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Tangibility as a quality factor in electronic commerce b2c

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Abstract

Purpose – The purpose of this paper is to analyze the role and importance of the tangible elements of purchase processes in business to customer (b2c) electronic commerce, as well as the impact on overall perceived quality and the customers' attitudes.

Design/methodology/approach – The database for this study was obtained from a sample of 191 individuals who had purchased on the internet. The techniques used in the statistical analysis of the data were the following: principal component, analysis structural equations and regression analyses.

Findings – The paper finds that four attributes – navigation, signposting, tools and explanation – explain the tangible dimension in electronic commerce. In the data resulting from the analyses, design is seen as an important factor of overall perceived quality and the willingness to recommend the purchase experience to others.

Research limitations/implications – If the company acts positively in the design, this will favorably affect overall perceived quality, but this is not enough to make a customer repeat. In future research, other dimensions which could retain the customers must be investigated.

Practical implications – The proposed scale to measure the dimension design could help firms to set an optimum design of their web sites, because a muddled and complex design represents a significant obstacle and may constitute a valid reason for a potential customer to decide not to return to the site.

Originality/value – Companies operating on the internet will find some suggestions in this paper on how to achieve competitive advantage through the optimum design of their web sites.

Keywords Quality, Worldwide web, Design, Data security, Navigation, Consumer behaviour

Paper type Research paper

Introduction

The internet constitutes the core of today's information society and is the meeting place for all basic information and communication technologies. This circumstance enables internet users to immerse themselves in a social, economic and cultural globalization. Nevertheless, while the most important characteristic of the internet is its capacity to transmit ideas and knowledge, in recent years this communication amenity has favored the development of a highly efficient commercial exchange market. Such a scenario effectively provides opportunities for numerous different types of economic interactions, including two particularly outstanding modalities: business to business (b2b) electronic commerce involving electronic operations between companies and business to customer (b2c) electronic commerce which reproduces the setting of physical purchasing in the digital context.

Within this context, actual and forecast growth for b2c electronic commerce (Rohm and Swaminathan, 2004; Forsythe and Shi, 2003; Meuter *et al.*, 2003, Kim, 2002) justifies the academic and professional attention which this modality is currently receiving. Nevertheless, this is not gratuitous expansion, but follows logical arguments that affect the participating agents: customer and firm. On the customer side, b2c

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electronic commerce enables 24-hour access, 365 days of the year to any web page, purchasing without outside help as well as significant price reductions (Douglas *et al.*, 2003; Khalifa and Liu, 2003; Page and Lepkowska-White, 2002; Trocchia and Janda, 2003; Voss, 2000). From the retailer's point of view, the internet provides a means of reaching the consumer with a more personalized and convenient offer, taking advantage to the full of its information potential (Reichheld and Schefter, 2000; Voss, 2000; Wilson-Jeanselme and Reynolds, 2005). As a result, small, medium and large firms co-exist in the electronic sphere (Muir and Douglas, 2001), attempting to achieve the benefits generated by the internet (Odekerken-Schröder and Wetzels, 2003).

As a parallel effect, customers can now enjoy a greater offer at the click of a mouse. This leads to more demanding customers who have clear ideas about what they want and how they want it, and who ask for more and tolerate fewer mistakes (Bitner, 2001; Cox and Dale, 2001; Douglas *et al.*, 2003; Muir and Douglas, 2001; Singh, 2002; Yang, Ahmed, Ghingol, Mei and Hwa, 2003). In other words, as pointed out by Duffy and Dale (2002, p. 440): "... the ease that e-commerce provides in contrasting prices and value added services, requires that b2c sites must work hard to exceed customer expectations". Hence the importance of satisfying the customer at every stage of their online purchasing experience, not only in terms of satisfying promises made, but also from the moment that the customer accesses the web site. Once we have accepted this premise, as Doyle and Broadbridge (1999) acknowledge, the importance of design as an element of organizational strategy has been underestimated, as it actually constitutes an influencing factor in terms of customer satisfaction.

Along these lines, and as pointed out by Douglas *et al.* (2003), since the design of the web site is the gateway to providing a purchase service, if the firm first offers a flawed action in the design of its web site, this will create a negative impression of the web site's quality and neutralize the customer's willingness to purchase. Similarly, Semeijn *et al.* (2005) argue that a site which is easy to navigate generates greater value from the customer's perspective than one which is difficult to navigate. In effect the perceived complexity of the design can mean that a customer is unable to complete the transaction and subsequently cancels the purchasing process (Odekerken-Schröder and Wetzels, 2003). Furthermore, as Elliot and Fowell (2000) point out, surfing difficulties and procedural complexity feature amongst the main reasons for customer dissatisfaction in terms of online purchasing experience.

