) lead to the decision to pursue or end the process. The decision to explore the different steps proposed by the configurator arises from the awareness of the trade-off between the time (duration of the process) and energy people are prepared to devote to the process and the expected value of the following steps. Deeper analysis of the main stages of the process resulted in the four sequences detailed in Appendix C.

Regarding the configurator itself, the learning loops are more complex because users need to understand the relevant product attributes and the way in which progress is achieved through a series of steps. When an unexpected outcome occurs, a learning loop is triggered to solve the problem. PU of the outcomes and perceived easiness of the process by which they are achieved determines users' willingness to pursue or abandon the configuration. Hence, the learning process is the major determinant of both the selection of attributes and overall satisfaction with the product resulting from the use of the configuration tool kit. Figure 1 is a conceptual framework that illustrates these arguments and shows the links between the concepts and the learning process presented in propositions from 1 to 8 mentioned above. It indicates 1) the antecedents of the learning process (the level of information, brand representations, level of complexity, and perception of freedom); 2) the learning process itself (involving the acquisition and sensemaking of information, the emotions felt and the duration of the process); and 3) the consequences on the value perception of the product through the TAM variables (i.e., the PU of the selected attributes and the configurator and the PEOU of the configurator).

5. Conclusion

5.1 Theoretical implications

The in-depth observations of the configuration process led to the enrichment of the antecedents of the TAM. To identify antecedents, we observed the learning experience during product customization. According to Spaulding and Perry [61], individuals engage with a company more if they are given the opportunity to customize their products. Product customization leads to the creation of an emotional bond between the customers and both the company and the product [33]. Product configurators enable consumers to customize predetermined product specifications exactly to their liking. Importantly, this paper identifies four broad areas where theoretical developments could lead to significant contributions. Some of these relate to the TAM itself, while others concern the learning process.

First, based on our observations, we can assume that experiential learning is an antecedent of the two TAM variables. Because knowledge is required to pursue all stages of a specific configuration process, it is likely that poor or incomplete learning processes will result in low

PEOU. Similarly, it is likely that the PU of the configurator and of the results obtained (i.e., the product attributes) will be low. From a theoretical perspective, viewing experiential learning theory as an antecedent of the usefulness or the ease of use of configurators should reinforce the value of the TAM in the design and the implementation processes of customers' interactions supported by technology. This finding is also consistent with the concept of flow of experience developed by Oh *et al.* [10], which posits that the acceptance of technology depends on how experience matches existing skill levels. With regard to recent attempts to improve the initial TAM [62, 63], demonstrating that experiential learning theory is an antecedent of the TAM constitutes a new and significant contribution to the field.

Second, we noted that the trial and error sequence described by Franke and Hader [18] appears extremely complex but can be explained more specifically. The "trial" aspect involves the outcomes of acquired knowledge concerning how to navigate and the outcomes of the sensemaking and decision-making processes resulting from previous steps. The "error" part involves a complex process of information processing composed of the nature of the information provided, sensemaking processes, and decisions related to the relevance of the attributes and to the value of moving on to the next steps. The overall process produces a renewed set of declarative and procedural knowledge associated with the product and/or the brand. The final decision stems from what is learnt during the exploration and the ensuing customization experience.

Consequently, further research is needed to examine how consumers give sense to situations when exposed to new information. In particular, following the initial development of Piaget's [64] concepts of "assimilation" and "accommodation," existing models proposed by Klein *et al.* [65] suggest that there are two major cycles of sensemaking activities. The first, an elaboration cycle, occurs when people question and use existing mental representations ("frames" in Piaget's work) to interpret new information and add details to the new information (in our case, specific variations in the product attributes) when it fits in with existing representations. The second, a reframing cycle, occurs when exposed to a new set of data, individuals reject the existing frames to replace them with more appropriate ones. Linking the nature of the information and tasks with the occurrence of one of the two cycles may lead to the improved understanding of the way configurators should be designed.

Third, assuming that individuals have a preferred and regular approach to organizing and representing information, it is likely that the learning process may differ from individual to individual to a large extent, leading to different response behaviors in the configuration process. Hence, understanding the way individuals' cognitive style [66] or learning style inventory [67] influences learning during the configuration process could lead to configurators being designed more closely in line with learning-related variables.

