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Contents

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Letter from the Managing Editor

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This issue of *Harvard Deusto Business Research* includes studies and research on data protection by design, effective techniques for presentation e-merchandising and the use of the "Clients Assisted" variable as opposed to the "Sales" variable for the analysis of the Product Life Cycle.

In the first article, Santiago Martín-Romo Romero and Carmen De-Pablos-Heredero propose that the technical and organizational measures that should be included in the processing of the data of natural persons, according to the approach of data protection by design, are determined as soon as the processes in which these data will be treated are defined, integrating their protection in the definition of the processes. These activities, carried out using the firm's different profiles, make it necessary to develop proper organizational integration amongst the participants, the activities performed by the different agents, the results exchanged and the common products used.

The work by Professors Juan Aída Galiano, Vicente Rodríguez and Manuela Saco analyzes whether the "Clients Assisted" variable is more useful than the "Sales" variable in calculating the stages of the Product Life Cycle (PLC) using the Bass model, proposing a new way to manage marketing and sales departments in companies. In their article, they apply the Bass model to define the stages of the PLC and non-linear regression models to estimate the PLC. The results show that more consistent estimations of the stages of the PLC are obtained through the "Clients Assisted" variable, which has theoretical and practical implications that can help with business management.

In her article, Professor Nuria Puente Domínguez wonders whether the behavior of online shoppers can be influenced through the internal layout of an online store. Many researchers have analyzed the influence of the physical point of sale on the consumer's emotional states and their buying behavior. However, although online stores are the greatest exponent of self-service, there is hardly any research on e-merchandising. Therefore, she conducts an exploratory study in order to better understand the context of the research when considering the analysis variables that are of interest within the study area, which will allow e-commerce companies to know which e-merchandising techniques must be implemented for efficient business management.

Finally, I would like to express our sincere thanks to the authors for their effort, to the members of the editorial committee and the referees for their inestimable collaboration and professionalism and to the readers of *Harvard Deusto Business Research* for their warm reception. Thank you very much to everyone.

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Data protection by design: Organizational integration

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Abstract
Firms perform the processing of physical personal data and are obliged to protect them according to the Acts. In the European Union, the General Regulation for Data Protection (GDPR) obliges firms to be proactive in the protection of the personal data they process, through data protection from the design. In this research, a group of technical and organizational measures to include in processing, under the focus of data protection from the design is determined from the definition of the processes in which data are processed. These activities, realized by making use of different firm's profiles, promote the need to develop a proper organizational integration amongst participants. The activities done by different profiles at firms promote the need to develop an organizational integration amongst participants, activities performed by different agents, results interchanged and common products used.

Key words
European Regulation for Data Protection; personal data; processes, privacy by design; organizational integration.

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The management of personal data in relation to privacy requirements is critical for companies

1. Introduction

Companies use the data and information belonging to both the individuals and legal entities with whom they interact. As the owners of their personal data, individuals have a series of rights pertaining to how companies process said data, at different phases, from the collection of information and its processing to its deletion (Perera, Ranjan & Wang, 2015).

Personal data are considered to be "any information about an identified or identifiable individual" (European Parliament & Council of the European Union, 2016), and *identifiable individual* is understood to mean "any person whose identity can be determined, either directly or indirectly."

The collection, storage and processing of these personal data, manual or automated, enter into the sphere of privacy of their holders and, therefore, the companies responsible for these operations are required by law to protect them.

Privacy, and in particular the management of personal data, has become one of the most controversial and important aspects of the relationship between businesses and the agents with whom they interact and a priority for organizations, for both reasons related to their reputation and the potentially substantial fines by regulatory bodies in the event of any infraction (OASIS, 2012).

Until recently, companies in Spain only had to comply with the law on the protection of personal data contained in the LOPD and the RLOPD, which satisfied the corresponding European Directive (European Parliament & Council of the European Union, 1995). As of May 25, 2018, compliance is mandatory with the GDPR, and it overrides the aforementioned legislation in terms of anything that might contradict the new regulation.

Current legislation in this area in European countries, based on the above-mentioned directive, was rendered outdated, mainly due to the technological advances that have arisen in recent decades. When the directive was created, the use of the Internet had barely penetrated the business fabric and even less so in society. Email, electronic file exchange (ftp) and static websites were practically the only Internet services used (Fundación Telefónica, 2015; AIMC, 2015). Since that time, the power and storage capacity of computers have increased significantly, telecommunication networks have become more developed and new devices have emerged (smartphones, tablets, etc.), and as a result new services have appeared for data processing in general. Today, we have data capture through websites, social networks, cloud computing, the Internet of things and big data, mobile devices, tablets, smartphones, etc. that connect to the organization's IT processes. Moreover, the information and communications systems of companies have suffered threats and actual attacks (De Pablos, López-Hermoso, Martín-Romo & Medina, 2012; DPI, 2013; Fundación Telefónica, 2015; AIMC, 2015).

This technological evolution promoted change initiatives in Europe in terms of the regulations related to data protection. Accordingly, in 2012, the European Commission proposed a new regulation (European Commission, 2012; European Parliament, 2014), that would be directly applied in each country (without the need to be transposed), for the protection of personal data. This regulation was approved by the European Union in 2016, thus resulting in the General Data Protection Regulation (GDPR) (European Parliament & Council of the European Union, 2016), which took effect in May 2016 and the application of which was mandatory as of May 25, 2018 for member states.

Taking into account the regulatory background, the present study deals with privacy from the design perspective, through the definition of business processes, i.e. at a level prior to the

Technological progress has promoted the emergence of new legislation at the European level

creation of the information systems. The proposal is that businesses, from the very moment they create a business activity, must incorporate the appropriate requirements in relation to privacy that they will have to comply with in that particular business activity.

2. Data protection by design

The concept of privacy by design (PbD) is recognized as a philosophy that helps to improve the privacy of individuals (Poullet, 2010; Antignac & Le Métayer, 2014).

The term PbD was included among the proposals in the new Regulation (European Commission, 2012; European Parliament, 2014) and was replaced in the final version (European Parliament & Council of the European Union, in its Article 25), by the expression data protection by design.

PbD is a concept created at the turn of the century by Canadian Ann Cavoukian, ex-Commissioner for Information and Privacy of Ontario. Her initial goal was to preserve the privacy by implementing measures that integrate the fundamental aspects of data protection within the technological system used for information processing. This focus was later expanded (Cavoukian, 2012) to include three areas of application, including business practices (organizations), technology and the physical design (infrastructures).

Since PbD was included in the GDPR, many statements have been made in favor of this philosophy. ICO (2017) states: "The basis of the privacy by design approach is that if a privacy risk with a particular project is identified, this can be an opportunity to find creative technical solutions that can deliver the real benefits of the project while protecting privacy." ICDPPC (2016) indicated the importance of PbD: "Not only engineers, but also researchers need to start considering privacy engineering principles like *privacy by default* and *privacy by design* in new research, products and services." However, works such as that by Colesky, Hoepman and Hillen (2016) indicate that in and of itself, PbD lacks the specific tools to aid software developers in designing and implementing privacy-friendly systems and there are also no clear guidelines on how to map the specific legal data protection requirements to system requirements.

Some authors, such as Bygrave (2017), believe that PbD has a number of deficiencies in the GDPR, particularly in terms of the lack of clarity on the parameters and methodologies to be applied to reach its objectives, the lack of clear, direct communication with those who are engaged in information systems engineering and the lack of necessary incentives to stimulate privacy-related interests.

In recent years, privacy by design has gained recognition, acceptance and notoriety. Companies, in order to comply with the PbD obligation, must use methods, techniques and tools that make it possible to apply it with a certain degree of order.

In the area of information systems development, these methods of support have begun to appear for implementing the concept of privacy by design, as seen in Compagna, Khoury, Krausová, Massacci and Zannone (2009); Tschantz and Wing (2009); Deng, Wuyts, Scandariato, Preneel and Joosen (2011); Gürses Troncoso and Diaz (2011); Rubenstein and Good (2013); Hoepman (2014), Luna, Suri and Krontiris (2012); and Le Métayer (2013). Different European projects have been undertaken or are underway with the aim of helping to apply concepts related to PbD, including EuroPriSe (2007), PICOS (2009), PRISMS (2012), SurPRISE (2012), PACT (2012), CAPPRIS (2013) and PRIPARE (2014). On an international level, this concept also appears in the ISO privacy framework standard ISO 29100 (ISO, 2011), in the confidentiality protection guide of the NIST (McCallister, Grance & Scarfone, 2010) and in the standard privacy protection method of the OASIS organization (2012).

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Privacy by design improves the management of personal data from a legal perspective

Almost from its origins, the practice of privacy by design has been analyzed from the perspective of risk management (Cavoukian, 2010; CNIL, 2012; ITU-T Technology Watch, 2012; ICO, 2013), which implies analyzing the threats to privacy, the possibility they will occur (vulnerability) and the impact that would result, calculating the risk to thus establish the necessary measures (security, organizational, etc.) that reduce, assume or transfer that risk.

Although the concept of PbD has acquired great importance in recent times, as indicated by Luna et al. (2012), the methods, techniques and tools that must accompany it have not kept pace, something which is also pointed out by Rachamadugu and Anderson (2008) and FTC (2010).

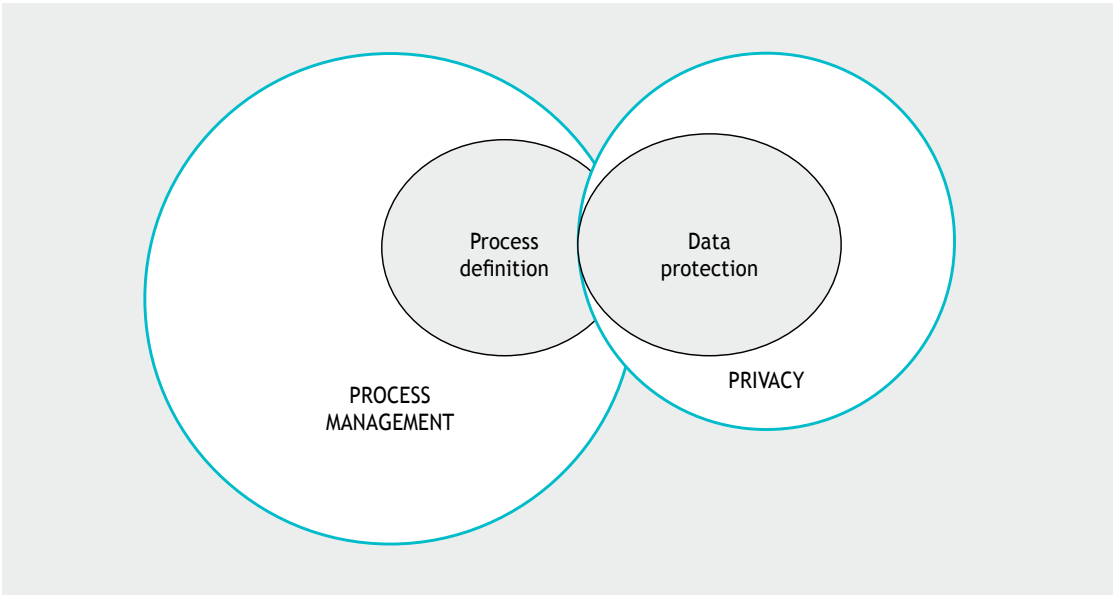
The potential benefits of applying the PDB have been recognized by both privacy regulators (European Parliament & Council of the European Union, 2016) and by data protection authorities (ICDPPC, 2010), although, as stressed by Notario, Crespo, Martin, Del Alamo, Le Métayer, Antignac, Kung, Kroener and Wright (2015), it is complicated to implement it, due to the lack of maturity of this discipline in its practical application.