Such a response is logical for at least two reasons. On the one hand electronic transactions are of a nature that is diametrically opposed to that of physical operations (Constantinides, 2002; Hoffman and Novak, 1996; Surjadjaja *et al.*, 2003; Walsh and Godfrey, 2000). As Semeijn *et al.* (2005) point out, in contrast to traditional business, online consumers do not interact with individuals, but rather they interact with seller organizations through a user interface that enables them to initiate the desired transactions themselves. As a result, the lessons learned from traditional service quality literature with respect to tangible factors must be reviewed. In short, it becomes necessary to develop a body of knowledge which is required for approaching the question of strategic and operative management of web design with a clear objective: to focus organizational resources on those electronic format characteristics which maximize optimum use and satisfaction on the part of the customer. A further argument justifying the study of tangible elements in the digital context is the fact that existing literature recognizes the design of the web site as a factor in online purchasing

which can generate insecurity and uncertainty on the part of the customer (Madu and Madu, 2002; Yang, Ahmed, Ghingol, Mei and Hwa, 2003; Levinson and Rubin, 2000). Hence the importance of studying such elements from the user perspective with a view to eliminating any obstacles which might hinder a decision to purchase.

For all of these reasons the following paragraphs address the study of the key aspects of web design that contribute towards a customer being able to carry out a purchase in an effective and efficient manner. First of all, the nature and functions of tangibility in b2c electronic commerce are analyzed. Second, a representative sample of empirical studies dealing with design as a key factor of customer satisfaction is reviewed. Third, a theoretical scale of design attributes for electronic purchasing is proposed. Fourth, the research objectives and methodology are presented. In fifth and sixth place the main results are analyzed and discussed. Finally the principal academic and practical implications are drawn up, as are the limitations of this study.

Tangibility in b2c electronic commerce: its nature and functions

According to Eiglier and Langeard (1989) the components of a service are grouped into two halves: those factors that come into contact with the customer and those which do not; in other words, what is visible to the customer and what is not. Thus, the internal organization system of the process facilitates the delivery of the service and affects performance, while in the performance of the service, the customer only sees and evaluates the physical support and the contact staff. With reference to the tangible aspects, which form the subject of this article, the environment provides an image of the service supplier, constituting a source of information for consumers and having a positive influence on customer satisfaction, their willingness to repeat the purchase experience and consequently, on sales (Bitner, 1990, 1992; Hutton and Richardson, 1995; Sharma and Stafford, 2000; Wakefield and Blodgett, 1994).

However, what role does tangibility play in electronic commerce b2c? Does it mean substantial changes in the theoretical and practical precepts of tangibility in the physical market? In reply, it can be stated that company-customer web interaction contributes to changes in the patterns of the traditional physical encounter (Alba *et al.*, 1997; Cox and Dale, 2001; Geissler, 2001; La and Kandampully, 2002; O'Neill *et al.*, 2001). At this point, we should mention the thoughts of Vicente (2000) regarding the existence of two product dimensions on the internet: the process used to sell, represented by the web site itself, and the products on sale through the site. In his opinion, the design and development of the web site is as important as, or even more important than, the product on sale. This is because the web site must be the company itself and represents the organization's image. In effect, the physical premises become a virtual place, where fittings and space are replaced by the pages through which the shopper moves as if in a physical store. As a consequence of this, the functions of tangibility in the digital environment center on strengthening and facilitating customer self-service, reducing the insecurity that acts as an electronic transaction access barrier, and reducing the heterogeneity of the service.

First of all, virtual shopping is fundamentally a self-service process, where the customer decides when to start and finish the transaction. In other words, the customers dominate the relationship in electronic commerce b2c by actively selecting who to interact with, which information they wish to offer, the profile of products or services they wish to receive, and when, how and where they prefer to do all of this

(Kolesar and Galbraith, 2000; Rust and Lemon, 2001). In this context, the user must be able to complete the process up to the point of payment or abort it in any of the preceding steps. This means that the web site must be designed in such a way that the customer concludes the transaction with no problems whatsoever (Douglas *et al.*, 2003; O'Neill *et al.*, 2001; Trocchia and Janda, 2003).

Regarding tangibility as an element reducing the sense of insecurity, web site designers must take note of consumers' needs and wishes in terms of design, since usability is the starting point to win the users' confidence in and support for the site. This is highlighted by Yang, Ahmed, Ghingol, Mei and Hwa (2003) when they establish that customers must find it simple to navigate and obtain the content they seek in an easy and enjoyable way, as otherwise they will feel confused and find the site complicated to use, leading them to reject it. In other words, it is impossible to transmit confidence with a poorly designed web site that has defects in its operation (Font, 2000). Levinson and Rubin (2000) take the same position when they recommend the use of an order processor that does not threaten the customers and allows them to control the process by adding, eliminating and/or canceling the purchase whenever they so wish. To repeat the opinions of Madu and Madu (2002), web site designers must heed the consumers' needs and wishes in terms of design, especially when usability is the key to winning the trust and support of the users.