Fourth, even though current findings indicate that some of the learning subprocesses are similar (willingness to be informed and learn about products and brands, perceptions and emotional reactions during the configuration process, etc.) for the same product categories, and even similar for different product categories (see Appendix C), there is no doubt that the degree of

involvement with the brand or the product category may alter the time spent, the complexity of choices, the combination of attributes, and the exploration behaviors. In the end, the configurator's PEOU has an impact on satisfaction with the product and the brand. This result is congruent with the findings of Bartikowski and Merunka [68] who demonstrate that PEOU is a determinant of satisfaction with e-vendors.

Finally, the study emphasizes the experiential dimension added to the design of a product through the selection of attributes. This leads us to hypothesize that overall assessment of the final product is a combination of the assessment of the selected attributes of the product with the customer experience during configuration. In other words, customization brings new attributes to the product. Not only do perceptions of the customized product differ, the configuration experience leads to a unique set of representations attached to the brand.

5.2 Managerial implications

In terms of managerial implications, this article could be of use to managers, providing leads to improve the design and processes of product configuration through a greater understanding of the customer learning process. Four aspects of the process are involved.

First, as it is based on experience, the learning process helps people increase their product- and brand-related knowledge. This is congruent with the studies of Haug *et al.* [14] and Trentin *et al.* [15], and shows that the configurator helps consumers to personalize their products through the set of options provided by the tool. The insights provided regarding the determinants of the learning process (information acquisition such as terminology, potential product options, and features, positive or negative emotions perceived during the experience, and duration of the process) can help managers to work on the product configurator design, focusing on such issues as the fit between the brand image and the configurator design, the ergonomics of the process, and the degree of customer freedom. As the findings indicate, consumers may feel disappointed or even frustrated when they do not understand the process or the vocabulary, when the options proposed do not appear worthwhile or do not match the brand image, or when the process is too complex.

Second, in line with the previous observation, managers need to provide a high level of information throughout the process. As Payne *et al.* [16] and Randall *et al.* [17] suggest, product configuration enables customers to increase their level of understanding through the information and choices offered by the brand. The results indicate that some product configuration options are viewed by the consumers as useless. It is thus worth showing why these elements actually matter in the product design and product manufacturing by explaining their function (e.g., a definition/explanation when people click on a term). In other words, brands need to inform and guide customers through the process by providing clear explanations about the product features and available options and why these are important factors in the product configuration. This resonates with the findings of Im *et al.* [69] who argue that

information such as the ease of use needs to be underscored by managers when they market a technology intended for hedonic or personal use.

Third, the duration of the process is important and should also be taken into consideration. Users rarely spend much time on brand or product concerns and may rapidly find the process boring. Simonson [29] demonstrates that the product configurator is a key determinant of online customer retention. Thus, we suggest that the process needs to offer a great and memorable experience for consumers by way of the gamification of product creation (video description, testimonials, customer feedback, etc.). Should this goal be met, product configuration will reinforce customer satisfaction and consequently positive attitudes toward the brand.

Finally, the results indicate that customers are particularly “*happy*” and “*proud*” when they customize a product that is different and personal. As Teichmann *et al.* [33] noted, customization tool kits help brands to strengthen the customer identification process. In our study, we found that these feelings of self-accomplishment may have many implications for the customer-brand relationship (e.g., brand satisfaction, customer loyalty, positive word of mouth, and repeated purchases), proving the importance of the design and the configuration experience overall. On the configurator web page, brands could indicate a list of the latest products configured by customers and encourage people to “like” the “best creations.” The products that receive the most “likes” could be marketed as “special editions” and the winners could receive a reward. Proposing the latest product configurations can also be seen as a source of inspiration for noncreative customers who wish to configure their products. In addition, Wong *et al.* [70] assert that using technologies to cocreate products increases the sense of community and relationships between participants. Overall, we may assume that creating communities to present customer preferences through segments and personalized solutions for the configuration process can add value for consumers and improve customer-brand relationships. This proposition is in line with the results of Tsai and Huang’s [71] study, conducted with Taiwanese e-retailers, which showed the need for companies to propose forums and communities to present customer preferences and tailor-made offers.

