EFFECTIVE PRODUCT ASSORTMENT COMMUNICATION: OVERCOMING THE "PRODUCT VARIETY PARADOX" ON THE NET

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Abstract

When a firm offers customiz ed products, variants and options may end up confusing the customer, instead of increasing sales. R ecent developments in Information and Communication Technology made available a class o f software products, often termed as "product config urators", which appears to offer new solutions to support the sale of customized products. The present paper analyzes the underlying principles on which successful sales configurators have been built. I n doing so, the paper attempts a formalization of the mechanisms throug h which a firm's product assortment can be efficiently and effectively presented to the customer

Keywords

E-commerce, product variety, product configuration, customization

INTRODUCTION

The assumption underlying variety-intensive product strategies (Sanderson and Uzmeri, 1995) is that customers have idiosyncratic needs. Consequently, by offering differentiated products a firm may be able to increase product price or market share because of the better fit of its products with what customers demand. However, the decision to proliferate the product offer, or to just allow customers to define more and more product features does not automatically lead to greater customer satisfaction and, hence, to greater commercial success. In fact, a wide assortment of product variants and options may end up confusing the customer, as he/she would experience high cognitive complexity in evaluating product alternatives (see Huffman and Kahn, 1998). In other words the firm may experience the "productivity paradox": offering more variety to increase sales may lend to loss of sales. From a theoretical point of view this phaenomenon may be framed in cognitive terms.

SETTING THE PROBLEM: COGNITIVE COMPLEXITY AND PRODUCT VARIETY

In order to better satisfy the customer trhough differentiated or personalized products, the customer must effectively individualize, among the different variants offered by the firm, the option that satisfies his requirements. Let us consider, for example, the difficulties we have when selecting a piece of clothing in a big department store: the proliferation of different models, colors, trademarks, etc. can exert a negative influence and become an obstacle for our decision to purchase. This kind of problem is not exclusive of the clothing sector. On the contrary, it may appear every time we have to select the product variant that suits our preferences among "n" possible variants. In this case, the buyer faces the so-called *cognitive complexity*; he finds difficulties in understanding what is offered and, in particular, how the products differ as far as utility. Even in the presence of only three alternatives (A, B and C) it is difficult to decide, considering their utility, which one is the best. "What characteristics of A satisfy my needs better than those of B or C? If in some aspects A seems better than B, but in some others the contrary is true, which one should I choose?" This kind of cognitive obstacles do not help the firm that adopts a strategy of variety, since such variety may confuse the customer rather than convince him that the firm has a solution for his problem.

Even if we admit that our potential client does not have great difficulties to determine whether the variant A is better than the variant B or C, the problem of cognitive complexity is not completely solved yet. Once the customer decided that, for example, the variant B is better that A and C, there is still a doubt: "Isn't there, among all the other variants offered, one that could be better than B?" When the variants are extremely numerous, to compare them as we did with A, B and C becomes an impossible and costly task. The risk is that the customer may delay his decision to purchase, not because he finds it complicated to choose among the variants, but because he does not have a complete knowledge of all the possible alternatives.

In synthesis, this is a paradoxical situation. On the one hand, the firm increases the product variety in order to capture a bigger number of customers or to obtain higher prices. On the

other hand, the decision to offer a great variety may mislead the client or make the process of selection so difficult that finally the client renounces. The problem of cognitive complexity is well known by the firms that offer variety and personalization. Generally, the solution is based on the sales force that can make the acquisition process easier for the client.