3. Privacy by design through the definition of processes

Privacy from the perspective of business process management has received little attention in research and there is a gap in the current literature, as no studies are found in relation to methodologies to integrate privacy into business processes (Majdalawieh, 2013; Rachamadugu & Anderson, 2008; FTC, 2010). PbD is in and of itself a process that is closely linked to process design (Kroener & Wright, 2014).

This work studies data protection with a focus on PbD, as required by the European regulation on data protection (European Parliament & Council of the European Union, 2016), but starting with process management, injecting privacy so that it originates with it already built-in. Table 1 shows a diagram of the concepts involved and their relationship to one another.

Table 1
Concepts and their interrelation



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Companies need methods and tools that will help and guide them in the implementation of PbD

The integration of privacy in the process definition and from an organizational perspective is a different approach from other studies, as the closest would be those studies that are focused on linking privacy with the development of information systems.

The aspects to consider when integrating data protection into process definition are defined below.

4. Integration of data protection into process definition

4.1. Process definition

For process definition, it is suggested to use structuring in phases, activities and tasks according to MÉTRICA (2000), as well as its global orientation in terms of products, techniques and participants. We must bear in mind that it is a product-oriented methodology; in other words, it is used in the development of an information system, which bears some similarity to process development. Both must be defined and clarified, with the collaboration of users and the involvement of certain profiles that employ a range of techniques and tools.

The objective of this activity is to obtain a detailed specification of the defined process that meets the information needs of users and will serve as a basis for further development in information systems.

The initial description of the process to be defined is created based on the products generated in the global process planning. The scope of the process is established, the general requirements are designed and the process is described with the initial high-level models.

The users are also established who will define the process, delimiting their responsibilities, profiles and dedications. In addition, the planning of the following tasks is also carried out.

In the definition of new process requirements, a detailed catalog of requirements is also created that makes it possible to precisely describe the process and also serves as the basis for checking the completeness of the specification of the models that are being obtained throughout the activity.

Work sessions are conducted with the aim of gathering the information needed to obtain the detailed specification of the new process. In the work sessions, it is a good idea to use the usage case technique to establish the requirements. This technique facilitates communication between process analysts and users. The functions are then described that will be facilitated by the process and the restrictions that must be considered in terms of processing frequency, security, privacy and access control, performance, etc. This set of information is incorporated into the requirements catalog.

During the next activity, the process is divided into analytic subprocesses to obtain the detailed specification of the different models and the monitoring of requirements.

4.2. Data protection

In this activity, the aim is to study the privacy of an environment in five stages, which are consecutive and based on the structure of the MAGERIT methodology for risk management and analysis (2012).

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The integration of data protection in the definition of processes entails defining the processes

The stages are the following:

- Stage 1. Organization of the work, establishing the necessary considerations for starting the project to ensure privacy. The opportunity of implementing it is studied, the objectives that must be met are defined and its scope is determined, planning the material and human means for its performance, making it possible for the project to be launched.
- Stage 2. Analysis of the personal information processed, which makes it possible to identify and assess the personal data processed, obtain an assessment of the shortcomings in the protection of said data and estimate the need for a more in-depth study with a risk analysis.
- Stage 3A. Management of privacy requirements, which allows you to configure the possible requirements that must be met in order to eliminate the shortcomings detected in the previous stage and always with the fulfillment of the stated objectives from the first stage. This stage is performed when it is not necessary to carry out a risk analysis regarding privacy.
- Stage 3B. Evaluation of the impacts on privacy, which constitutes a risk analysis and management, and therefore entails the typical risk components and identifies and evaluates the assets, threats, vulnerabilities, impacts and thresholds pertaining to the risks. This is done when the study setting has some very specific characteristics.
- Stage 4. Selection of safeguard mechanisms to deploy, developing an orientation for the deployment plan for the selected mechanisms, establishing the means for monitoring the deployment, collecting work reports on the process to ensure privacy, obtaining the final project documents and making the presentations of the results in the organization.

According to the perceived intensity in terms of the risks to privacy, the user of the method will have to choose between following stage 3A or 3B. In the latter case (Stage 3B) is aimed at high-risk environments for privacy, a study referred to as the *Privacy Impact Assessment* (PIA).

4.3. Integration of both

The integration of data protection in the definition of business processes makes it possible to obtain appropriate privacy requirements during the definition of the business processes.

This proposal is based on the integration of some of the products obtained in the data protection with some of the products obtained in the process definition, so that the process is defined with privacy already built in. As indicated in ICO (2013), it is a matter of searching for open doors that allow information to be exchanged from one method to another, providing for a synergy between the two. Various methods in other areas related to information processing are integrated into one another, as can be seen in Hanouz (1993), Baskerville (1993), MÉTRICA (2000), GISSIP (2006), ENISA (2008), MAGERIT (2012) and ICO (2013).

The integration proposal seeks the incorporation of the contribution made by users to the privacy requirements and designing options via the modeling of processes with the use of collaborative work flow tools and modeling and expression conceptual languages that are flexible to represent and formalize said requirements, providing mutual understanding between the user, the legal side, the technical side and the government regulators involved.

The objective of the proposed integration is to assist specialists in processes to incorporate the user requirements and organizational requirements in terms of privacy and data protection

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The integration of data protection in the definition of processes implies protecting data

from the very beginning (i.e., the PbD philosophy) in the definition of processes and do so in a way that is coherent, iterative, systematic and assessable. The processes will be more reliable by taking privacy needs into consideration from the start, since later in their development, technological solutions will materialize the models designed with built-in privacy.

The recipients of this method of integration are both business analysts and privacy analysts, since it will serve as a reference guide to both for the exchange of information in their respective specialties.

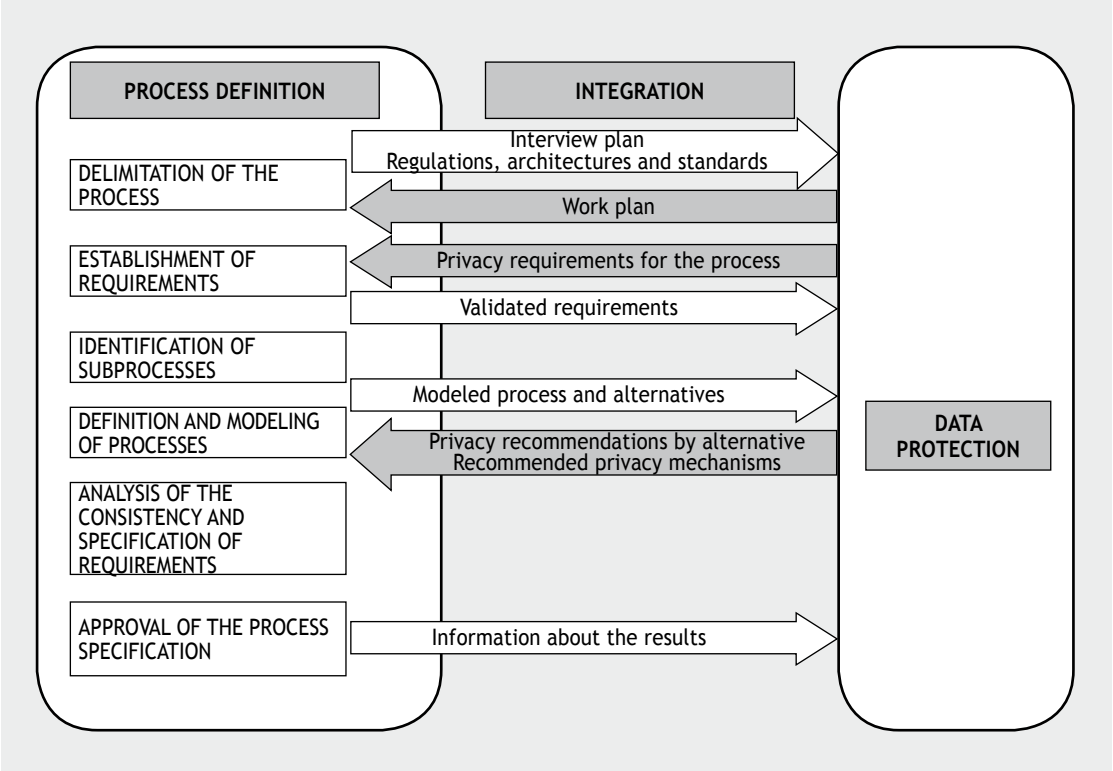
The data protection activities define a cycle of privacy analysis and management along two complementary lines:

- Integrating it into the proposed life cycle in the early stages of BPM methodologies, for the management of business processes, thus permitting the definition of several models of privacy in the processes, according to their level of abstraction.

- Establishing the activities to be carried out to obtain the corresponding evaluations and privacy requirements for each of these models. The corresponding interfaces with the phases, activities, tasks and techniques involved in the process definition are created.

With the data protection, the privacy safeguards are specified for each process, incorporating them as processes of quality assurance into the specification, in order to complete it and to be able to contrast it with the users, based on their roles, prototypes and functional definitions. Figure 2 shows the details of the integration.

Table 2
Integration of data protection into process definition



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The integration of data protection in the definition of processes implies integrating both of them

5. Organizational integration of the PbD into process definition

5.1. Integration of products

The products obtained in both types of tasks will be documentary in nature, and due to the different objectives, they will have little in common. The subject matter, methods and techniques used to get the products will barely coincide, due to the fact that they are applied in very different areas within the companies.

The activities involved in defining processes are oriented towards how to obtain the products and services provided by the company and the data protection activities seek to ensure the privacy of those involved in these products and services.

Those professionals who perform and/or use products of process definition or data protection activities must know and understand very well the products of both, as integrating the products of one into the other is complex.

The activities of process definition include a hierarchy, with a structure to obtain different products throughout the order in which they are performed. The products obtained in the data protection activities must be incorporated into this structure. The products generated for data protection activities (lists of recommended measures and management reports) will be introduced under the name of "data protection products." These products of data protection activities will generate some requirements that will affect other process definition products. Mylopoulos, Chung and Nixon (1992) already distinguished between the functional requirements (what the system does) and the non-functional requirements (those referring to restrictions, conditions, quality and others). In the latter case would be the privacy requirements.

The requirements generated by the data protection activities will be added to the requirements catalog generated in the process definition, and later adapted in the process development phases. A complete specification of the requirements at all levels is key for the correct development of the process.

There are two products that are the most important products of a data protection review:

1. The data protection management report.
2. The recommended protective measures (requirements) and the mechanisms to meet the requirements.

These products need to be interpreted and analyzed by the process definition team. The following key factors must be considered:

- The data protection analysts must discuss the requirements with the professionals defining the processes to create a list of new privacy-related proposals.
- The different types of protective measures should be incorporated in the detailed definition of the process phase.

5.2. Integration of participants

As Hitpass (2012) points out, the process definition activities are carried out by the process analyst with the collaboration of the process manager and the process participants (user, business executive). The data protection activities will be performed by the data protection analyst, in collaboration with the process manager and the process participants (user, business

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The proposed integration will help incorporate the requirements of both users and the organization

executive). Both teams will work in parallel, with the process definition team doing most of the work. Therefore, a careful plan is required to integrate the data protection activities with the process definition activities.

Once the product has been established that is to be obtained with the process definition, it is important to hold a series of management meetings to discuss the results of each data protection review. The number of meetings, their field of action and their frequency will depend on the scope of the project.