5.3 Limitations and future research

Like most qualitative research, this study also has some limitations. Even though the methods we adopted led to result reliability as defined by Silverman [72], potential generalization of the qualitative findings would benefit from being extended to other categories of products and brands, as different web interfaces could potentially lead to a broader set of learning behaviors.

As we focused on the consumer learning process during product configuration, we did not measure brand attachment or brand experience before customers began the configuration process, or whether the configuration process had an impact on the relationship between the customer and the brand. Further research could measure brand attachment and experience using measurement scales [73, 74] before the configuration process so as to identify the influence of product customization on the customer-brand relationship. For instance, luxury brands are

particularly noted for being emotionally, relationally, and humanly engaged with their customers [75, 76]. Moreover, if customers are strongly attached to a brand, they will probably make more effort to try and configure their products until the process ends, as Park *et al.* [74] suggest. The authors also point out that customers who are particularly attached to some brands are more willing to engage in difficult behaviors (those that take time, money, energy, etc.) to maintain or deepen their relationships with their favorite brands. However, according to Perrin-Martinenq [77], customers who have a particularly strong brand attachment may dissolve the relationship with the brand in certain circumstances (decrease in quality, brand trivialization, etc.). Consequently, if the configuration process does not match the customer requirements, there may be negative outcomes on the customer-brand relationship.

Customization offers companies numerous opportunities to deliver their value propositions more effectively, providing customers with the opportunity to select the attributes that correspond to their preferences. Increasing our understanding of customization management is essential to improve and guarantee the efficiency of the process, but the crucial success factor in this collaborative method does not lie solely with the company's knowledge and expertise. Komulainen [78, p.239] suggests that "If learning does not take place, value co-creation cannot happen, and the customer does not perceive value in the service". Hence, understanding internal customer processes, such as emotions and perceptions during the learning processes induced by customization, is crucial to the creation of a mutually beneficial experience for customers and brands.

References

- [1] Alam I. (2002). An exploratory investigation of user involvement in new service development, *Journal of Academy of Marketing Science*, vol. 30, n°3, 250-261.
- [2] Bhalla G. (2010). *Collaboration and co-creation: New platform for marketing and innovation*, Springer-Verlag, New-York.
- [3] Davis F.D., Bagozzi R.P., Warshaw P.R. (1989). User acceptance of computer technology: a comparison of two theoretical models, *Management Science*, vol.35, n°8, 982-1003.
- [4] Ha S., Stoel L. (2009). “Consumer e-shopping acceptance: Antecedents in a Technology-Acceptance Model”, *Journal of Business Research*, vol.62, n°5, 565-571.
- [5] Merle A., Chandon J.L., Roux E. (2008), Comprendre la valeur perçue de la customisation de masse. Une distinction entre la valeur du produit et la valeur de l’expérience de co-design, *Recherche et Applications en Marketing*, vol. 22, n°3, 27-50.
- [6] King W.R., He J. (2006). A meta-analysis of the technology acceptance model, *Information & Management*, vol. 43, 740-755.
- [7] Kee-Sook L., Jeon-Su L., Heinrichs J. H. (2008). Testing an Integrated Model of E-Shopping Web Site Usage, *Journal of Internet Commerce*, vol. 7, n°3, 291-312.
- [8] Rauniar R., Rawski G., Yang J., Johnson B. (2014). Technology-Acceptance Model (TAM) and social media usage: an empirical study on Facebook. *Journal of Enterprise Information Management*, vol. 27, n°1, 6-30.
- [9] Normalini M.K. (2019). Revisiting the Effects of Quality Dimensions, Perceived Usefulness and Perceived Ease of Use on Internet Banking Usage Intention. , *Global Business & Management Research*, vol. 11, n°2, 252-261.
- [10] Oh J.C., Yoon S.J. (2014). Predicting the use of online information services based on a modified UTAUT model, *Behaviour & Information Technology*, vol. 33, n°7, 716-729.
- [11] Geissler, G. L., Zinkhan, G. M., & Watson, R. T. (2006). The influence of home page complexity on consumer attention, attitudes, and purchase intent. *Journal of Advertising*, 35(2), 69-80.
- [12] Barczak G. (2012). The future of NPD/innovation research, *Journal of Product Innovation Management*, vol.29, n°3, 355-357.
- [13] Osborne S.P., Strokosch K. (2013). It takes two to tango. Understanding the co-production of public services by integrating the service management and public administration perspectives, *British Journal of Management*, vol. 24, 131-147.
- [14] Haug A., Hvam L., Mortensen N.H. (2012). Definition and evaluation of product configurator development strategies, *Computers in Industry*, vol. 63, n°5, 471-481.
- [15] Trentin A., Perin E, Forza C. (2012). Product configurator impact on product quality, *International Journal of Production economics*, vol. 135, n°2, 850–859.
- [16] Payne, A.F., Storbacka K., Frow P. (2008). Managing the co-creation of value”, *Journal of the Academy of Marketing Science*, vol. 36, n°1, 83-96.
- [17] Randall T., Terwiesch C., Ulrich K.T. (2005). Principles for user design of customized products, *California Management Journal*, vol. 47, n°4, 68–85.
- [18] Franke N., Hader C. (2014). Mass or only “niche customization”? Why we should interpret configuration tool kits as learning instruments, *Journal of Product Innovation Management*, vol. 31, n°6, 1214-1234.