Coming back to the example of the clothing department store, the role of the shop assistant is to help the customer find, among the chaos of garments offered, the variant that best suits his requirements. But, why is the shop assistant useful to individualize what we are looking for? To answer this apparently simple question, we must compare our behavior in two different situations: 1- when we are alone, looking for the product and 2- when the shop assistant helps us to look for the product. In the first case, we examine, sequentially and systematically, the garments in the way they are displayed (obviously in the corresponding area). At a glance, we quickly verify if each piece of clothing can suit our needs. In the second case, instead, we tell the shop assistant what we are looking for, adding a series of attributes: a shirt with vivid colors, made of cotton, button-down, backstitched, etc. The shop assistant considers the options the shop can offer, and then proposes us a number of shirts. In other words, he minimizes the complexity we are supposed to face if we want to understand what the shop is offering. We already know that the type of shirt that interests us – if the assistant has not forgotten any option- is in front of us, thanks to the previous selection made by the salesman. The complexity of the selection process was eliminated because the variety of product was presented by attributes (color, stitch, fabrics, etc) rather than by alternatives (shirt # 1, # 2,…..#87 …from a shelf 10 meters long) and because we trusted the shop assistant for a first skimming of the products offered by the department store.

To understand how the representation of a set of product variants influences the cognitive complexity in the selection process of a potential customer, two marketing researchers chose 78 students for an experiment. They had to select a sofa for the house where they would live after graduating. In the first part of the test, the students had to understand the product offer. The results was that the representation of the offer in terms of attributes, rather than in terms of alternatives, helps the customer's understanding of the offer and enables him to express his specific requirements and choose a satisfactory variant.

This experiment demonstrates that the description of product varieties in terms of attributes, rather than in terms of alternatives: 1- allows the firm to transmit, with considerable efficiency, the offer to its customers and 2- enables the customer to express, in a more precise way, his own requirements.

AIMS AND METHOD

Recent developments in Information and Communication Technology made available a class of software products, often termed as "product configurators", which appears to offer new solutions not only to the back office – automatically generating technical product documentation – but to the front office as well – supporting the interaction with the customer when custom products are offered. To date, however on, research product

configuration has been focussing especially on the back-office advantages of such solutions, while we still know very little of the potential of such class of software products to reduce the "product variety paradox".

As mentioned before, the sales personnel typically carry out this activity of "education" of the customer or of "support to selection". The learning process, however, may be long and repetitive, involving high commercial costs. There is still a problem, how to enable the customer to "teach himself" or "auto-configure the product", at least partially. To fulfill this aim, it is necessary to design a supporting program that describes the product, from the commercial point of view. The planning of this support requires a series of fundamental actions and choices which will be analysed throughout the paper:

- choose methods for product description
- delimit the space of the possible choices on the part of the customer
- communicate how different options may create values for the customer
- structuralize the ways in which the customer learns and/or defines the product characteristics
- foresee how the interaction between the customer and the commercial support facilitates the learning process and, therefore, minimizes the cognitive complexity faced by the customer

From a methodological standpoint, the following sections of the paper analyze the underlying principles on which successful sales configurators have been built, based on anecdotal evidence present in the literature or on the analysis of sales configurators present on the web. In doing so, the paper attempts a formalization of the mechanisms through which a firm's product assortment can be efficiently and effectively presented to the customer. We then discuss how these mechanisms, as a whole interact and how they can increase a firm's commercial success. Finally, we speculate about the possibility of extending the proposed mechanisms outside the scope of designing sales configurators, proposing that they can be taken as general principles to describe efficiently and effectively a firm's product assortment.

DESCRIBING THE PRODUCT

There is not only one way of representing a generic product to the customer. The product complexity, its importance for the customer and the customer's availability (or not) to get information about the product are factors that contribute to determine the most suitable method to describe the product, as far as its commercial configuration. To understand how different descriptions of the same product differ one form the other, we may consider the simple case of automobiles (See Figure 1).

