Customer Heterogeneity in Operational E-Service Design Attributes: An Empirical Investigation of Service Quality

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Keywords: E-Services, Operations Strategy, Service Design, Quality.

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Abstract

This study empirically examines whether heterogeneity in personal customer profiles translates to heterogeneity in the valued operational e-service design attributes. It focuses on a key operational e-service design attribute – web site quality – by investigating whether customers with different profiles (demographics, pattern of use of the service, and pattern of channel use) attach different levels of importance to different dimensions of web site quality. The study is based on triangulation of data collected from multiple sources in a real e-service setting (e-banking): data from an online survey of the customers of the e-service; data stored in the transaction and log files generated by the operation of the e-service over time; and data from the e-service provider's customer database and back office IT systems. The results suggest that: i) customer demographics, pattern of service use, and pattern of channel use have no influence on the importance attached to web site quality dimensions; and ii) customer demographics affect the pattern of use of an e-service. The implications of the findings for e-service design are discussed.

Keywords: E-Services, Operations Strategy, Service Design, Quality.

1. Introduction

The need for alignment between the target markets and the supporting service delivery systems (SDSs) is widely recognized in Operations Strategy (e.g., Hill, 1985; Skinner, 1969) and Service Operations (e.g., Pullman and Moore, 1999; Smith and Reece, 1999). According to this notion, there should be a fit between the *operational* requirements of the target markets and the design attributes of the SDS, some of which may be conflicting. If the target markets are fairly homogeneous, a single SDS design may be appropriate. However, if the target markets are very diverse, an operation-focused strategy may be desirable, which employs different SDS designs, each focusing on a fairly homogeneous target market (e.g., Hayes and Wheelwright, 1984; Hill, 1985).

In e-services, i.e., services provided through the Internet, this notion translates into the need for an alignment between the target segments and the supporting web site (Boyer et al, 2002). Because of the wide customer reach of the Internet channel (Evans and Wurster, 1999), a web site is typically exposed to a large number of customers with different personal profiles (Boyer et al, 2002), including demographic and behavioral attributes. Therefore, there is a high likelihood of heterogeneity in customer requirements. In addition, a great deal of information about personal customer profiles can be generated and processed automatically at a low cost in e-services due to the Internet data exchange between providers and customers. As a result, it is relatively easy to make use of this information for alignment decisions.

This context has spun a lot of research investigating the effects of customer heterogeneity on web design, which has been dominated by a Marketing perspective. In Marketing, it is generally accepted that customers with different personal profiles value different attributes in a product or service, which is a core notion of the market

segmentation approach. The objective is to identify important differences between customer profiles so that different marketing strategies can be developed to exploit those differences. Applied to e-services, Marketing approaches have generally concluded that heterogeneity in customer profiles translates into heterogeneity in terms of the general attributes that customers value in a web site, especially those related to information content. As a result, they have advocated the "one-to-one" marketing strategy (e.g., Peppers, Rogers and Dorf, 1999), as well as the design of personalized web sites, typically in terms of the displayed information (e.g., Ansari and Mela, 2003).

However, from an Operations Management (OM) perspective, the relevant question is whether differences in personal customer profiles translate into differences in the valued *operational* e-service design attributes, such as quality or flexibility. The market segmentation approach does not take into account the capabilities of the organization (Jenkins and McDonald, 1997), including its OM capabilities (Berry et al, 1991).

A full understanding of this question is critical to making effective operational alignment decisions. If the customer base is very heterogeneous in terms of operational e-service design attributes, offering a single type of web site design (and the associated SDS) for all the customers, i.e., embodying a particular combination of priorities across several operational site attributes, may cause serious dissatisfaction in several customer segments. In this case, the service provider may need to design different types of web sites for different customer segments in order to achieve a high level of performance. However, if the customer base is fairly homogeneous, then the expense and effort of customization is unnecessary [according to a Gartner Group study (Satterthwaite, 1999), an average site costs $1 million and five months of implementation time]. In this case, the service provider may adopt a single type of web site design embodying the combination of operational

attributes preferred by its customer base and should invest its effort in uncovering the optimal combination rather than in customization. Understanding the extent of customer heterogeneity is also useful to inform New Service Development. In fact, armed with this knowledge, the service provider can use web site design choices proactively in order to attract the desired type of customers (Reichheld and Schefter, 2000).