The integration for business process analysts has the following objectives:

- Ensuring an adequate understanding of the process definition method from the perspective of the privacy in the processes being defined.
- Providing a sufficient basis to prepare for the integration.
- Collaborating in establishing the optimal conditions to protect privacy in the newly defined processes.

In the process definition environment, the data protection analyst is faced with the challenge that much of the required information is merely theoretical, and quite vague.

5.3. Integration of activities

When integrating data protection within a process definition project, it is important to plan the activities required by both types of work at the same time to prevent unnecessary delays. It is therefore necessary to hold a series of meetings and interviews with the process definition project team and the data protection analysts at the start of the project to establish the basis for later development. It is very important to schedule all the work that is to be done by the data protection team in conjunction with the planning carried out by the process definition team. Furthermore, whenever data protection reviews are carried out, the process definition team will need fast results.

Both the process definition professionals and those reviewing the data protection need to conduct interviews with the profiles representing the process manager and the participants in the process. For the process definition professionals, these interviews are important to determine the business requirements needed to define the processes. For those reviewing data protection, on the other hand, these interviews are important to establish the processing of personal data and their sensitivity, as well as the evaluations of the threats and vulnerabilities related to privacy. Both types of interviews must be performed simultaneously to ensure the smooth running of the project and prevent wasted time by the users.

To summarize, the planning and preparation for these interviews must be a key point on which both the data protection reviewers and the process definition team must work together.

6. Conclusion

Data protection by design, as a new mandate of the GDPR, involves establishing the technical and organizational measures as soon as possible in the cycle in order to respect the rights of individuals when companies process their data. This paper proposes that the establishment of these privacy requirements be studied as soon as the processes are proposed that will process these data. In this way, by defining these processes with their functional requirements, the data protection requirements will be incorporated in such a way that they are described and implemented with the most appropriate mechanisms in later phases.

The proposal will allow you to check the consistency of data during the life cycle of the process

The definition of processes and the establishment of the data protection requirements are activities performed within companies by different profiles, which makes it necessary to establish proper organizational integration among the different agents, to coordinate the activities they will perform and to use the products obtained.

The following are the advantages of integrating data protection in the process definition:

- It provides an analysis of the protection of the data processed by the process in question prior to its development.
- It incorporates safeguards before it is completed (which is more effective and cheaper in the long run).
- It ensures consistency throughout the life cycle of the process.

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Are clients assisted an outstanding variable to analyze the Product Life Cycle?

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Abstract
The forecasts about the behaviour of the Product Life Cycle (PLC) have been done by the Bass Model. The main contribution of this investigation is to propose the use of the clients assisted variable in the face of sales variable. Its main target is to analyze which variable is the most useful to calculate the stages of the PLC through Bass model, proposing a new way to manage marketing and sales departments in companies. In this investigation 223.557 clients assisted were analyzed nationwide by an automobile network dealer, 36.819 of them purchased cars during 24 months, which was the period of the study. In this analysis, the Bass model and non linear regression models were applied to define the stages of the product life cycle. The results show that we can get more consistent estimations of the product life cycle thanks to clients assisted variable. This study has theoretical and practical implications that can help enterprise management.

Key words
Bass model, time series, life product cycle, consumer behavior, automotive.

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The main methodological contribution is the use of the clients assisted variable in the Bass Model

1. Introduction

Companies analyze the product life cycle (PLC) to predict variations in the product marketing process, consumer behavior and the adaptation to changes that occur in the environment and in the competition. These changes condition the design of the marketing strategy; knowledge of market behavior can thus contribute to reducing the level of uncertainty and improve marketing decisions (Briede-Westermeyer, Cabello-Mora, Pacheco-Blanco & Cartes-Sanhueza, 2016). In this sense, Miquel & Mollá (1982) indicate that "recognition of the existence of the PLC highlights the need for product innovation by companies. In doing so, an important element as a basis for planning the innovation strategy within a company is the positioning of their products with reference to the PLC and how this takes shape."

The PLC analysis is extremely important for companies, since it enables them to be prepared and to use the forecast as a tool to strategically plan investments in innovation and marketing, thus making their knowledge and development a scientific challenge in the coming years. Saffo (2007) supports this position, stating that "the art of forecasting lies in identifying an S curve when it starts to emerge, long before its turning point." Furthermore, it has been demonstrated (Qualls, Olshavsky & Michaels, 1981; Gan, Pujawan, Suparno & Widodo, 2015) that the sales performance of the most recent innovations shows a progressive shortening of the duration of the life cycle, particularly during the introduction and product growth stages.

Different authors (Aguilar, Ávalos, Giraldo, Quintero, Zartha & Cortés, 2012; Rink & Swan, 1979; Fu, 2009) indicate that the PLC stages act differently from the customary "S" model so widely used in the literature. Sales, which are currently the performance parameter commonly used for PLC analysis, may not be the most consistent variable because they are affected by certain economic phenomena, such as general price increases in the economy (inflation), or by variations in relative prices (certain products compared to others). Spain is one of the OECD member countries in which the available income is noticeably affected by redistributive tax policies, particularly in expansionary times when these take on a strong social component (Camacho & Galiano, 2009).

The aim of this article is to study the behavior of the life cycle of a consumer durable goods product in the Spanish market. It delves deeper into the analysis of the PLC, distinguishing between the variables "Clients assisted" and "Sales" in order to develop a business decision-making methodology that makes it possible to discriminate between the use of the two variables. We believe that this is the basis for the foundation and gives importance to the research conducted in this document, the originality of the use of the clients assisted variable, which suggests a new line of research. The main methodological contribution is the use of clients assisted in the Bass Model, since historically the variable of sales has commonly been used, thus obviating the use of other variables without any previous study that would make it possible to highlight the use of this variable.

This has led us to pose the following question in this research: Can the clients assisted variable constitute an efficient and consistent replacement for the sales variable in order to estimate the PLC?

2. Theoretical framework

2.1. Product life cycle

In this article, we have conducted a thorough review of the literature on PLC and the Bass Model (which plays a predominant role in dating the stages of the PLC) and we have

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repeatedly found that the articles refer to the number of sales as the sole variable for conducting the analyses. The most relevant articles reviewed that have used the sales variable for the PLC analysis and the Bass Model are summarized in Table 1.

Table 1
Summary of the review of the theoretical framework for using the sales variable for the analysis of the PLC and the Bass Model

Variable used	Scope of application	Research objective	Limitations of the study	Sources
Sales	The sales of 314 industrial vendors	New product launches	First years of the product launch	Fu (2009)
Sales	Sales of technology products	PLC forecast model	This research uses historical data	Orbach & Fruchter (2014)
Sales	Sales of 29 brands	Introduction in new markets	Shallow depth of the product PLC	Shankar, Carpenter & Krishnamurthi (1999)
Sales	Sales of new products and the PLC	PLC analysis	No benefits defined in the relationship between the two variables	Suomala (2004)
Sales and price	The evolution of sales and price	PLC analysis	Supply and demand behavior	Kaldasch (2015)
Sales	Sales analysis of eight products in nine countries	PLC analysis	Analyzes durable goods	Palacios (2013)
Sales	Purchasing intention of potential customers	New product launches	Lack of analysis of purchasing decisions	Briede- Westermeyer et al. (2016)
Sales	Sales of three products	PLC analysis	Lack of customary influence	Ratcliff & Doshi (2016)
Sales	Evolution of sales over time	New product launches	Lack of analysis of market size	Cetinkaya & Thiele (2016)
Sales	General Electric sales	Conversion rate	Analyzes sales in a market	Ledingam, Kovac & Simon (2006)
Sales	Sales of mobile phones and Internet access	Communications sector and the digital economy	Lack of adoption patterns among countries	Weissmann (2008)
Sales	Sales in the electricity market	PLC analysis	Lack of business implications	Hachula & Schmeidel (2016)
Sales	Fatigue analysis of customers regarding the product	PLC analysis	Homogeneous population Cross sales not considered	Wu, Wang & Li (2015)
Sales	Apparent consumption	Analysis of the behavior of the life cycle of durable consumer goods	Estimated sales due to the lack of data	Polo (1983)
Sales	Sales to define the real diffusion curve	Analysis of the diffusion of sales in several countries	Poor model fit in some countries	Zhu, Tokimatsu & Matsumoto (2017)
Sales	Sales in product units from the industrial sector	Measurement of the product life cycle	Influence of the macroeconomic variables on sales	Aguilar et al. (2012)
Sales	Theoretical approach to the PLC	Convergence between chaos theory and the PLC	Sensitivity of the sales curve using the PLC	Rodríguez Escudero (1996)
Sales	Sales and inventory management simulations	Fashion product demand forecasting based on the Bass and Newsvendor models	Use of theoretical models	Spragg (2017)

The Bass Model has been developed fundamentally to estimate the stages of the PLC and to forecast the diffusion of innovation in the durable goods markets

The PLC has been historically defined as the evolution in the sales of a product during the time that it remains on the market (Levitt, 1981). Some works, although few in number, mention the use of other variables. Two such examples are the work by Lambkin & Day (1989), based on the analysis of the competitive context and the evolution of competition (supply factors) and that by Aguilar et al. (2012), which indicates the importance for companies to use other measurement variables.

2.2. Bass Model: origin and benefits

The Bass Model has been developed fundamentally to estimate the stages of the PLC and to predict the diffusion of the innovation in the durable goods markets (Cetinkaya & Thiele, 2016). This model considers that sales of a new product at any given time depend on the probability of conversion of the "innovators" and the influence they have on the "imitators" (Santesmases, 2012): first is the fast wave resulting from the spontaneous purchase by the potential adopters (innovators) with the innovation rate; second is the slow wave that spreads throughout the market, triggered by social learning, where the number of adopters increases with the rate of imitation (Kaldasch, 2015). The adoption of a product is the point at which a new product is introduced in a market. Once the new product is adopted, the diffusion pattern is formed. These two terms can be understood as the breadth and depth of a product in different countries (Palacios, 2013). For the correct application of the Bass Model, first we must consider the speed with which customers adopt the new innovation and second, whether the company has the right capacities and sufficient organizational capacity to manage this growth (Ratcliff & Doshi, 2016).

Table 2 below lists the main authors and their contributions that make up the theoretical framework used in this research.