Some of the possible buyers of automobile are interested in some fundamental performance, without caring about which functions or systems are required. For example, a grandmother who wants to change her car or the head of a family who is not interested in reading specialized magazines, may only ask for an "economical and safe car". A more

expert buyer may probably require an automobile with ABS or traction control. In other words, the customer speaks in terms of functionality, rather than in terms of performance: the wheels should not be blocked when braking or accelerating. A more expert buyer, one who knows how the car is made, may ask for an automobile assembled with a special kind of wheels, to enhance grip, or he may prefer a model with auto-cooling disk brakes rather than with the traditional single disk brakes. In the case of a really expert driver, he may even ask the concessionaire to install a switch to deactivate the ABS system when very skilful driving is needed, for example under bad road conditions, due to snow or frost. The third type of customer, in synthesis, describes the product in terms of components rather than in terms of functions.
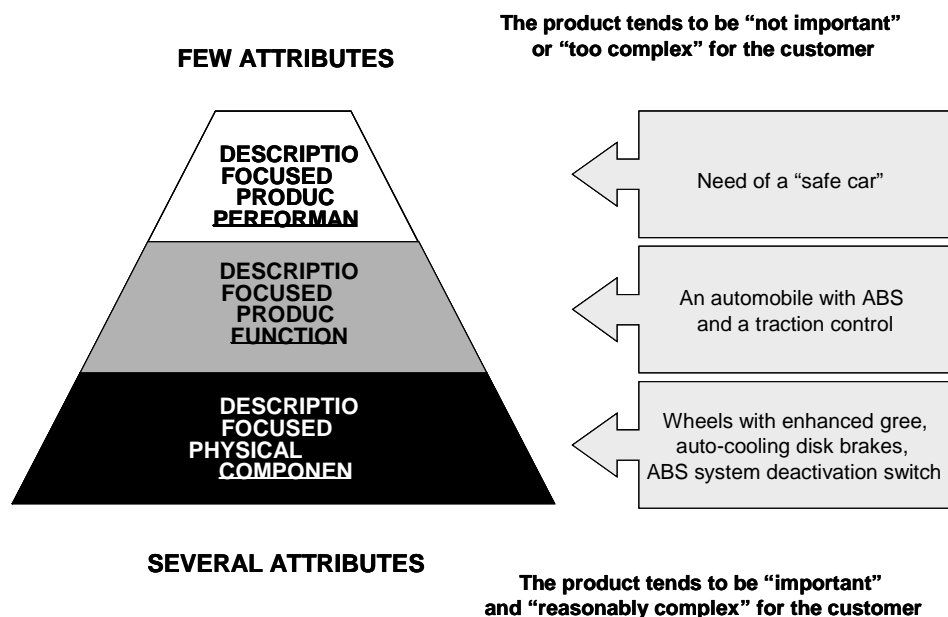

Figure 1 – Product descriptions with different degrees of abstraction

The example of the automobile shows us how the same product can be described in very different ways. Different product descriptions can be lined up on a one-dimension continuum. On one end of the line, we can place synthetic descriptions focused on performances and on the other end detailed descriptions focused on product components. In the intermediate position we find the descriptions focused on the functions.
It is important to notice that the three situations are compatible with product descriptions based on attributes. The change is in the nature of the attribute: performance, function or components.

An example of different product descriptions is given by the notebook selector of ZDnet and by the Chl personal computer configurator. In the first case, it is not a configurator, but a selector that starting from a series of characteristics, singles out one or more suitable product variants. Anyway, the elaboration of a commercial model or of a formal description of the product, from the commercial point of view, are activities performed by the selector or by the product configurator. In the case of ZDnet (www.ZDnet.com) the firm has conceived a product description at a very abstract level, to help the inexpert potential customer to choose among the numerous variants offered. The selector asks

general questions such as: how much are you willing to spend? How often do you take a plane, situation where weight is an important factor? If weight is not a problem, are you looking for a notebook that can be used as a substitute for a desktop PC? These simple questions, that anyone can answer, allow the customer to skim the offer, reducing the number of options to a dozen of potential products. On the other side of the ZDnet selector, we find the personal computer configurator created by Chl (www.chl.com). In this case the product description is made at the level of single physical components, that must be entirely specified, from the computer case to the motherboard to the possible peripheral units. It is necessary to have considerable knowledge of the components and functions of a personal computer, to get an effective advantage from the possibility of expressing one's preferences at a product component level.