Third, the tangibility of the web site helps reduce heterogeneity in the supply of the service and so improve quality control. The sales process is one of human interaction which produces high heterogeneity due to the difficulty in controlling the behavior not only of the vendor, but also of the purchaser. However, when that physical presence is not so important, as in electronic commerce b2c, a higher degree of homogeneity of service can be guaranteed by maximum standardization of the sequence of steps. In other words, electronic commerce b2c is a process that is dominated by and channeled through technology (Meuter *et al.*, 2000; Cox and Dale, 2001), making it a mechanized process whose result is quite predefined. However, it can be seen that there is a potential heterogeneity stemming from the very actions of the customer and as a consequence of the level of experience and/or the technological capacity of the equipment used. With reference to the level of experience, a person who carries out an electronic transaction for the first time will meet more difficulties and make more mistakes than someone with experience. Therefore, it is important to have a design that is intuitive, simple and adapted to all types of customer. Regarding the technological capacity of the equipment used, a customer may notice that it takes a long time to download pages, not because of a large number of graphics, but because the receiving computer does not have an adequate processing capacity. This makes it advisable to create sites which, when downloaded to any computer, have none of their characteristics altered; in other words, to work with broadband.

Tangibility as a quality factor in online quality studies

A review of related literature revealed various studies aimed at identifying determinant factors of customer satisfaction in electronic commerce b2c and which also conclude that tangibility affects the perceived quality of virtual supply, thus stressing its academic and professional importance. A sample of these studies is shown in Table I, where the set of dimensions for each proposed scale is specified in the column "Dimensions". The column "Attributes" of tangibility specifies some attributes

Table I.
Design as an online success factor

Authors	Analysis	Dimensions	Attributes of tangibility
Aladwani and Palvia (2002)	Delphi method. Principle components analysis with varimax rotation	Specific content; content quality; appearance; technical adequacy.	Ease of navigation Search facilities Availability Valid links Speed of page loadings
Barnes and Vidgen (2002)	Principle components analysis with varimax rotation	Usability; design; trust; empathy; information	I find the site easy to learn to operate My interaction with the site is clear and understandable I find the site easy to navigate The site has an attractive appearance The site conveys a sense of competency
Cai and Jun (2003)	Principle components analysis with varimax rotation	Web site design/content; trusworthiness; prompt/reliable service and communication	The organization and structure of online catalogs was logical and easy to follow The web site design of the internet retailer was aesthetically attractive
Ranganathan and Ganapathy (2002)	Exploratory factor analysis	Information content; design; security; privacy	Ease of navigation for information search Time taken for navigation Presence of visual presentation aids (graphics, audio, video)
Yang, Peterson and Cai (2003)	Content analysis of consumer reviews	Responsiveness; credibility; ease of use; reliability; convenience; communication; access; competence; courtesy; personalization	Effective navigation Functions that customers need User friendly Response speed Accurate online transactions
Yoo and Donthu (2001)	Exploratory factor analysis. Confirmatory factor analysis	Ease of use; aesthetic design; processing speed; security.	The site is convenient to use It is easy to search for information This site is colorful This site is creative This site shows good pictures of the products It is easy to access the results This site has quick process
Wolfinbarger and Gilly (2003)	Principle components analysis with varimax rotation. Confirmatory factor analysis	Reliability/fulfillment; web site design; privacy/security; customer service	The site does not waste my time It is quick and easy to complete a transaction at this web site
Jun *et al.* (2004)	Principle components analysis with varimax rotation	Reliable/prompt responses; attentiveness; ease of use; access; security; credibility	Ease of navigation; well-organized and understandable content; smooth transactional processes

(*continued*)