- [19] Patton M. (1990). *Qualitative evaluation and research methods*, Sage, Beverly Hills, CA.
- [20] Kaplan, A.M., Haenlein, M. (2006). Towards a Parsimonious Definition of Traditional and Electronic Mass Customization, *Journal of Product Innovation Management*, vol. 23, n°2, 68–82.
- [21] Ballantyne D. (2004). Dialog and its role in the development of relationship specific knowledge, *Journal of Business and Industrial Marketing*, vol.19, n°2, 114-123.
- [22] Mahr D., Lievens A., Blazevic V. (2014). The value of customer co-created knowledge during the innovation process, *Journal of Product Innovation Management*, vol. 31, n°3, 599-615.
- [23] Dellaert B.G.C., Stremersch S. (2005). Marketing mass-customized products: striking a balance between utility and complexity, *Journal of Marketing Research*, vol. 42, n°2, 219-227.
- [24] Nambisan S., Baron R.A. (2009). Virtual customer environments: testing a model of voluntary participation in value co-creation, *The Journal of Production Innovation and Management*, vol. 26, n°4, 388-406.
- [25] Füller J. (2010). Refining virtual co-creation from a consumer perspective”, *California Management Review*, vol. 52, n°2, 98-121.
- [26] Aldanondo M., Hadj-Hamou H., Moynard G., Lamothe J. (2003). Mass customization and configuration: requirement analysis and constraint-based modelling propositions”, *Integrated Computer Aided Engineering*, vol. 10, n°2, 177-189.
- [27] Von Hippel E. (2001). User Toolkits for Innovation, *Journal of Product Innovation Management*, vol. 18, 247-257.
- [28] Wind J., Rangaswamy A. (2001). Customerization: The next revolution in mass customization, *Journal of Interactive Marketing*, vol. 15, n°1, 13-32.
- [29] Simonson I. (2005). Determinants of customers’ responses to customized offers: conceptual framework and research propositions, *Journal of Marketing*, vol. 69, n°1, 32-45.
- [30] Lee Y., Kozar K.A., Larsen K.R.T (2003). The Technology Acceptance Model: Past, Present, and the Future”, *Communications of the AIS*, vol. 12, 752-780.
- [31] Ajzen I., Fishbein M. (1975). A Bayesian analysis of attribution processes, *Psychological Bulletin*, vol. 82, n° 2, 261-277.
- [32] Davis F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology”, *MIS Quarterly*, vol.13, n°3, 318-340.
- [33] Teichmann K., School-Grissemann U., Stokburger-Sauer N.E. (2016). The power of codesign to bond customers to products and companies : the role of toolkit support and creativity, *Journal of Interactive Marketing*, vol. 36, 15-30.
- [34] Janiszewski C., Noel H., Sawyer A.G. (2003). A meta-analysis of the spacing effect in verbal learning: implication for research on advertising repetition and consumer memory, *Journal of Consumer Research*, vol. 30, n°1, 138-149.
- [35] Aaker D.A., Keller K.L. (1990). Consumer evaluation of brand extensions, *Journal of Marketing*, vol. 54, n° 1, 27-41.
- [36] Anderson J.R. (2000). *Learning and Memory, An Integrated Approach*, Wiley & Sons, Hoboken.
- [37] Walters C.G., Bergiel B.J. (1989). *Consumer Behavior: A Decision-Making Approach*, South-Western Publishing Co, Cincinnati.