To choose the appropriate way to describe a product is not a question of using a language that could be more or less abstract. In some cases, the product characteristics require an input for the commercial configuration that has a format different from the textual one, up to now considered. For example, a firm that sells cooling systems for cold stores, has as a fundamental input for the commercial configuration process, the layout of the cold store: the plan of the room, free walls on which the cooling fins can be placed, possible obstacles for the installation. A description in terms of measures, using a standard format to collect the necessary information, would be practically impossible! In general, the problem of getting the characteristics in the form of a layout is common to all the firms that manufacture systems. The alternatives for these firms are two: 1- to limit the configuration only to system components; leaving to sales engineering the layout definition, 2- to invest in the development of an instrument for information acquisition through layouts. In this case, the company has to compare very carefully, the benefits of automation with the costs for the development of a software solution that, with great probability, will require a certain degree of personalization, and therefore a further investment.

Another important aspect of commercial configuration is the total description of the configured variant. Obviously, this requirement is based on the fact that the final aim of a commercial configuration is to carry out an economic transaction. Price and an indicative delivery time are fundamental outputs of the commercial configuration process. To define all the aspects of the product is very important to avoid misunderstandings, opportunistic behaviors, disputes, etc. Furthermore, it is essential to give a complete vision of the product ordered by the potential customer, because in this way he is able to verify at a glance, the whole effect of his preferences, considering even some interactions that may be neglected due to his choice by attributes. Let us consider, for example, the case of the sofa, described in the first paragraphs. If we offer the client the possibility to choose the type of wood needed for some parts of the sofa and the color of the fabric, surely, he will be interested in knowing whether both colors, put together, produce a pleasant match or not. This problem could have been avoided if the choice had been made by alternatives, showing each one with its corresponding illustration. The sites of some automobile factories, that allow the customer to simulate the matching between the colors of the interior and the body, avoiding unpleasant delusions when the automobile is taken from the car-shop, offer this kind of service.

DELIMITING THE OPTIONS

Even if the most suitable way to describe the product has been determined, the problems associated with the definition of the commercial model have not finished yet. A typical dilemma is to decide whether to include in the commercial model all the possible variants. From a productive point of view, it is important to remember that, even if the various components needed to create an offer of "n" products have been already designed, to include all of them in the commercial model means to assure the supply to a possible client, of a variant that is very rarely manufactured. This may bring about a series of difficulties in the supplying, planning and control of the productive activities, with the risk that the costs may be higher than the profit obtained by selling that kind of variant. In synthesis, it is necessary to remember that behind a commercial model there is always a workshop that has to manufacture the product!

Furthermore, the reasons for limiting the variants among which the customer can choose, in relation to the ones the firm can offer, may be purely of commercial nature. In fact, to offer many variants, at the end, always complicates the commercial model as well as the customer's choices. Sometimes it can be more practical to label some "exotic" options as not available, in order to reduce the quantity of information the customer has to supply to obtain a complete configuration. The simplification of the configuration dialogue – a further confirmation of the problems associated with the cognitive complexity of the configuration tasks- is one of the requirements most frequently underlined by the commercial department of the firms that are implementing a product configurator.

The customer who asked for something that is not foreseen by the product model should get in touch with a salesman and check the possibility to obtain the requested variant.
In other cases, the decision to delimit the variants among which the customer can choose, is a consequence of the rationalization of the offer the firm makes, when it decides to structure the configuration process. Very frequently, the company "realizes" that different product families, in some way, tend to overlap. The most expensive variants of the family at "entry level" or with "low power" overlap with the cheapest variants of the immediately superior family. This may happen even in the most famous companies. Boeing, for example, expanding the capacity of the 737 family and developing more spacious and comfortable versions of the 767 family, finished up by covering, with these two families, the field of the 757 family (that never actually "took off"!) In general, if the overlapping of product families is not commercially justified, the formalization of the dialogue should reasonably lead towards a limitation of the variety offered, in relation to the variety the firm is potentially able to offer (and in the future towards a new definition of the latter).