Table 2
Summary of the theoretical framework used in the research

Research objective	Methodology	Conclusions	Source
		Bass Model	
Analysis of the product life cycle	Chaos theory	Implications for dynamic product management	Rodríguez Escudero (1996)
	Bass and Mansfield models	Diffusion and adoption of new products in Latin America	Palacios (2013)
	Bass Model	The Bass innovation-diffusion model has shown a satisfactory fit with sales evolution data over time	Polo (1983)
	Bass Model	The PLC behaves regularly in homogeneous goods markets	Kaldasch (2015)
	Bass Model	Use of the Bass Model to analyze the diffusion of new products	Ratcliff & Doshi (2016)
	Bass Model: analysis of feature fatigue	The evolution of sales can be used to analyze the characteristics that must be added to the product to reduce the feature fatigue of the products	Wu et al. (2015)
		Product life cycle	
Product life cycle measurement	Logistic model of demographic growth	Knowledge of the points of inflection for strategic decision-making	Aguilar et al. (2012)
Product life cycle	Process management	Project management model proposal	Ferreira, Faria, Azevedo & Marques (2017)
	Mathematical model	Mathematical model proposal	Hachula & Schmeidel (2016)
	Qualitative	Positioning strategies proposal	Moon (2005)
Study of product innovation and its effects on the life cycle	Review of the literature	Proposal for a typology of the different types of innovations	Miquel & Mollá (1982)

Table 2 (continued)
Summary of the theoretical framework used in the research

Bibliographical review of the product life cycle	Qualitative-type inductive-analytic research method	ESVIPROMER model proposal	Peralta, Cervantes, Olivares & Salazar (2014)
Review of the usefulness of the product life cycle today	Review of the literature	The PLC represents highly valuable information for decision-making in marketing; however, the forecasting capacity for sales has limitations	Muñiz Ferrer (2008)
Studies on the product life cycle	Review of the literature	Twelve different types of PLC can be found, with the classic form being the most common	Rink & Swan (1979)
Analysis of the product life cycle	Chaos theory	Implications for dynamic product management	Rodríguez Escudero (1996)
	Review of the literature	Proposal of different marketing techniques according to each of the stages of the PLC	Suomala (2004)
PLC pattern prediction model	Parametric model	This model is capable of explaining PLC patterns that could not be explained before	Orbach & Fruchter (2014)
	Dynamic system model	Improves the performance of the innovation in the PLC stages	Zou, Guo & Guo (2016)
Introduction in new markets	Dynamic model	Advantages of access to new markets when the product is in an upstream stage of PLC	Shankar et al. (1999)
		Theoretical problems	
New product launches	Growth curve model	The age and experience of sellers can determine the success of new products	Fu (2009)
	Expanded model for conceptual design	Improves communication with stakeholders (client, user and expert)	Briede- Westermeyer et al. (2016)
	Price-time sensitivity model	Advantages of applying suitable pricing policies in the PLC stages	Gan et al. (2015)
	Bass Model	Reduction of uncertainty in the launching of new products	Cetinkaya & Thiele (2016)
Conversion rate	Recompilation	The application of scientific methods in sales management increases prospects and the conversion rate	Ledingam et al. (2006)
		Applied uses of the Bass Model	
Tourism sector	Estimation of the tourism demand	New focus on estimating the tourism demand based on the diffusion methodology applied to information from tourists who have visited a site	Ayaviri, Quispe & Sánchez (2017)
Automotive sector	Estimation of the diffusion curve in different countries	The effectiveness of the proposed model to estimate the diffusion curve varies according to the country	Zhu, Tokimatsu & Matsumoto (2017)
Textile sector	Prediction of the seasonal demand for fashion	Analytical use of the Bass Model with the Newsvendor model within the context of fashion No data on real-world sales are available	Spragg (2017)
Communications and digital economy sector	Introduction of the heterogeneity of individuals in the Bass Model estimate	Differences in the Bass Model estimate according to the age and education of individuals	Alonso & Arellano (2015)
	Diffusion of new technologies and estimation of demand for new products	Determination of diffusion patterns for new technologies	Weissmann (2008)
	New technological diffusion model	The Bass Model presents fit problems when applied to the Internet sector	López, Orero & Arroyo (2007)

The analysis of the PLC is expanded, distinguishing between the clients assisted and sales variables, for the purpose of discovering which of the two variables is more useful for calculating the stages of the PLC using the Bass Model

In this context, the present article aims to contribute to the joint research on commercial and marketing management from both a theoretical and practical perspective, analyzing the PLC in greater depth, distinguishing between the variable of clients assisted and sales, in order to discover which of the two variables is the most useful for calculating the stages of the PLC using the Bass Model. With this purpose in mind, this research proposes the following hypothesis:

H1 The clients assisted variable provides more efficient and more consistent results for estimating the Product Life Cycle than the sales variable.

3. Methodology

3.1. The econometric model

In order to conduct this research, the Bass Model has been developed based on the distribution function *F(t),* which represents the adoption of the period *t,* and its related density function *f(t)*. Based on them, following a hazard rate, the probability of being an adopter is defined among those who have still not done so at moment *t* as $\frac{f(t)}{1-F(t)}$, which is defined linearly as shown in equation 1.

$$\frac{f(t)}{1 - F(t)} = p + q \cdot F(t) \qquad (1)$$

where *p* is the innovation coefficient and *q* is the imitation coefficient. Thus $p, q \in (0,1)$, in which the following conditions must be met: $p < q$ and $(p + q) < 1$. Said parameters are also known as external and internal influence coefficients, respectively. The model thus represents a modeling of combined influences (external and internal).

The first estimation method used, according to Schmittlein & Mahajan (1982), is the direct estimation by non-linear methods of the solution reached when solving the differential equation, whose solution for *f(t)* is shown in equation 2.

$$f(t) = \frac{\left(\frac{p+q}{p}\right)^2 \cdot e^{-(p+q)t}}{\left[1 + \frac{q}{p} \cdot e^{-(p+q)t}\right]^2} \qquad (2)$$

The result of this estimation is obtained through non-linear methods; specifically, a non-linear estimation using ordinary least squares (OLS) in the defined equation. The estimation of this function enables us to directly obtain the estimate of the parameters *p, q* and *m* and from them, estimate *f(t),* the representation of which allows us to draw the density function previously introduced by the Bass Model. Applying the non-linear methodology, the coefficients estimated by MCO will be used as a starting point in the iterations.

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The data were collected during a 24-month study period between August 2014 and July 2016

3.2. Sources of information and data

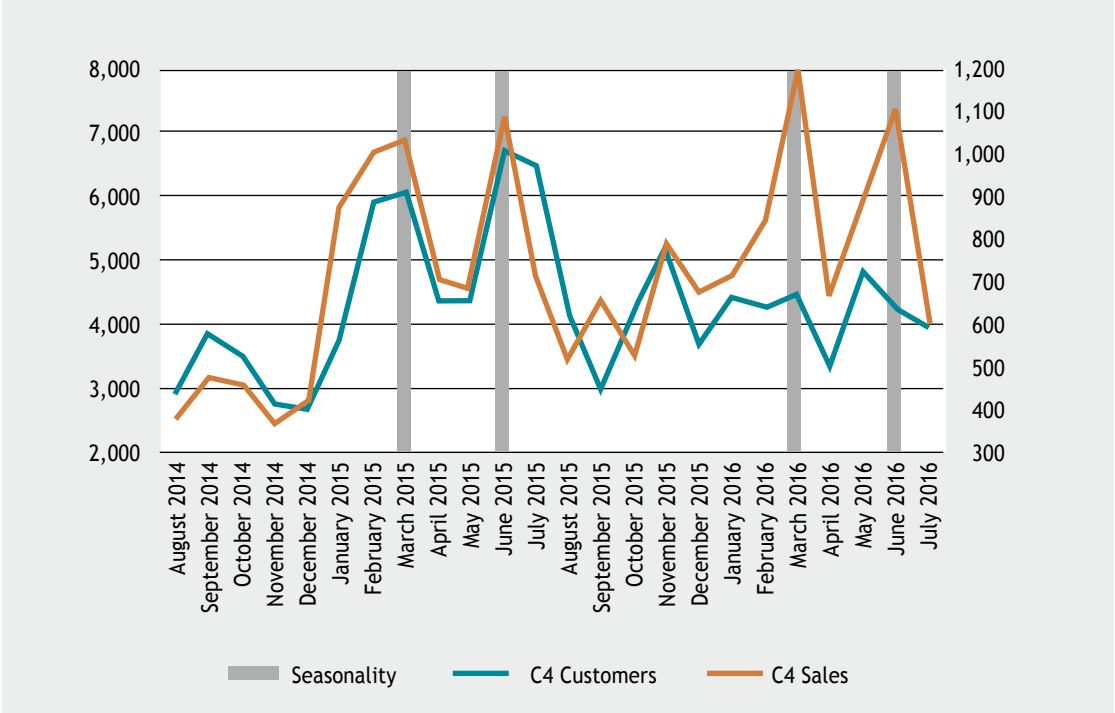
The data used in this study were provided by the company Automóviles Citroën España. The models analyzed (C3 and C4 Cactus) are two models that are considered to be substitutes, which makes the research more relevant, since the changes in the volume of clients assisted and/or the sales of both models cannot be attributed to the variation in customer behavior. Furthermore, it must be kept in mind that both models represent an important percentage of sales for the manufacturer.

The C3 is a model that has been very well received in the market over the years that it has been sold, and continues that way even today. Throughout the entire period, it has had a mean value of 4,925 clients assisted per month. It is therefore expected to be found throughout the analyzed period in the mature stage of the product.

The C4 Cactus model was launched in August 2014, when we started the data collection. Two clear trends are observed in its evolution, corresponding to the introduction and growth (first trend evidencing strong growth until August 2015, with a growth rate of 3%) and the maturity of the product in the market (where maintenance in the market is observed, with a value for clients assisted oscillating around a mean value of 4,148 units).

On the other hand, it must be pointed out that the units of observation were recorded on a national level and were gathered from the entire network of Citroën Spain car dealerships, which consist of 140 dealerships located throughout the entire country. The data (see Table 3) were collected during a 24-month study period, which lasted from August 2014 to July 2016. Said period coincides with the entry into the market of a new model, the C4 Cactus, and the continuity in the market for an older model, the C3.

Table 3
Representation of the seasonality of the sales and clients assisted variables



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This research represents and interesting scientific challenge, since the 24-month analysis enables us to discover the behavior and dating of each of the stages in the life cycle of a capital good, such as the automobile

Two types of variables are considered:

1. Number of clients assisted (customer prospects) per dealer and the total for the network of dealerships, as defined by their interest in the C3 and/or C4 Cactus car models in a network of car dealerships.
2. Number of sales per dealer and total sales for the network of dealerships.

The number of observations is 223,577 clients assisted, who purchased a total of 36,819 units of the C3 and C4 Cactus models (sales) at the points of sales during the study period.

As a result of all of the above, this research represents an interesting scientific challenge, since through this 24-month analysis, we are able to discover the behavior and dates of each of the stages of the life cycle of a capital good such as an automobile, which belongs to the automobile industry, an area of paramount importance in the Spanish economy (Rodríguez, Olarte & Saco, 2015).

3.3. Analysis strategy

In order to analyze the different behaviors from different stages of the life cycle of both products, the analysis period is divided into the following sub-periods, based on the behavior of the C3 and C4 Cactus models defined in the previous section:

- From August 2014 to March 2015: this is the launch period for the C4 Cactus and the maturity stage of the C3.
- From April 2015 to August 2015: this is the growth period for the C4 Cactus and the maturity stage of the C3.
- From September 2015 to July 2016: during this period, both models were in their maturity stage.

From these sub-periods on, we consider three types of analysis to meet the previously defined objectives:

- Analysis 1: to analyze the behavior of the entire period, from August 2014 to July 2016, for the C3 and C4 Cactus models so that the analysis can reveal whether there are different behaviors as the result of being in different stages of the PLC.

- Analysis 2: to analyze the behavior of the C4 Cactus during the periods August 2014 to March 2015, April 2015 to August 2015 and September 2015 to July 2016. The objective of this study is to see whether the results of this research are consistent with those found in the PLC literature.

- Analysis 3: to compare the results of the C3 between August 2014 and March 2015 and between April 2015 and August 2015 with those of the C4 Cactus. If the results of this analysis are different, this would demonstrate that they are in different stages of the PLC.