- [38] Bagozzi R., Gopinath M., Nyer P. (1999). The role of emotions in marketing”, *Journal of the Academy of Marketing Science*, vol 27, n°2, 184-206.
- [39] Kim H.W., Gupta S., Koh J. (2011), Investigating the intention to purchase digital items in social networking communities: A customer value perspective, *Information & Management*, vol. 48, 228-234.
- [40] Woodside A.G. (2001). Editorial: Sense making in marketing organizations and consumer psychology: Theory and Practice”, *Psychology and Marketing*, vol. 18, n°5, 415-421.
- [41] Kolb D.A. (1984). *Experiential Learning: Experience as a source of learning and development*, Prentice Hall, New Jersey.
- [42] Kim D.H. (1993). The link between individual and organizational learning, *Sloan Management Review*, vol. 35, n°1, 37-50.
- [43] Alba J.W., Hutchinson J.W. (1987). Dimensions of consumer expertise”, *Journal of Consumer Research*, vol. 13, 411-454.
- [44] Vogt W.P. (1999). *Dictionary of statistics and methodology: A nontechnical guide for the social sciences*, Sage, London.
- [45] Onwuegbuzie A.J., Leech N.L (2007). Sampling designs in qualitative research: Making the sampling process more public, *The Qualitative Report*, vol. 12, n°2, 238-254.
- [46] Bernard R.H. (2012). *Social Research Methods: Qualitative and quantitative approaches*, Sage, Thousands Oaks.
- [47] Guest G., Bunce A, Johnson L. (2006). How many interviews are enough? An experiment with data saturation and variability, *Fields Methods*, vol. 18, n°1, 59-82.
- [48] Le Flore. (2015). <https://www.bfmtv.com/economie/les-marques-preferees-des-francais-sont-1518004.html> Accessed 16 July 2019
- [49] Richards L. (2014). *Handling Qualitative Data*, Sage, Thousand Oaks.
- [50] Braun V., Clarke V. (2006). Using thematic analysis in psychology, *Qualitative Research in Psychology*, vol.3, n°2, 77-101.
- [51] Gibbs G.R., Taylor C. (2010). How and what to code. http://onlineqda.hud.ac.uk/Intro_QDA/how_what_to_code.php/ Accessed 16 July 2019.
- [52] Newell A. (1994). *Unified Theories of Cognition*, Harvard University Press, Cambridge, MA.
- [53] Ketokivi, M., Mantere, S. (2010). Two Strategies for Inductive Reasoning in Organizational Research, *Academy of Management Review*, vol. 35, n°2, 315–333.
- [54] Mantere S., Ketokivi M. (2013). Reasoning in Organization Science, *Academy of Management Review*, vol. 38, n°1, 70–89.
- [55] Dudovskiy, J. (2016). The ultimate guide to writing a dissertation in business studies: A step-by-step assistance, *Journal of Mixed Methods Research*, vol. 41, n°1, 6-16.
- [56] Nadkarni, & Gupta. (2007). A Task-Based Model of Perceived Website Complexity. *MIS Quarterly*, 31(3), 501.
- [57] Lankton, N. K., Wilson, E. V., & Mao, E. (2010). Antecedents and determinants of information technology habit. *Information & Management*, 47(5), 300–307.
- [58] Xu, J. (David). (2016). Retaining customers by utilizing technology-facilitated chat: Mitigating website anxiety and task complexity. *Information & Management*, 53(5), 554–569.