A third possibility to reduce the quantity of commercial characteristics to be specified in the product configuration is the pre-determination of some characteristics that generally are requested in a certain standard. In other words, to foresee default values for some product characteristics that rarely acquire values different from those pre-established. An extreme case of this approach is to offer the customer a set of pre-configured products, with the possibility to modify the attributes according to his preferences, as long as he respects the links defined in the commercial model.
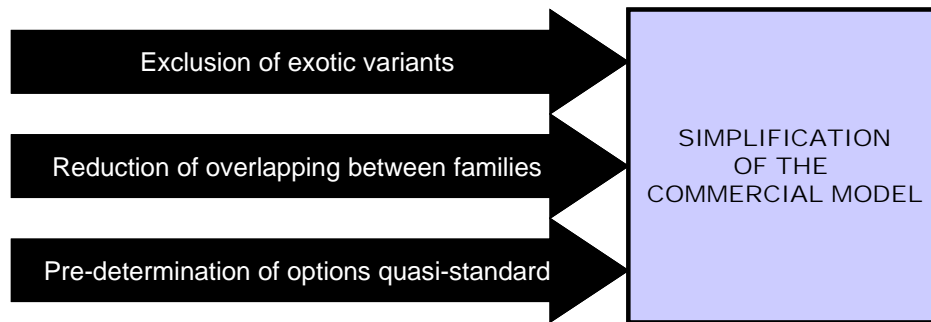
Figure 4 – Simplification of the commercial model by limiting the options

COMMUNICATING THE VALUE

As mentioned before, any kind of strategy of product proliferation develops different options that create different functions, as a more precise answer to the preferences expressed by different customers. To communicate the value of such options, we can certainly describe the product attributes using a language that the customer can easily understand, we can avoid overwhelming him with too many options, but this is not enough. Maybe the customer simply wants to understand the product or the way in which the different attributes determine the functionality of the product. This is a typical activity performed by the commercial staff. It is a complex function, because it somehow implies a certain "didactic" skill on the part of the salesman, and because the learning process on the part of the customer may be long. Moreover, and above all in the case of complex products and/or subject to rapid technological evolution, it is necessary to teach the different product functions not only to the customer, but also to the salesman. To develop automated solutions to illustrate the functions associated with the different product attributes, on the one hand, enables the client, as well as the salesman, to learn autonomously, on the other hand, the learning process is carried out according to the modes and times of the user, maybe when he is relaxed at home or during a calm moment at work. Better knowledge will give the customer better elements to decide about the product he is willing to buy
If the product presented by the firm is neither valid nor suitable for the customer, the firm that implements this approach will lose a potential client. But, if the product is not suitable and the customer decides to buy it, at the end the firm will also lose the client.

The progress of multimedia and the growing bandwidth of telecommunication services offer a number of promising opportunities to the firms that want to communicate the values of their product varieties. Films, animations, graphics and sounds help to reduce the time the customer needs to understand the complexity of a product family and consequently increase the profits of strategies of product proliferation.

To communicate the value of the variety offered to the customer does not mean only to explain what the different alternatives are able to do. All the alternatives are not equally easy to elaborate. Some of them may request the design of some ad-hoc components, and are part of a field that is out of the product configuration process. However, due to some commercial reasons, the firms cannot exclude from their product offer those semi-configured or particularly problematic variants. In these cases, to communicate the value of

his specific choice to the client, also means to make him aware that *he is asking for something "special",* and that his requirement most probably will influence the price and/or delivery times.