Authors	Analysis	Dimensions	Attributes of tangibility
Long and McMellon (2004)	Principle components analysis with varimax rotation	Tangibility, reliability, response capacity, security, purchase process	Easy to navigate Easy to find the products Had clear instructions Not too confusing Worked well No traffic problems
Muylle *et al.* (2004)	Confirmatory factor analysis	Information relevancy; information accuracy; information comprehensibility; ease of use; entry guidance; web site structure; hyperlink connotation; web site speed; layout; language customization	The web site is easy to use The web site is clearly structured The hyperlinks are easy to understand The web site is fast The layout of the web site is visually comforting
Yang *et al.* (2004)	Confirmatory factor analysis	Reliability; response capacity; competence; ease of use; security; product portfolio	Using the company's web site requires a lot of effort The organization and structure of online content is easy to follow It is easy for me to complete a transaction through the company's web site
Lee and Lim (2005)	Confirmatory factor analysis	Web site design; reliability; response capacity; trust; personalization	The online bookstore is visually appealing The user interface of the online bookstore has a well-organized appearance It is quick and easy to complete a transaction at the online bookstore
Parasuraman *et al.* (2005)	Principle components analysis with varimax rotation. Confirmatory factor analysis	Efficiency; compliance; system availability; confidentiality; response capacity; compensation; contact	This site makes it easy to find what I need It makes it easy to get anywhere on the site It loads its pages fast This site is simple to use It enables me to complete a transaction quickly This site does not crash This site launches and runs right away

Table I.

of each scale that we consider to be tangible aspects, irrespective of the dimensional assignation of their authors.

After the review of previous works, we observed that, in generic terms, design refers to usability (ease of navigation), aesthetic aspects of the web site, and page download speed (Yoo and Donthu, 2001; Jun *et al.*, 2004; Lee and Lim, 2005). However, there is a certain overlap between design, reliability of the service and web site content. Thus, the works of some authors (Long and McMellon, 2004; Parasuraman *et al.*, 2005) recognize the reliability of the site as part of the design, with reliability understood as the electronic format functioning correctly at all times and being error-free in design terms. However, a review of the works listed in Table I and other works revealed a contrasting posture. For example, Song and Zinkhan (2003) consider that error-free functioning of the web design is an indicator of the reliability of the company. On the other hand, while many authors relate page download speed with design (Aladwani and Palvia, 2002; Ranganathan and Ganapathy, 2002; Wolfinbarger and Gilly, 2001), for others it is an indicator of the web site's response capability (Yang and Jun, 2002). Furthermore, some studies consider that site content, especially information about the offer, is part of the design (Cai and Jun, 2003; Wolfinbarger and Gilly, 2003; Long and McMellon, 2004).

Another point of interest is the extent to which customers value aspects related to tangibility; information that is given in the column "importance" in Table I. In this respect, in traditional literature on quality in physical services, Parasuraman *et al.* (1991) demonstrate that consumers consider that the dimension reliability is the most important; in other words, the consumer expects no less of the company than to receive the promised service, which is the prime motive for requesting the company's services. That premise seems to extend to electronic commerce b2c, with a significant number of works considering that, from the customer perspective, reliability is the most important dimension of electronic purchasing (Yang and Jun, 2002; Keating *et al.*, 2003; Wolfinbarger and Gilly, 2003; Lee and Lim, 2005; Parasuraman *et al.*, 2005). However, other works also reveal the importance of tangible aspects as the most significant dimension (Yoo and Donthu, 2001; Barnes and Vidgen, 2002; Van Iwaarden and Van der Wiele, 2002; Long and McMellon, 2004). In this respect, regardless of how customers choose to rank the importance of the different attributes of design, it is certain that those attributes appear as important variables which significantly explain quality. As Odekerken-Schröder and Wetzels (2003) indicate, once the customer has found the product or service that he/she is seeking on a web site, if he/she is unable to complete the transaction, he/she will cancel the purchase, and herein lies the true importance of design.

Drawing on a review of previous works, we can make a series of reflections. On the one hand, there has been no previous comparative analysis of the dimension design in works on scales of quality and customer satisfaction. After filling that gap, we can see that a command of design in electronic contexts requires greater conceptual delimitation to avoid overlaps of the different dimensions. On the other hand, given the broad range of proposed variables of design found in the literature, and in order to reap the benefits of organizational resources, we aim to analyze empirically what the most important attributes really are from the customer perspective. Thus, from the business perspective, our purpose is to help to center, both strategically and operationally, on

the problem of web design, to delimit the conceptual context and to simplify the questionnaires in future research.

A theoretical proposal of tangible attributes in web design

Drawing on the review of works in Table I and an examination of commercial web sites, we selected the following items as representative of the dimension design:

- Visually attractive design.
- Intuitive navigation and uniform style throughout the site, making it easy to learn how it functions (uniform appearance and positioning of the navigation elements (menus, links . . .), clear visual hierarchy, easily understood words and phrases).
- The customer knows at any given moment the section or page of the site where he/she is.
- Rapid page download.
- Orientation and distribution of the pages (information, sections . . .) in an ordered and logical fashion, avoiding confusion on the part of the customer.
- The web site offers the means necessary to give rapid and complete access to information of interest (search engines, menus . . .).
- The possibility of taking and reversing steps of the purchase process (cancel/add/change/eliminate characteristics and/or previously selected options, or even the entire transaction) before the confirmation or definitive acceptance of the order.
- Speed of movement through the site (go from one page to another or from one step of the purchase process to another in few steps).
- Explanation and orientation at all times (disclosure of the content of each section, explanations of how to complain, how to make a consultation, how to ask for specific information . . .).