4. Results

As previously mentioned, for each type of product (C3 and C4 Cactus) and for the study periods defined in the previous section, innovation *(p)* and imitation *(q)* coefficients will be estimated using MCO and MCNL. The results obtained by MCO for the parameters β_0, β_1 and β_2 do not allow consistent estimates to be obtained for *p* and *q*, given the restrictions that the values of these parameters must meet: they are contained in the interval (0,1) and the sum of

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The clients assisted variable obtains a better fit and greater consistency in the results in the estimation of the analyzed period

the two must be less than one. Most of the estimates do not meet these restrictions. Just the opposite is the estimate of the *p* and *q* obtained by MCNL, which provides results that meet the aforementioned restrictions.

4.1. Comparison of the behavior of both models throughout the entire period (analysis 1)

Table 4 shows estimates of *p* and *q* obtained for the two products throughout the entire analysis period, from August 2014 to July 2016, differentiating between the estimates made based on the clients assisted and sales variables.

Table 4
MCNL estimate for the entire period (from August 2014 to July 2016)

	Innovation coefficient (p)	Imitation coefficient (q)	R^2 of the model
Clients assisted			
C4 Cactus	0.0223***	0.0995***	0.963
C3	0.0098	0.0213	0.983
Sales			
C4 Cactus	0.0147**	0.0647*	0.925
C3[1]	0.0001***	0.0086	0.955

[1] Converges after reaching a high number of iterations and does not reach the value for the model constant *(m)*. The significance of the estimated parameters is displayed next to each estimate: *** < 1%; ** 1-5%; * < 5-10%.

For both variables and both models of vehicles, it is observed that the estimates for the innovation coefficient parameter *(p)* are lower than for the imitation coefficient *(q)*. On the other hand, the estimates show that the innovation coefficient of innovation of the C4 Cactus is greater than that of the C3, for both the clients assisted variable and the sales variable. The imitation coefficient *(q)* is also greater, which indicates that the C4 has a larger imitation coefficient as compared with both itself and the other vehicle model (the C3). Furthermore, this result is significant at 1%, although this only occurs for the clients assisted variable (at 10% for the sales variable), which shows a better fit (with a coefficient of determination of 0.96 as compared to 0.92 for the sales variable). The fact that a greater imitation coefficient *(q)* is obtained for the C4 Cactus indicates that this is a vehicle model in a growth stage, as compared to behavior of the C3.

From the previous analysis, it can be concluded that the clients assisted variable obtains a better fit and greater consistency in the results on the estimation of the analyzed period. This reveals that the clients assisted variable provides more reliable results than the sales variable. These results show that the behavior of the C3 and C4 Cactus models is different over the period of time studied and therefore it can be inferred that they are in different stages of the PLC.

4.2. Comparison of the behavior of the C4 Cactus throughout the different sub-periods (analysis 2)

Table 5 shows the *p* and *q* estimates obtained for the C4 Cactus for the different sub-periods justified above.

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For the estimation of each of the stages of the PLC, the clients assisted variable is more efficient and more consistent than the sales variable for the behavior of the C4 Cactus model

Table 5
MCNL estimate for the C4 Cactus, differentiating among three sub-periods

	Innovation coefficient (p)	Imitation coefficient (q)	R^2 of the model
Clients assisted			
August 2014 - March 2015	0.0287	0.1466	0.954
April 2015 - August 2015[1]	0.0014	0.5523	0.975
September 2015 - July 2016	No convergence		
Sales			
Fails to converge for any of the sub-periods			

[1] The convergence value is reached with B0 = cumulative period value. The significance of the estimated parameters is displayed next to each estimate: *** < 1%; ** 1-5%; * < 5-10%.

Compared to the previous analysis (Analysis 1 presented in Section 4.1), in this analysis it should first be noted that the model does not converge for the sales variable in any of the sub-periods analyzed. This should be understood as a deficiency of that variable to provide estimate results for the Bass Model (convergence is reached for random values, which shows the lack of consistency in the model fit based on this variable). This provides support for the previous analysis, which showed that the sales variable presented a poorer fit. This demonstrates that, for the estimation of each of the stages of the PLC, the clients assisted variable is more efficient and more consistent than the sales variable for the behavior of the C4 Cactus model. This statement reveals a contribution to previous scientific literature and represents an important new line of scientific research.

With regard to the clients assisted variable, in spite of the fact that the results do not produce significant estimates, it is observed that the innovation coefficient *(p)* decreases once past the introduction stage (August 2014 - March 2015) and entering the growth stage (April 2015 - August 2015), while the imitation coefficient shows the opposite evolution: an increase between the introduction stage and the growth phase.

A greater imitation coefficient *(q)* is obtained in period 2 (April 2015 - August 2015), which corroborates the fact that this period must be treated as a PLC growth stage. In addition, the results of both the introduction and growth stages are significantly different for every level of significance (and thus we must reject the parameter equality hypothesis). However, and while the results can be interpreted, they are not significant for any of the customary levels of significance.

In light of the results presented here, we may question whether, by choosing the clients assisted variable, based on the estimates presented, we are giving priority to the analytical tool over the business objective. In this regard, it is true that beyond the fact that the clients assisted variable correctly fits the Bass Model, the authors must consider whether this variable is useful for making success predictions or for the future evolution of the product. To this end, the researchers made a six-month prediction using both variables for the C4 Cactus model (since this model covers the different stages in the same cycle), using in both cases a first-order moving average time series model. This model proved to be the one that best represented the behavior of both variables. The results obtained show that the measurement and goodness of

The authors propose the use of the clients assisted variable over the sales variable for the analysis of the PLC

fit statistics for the prediction made provide similar results with both variables, producing a Theil's U statistic of 0.87 in the case of the clients assisted variable and 0.89 for the sales variable. While these results and their proximity to 1 show a prediction that is not very useful, since it does not contribute anything more than the use of the criterion $P_{t+1} = X_t$, they reveal that neither variable is identified as better than the other as a predictive tool. Therefore, the authors logically believe that both variables are equally useful for forecasting.

As a result of everything indicated in this article, it can be stated that the clients assisted variable is more functional and effective than the sales variable for the following reasons:

- The forecasts obtained from both variables (clients assisted and sales) fail to reveal that one variable is any better than the other.
- The ease in recording and monitoring the clients assisted variable is the same as for the sales variable.
- However, the sales are affected by macroeconomic phenomena that negatively affect its usefulness as a reference variable for the analysis of the PLC. This aspect advises against the use of sales as the sole aspect for evaluating the business success of a product.
- Furthermore, it has already been indicated that, over the short term, sales are a more seasonal variable than the clients assisted variable, since the purchase itself is linked to certain times of the year, such as the months of March and June.

In short, the authors propose the use of the clients assisted variable over the sales variable for the analysis of the PLC for the following reasons:

- The clients assisted variable better fits our Bass Model.
- It is a variable that is equally effective for forecasting.
- The data for both variables are equally easy to obtain by companies.
- The clients assisted variable is unaffected by macroeconomic phenomena and its seasonality is lower than for the sales variable.

4.3. Comparison of the behavior of the C3 throughout the different sub-periods (analysis 3)

Table 6 shows the previous analysis, but only for the case of the C3 model. Just the opposite of what occurred in the analysis of the C4, the results for the different sub-periods are all

Table 6
MCNL estimate for the C3, differentiating among three sub-periods

	Innovation coefficient (p)	Imitation coefficient (q)	R^2 of the model
Clients assisted (C3)			
August 2014 - March 2015	0.0755***	0.1814**	0.99
April 2015 - August 2015	0.0118***	0.1330***	0.99
Sales (C3)			
August 2014 - March 2015	0.0783***	0.2922**	0.97
April 2015 - August 2015	0.0113***	0.1232**	0.96

The significance of the estimated parameters is displayed next to each estimate: *** <1%; ** 1-5%; *<5-10%.

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significant at the 5% and 1% level for the C3, regardless of whether the clients assisted or the sales variable is used. However, if we consider the regression fit, once again the results obtained for the C3 model reinforce those obtained for the C4 Cactus model in terms of the greater efficiency of the clients assisted variable. The result of this analysis is the discovery that, for the estimation of each of the stages of the PLC, the clients assisted variable is more efficient and more consistent than the sales variable for the behavior of the C3 model, as occurred in analysis 2 for the C4 Cactus model. This statement reinforces the results of Analysis 2 and reveals discrepancies with the previous scientific literature, reinforcing this interesting new line of scientific research.

The results for the C3 show that the criterion that the innovation coefficient *(p)* is lower than the imitation coefficient *(q)* is once again met. Furthermore, the hypothesis that the results of the values produced by the imitation coefficient are equal is not rejected, and thus no difference is observed between the two stages.

If the results are compared to those obtained in the analysis of the C4 Cactus, we see that in the period April 2015 - August 2015 the *q* value is significantly greater than that obtained for the C3, which reinforces the evidence that the C4 is in a growth stage in which the C3 is not.

5. Conclusion

This work opts to use the clients assisted variable for the PLC analysis for the purpose of evaluating its usefulness in the Bass Model and its usefulness in dating the life cycle stages of a product (PLC) for durable goods, as compared to the sales variable commonly used in the existing literature.

This article is in line with the results obtained in previous works, such as those by Rodríguez Escudero (1996), Aguilar et al. (2012), Muñiz Ferrer (2008) and Mahajan & Muller (1979), which propose that the sales variable is not the best measurement parameter, as it is affected by economic and sociodemographic variables. These authors indicate the lack of usefulness of forecasts based on this variable over the long-term, when used for PLC analysis, given the extreme sensitivity of the sales curve to the initial conditions.

The bibliography reviewed in this research proposes that the knowledge of the stages of the PLC is a relevant challenge within the business strategy (Shankar et al., 1999; Rink & Swan, 1979; Palacios, 2013). Likewise, this knowledge of the PLC stages makes it possible to improve product-price positioning, as well as improving the effectiveness of marketing strategies in companies (Kaldasch, 2015; Moon, 2005). There is a broad consensus on the part of different authors on the need to take into account the PLC when determining the marketing strategies that must be followed. As explained in this empirical work, the main differences among the authors who defend the usefulness of the PLC and those who are critical of its use in business practice lie in the accuracy of the forecasting capacity of the sales for the PLC analysis (Muñiz Ferrer, 2008). This power to forecast the future could be implemented with the use of the clients assisted variable in the future, as shown in this article.

This statement is in line with the previous articles such as that by Camacho and Galiano (2009) who indicate that sales, which are currently the performance parameter commonly used for PLC analysis, may not be the most consistent variable because they are affected by certain economic phenomena, such as general price increases in the economy (inflation), or by variations in relative prices (certain products compared to others).

Sales are a more seasonal variable than the clients assisted variable, since the purchase itself is linked to certain times of the year

In the field of marketing and sales strategies, the analysis and duration of the PLC stages is relevant. The authors propose comparing the use of two variables in the dating of the PLC: sales and clients assisted in the Bass Model. This article also establishes the dates for and shows the stage or stages in which two specific products are found within the Spanish automobile sector: the Citroën C3 and the C4 Cactus. Both vehicles have been analyzed to consider the acceptance of both models during the study period (Rodríguez, Olarte-Pascual & Saco, 2017) and therefore the acceptance of the models cannot be considered a distorting factor affecting the research results.

The results obtained based on a strategy of analysis that follows three differentiated steps in time are as follows:

- Analysis 1 shows that the complete period of study, from August 2014 to July 2016, indicates that the C3 and C4 Cactus models are passing through different stages. This fact is also corroborated in the comparative analysis of the strategy 2 and 3. This coincides with the scientific literature. In this research, it has been shown that the clients assisted variable is more efficient for this analysis than the sales variable.