Communicate
how each option
contributes to satisfy
a specific need or functionality

$$\text{VALUE} = \frac{\text{NEED SATISFACTION}}{\text{COST \& TIME}}$$

Communicate
implications on
price and delivery time
of each choice

Figure 5 – Fundamental activities to communicate the value of the variety offered by the firm

Dell Computers, one of the first companies in the world to sell configurable products online and one of the biggest producers of PC and portables, provides an example of "customer's education" aimed at optimizing the utility of the available options that is perceived by the client. If we take, for example, the option of hard drives in the main configuration dialogue, we see that there are a number of variants. If the customer is not ready to decide yet, he can ask for more information (learn more) At this point he is able to consult three lists. Two of them have an exclusive educative function: one explains the primary characteristics of hard drives and how they determine functionality, the other describes one by one all the technical attributes of the hard drive. The third list combines the information obtained with what the firm offers, supporting the selection process of the potential client. Finally, but not of minor importance, another benefit of customer's education is that the potential client, after getting an idea of what product could satisfy his needs, can go back to the main menu and evaluate if price variations are justified.

STRUCTURING THE PROCESS OF INTERACTIONS WITH CUSTOMERS

The elaboration of a commercial model and the definition of how the commercial dialogue will be carried out raises - apart from the problems mentioned in the previous paragraphs – the issue of how to structure such interaction. In the simplest case, the answer to this question implies the definition of the order according to which the different questions are asked. A firm that wants to communicate its customers the idea that it offers strong customization, for example, may consider useful to present, in the first place, the product attributes that offer more possibilities of choice. For a firm that sells tailored shirts, the type of pattern (checked, striped, plain, etc.) and the different variants (big or small squares, tartan, etc.) will surely be the first questions to ask. In other cases, especially for technical products, the sequence of questions has to follow, as close as possible, the order the customer typically uses when describing or specifying the product. For example, a firm that offers personalized pumps, firstly, will ask the type of application (submergible,

peripheral, etc.) And then, some fundamental data such as flow rate, discharge head and so on. In general, the idea is to *allow the client to search the variety offered by the firm in the most natural and spontaneous possible way.* The importance of this condition is not reduced if the user is the salesman. In fact, if the salesman perceives the process followed to define the product characteristics as something complicated and unnatural, the possibilities to implement a successful solution, even if partially automated, are very low. The elaboration of a structured process that leads the customer, probably with the help of the salesman, towards the definition of a commercial configuration, presents some difficulties that derived, not from the customer, but from links between different product attributes. For example, in the case of a utility vehicle, the option "air conditioning" may not be available for the version with a reduced cubic capacity, due to the fact that excessive power will be absorbed by the cooling compressor from the crankshaft. The presence of links between options determines a sort of rigid order in the commercial dialogue. For example, some questions must be asked following a fixed sequence. Let us take the case of a scooter: if we want to configure a scooter with the options "Country" and "double-seat", we must ask first the option "Country" and then the option "double-seat", because in some countries two people are not allowed to ride on the same motorcycle while in others it is permitted. A second rigid condition, related to the first one, is the fact that possible choices of a certain attribute depend on previous choices of other attributes. For example, if in the configuration of a bicycle, we have selected the options " titanium alloy frame" and "double damper", it is evident that the choice of different types of rims will be limited to those that respect or surpass a certain minimum value of strength. In some cases, these limitations finally eliminate any kind of freedom while choosing certain attributes: only one of the levels admitted for a certain attribute could be compatible with the choices previously made in the commercial dialogue. Anyway, the presence of links between product attributes on which the customer can express his preferences, generally does not exclude the possibility to define various alternatives. Let us consider again the example of the bicycle. For the attributes " type of frame" and "weight" the customer could specify the maximum weight, and so a series of "heavy" component variants would be automatically excluded from the choice (frames of chromo-molybdenum steel, standard saddles and other elements) On the contrary, the weight could be simply calculated by adding all the weights of the components selected. In this case, in order to reach the required weight, it may be necessary to modify the choices made. It would be interesting to allow the customer to start the commercial dialogue from any compatible attribute of the product. Yet, this complex option is rarely found in commercial applications. In fact, the most common approach consists in considering a precise sequence of questions and answers, in which   shown in