- [59] Perron B., Schorter F. (2016). Video games and the mind: Essays on cognition, affect and emotion, McFarland & Company, Jefferson.
- [60] Festinger L. (1957). *A theory of cognitive dissonance*, Row & Peterson, Evanston.
- [61] Spaulding E., Perry C. (2013). Making it Personal: Rules for Success in Product Customization, <https://www.bain.com/insights/making-it-personal-rules-for-success-in-product-customization/> Accessed 16 July 2019.
- [62] Venkatesh V., Morris G.M., Davis B.G., Davis D.F. (2003). User acceptance of information technology: towards a unified view, *MIS Quarterly*, vol. 27, n°3, 425-478.
- [63] Savic, J., Pesterac, A. (2019). Antecedents of mobile banking: Utaut model”, *European Journal of Applied Economics*, vol. 16, n°1, 20-29.
- [64] Piaget J. (1936). *Origin of intelligence in the child*, Routledge & Kegan, London.
- [65] Klein G., Moon B., Hoffman R.R. (2006). Making sense of sense-making: a macro cognitive model”, *IEEE Intelligent Systems*, vol. 21, n°5, 88-92.
- [66] Chen S.Y., Macredie R.D. (2002). Cognitive Styles and Hypermedia Navigation: Development of a Learning Model”, *Journal of the American Society for Information Science & Technology*, vol. 53, n°1, 3-15.
- [67] Kolb A.Y., Kolb D.A. (2005). Learning styles and learning spaces: Enhancing experiential learning in higher education, *Academy of Management Learning & Education*, vol. 4, n°2, 193-212.
- [68] Bartikowski B., Merunka D. (2015). Modeling the effects of the three dimensions of trust towards the e-vendor on online consumer behavior”, *Systèmes d’Information et Management*, vol.20, n°1, 9-30.
- [69] Im I., Kim Y., H H.J. (2008), The effects of perceived risk and technology type on users’ acceptance of technologies, *Information & Management*, vol. 45, 1-9.
- [70] Wong T.Y.T., Peko G., Sundaram D., Piramuthu S. (2016). Mobile environments and innovation co-creation processes and ecosystems, *Information and Management*, vol.53, 336-344.
- [71] Tsai H.T., Huang H.C. (2007). Determinants of e-repurchase intentions: an integrative model of quadruple retention drivers”, *Information & Management*, vol. 44, n°3, 231-239.
- [72] Silverman D. (2004). *Doing Qualitative Research*, Sage, Thousand Oaks.
- [73] Brakus J.J., Schmitt B., Zarantonello L. (2009). Brand experience: What is it? How is it measured? Does it affect loyalty?”, *Journal of Marketing*, vol.73, 52-68.
- [74] Park C.W, MacInni D.J., Priester J., Eisingerich A.B., Iacobucci D. (2010). Brand attachment and brand attitude strength: conceptual and empirical differentiation of two critical brand equity drivers”, *Journal of Marketing*, vol. 74, 1-17.
- [75] Batat W. (2017). *Luxe et expérience client*, Dunod, Paris.
- [76] Kapferer J.N., Bastien V. (2009). The specificity of luxury management: Turning marketing upside down”, *Journal of Brand Management*, vol. 16, n°5, 311-322.
- [77] Perrin-Martinenq D. (2002). Brand detachment: conceptualization, antecedents and proposition of a measurement scale. Paper presented at the Second Nordic Conference on Relationship Dissolution, Visby, Sweden.
- [78] Komulainen H. (2014). The role of learning in value co-creation in new technological B2B services”, *Journal of Business and Industrial Marketing*, vol. 29, n°3, 238-252.

Appendices

Appendix A: Instruction sheet

Using the configurator

Please **read the instructions carefully before starting**.

Step 1. Go to (*mail address of the configurator*)

Step 2. On the sheet provided, make a note of **each step of the process you go through** (Step a, b, c., etc.) and indicate the following elements **for each step**:

- *What you have learnt*
- *The emotions you felt (*pleasure, frustration, irritation, etc.*) and the reasons for such emotions*
- *The moment you decided to stop the product configuration and why*
- *The time spent on each page before leaving it.*

Step 3. Specify whether you visited **other pages** in addition to your experience on the configurator.