The selected criteria correspond to the aspects that are most addressed in the literature and that strictly deal with questions of usability and navigation. However, prior to the empirical validation of the scale, the initial theoretical proposal was subjected to an examination and review by six people (two experienced shoppers, two with little experience, an electronic commerce expert and a quality management expert). This process resulted in the scale undergoing some changes in its format, mainly regarding the expansion of the attributes and the phrasing. At a content level, some attributes were found to be redundant: intuitive navigation already facilitates speed of movements and implies an ordered orientation and layout of the pages; explaining and orienting lead to the customers knowing where they are at any given moment; and rapid download speed suggests speed of movements and performance of the processes. It was also recommended to exclude the attribute that refers to the possibility of reversing steps in the purchase process because this is a feature present in practically all commercial web sites and hence more a basic criterion than a differentiating element. Additionally, the wording was improved. After these changes, the final model and some authors of reference who had cited each of attributes similarly or with the same sense are shown in Table II.

Attributes	Authors
Visually attractive design of the web site (colors, illustrations, type of font, layout of contents ...)	Barnes and Vidgen (2002) Madu and Madu (2002) Cai and Jun (2003) Kim and Stoel (2004) Lee and Lim (2005) Santos (2003)
Intuitive and simple navigation (uniform style of the site's navigation elements, such as icons, different colors for different sections, standard positioning of navigation elements ... making it easy to learn and to operate)	Wang *et al.* (2001) Aladwani and Palvia (2002) Jun *et al.* (2004) Long and McMellon (2004) Rosen and Purinton (2004) Santos (2003) Parasuraman *et al.* (2005)
Identification and signposting of the section or page in use (by means of signs, for example, on the navigation bar, menus, section links ...)	Yang and Jun (2002) Cai and Jun (2003) Santos (2003) Long and McMellon (2004) Yang *et al.* (2004)
Continuous explanation and orientation of the site contents (previews/describes the content of each section, explains how to complain/consult/ask for specific information, guides through the purchase process ...)	Barnes and Vidgen (2002) Santos (2003) Long and MacMellon (2004) Muylle *et al.* (2004)
Presence and correct functioning of navigation tools that allow full and rapid access to the information and sections of the web site	Liu and Arnett (2000) Aladwani and Palvia (2002) Ranganathan and Ganapathy (2002) Yang, Peterson and Cai (2003) Yoo and Donthu (2001) Parasuraman *et al.* (2005)
Page download time (main page and inside pages).	Liu and Arnett (2000) Yoo and Donthu (2001) Wolfinbarger and Gilly (2003) Muylle *et al.* (2004) Parasuraman *et al.* (2005)

Table II.
Theoretical scale

Objectives and methodology of the study

Based on the above, a study of the following proposed objectives are of interest:

(1) objective 1, to validate empirically the proposed theoretical scale; and

(2) objective 2, to measure the impact of the dimension design on overall perceived quality, on the willingness to repeat the purchase experience and the willingness to recommend it to others.

Thus, this study aims to determine which variables of design contribute most to customer satisfaction and to reinforcing attitudes of future positive behaviors.

The population of the study was defined as those lecturers of the University of Las Palmas de Gran Canaria (ULPGC) who had purchased through the internet. The choice of university lecturer as the active agent was considered appropriate for the following reasons: it matches the profile of the average internet purchaser in terms of education,

income and age, and product purchased; mainly the most purchased on the internet – books, IT products and travel. After a telephone survey of 835 ULPGC lecturers, the population was 452, with the final number of surveys at 191: this margin was mainly due to problems related to locating, accessing, and availability of the lecturers. The size is considered adequate since it is recommended that there are five respondents per attribute in the refinement of quality scales. The details of the technical specifications are shown in Table III. The most important sociodemographic data for the sample were: 73 percent males to 27 percent females, mostly between the ages of 31 and 40 (119 individuals), and 41 and 50 (51 individuals), 97 percent of whom accessed the internet everyday.