Figure 5-8, we can have:
- questions that depend on the previous answers
- possible answers that depend on the previous answers
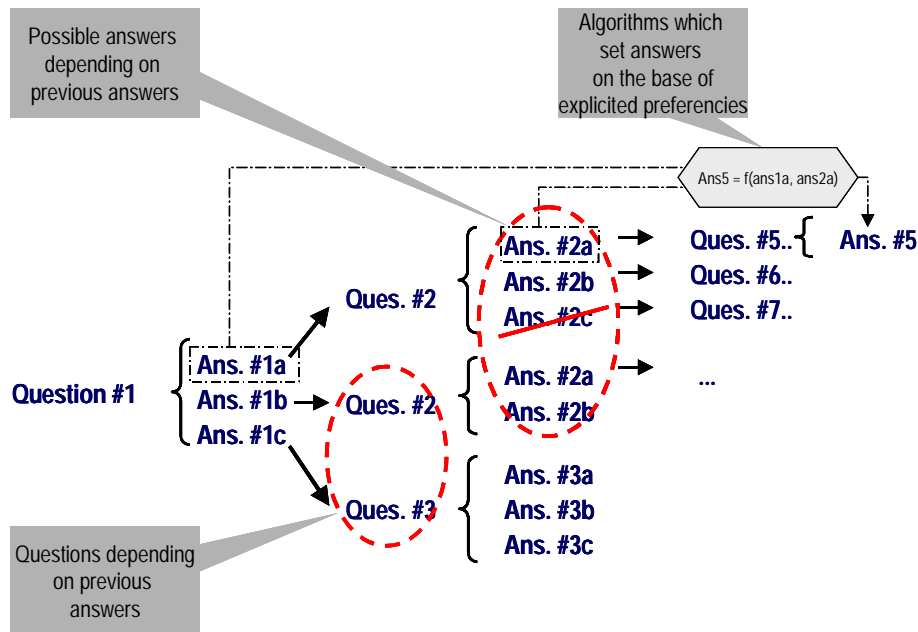- algorithms that develop answers on the basis of previous preferences

Figure 7 – Structure of the commercial dialogue

To represent the commercial dialogue as a decision tree is a conceptual approach to the planning of the commercial model. The way, in which this representation will be implemented in the product configurator, obviously depends on the particular software system adopted.

Methods for product description, delimitation of customer's choices, communication of the value related to the different options and finally, structure of the commercial dialogue, sum up the actions needed to build a good commercial product. We still have to consider the fact that a firm has to serve, with the same product family, many types of different customers (let us take the example of automobile factories) The question is: Is it possible and efficient to serve all these types of clients using a single commercial model and, consequently, using a single commercial dialogue? or is it better to develop different commercial models according to different types of customers? There is not a correct answer. First, it is fundamental to consider marketing aspects and the investment necessary to develop different commercial models and then, to determine if and to what extent, one solution is more appropriate than the other.

INTERACTION AND LEARNING

The reduction of the complexity of the product offer, that the customer notices, as mentioned before, is reached not only by diminishing the information load for the client, but also by increasing his ability to understand and evaluate the available product information. In other words, learning is a fundamental activity that reduces cognitive complexity. Learning is a process, i.e. it consists of a series of actions carried out during a period of time. The salesman, who visits the customers now and then, gives him product documentation and communicates with him in different ways, feeds a learning process on the part of the customer. A solution for product configuration, that can be - at least

partially- automated, will be successful if it is able to support the customer's learning process. Fortunately, interaction is in some way, an intrinsic characteristic of computer applications. That is the reason why the customer can use a commercial model as a base for his progressive learning or updating, related to product information. In order to understand the product, the structure of configuration dialogue can be consulted several times, giving different answers to see how the final product configuration changes. A better understanding of the product, eventually, enables the customer to appreciate how different possible attributes contribute to create a configured product variant that can satisfy his requirements.