- Analysis 2 reveals that the clients assisted variable proposes results that are more efficient and more consistent for estimating the PLC than the sales variable for the C4 Cactus model. These results represent an interesting new line of research, since they permit a greater and better fit to the PLC than that obtained with the sales variable.

- Analysis 3 reveals that the clients assisted variable proposes results that are more efficient and more consistent for estimating the PLC than the sales variable for the C3 model. In the previous analysis, it is observed that the C4 Cactus is in the growth stage, as it shows a high imitation coefficient that is significantly different from the previous period, which is not the case with the C3. These results offer the possibility for improved control over the effectiveness of the marketing strategies throughout the PLC.

- The estimate by the Bass Method obtains consistent results with analyses 1, 2 and 3 of this research. The conclusion obtained in this study is that the clients assisted variable provides as a result estimates that are more efficient and consistent than those of the sales variable. Therefore, hypothesis 1 of this research is accepted.

Over the short term, sales are a more seasonal variable than the clients assisted variable, since the purchase itself is linked to certain times of the year. It should be noted that both variables are equally easily to obtain. This is due to the fact that companies have records of clients assisted that permit them to know the store traffic and therefore know whether their volume of sales is due to the number of customers who visit the store or to the conversion rate.

The clients assisted variable is an element that is just as easily available to companies as sales data. However, the use of this variable improves the analysis of the PLC, which enables companies to improve their forecasts. The clients assisted variable becomes a tool for strategically planning investments in innovation and marketing, thus reducing uncertainty in business management.

The use of the clients assisted variable is recommended in the field of business for the calculation of the PLC stage because it enables us, first of all, to know the speed with which customers adopt the new innovation, and to determine the behavior and influence of innovators on imitators; and secondly, because it helps those responsible for marketing to

The clients assisted variable becomes a tool for strategically planning investments in innovation and marketing, thus reducing uncertainty in business management

design a communication plan in the most effective manner in terms of determining the objectives, the instruments to be used, the investment in communications in the different stages of the PLC and/or the decision to prolong the maturity stage, to continue to attract new users to the dealership and to create brand preference.

As a final conclusion, the results show that the C3 and C4 Cactus models are in different stages of the PLC, which is consistent with the previous literature. The C4 Cactus model is clearly in a growth stage, in which the greater influence of the imitators is observed, while the C3 behaves differently and does not form part of this stage.

However, what is most noteworthy about this research is having demonstrated the functionality of the clients assisted variable over the sales variable for the Bass Model and thus for estimating the PLC. These results open a new and interesting line of research on which the authors of this article intend to elaborate in future studies.

5.1. Limitations and future lines of research

The main limitation of this research is the lack of prior scientific literature that uses the clients assisted variable in the Bass Model. In any case, the theoretical framework on the Bass Model in the analysis of the PLC is quite limited as compared to other areas of analysis of the product variable (Suomala, 2004).

Another limitation to this article is that this study focuses on analyzing durable consumer goods. This aspect represents a limitation when it comes to extrapolating the results. Therefore, it is recommended to replicate this study in other activity sectors to contrast the results.

The time horizon analyzed can also be considered a limitation, as it does not include the decline and product removal stages, which are quite ephemeral in the automotive sector.

On the other hand, the main lines of research that are opened based on this study are the following:

- Analysis of the PLC, including all its stages.
- Analysis of the behavior of the conversion rate in each of the stages of the PLC.
- Delving deeper into the relationship between investment in communication, clients assisted and the PLC.

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Effective presentation e-merchandising techniques. The importance of review the literature to improve the management of digital companies

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Abstract
Can we influence the behavior of online shoppers through the inside layout of the online store? When merchandising emerged for more than a hundred years, many researchers have analyzed the influence of the point of sale on the consumer's emotional states and their buying behavior. However, although online stores are the ultimate exponent of self-service, there is hardly any research on e-merchandising. Therefore, an exploratory study is conducted in order to better understand the context of the research and to make an approximation to the variables of interest within the study area, which will allow e-commerce companies to know which e-merchandising techniques must implement for efficient business management.

Keywords
E-commerce merchandising, web design, information architecture, perceived risk.

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Merchandising: set of commercial techniques related to distribution marketing aimed at achieving a situation where the products sell themselves, in the best material and psychological conditions

1. Introduction

In the early part of the 20th century, with the birth of the free service trade, the figure of the seller disappeared and products had to begin to sell themselves. It was at this time that merchandising emerged, understood as the set of commercial techniques related to distribution marketing, the aim of which is to achieve that the products sell themselves, under the best material and psychological conditions, i.e., meeting the needs of the market and improving the profitability of the point of sale (Salén, 1994).

In general, consumers use key factors in the selection of the point of sale, such as differences in products and prices, for example. However, when these are minimal between the different establishments, consumers need more discriminating criteria, and thus matters related to the point of sale become particularly relevant (Reinares & Calvo, 1999). This is true to the point that some authors have gone so far as to suggest that weather conditions may even have a greater influence on purchasing decisions of individuals than the product itself (Kotler, 1973).

Along these lines, it is no wonder that in online stores, the ultimate expression of self-service, it is even more necessary to intensively develop communication strategies capable of persuading and enticing shoppers (Martínez, 2005). In light of this need, merchandising techniques have shifted towards the virtual shopping context, with the aim of attracting users and providing a convenient, quick and entertaining visit that ultimately promotes better sales results (Lorenzo, Mollá & Gómez-Borja, 2006).

Electronic merchandising (also known as e-merchandising or e-commerce merchandising) is therefore the "integration of all the persuasive communication and marketing actions that are carried out on the online point of sale and with the aim of maximizing profitability by generating value for customers and managing information" (Martínez, 2005).

The influence of the factors that define the physical shopping environment on the emotional states and shopping behavior of individuals is a fact that has been more than demonstrated in the literature (Babin, Darden & Griffin, 1994; Baker, Parasuraman, Grewal & Voss, 2002; Bitner, 1992; D'Astous, 2000; Donovan & Rossiter, 1982; Mehrabian & Russell, 1974; Turley & Milliman, 2000). However, much less research has been done on its nature and effectiveness in web environments (Gómez & Lorenzo, 2006; Puente, 2016). As a matter of fact, a simple initial search of the different multidisciplinary digital databases of recognized prestige (such as ScienceDirect, Springer, Wiley, Taylor & Francis and Emerald, for example) is enough to see that the e-merchandising applied to the mass market food-based sector has received little attention in the literature. For this reason, it is considered fundamental to carry out a thorough review of the literature that will allow us to have a better grasp on the context of the research and give us a tentative approach to the analysis variables that are of interest within this area of study.

The objective is definitely to identify some implications for management that would enable online shops in the mass market food-based sector to design their websites efficiently, merging the information architecture with persuasion to guide the user toward the final objective, which is the purchase. For this reason, from a methodological point of view, we have considered the multidisciplinary nature of the topic, analyzing the literature from both the commercial and marketing area and that of computer science and usability.

2. Presentation e-merchandising

Throughout the literature, various researchers have studied the customer shopping experience (Chang & Huang, 2016; Fatma, 2014; Fernández-Sabiote & Román, 2016; Homburg, Jozić &

The design of the online store is a crucial factor to create satisfactory, long-lasting experiences

Kuehnl, 2017; Lin & Bennett, 2014; Lipkin, 2016; Pappas, Pateli, Giannakos & Chrissikopoulos, 2014; Sukwadi, 2015; Trevinal & Stenger, 2014), understanding it to mean the set of human states and activities (Ranjan & Read, 2016) during each individual's contact with the company (Puccinelli, Goodstein, Grewal, Price, Raghubir & Stewart, 2009; Homburg, Jozić & Kuehnl, 2017). According to Kamaladevi (2010), consumer shopping behavior can be significantly influenced by the atmosphere of the shop. Along these same lines, authors like Joshi (2014) and Li and Yeh (2010) suggest that the design of the online store is an essential factor to generate successful, long-lasting experiences.

Dailey (2004) defines the web environment as "the intentional design of web environments to create positive cognitive and affective states in users, with the intent of favorably increasing the shopper's responses (for example, revisiting the website or browsing the site longer)". Many studies recognize web design as a key factor for the development of successful e-commerce (Huizingh, 2000; Jarvenpaa & Todd, 1997; Ranganathan & Ganapathy, 2002), stressing in this regard the importance of presenting good contents, with quality information and easy, attractive navigation (Burke, 2002).

Obviously, in virtual environments, the shop is reduced to the screen of the computer or device in question, so it lacks three of the five appeals to the senses (smell, taste and touch). In addition, there is not direct contact with other people in the shop (employees or customers). However, research by Vrechopoulos and Siomkos (2002) shows that these shortcomings can be overcome with other properties that, in the right combination, can create a significantly different context than that of traditional brick-and-mortar stores, but not necessarily one that is less profitable.

Within e-merchandising, the techniques focused on the way to present items in the shop with the intention of making the purchase as easy as possible for the customer and as profitable as possible for the merchant are those of presentation e-merchandising. This is a subcategory within e-commerce merchandising that encompasses multiple techniques. No common classification criterium is found in the literature, which is why the decision was made to approach them according to two large groups: those related to the interior layout of the point of sale and those related to the presentation of stock (Díez de Castro & Landa, 1996; Masson & Wellhoff, 1991).

2.1. Interior layout of the point of sale

Within the first group, from the perspective of the interior layout of the point of sale, the traditional merchandising techniques are classified into three large subgroups: those related to the customer circulation flow, those concerning the arrangement of the sections and those linked to hot and cold spots in the point of sale.

2.1.1. Customer circulation flow

With regard to the first category, those related to the customer circulation flow, it must be said that the aim is to get the customers to circulate throughout most of the sales area, but without giving them the impression that they are being forced to follow a preset route (Díez de Castro & Landa, 1996; Escrivá & Clar, 2005). To accomplish this, we rely on three pillars: itinerary, speed and duration or length of the visit.

1. Itinerary. In the brick-and-mortar world, the path a customer follows inside the store can be modified by varying certain factors, such as the position of the boxes and the entrance door (Kumar & Karande, 2000), the way the furnishings are arranged (Newman, Yu & Oulton, 2002), product placement (Lorenzo et al., 2006; Zorrilla, 2002) and the use of information elements (Díez de Castro & Navarro, 2003).

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Its aim is to encourage customers to circulate throughout most of the sales area, but without giving them the impression that they are being forced to follow a set path

In the online environment, when users have just landed on an e-commerce site, they can perform one of two actions (Nielsen, 2000; Nielsen & Loranger, 2007): they can search directly for what they need, in which case navigation has a goal-oriented objective, or they can browse the website freely, in which case a more experiential approach would predominate. Regardless of the action chosen, it is important for the virtual merchant to contemplate both options when designing the information architecture of the website, i.e., the articulated combination of systems used to organize, label, search and navigate, with the aim of improving how users utilize them (Baeza-Yates, Rivera & Velasco, 2004; Hassan & Ortega, 2009; Martín & Hassan, 2003).

The organizational systems are composed of schemas that divide and classify the website contents, and of structures that organize said contents, revealing the logical dependencies between them. An important aspect that must be taken into account in the navigation structure is establishing who is in control of it. With a more rudimentary design of the interface, the web designer can control where the user will go. However, the most modern web designs are characterized by greater flexibility in navigation that gives control to the users, since the fact that they can see all the hyperlinks available on every page makes searches easier and allows for quicker movement. This gives users the impression that they are using and controlling the entire website, and not just a certain page. Some of the methods that can be used to reduce the clutter in navigation are aggregation (showing an information unit that represents a set of smaller units), summaries (presenting a large amount of data with a lesser amount), filters (which allow the elimination of complete blocks of information that are not of interest), pruning (cutting out all of the content except for the initial parts of the information, and allowing the user to expand them) and example-based representations (displaying only some representative models and communicating that there are others) (Nielsen, 2000).