In order to validate the proposed scale empirically, a survey was conducted. Each respondent answered various questions and completed a self-administered personal questionnaire on which he/she had to indicate, on a nine-point Likert type scale: his/her opinion of the performance of his/her usual purchase company (the one with which they had most experience, in order to ensure recall of the purchase, and the quality of the responses) in each of the scale's attributes; the importance attached to each attribute; the perceived overall quality; the disposition to repeat and the disposition to recommend to others. Once the completed questionnaires had been received, various analysis methods and techniques were applied. First, a principal components analysis was applied as a data reduction technique, followed by structural equations as a confirmatory technique. Second, and to validate the scales' predictive capacity related to overall quality and behavioral intentions, regression analyses were conducted.

Results analysis

A principal components analysis with varimax rotation was applied to the database, with the criterion of an eigen value of 1 or above in the choice of factors. The resulting rotating matrix of saturations, which provided the correlations between the original items and the factors, was used to: restructure or eliminate those factors that overlapped; eliminate items with insignificant weight in any factor – they do not contribute relevant information, or that have a high weight in several factors – they contribute redundant information; and finally, reassign the remaining items and to interpret the factors. It can be seen in Table IV that a factor structure with one

Methodological procedure	Questionnaire
Delimitation of universe	ULPGC lecturers who had purchased in internet, and who also met certain requirements in terms of products acquired (mainly books, airline tickets and IT products), memory of the purchase, the steps taken personally in the purchase process, and the willingness to participate in the study
Geographical context	Gran Canaria
Population	452 lecturers
Information gathering method	Personal questionnaire
Sampling procedure	Attempts were made to contact all ULPGC lecturers Finally 54 percent were contacted
Sample size and response rate	191 (78 percent)
Reliability level	95 percent $Z = 1.96$ $p = q = 50$ percent
Sample error	5.4 percent

Table III.
Technical specifications of the research

dimension – design – and four attributes were obtained. The KMO ratio (values of between 0.8 and 0.9 are considered excellent) and Bartlett's sphericity test (the value must be significant, that is, the error must be below 0.05) of the model confirm the viability of conducting the factor analysis. The data show that the:

- results of the factor analysis can be considered satisfactory since around 62 percent of total extracted variance is explained;
- correlations between the factors and the different items, expressed through factor loads, are highly significant in that they are in levels above 0.5 (minimum value obtained: 0.78); and
- proportion of explained variance of each of the items, expressed in terms of communalities, is acceptable (minimum value obtained: 0.61, above 0.50) (Hair *et al.*, 1988).

With regard to the reliability of the scales, measured by Cronbach's alpha, the reliability of the total scale in the model exceeded 0.7 (minimum acceptable value).

In addition, confirmatory factor analyses were also applied to the model. Focusing on the data related to the perception and weighted perception models (Table V), we see that the goodness of fit indicators are acceptable (Bollen, 1989; Marsh *et al.*, 1988; Hair *et al.*, 1988). The chi-squared probability (CMIN) of the model (0.250) is above the

Table IV.
Indicators of the model in the principal components analysis

Indicators of the model in the principal components analysis		
Kaiser-Meyer-Olkin measure of sample suitability	0.784	
Barlett sphericity test	208.213; Significance level 0.0000	
Reliability of overall scale (alpha)	0.79	
Total explained variance	61.390	
Attributes	Communality	Factor load
Navigation	0.610	0.781
Signposting	0.608	0.779
Explanation	0.622	0.789
Tools	0.616	0.785

Table V.
Estimators of regression weights, reliability and variance. Confirmatory factor analysis

Indicators of overall fit				
CMIN = 2.771; gl = 2; p = 0.250 CFI = 0.996 AGFI = 0.964 RMSEA = 0.045				
Estimators of regression weights,reliability and variance				
Indicators	Estimator	Typical deviation	Critical ratio	Standard estimator
Navigation ← design	1.000			0.692
Signposting ← design	1.119	0.145	7.729	0.688
Explanation ← design	1.266	0.166	7.604	0.707
Tools ← design	1.221	0.165	7.403	0.700
Compound reliability	0.79			
Extracted variance	0.49			
Cronbach's alpha	0.79			

recommended level of 0.05, which shows that there is acceptable correspondence between the matrix produced by the models and the observations matrix. With regard to the compound reliability of the dimensions, which explains the degree of internal consistency of the variables (attributes), in other words their capacity to represent the common latent variable (dimension), the value reached the minimum value of 0.60, recommended by Bagozzi and Yi (1988). Moreover, the extracted variance, which indicates the total variance of the variables and is represented by the latent variable and whose value must be close to 0.5 was 0.49. This value is valid.

Once the structural model had been accepted, there was a regression analysis of the dimension design with overall perceived quality, the willingness to repeat and the willingness to recommend to others. According to the data obtained, the design exerts significance influence on overall perceived quality and on the willingness to recommend to others. However, the design of the web site has less impact on the willingness to repeat (Table VI). We can conclude from these data that, while an optimum design has a positive effect on perceived quality and that a quality purchase experience also has a positive impact on the willingness to recommend, its influence on the willingness to repeat was much lower.