The configuration of a truck offers an interesting opportunity to understand the fundamental role played by interaction, in the comprehension of how the choices we make are interdependent (product knowledge) and how these choices influence the general performance of the product. The truck studied presents a considerable number of possibilities: cabin type (7), engine (4), class (4), chassis type (2), wheel configuration (11), chassis height (4), suspension (3), power (11). Furthermore, the client can express his preferences in terms of maximum price, level of comfort, versatility, performance and fuel economy. (see figure 5-9) All these items are interdependent.

Let us start from the basic configuration provided by the system, characterized by a "normal" level of comfort. Let us suppose that we want to purchase a more comfortable vehicle, so we specify a "very high" level of comfort. Immediately the system offers us (associated to configuration B) a modified outlook of the performance, different from the one shown in association with configuration A. In the new table (provided with configuration B) we can see that the increase in the level of comfort implies a decrease in the level of performance (Low) while the level of versatility does not change (Normal) and the level of fuel economy is the same (High). The price of configuration B is 15% higher as well.

At this point, it is interesting to see what happened at a level of components, that is to say which components guarantee high performance in terms of comfort. The system shows that the option of very high comfort has modified the cabin type (CP 19 instead of CT 14), the chassis height (low instead of normal) and the suspension (air instead of leaf suspension). Exploring these interdependences, the potential customer can get a clear idea of what the firm offers and above all, of what the firm can do for him. We must remember that a family of heavy trucks may have thousands of possible configurations, considering the detailed specifications.

CONCLUSION

At this point, it is possible to summarize the activities that lead towards a structured knowledge of the product, from the commercial point of view, and towards the building of a good commercial model and finally, of an efficient commercial dialogue. The starting point is, as repeatedly mentioned before, to reduce the cognitive complexity related to the efforts the potential customer has to make, in order to understand what the firm offers and how the different solutions can satisfy his requirements. The mainlines to project the interaction with the customer are: 1- describing the product, 2- delimiting the options the customer can make, 3- communicating the value of the different alternatives, 4- structuring the customer's process of interaction (see Figure 8). The possibility, for the client, to interact directly with the commercial model or through the salesman, generates a learning process that facilitates the understanding of the offer and relates it to the customer's specific needs.
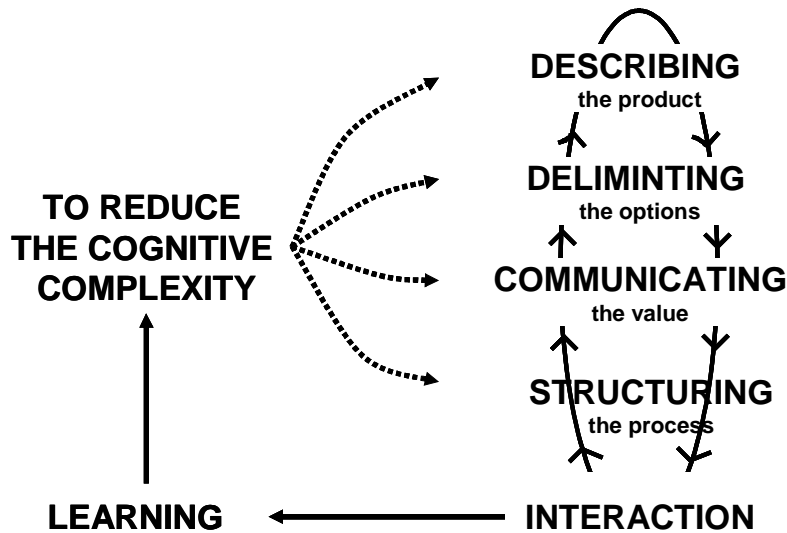

Figure 8:   Integrated scheme for designing customer interaction when selling configurable proudcts

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