In terms of labeling or marking systems, it must be said that when users are in browsing mode, they usually ignore the large blocks of content and focus their attention on the links to get an idea of the meaning of the site. For this reason, it is crucial to create names as short and specific as possible to maximize browsing. It is also recommendable to intensify the links starting with an informative keyword that helps users to quickly identify what interests them (Nielsen & Loranger, 2007). The objective is to facilitate access to the information, so it is important to present the content in an efficient manner by using the right labels.

Thirdly, in terms of search systems, it should be noted that, generally speaking, every time a user accesses a website, it is because they are looking for something. Therefore, the success of a website lies in visitors being able to find what they are looking for in the shortest possible time. Searches are such an important part of the web experience that users harbor great expectations about the way they should work. The internal search engine is one of the most important design elements of a website and it is especially useful for searchers who know exactly what they want and what terms they should enter in the search box. That being said, offering good categories of links encourages browsers to explore the website and discover what is available, especially when they are simply glancing over a website in search of an emotional experience or they do not know the most appropriate search terms. Bearing in mind that more than half of the users opt for searches, nearly one fifth of them follow the links and the rest exhibit a combination of behaviors, it is clear that promoting both types of behaviors is important in order to capture a wide audience (Nielsen, 2000; Nielsen & Loranger, 2007).

According to user expectations, some of the factors that are used to assess the suitability of an internal search engine are: its location (it must be located in an area with a high visual

The success of a website lies in visitors finding what they are looking for on it in as little time as possible

hierarchy, preferably on the right-hand side, and be accessible from anywhere in the structure), its identification and clarity –there are three standard elements any search engine should have so that users can identify it as such (Koyani, Bailey & Nall, 2004; Nielsen & Loranger, 2007): a box to type in words, a button labeled "Search" and a SERP page or a page with the most relevant results, listed in order according to their relevance–, its autocompletion option (a functionality that attempts to predict the user's search as it is being typed, thus making the process faster) and the size of the box (considering that larger search boxes are better, because they reduce the possibility of making a mistake and encourage users to enter longer queries, which usually leads to more accurate and useful results; it is recommended for search boxes to be thirty characters wide), among others (Koyani et al., 2004; Nielsen & Loranger, 2007).

Finally, with regard to navigation systems, it should be mentioned that in conventional retail environments, shoppers look for the products they want through the identification of the spatial representations of the store design and by recognizing how the products are grouped (Titus & Everett, 1995). Traditional merchants combine different elements that make up the atmosphere of the store in order to provide the customer with an easy, convenient and entertaining visit (Baker et al., 2002). Likewise, virtual vendors use texts, images and links as signals that facilitate the user's navigation within an online point of sale (Hoffman & Novak, 1996). Attractive web designs must be created that are fun and easy to navigate, in order to get users to spend more time on them. Thus, an effective design of the web interface can lead to a competitive advantage for merchants (Alba, Lynch, Weitz, Janiszewski, Lutz, Sawyer & Wood, 1997).

Vrechopoulos, O'Keefe, Doukidis and Siomkos (2004) investigated the effects of shop design on buyer behavior in a virtual context and found that the traditional design is not directly applicable to this environment, since the effects on the individual responses do not match what is established in the literature on conventional commerce in this regard. For this reason, they suggest adapting the virtual designs and using them with special care in order to achieve the desired effects. Vrechopoulos (2001) and Vrechopoulos and Siomkos (2002) distinguish three types of organizational designs for online shops*:* the network design (hierarchical navigation network in the form of an inverted tree based on the criteria of "being part of" something and characterized by the use of restrictive navigation bars), which is the equivalent of straight grid placement of physical retail shops; the circular design (users are guided by the system along certain paths, so they can search for the products they want, which implies the mandatory use of the forward-backward bars on the browser), which is equivalent to a herringbone arrangement; and the free design (a non-restrictive navigation structure that allows users to move freely through all the pages of the website through multiple links provided on each page; this design is thus characterized by facilitating immediate access to each existing category).

The stimuli that make up the virtual environment (specifically, the navigation design) affect the internal statuses and the behavioral responses by users (Bigné & Andreu, 2004; Childers, Carr, Peck & Carson, 2001; Dailey, 2004; Eroglu, Machleit & Davis, 2001). In general, users have more positive internal states when they are exposed to non-restrictive web designs, which in turn favors their rapprochement responses. According to Dailey (2004), when companies develop environments with restrictive navigation structures, people experience increasing levels of negative emotions, such as frustration, anger and hostility. On the other hand, in free navigation web designs, users purchase more products and spend more money than in network designs, although they spend more time on the website in the latter case (possibly because navigation is more difficult due to the greater

In free navigation web designs, users buy more products and spend more money than in network designs

restrictions, and therefore they need more time to browse through the entire shop) (Lorenzo, Mollá & Gómez-Borja, 2009).

2. Speed. The elements that have an influence on the agility of movement within the brick-and-mortar store are the width and length of the aisles, the presence of bottlenecks and the information on the location of departments and products (Díez de Castro & Navarro, 2003). In the online world, in turn, speed is also a *conditio sine qua non*. To achieve optimal usability (UX or User Experience), the pages need to download in less than one second (Koyani et al., 2004). Given that the decision to remain on a website or to leave it is usually made on the home page (or after examining one or two pages linked to it), this page must transmit value immediately and allow visitors to find what they are looking for within a margin of two seconds. If the home page is slow, users will conclude that the rest of the site is also slow, and it is more likely that they will abandon it (Nielsen & Tahir, 2002).

The bottlenecks inherent in the physical world can be compared to online situations in which collapses occur that hinder the natural activity, such as the lack of trust, usability or information. Along these lines, there are three most probable forms of risk in virtual shopping environments: financial risk (to avoid this, it is necessary for the customer and the merchant to establish a relationship based on mutual trust, and thus it is necessary for the merchant to opt for transparency in terms of prices and privacy, returns and security policies, to offer corporate information that shows the user that behind the website are real, honest people, to opt for flexibility of payment and shipment, and to maintain contact with the customer during the purchasing and delivery process) (Alonso & Grande, 2013), functional risk (the design must be attractive, simple and effective, since online shopping is influenced not only by the cultural, personal, social and psychological characteristics of the individual, but also by his or her Internet shopping skills, which may present a barrier for some people, in spite of the fact that for others they enhance the convenience aspect) (Dholakia & Uusitalo, 2002; Jee & Lee, 2002; Kim & Eom, 2002) and the psychological risk, which alludes to the doubts users have when they go to purchase a product and they do not have the information they need to make the final purchasing decision. In the latter case, to eliminate this, it is necessary to design the product pages in such a way that they can provide the information they need to make buying decisions with confidence, according to the different phases through which they pass. It would be ideal for them to be designed in layers, first showing the key points, along with specifications and general details of the products (Nielsen & Loranger, 2007).

Along these lines, the first step in any shopping process is attention (Nielsen & Loranger, 2007; Nielsen & Pernice, 2010). This is the first contact the user has with the product, so the page must include the product name, some pictures, its price and availability and a button to add it to the shopping cart. It is important for the price to be shown from the outset, since it is one of the first pieces of information that any shopper wants to know, since it provides some clues as to the value of the product, whether it matches the budget and whether they are shopping in the right segment. It is also a key component for comparing products. Not showing prices to users goes against their needs and creates a hostile shopping environment. The prices should be shown both on the products lists for each category and on the individual pages for each product, since forcing the customer to have to go back and forth is inconvenient. Likewise, it is recommended to show any additional costs as soon as possible, and in any case on the first page of the shopping cart, to prevent unnecessary surprises. As far as pictures go, a priority is for them to be clear and to provide added value for the user (providing different views of the same image or adding rotation functions, for example), since customers look at them even when they are buying products that are not important to

The length of time that users spend on a web page follows a Weibull distribution

see and whose complete description they have already read (Nielsen & Loranger, 2007; Nielsen & Pernice, 2010).

The second step is interest. Once the product has captured the attention of the user, it is quite likely that the they feel that it meets their expectations, but they are still not sure, so they will try to expand on the initial information. In this case, the product information must include a description of the product and its features, as well as secondary images and videos. Precise descriptions with appropriate images help customers make confident buying decisions, but they need to be detailed enough to help differentiate the product. It is recommended to facilitate the purchasing decision as much as possible, enabling customers to narrow down their options. To do this, it is best to provide support for comparative sale through the use of tables, since these are usually the most effective method for communicating differences between similar items (Koyani et al., 2004; Nielsen & Loranger, 2007).

The third step is decision. This last level is not necessary for all users. It includes evaluations, recommendations of alternative products, comments and videos created by other shoppers and information from the social networks.

3. Duration. Liu, White and Dumais (2010) discovered that the time customers remain on a web page follows a Weibull distribution, in such a way that 99% of all websites have a negative aging effect, since customers know that they have a very variable degree of quality and do not usually waste time on those of poor quality. This implies that the first ten seconds of the visit are critical when making the decision to stay on the web or abandon it, with a very high probability of leaving it during this period. After this first screening, users take a look at the website, subjecting it to a second evaluation, and therefore, during the next 20 seconds, the probability of abandonment remains very high. It is only after people have remained for thirty seconds that the curve becomes relatively flat. The length of time a user stays on an e-commerce site is related to the two variables mentioned above: the itinerary, or the number of pages seen, and the speed of movement, in which we must pay special attention to the speed with which the website loads. Just like offline shopping environments, it is impossible to establish the optimal duration for a visit, but it must be kept in mind that excessively quick visits (as shown by indicators such as the bounce rate) are negative, because they indicate almost zero interest on the part of the user. Likewise, excessively long visits may mean one of two things: that navigation is difficult and excessively restrictive, which forces the user to make a greater effort, or that the content is of great value to the user. Therefore, the ideal duration will be that which permits users to fulfill their objectives in a satisfactory manner and leave the e-commerce site with a feeling of having had a good experience.

2.1.2. Layout of the sections

Continuing on with the merchandising techniques related to the interior layout of the point of sale, we should mention in second place the techniques related to the layout of the sections. The customer behavior model by Chétochine (1994) differentiates between planned or scheduled purchases (those the customer has thought about before entering the point of sale and the search for which constitutes the reason for his or her movement) and unplanned or impulse buys (the result of having seen the product at the point of sale), which are those that make a difference in a company's profits and in which presentation merchandising is especially important. Therefore, it is vitally important to know the impulse coefficient for a point of sale (the relationship between the planned and unplanned purchases) in order to properly allocate the sales space among the different sections so that they present a logical, rational order that makes shopping easier (Alonso & Grande, 2013; Díez de Castro & Landa, 1996; Miquel,

The presentation of products in a strategic location, depending on the moment, demand, seasonality and characteristics is a key factor

Escrivá, Clar, Miquel & Parra, 2004; Quintanilla, 2002). The presentation of the products in a strategic place, according to the time, their demand, their seasonality and their characteristics is a key factor that must be given careful consideration, depending on the type of product (Lorenzo et al., 2006; Zorrilla, 2002).