Discussion

The digital economy contributes to maximizing the tangibility of the sales process. However, it is logical that the attributes defining tangibility in virtual purchases differ from those normally used in the literature on services in the traditional market. In this respect, the study of the new idiosyncrasy of tangible attributes in the electronic market is extremely important from the moment that the design of a web site represents the customer entrance and so must convince from the very first moment. What is more, as a dimension or area of action it must contribute to reducing the uncertainty generated by any new context. Furthermore, it has to favor the practice of self-service oriented to the customer and guide him/her through each step of the purchase process. It also represents an important factor of the overall quality perceived by the customer in electronic commerce b2c and, therefore, must receive the resources and attention that it merits.

As proposed, the set of attributes involves a single dimension, namely, design, although an attractive design and download time were eliminated. Among the

Dimension	Standardized beta coefficient	t	Sign.
Regression analysis with overall quality [a]			
Design	0.479	7.500	0.000
Regression analysis with willingness to repeat [b]			
Design	0.256	3.647	0.000
Regression analysis with willingness to recommend [c]			
Design	0.45	6.452	0.000

Notes: [a] $R^2 = 0.229$ R^2 adjusted $= 0.225$; [b] $R^2 = 0.066$ R^2 adjusted $= 0.061$; [c] $R^2 = 0.181$ R^2 adjusted $= 0.176$

Table VI.
Regression analysis

arguments that may be highlighted as factors determining the exclusion of attractive design is the fact that the customers taken as the sample unit were users with clear purchase objectives. In other words they seek to acquire a determined product or services and do not access the internet for entertainment or fun. In fact, during the questionnaire completion process, those surveyed indicated that it did not matter to them that the design was attractive, with colors and sophisticated technologies aimed at entertainment. The only aspect that interested them was that the web site had clear directions and was easy to navigate. Wolfinbarger and Gilly (2001) express this when they differentiate between browsers with an objective (utilitarian ends), for example to purchase or to seek specific information, and those with no clear objective who browse for fun (hedonistic ends). These authors point out that the attributes determining the satisfaction of the two types of browser may differ because, among other reasons, users with objectives are more interested in functional web sites, while those who browse for entertainment value an aesthetic design and advanced technologies in the operation of the site.

Second, a high percentage of those surveyed positively valued the time taken to download the main page and other pages. In fact, they even expressed understanding that, at certain times, the download is slow and they identified the delay with peak hours with maximum traffic on the internet. Faced with this, they try to find alternative solutions, such as accessing the internet at times of day when there is less traffic. Those surveyed also considered that the download time rather depends on the capacity of the computer equipment used. In relative terms, they were satisfied with the capacity of their equipment, which had a positive influence on their evaluation of page download time. As a result, the respondents' scores for download speed reach values that are homogeneously acceptable. Thus, download time was seen to be a not very discriminatory factor and was statistically eliminated from the analysis.

In the data resulting from the regression analyses, design is seen as an important factor of overall perceived quality and the willingness to recommend the purchase experience to others. However, its low impact on the willingness to repeat the service is surprising and is a highly relevant fact. One possible reason for this may be found in the classification by Hill (2000), who applies the term order-qualifying criteria to those aspects of the service where the company provides an adequate, albeit not the best, service. An order-qualifying criterion contributes to the consumer considering the company a possible supplier. On the other hand, the criterion or criteria that prompt the customer to choose one company web site over that of another company or marketing channel are termed as order-winning criteria. Using this classification, Wilson-Jeanselme and Reynolds (2005) obtain empirical data that show how ease of web site use was not an order winning criteria although it was quite important. In line with this, Liang and Lai (2002) empirically show that there is a higher probability that customers will visit the web site again than that they will repeat the purchase. This infers that while an optimum design is necessary, it is not significant in retaining the customer; hence the respondents' low willingness to repeat.

Everything seems to indicate that, first and foremost, the company must not devote more resources than necessary to design; in other words, design should be simple rather than complex. In contrast, a muddled and complex design represents a significant barrier and may constitute a valid reason for the potential customer to decide not to purchase. What is more, an optimum design influences the overall

perceived quality from the moment that it is set as a reference for adequate evaluation of a web site. However, if the company acts positively in the design, this is not enough to make a customer repeat. This is logical from the moment that the customer, faced with the diversity of offers available on the internet, decides with just a click to purchase from another site. Thus, the literature recognizes that customers' switching costs on internet are low. Therefore, companies operating on the internet must seek their competitive advantage in other dimensions.