Step 4. Summarize your experience by indicating how you **perceive** the quality of the two configurators regarding the following aspects: *ease of use, ease of access, aesthetics, level of information, personalization and interactivity, etc.*

Appendix B: Thematic coding

	Category	Definition	Verbatim statements
The offer	Learning from the offer	<p>Process by which users select an option proposed by the configurator to customize a specific product offer.</p> <p>Users organize some kind of test, or comparison, with the deliberate purpose of learning something from the offer.</p> <p>The process is made up of the following sequence: scan the potential options, select one of them, and observe the consequences (visuals and price), validate or start another trial. At some points, groups of options are observed with concern for the consistency of visuals, brand image, and price.</p>	<p><i>“I learnt about the customizing options, which model can be customized... I learnt what my own preference could be.”</i></p> <p><i>“I was frustrated as the options displayed in stores are not available online.”</i></p> <p><i>“I understood that my personal design of the shoe lay in the multiple options proposed. I tried all the colors and chose pink.”</i></p>
	Satisfaction/Dissatisfaction	<p>Positive or negative perceptions of the contribution of the customization process.</p>	<p><i>“Half sizes are available. This increases the brand’s quality image.”</i></p> <p><i>“The limited number of colors is linked to the price premium.”</i></p> <p><i>“I’m surprised at the number of alloy wheels...I have no interest in gadgets...”</i></p>
	Emotions perceived	<p>Range of emotions, from negative to positive that result from the offer itself.</p>	<p><i>“Surprised by the huge number of possible combinations...”</i></p> <p><i>“Pleasure with the beautiful colors and the end result...”</i></p> <p><i>“Irritation when all choice limitations became clear...”</i></p> <p><i>“Frustration because the brand doesn’t have my size.”</i></p>
The configurator	Learning from the configuration system	<p>Process by which users understand how the configurator is organized and how to behave, to navigate, and make choices.</p> <p>The process is made up of the following sequence: scan the</p>	<p><i>“During the configuration of the sole of the shoe, I discovered that only seven colors are possible.”</i></p> <p><i>“I explored the first page to understand how to start and the shoe model choices.”</i></p>

		<p>first screen, select one of the options proposed in the menu, observe consequences (visuals and product), validate, or start another trial. At some points, “back” steps are used to reset previous choices.</p> <p>Combine visuals and text to understand the technical vocabulary.</p>	<p><i>“I tried different colors and made a choice after different trials. Learnt vocabulary by looking at pictures.”</i></p>
	Satisfaction/ Dissatisfaction	<p>Positive or negative perception of the contribution of the configurator.</p>	<p><i>“I got a final price in 2 minutes but was tempted to look at the second car proposed in the comparator.”</i></p> <p><i>“I learnt about the configuration process but didn’t understand the logic of progression.”</i></p> <p><i>“I found the process boring as there was no added value from the selection of colors.”</i></p>
	Emotions perceived	<p>Range of emotions, from negative to positive, and resulting from the design of the configurator.</p>	<p><i>“Happy to have direct access to the configurator... I love the idea of sharing models created with other users... Was surprised as creation is possible for all models.”</i></p> <p><i>“Irritation as differentiation between models is not clear.”</i></p> <p><i>“A lot of options should be proposed in the basic offer and not as options. Some options don't correspond to Toyota’s brand image.”</i></p>

Appendix C: Learning loop triggered by one step of the configuration

	<i>Main Stages of Kolb's Experiential Learning Model</i>			
	<i>Practical experience</i>	<i>Observation of the results of the experience</i>	<i>Forming abstract concepts and generalizations</i>	<i>Testing the ideas in new situations</i>
<i>Dimension related to product attributes</i>	-Looking at the display of attributes resulting from the choice.	-Understanding the information displayed. -Trying to make sense of the attributes proposed. -Perceiving the positive/negative emotions induced by the results.	-Comparing the resulting attributes with expectations. -Making sense of the results in the attributes. -Understanding the contribution of the configurator to the design of the final product.	-Adopting the selected attributes. -Acquiring further information to decide.
<i>Dimension related to the use of the toolkit</i>	-Selecting from the menu proposed. -Understanding how to choose between the different options.	-Assessing the result of the action taken.	-Experiencing satisfaction/dissatisfaction with the results of the action taken. -Making sense of the tool kit's use.	-Deciding to continue the process for the following steps. -Moving forward. -Going back. -Abandoning the configuration process.