Along these lines, we must distinguish among several types of products (Díez de Castro & Landa, 1996; Escrivá & Clar, 2005; Reeves, Moose & Venema, 2014). First of all are the products with the power of attraction, the star products, i.e., the best-sellers. It is a good idea to put them in different sections to promote navigation and increase the amount of time spent on the website. Placing them on the home page is also a selling point. Secondly, it is possible to differentiate between products that constitute rational purchases and those that are impulse buys. Taking into account the decision-making process in each case, it is recommended that the former be accompanied by a video or interactive image that allows the user to reflect on the purchase and see the added value of the product. However, in the latter case, it is a good idea to reserve a strategic location, such as the start of the payment process (the equivalent of the check-out lanes in traditional supermarkets), and to visually show that the product is on sale.

Thirdly, when it comes to segmenting the catalog into categories, it is important to consider complementary products. Cross-selling and upselling are cross sales strategies based on the recommendation of complementary or related products, equivalent to the typical "Can I get you anything else?" that we so often hear in traditional shopping environments. Cross-selling is a sales multiplier that offers users several products that complement their selection in order to increase the amount of their order. In this case, the ideal thing is to show this type of products once the user has added the original product to the shopping cart, but avoiding any distractions. A good way to do this is to appeal to impulsiveness, facilitating their purchase with a single click, with no need to show the full product information to the user. Upselling offers users a similar product to the one they are seeing, but one that is more profitable for the company. It does not necessarily have to be more expensive; it can have a higher profit margin or the store may just be interested in selling it for other reasons, such as an overstock, for example. It is important to bear in mind that this technique must be implemented before the user adds the product to the cart, since otherwise it could result in a lost sale as the result of too much distraction. Unlike cross-selling, upselling does not attempt to multiply sales, but rather to trigger conversion through product comparison. Product recommendations are a very powerful tool that enables us to reduce the number of clicks that users must make to buy a product, thus increasing the conversion rate (CR) and the average order value. They can be implemented through joint promotions or by showing users other items related to the one they are seeing to provide different options for purchases and prevent customers from leaving the site because the specific product they are looking at fails to interest them.

2.1.3. Hot and cold points

Finally, to conclude the discussion of the merchandising techniques related to the interior layout of the point of sale, it is necessary to analyze the hot and cold points. All designers know that their websites compete with others for the attention of the public, but it is true that competition also exists within each page: menus, images, links and promotions compete with one another for the visitors' attention, and not all of them can win. Understanding how users look at web pages and what type of elements catch their eye helps determine where and how to place the most important content and how to keep the page elements competing for their attention. In online shopping environments, web analytics and techniques like eyetracking make it possible to identify hot and cold areas of the e-commerce site. The prominent locations of a website are usually the home page, the main page of each section, the first screen of each page (above the fold) and the top part of the menu (Nielsen & Pernice, 2010).

The commercial function must be defined based on the imperatives of usability and efficacy, which must be made compatible with attraction and convenience

This being the case, what causes users to dedicate more visual attention to one area of the interface over another? To answer this question, we must first understand that during the first moments of visual perception, the information flows massively in the form of basic characteristics: color, movement, orientation, size and other similar aspects. People voluntarily and actively guide their attention, deciding what graphic properties (characteristics of the desired objects: links, text, images, controls, etc.) they want to pass through the filter of visual attention and which they do not at each particular moment; this activity can be facilitated or hindered. According to the type of element they are looking for with each visual search, users are more likely to pay attention to the areas of the interface where it is usually found on most websites (Hassan & Ortega, 2009).

2.2. Presentation of stock

Presentation e-merchandising, like its corresponding equivalent in the physical world, is focused on the method of presenting the items in the store to promote sales, with the caveat that in the virtual world, the products have a great disadvantage: their intangibility. Customers cannot touch the product, so they cannot be sure of the correspondence between the visual quality that they see on screen and the real quality (Lorenzo et al., 2006). The counterpart to this is that the tangible signals from the environment help shape the attitudes and behaviors of consumers (Baker, Grewal & Parasuraman, 1994; Bitner, 1992; Shostack, 1977; Zeithaml, 1988).

The website content is one of the key factors for the success of virtual trade transactions and contribute to ensuring future visits (Rosen & Purinton, 2004). Both the general and specific information about the products and the structure and spatial layout of said information represent design tools that influence the perceptions of users (Van der Heijden & Verhagen, 2003; Khakimdjanova & Park, 2005) when it comes to decision-making (Lurie & Mason, 2007), their satisfaction with the website (Liu & Arnett, 2000; Zviran, Glezer & Avni, 2006) and their online buying intention (Richard, 2005). In terms of defining the "customer's information environment," we must bear in mind that users react differently, depending on how the product is presented (Lynch & Ariely, 2000; Hong, Thong & Tam, 2004).

The visual information includes images and graphic elements that show the information more clearly and succinctly (Lurie & Mason, 2007), which facilitates decision-making. Appearance is one of the main dimensions of the quality of a website; it determines whether the user ultimately decides to enter the store, improves the perception of the information needed to make decisions and can lead to greater satisfaction on the part of individuals (Kim & Stoel, 2004; Melián & Padrón, 2006; Tan & Wei, 2006). Normally, e-commerce websites attempt to improve the quality of the visual presentation of the products by increasing the size of the images and using better-quality formats, 3D effects and images with movement. However, doing so creates a technical problem, given that the website loads more slowly. Faced with this dilemma, online stores need to be aware that in a commercial environment oriented towards sales and customer loyalty, the communicative function of the website is situated in a framework in which the more intuitive the functionality is, the better. Therefore, the commercial function must be defined based on the imperatives of usability and efficacy, which must be rendered compatible with attraction and convenience (Lorenzo et al., 2006).

Textual information, in turn, includes the verbal descriptions of the products that offer detailed information about their characteristics (Kim & Lennon, 2008) and can be presented in one of two ways: in paragraphs with the information on the product characteristics or in a schematic form, with lists/tables of characteristics and specifications. The literature has demonstrated that users process information better when it is in the latter form (Koyani et al.,

Digital marketing is an area that is enriched by including variables from other disciplines (such as psychology and computer science) when studying consumer behavior

2004; Lurie & Mason, 2007), since it is easier to remember and facilitates knowledge about the product and the purchasing decision.

Generally speaking, there is no optimal combination of the two types of information (visual and textual) that represents the best option in every case, but rather it depends on several factors, such the type of product, shopper characteristics or their needs when searching for information. Nonetheless, it has been demonstrated that visual information plays a more important role than textual information in the context of online supermarkets, while textual information carries a greater weight in products related to fashion and electronics (Lohse & Spiller, 1999).

3. Final considerations with regard to presentation 'e-merchandising'

Although there is research that analyzes specific techniques (Vrechopoulos, 2001), the truth is that from a theoretical point of view, e-merchandising lacks a solid framework of study (Puente, 2016), which complicates the efficient management of digital companies.

Digital marketing is an area that is enriched by contemplating variables from other disciplines (such as psychology and computer science) when studying consumer behavior and the new phenomena resulting from the use of new technologies (as in the case of e-commerce). For this reason, the main contribution of this study is a review of the multidisciplinary literature, which by analyzing e-merchandising with the same structure as its physical counterpart, allows us to know the similarities and differences that exist between the two, considering them in greater depth and taking a first look at the analytic variables that are of interest within the area of study and that have been explained throughout this text (such as the different types of perceived risk that act like the bottlenecks found in the physical world, for example), which is not only useful for future research, but also for the professional practice of sector companies.

In this regard, it is important to point out certain implications for management:

- **Interior layout of the point of sale:**
  - **Customer circulation flow (itinerary, speed and duration):** mass market purchases can be classified as planned or scheduled, since normally before entering an online point of sale, users have thought about what products they are going to buy and it is precisely the search for these products that motivates their circulation. The first ten seconds of the visit are critical when it comes to making the decision to remain on the website or to abandon it, so the website must download in less than one second and help users find what they are looking for in less than two seconds, preventing the bottlenecks typically found in the online media (lack of confidence, usability or information). Although key performance indicators (KPI) must be defined according to each business and sector, as a guideline, an ideal rebound rate could be considered to be less than 40%. Bearing this in mind, it is crucial for online supermarkets to have a good information architecture (an articulated combination of organization, navigation, search and labeling systems aimed at improving how users utilize them).
    - **Organization and navigation systems:** the most effective web design to improve the ease of use of an e-commerce site is a network design, i.e., opting for a hierarchical navigation structure characterized by the use of restrictive navigation bars. However, considering that free designs (non-restrictive navigation structures that facilitate the

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It is necessary to bear in mind that users react differently, depending on how the product is presented

immediate access to each category) improve variables such as perceived usefulness and time, which cause users to buy more products and spend more money, the best recommendation is the combination of both designs, so that the e-commerce organization system relies on a hierarchical structure, but with a free navigation system so that users can choose the product category they wish to see at any given moment, without this decision impeding the free access to others. Furthermore, the navigation menu should be in a single row at the top of the page.

- **Labeling systems:** short, specific names should be used, as well as carefully chosen key words to facilitate access to information and prevent common problems such as ambiguity, arbitrariness and disorientation. Along these lines, it is not recommendable to categorize food according to the type of meal throughout the day (e.g., breakfast, snack, supper), since consumption habits vary and it is not always clear what products belong in each category.

- **Search systems:** it is recommended for the search engine to be an open field not enclosed in the navigation menu and located at the top of the website (preferably the top right corner).

– **Layout of the sections:** taking into account that the impulse buy coefficient in a supermarket is minimal, the presentation of products in a strategic location is a key factor for success.

- **Products with the power of attraction:** the best-selling items must be placed in different sections (including on the home page) to promote navigation and increase the time spent on the website.

- **Impulse buy products:** given the low consumer involvement with mass market products, it is important to boost their impulse buying by placing certain products in a strategic location that does not interfere with the search task (for example, at the start of the payment process).

- **Complementary products:** taking into account that the mass market sector is characterized by very low prices and per unit profit margins and its profitability relies on achieving large sales volumes, it is necessary for online supermarkets to implement sales techniques like cross-selling and upselling. In the case of Spain, food-based e-commerce sites know this and take advantage of the fact that the more committed consumers are to food and cooking, the more money they spend on mass market products to implement this type of techniques. Most are implementing a content strategy related to the world of gastronomy and offer their community ideas and recipes for dishes whose ingredients and cooking utensils can be conveniently purchased in their stores.

– **Hot and cold points:** the strategic locations must take into account hot and cold zones in order to direct user traffic towards certain products, bus also in order to know where to place each type of content so that it meets user expectations. It is important to remember that the prominent locations on a website are usually the home page, the main page of each section, the above the fold and the top part of the menu. Moreover, the content area zone that catches the eye the most is the top left corner.

- **Presentation of stock:** when it comes to deciding how the stock will be arranged, it is necessary to bear in mind that the objective is to attract and seduce customers and offer

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It is a matter of merging the information architecture with persuasion to guide the user towards the final objective

them the products they need without any type of obstacle. To accomplish this, it is recommended to take advantage of the possibilities offered by the Internet: interactivity, dynamic content updating, hypertexts and a global presence, among others. Aspects related to design and the ease of using the web pages currently constitute basics in the "tangibilization" of an online store and its offer, but the web contents are also important (both the general and specific information about the products and the structure and spatial layout of this information).

In short, it is a matter of merging the information architecture with persuasion to guide users towards the final objective. Ensuring that users can access products in a simple manner is crucial, but not enough. The website must be designed from a commercial and marketing perspective, in order to create persuasive user experiences. From the moment users enter the website, it is necessary to understand their motivations in order to communicate to them that they are in the right place, causing their movements to flow naturally through the different pages and convincing them that there is no better alternative for purchasing the product and the best time to do it is "now."

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