Implications and limitations of the study

Based on the above, we can put forward a set of academic and practical reflections and implications that are intended to serve as a guide in the treatment and analysis of tangible aspects of electronic purchasing. More specifically, we deal with questions to be considered in future research work, strategic lines of action to be followed and the management of the resources to be employed. Additionally, we recognize the limitations of this investigation.

Future research work

A review of online quality scales literature reveals a large number of design attributes. Furthermore, we observe a certain degree of overlapping with other dimensions such as reliability and capacity of response. As a result, we focus our research exclusively on those attributes which are designed to measure usability, the aesthetic aspects of design and downloading time. Later, the statistical treatment applied enabled a one-dimensional, four-attribute scale to be obtained – intuitive navigation, section signposting, navigation tools and explanation of sections –eliminating the aesthetic and downloading attributes.

The identification of these attributes allows us to discriminate other parallel questions which could overlap with other dimensions or which do not provide any differential value. On the other hand, from a utilitarian perspective, customers are interested in efficient purchasing which enables them to achieve their aims with the minimum effort, while from the hedonic perspective customers value the fun and entertainment to be gleaned from the purchasing experience (Hirschman and Holbrook, 1982). Thus aware that the online shopper is basically a customer oriented towards functional objectives, it would be advisable that future studies deal only with attributes designed to measure an intuitive design that facilitates self-service and eliminates all uncertainty. Similarly, from a practical point of view, a smaller number of attributes allows shorter and more simple scales to be created, which are easier to complete by the customer. This in turn increases the customer's disposition to fill in the questionnaire and reduces the time needed to complete the process. This is because a saturation of unwanted content, such as SPAM, generates a negative attitude on the part of the customer, so it becomes necessary to simplify internet research in order to achieve a greater predisposition.

Strategy

From a strategic point of view design analysis can be directed towards two lines of action: the standardization of the web site or the personalization of the design. The first option aims to adopt a web site design that respects habitual practice in terms of the electronic format of alternative commercial web sites. With this option, the company

should attempt to produce simple and functional designs that facilitate the execution and closing of the purchase. In this way the learning process is made easier by reproducing standard models on the internet and the perception of design error caused by lack of user experience. Furthermore, by simplifying the electronic format it is possible to reduce page downloading time and the time required to execute the service. Moreover, as a result of an intuitive and guiding design the customer will feel more secure and will be able to control the process in an independent manner, all of which will have a positive effect on the perceived quality of the online purchasing process. Nevertheless, let us remind ourselves at this point of Hill's (2000) order-qualifying criteria which emphasize that an optimum design is necessary, but do not differentiate between companies with regard to making choices between them.

The alternative strategic option is the personalization of the web site, which seeks to adapt the design to each individual user and which constitutes a useful tool to retain customers (Reichheld and Schefter, 2000; Voss, 2000). According to Hill's (2000) classification, design personalization would be an award-winning criteria since it raises change costs on the part of the customer. This is because personalization creates a sense of belonging, familiarity and very strong commitment and only a very strong reason would suffice to break such a relationship (Walsh and Godfrey, 2000). Along these lines we could cite as an example the company which having learned a user's behavioral pattern, leads him/her immediately once he.she enters the web site to the sections which he/she habitually visits. Personalization is obviously not contrary to a standardization policy – in other words the creation of simple and useful designs aimed at selling.

Resources

In this study the clients were only interested in utilitarian objectives (the purchase of products or services), and there was no room for the so-called hedonistic objectives (entertainment or intrinsic enjoyment) which can be reached through the use of designs of aesthetic and interactive complexity. For this reason the attribute measuring aesthetic design was statistically eliminated in the analysis. On the other hand, downloading time, far from being unimportant, tends to behave in a uniform manner and to comply with the standard of not taking more than a few seconds in practice (otherwise the user tends to abandon the process).

In the light of all these data company managers would be advised to focus their attention on the construction of functional designs which facilitate the following through and closing of a purchasing action. Any resource surplus should be devoted to other areas such as improving the logistics of the delivery chain or increasing product or service options on offer in cases where companies can and should mark positive differences with respect to their competitors. In other words, design is a dimension of online shopping which is more significant when deficient (confusing and non-functional designs) than when excellent (complex and artistic designs).

Limitations of the research

We devote this final paragraph to a recognition of the limitations of this study. First and foremost we should emphasize that this study constitutes an exploratory investigation, carried out in a specific context, which attempts to identify the average characteristics of the internet purchaser with respect to the normal products which he

or she buys. Nevertheless, it would be advisable to validate the model empirically with respect to older generations, with different customer profiles and for different types of products. This would enable us to perfect the model and to capture possible differences and/or deficiencies with have not been covered in the course of this study. We will devote future studies to this end.

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