Despite its importance, there is little research addressing this question from an OM perspective. This paper sets out to address this issue by focusing on a key operational design attribute of e-services, namely service quality. Service quality is important because it enhances customer retention in an environment where switching costs are low. The perceived quality of an e-service is mainly determined by the quality of the associated web site (Sousa and Voss, forthcoming). The dimensions of web site quality include information quality, ease of use, privacy/security, graphic style, and fulfillment (Zeithaml et al, 2002a), some of which may be conflicting in terms of the supporting SDS design choices. For example, improving ease of use by means of cookies may harm privacy; or improving graphic style by increasing the use of graphics may lengthen response time, which is an aspect of fulfillment. According to the alignment logic, the quality performance of a web site will result from the degree of fit between the importance attached by target segments to different web site quality dimensions and the web site quality design choices (i.e., the extent to which the web site achieves a high rating on the quality dimensions most valued by the target customers).

In this connection, this paper empirically examines whether customers with different profiles attach different levels of importance to different web site quality dimensions. In our study, we take an explicit Service Operations/Service Quality perspective, concentrating our investigation on quality dimensions as our intended service

design lever. The structure of the paper is as follows. First, we review the relevant literature to develop an exploratory model relating customer profile to web site quality dimensions. Specifically, we consider three sets of customer profile variables, namely demographics, pattern of use of the service, and pattern of channel use. Second, we describe the study's methodology, based on triangulation of data collected from multiple sources in a real e-service setting (e-banking): data from an online survey of the customers of the e-service; data stored in the transaction and log files generated by the operation of the e-service over time; and data from the e-service provider's customer database and back office IT systems. We then test the developed model using path analysis and discuss the main findings and conclusions. Finally, we discuss the study's limitations and suggestions for future research.

2. Research Model

It is generally recognized that customers with different profiles may have different requirements for a product or service. This notion is at the basis of the market segmentation approach, which typically employs two main sets of customer profile variables, namely basic customer characteristics (e.g., demographics) and behavioral characteristics (e.g., usage rate of a product or service) to segment a market (Dibb, 2000). It is also recognized that there is a relationship between basic customer characteristics and behavioral characteristics (e.g., Kotler, 1991; Loudon and Bitta, 1993). Figure 1 shows this logic.

INSERT FIGURE 1 ABOUT HERE

We reviewed the literature to adapt the general research model in Figure 1 to an e-service context, particularly adopting web site quality dimensions as the customer

requirements of interest. This resulted in the building of a model relating customer profile variables to the importance attached by customers to different web site quality dimensions. We found that the existing studies only indirectly addressed such relationships and tended to fall in the areas of consumer behavior on the Internet, acceptance and use of information technologies and, sparsely, e-service quality. Hence, our model is of an exploratory nature.

The model we have arrived at is depicted in Figure 2. We consider three groups of interrelated customer profile variables in the model, namely one group of basic customer characteristics (i.e., demographic variables), and two groups related to service use behavior (i.e., pattern of service use - experience with the service and frequency of use, and pattern of channel use). These variables were considered for several reasons. First, as will be explained in the next section, the review of the literature suggests that these variables may be pertinent to influencing the importance attached to web site quality dimensions through the depicted model (Relationships 1 to 5 in Figure 2). Second, demographic characteristics and use behavior variables are extensively employed in segmentation exercises. Third, they are observable and measurable variables in an e-service setting, a key requirement for providing a scheme for customer segmentation (Kotler, 1991) and for making operational alignment decisions. In fact, in many e-services today, firms may require customers to register, which solicits demographic information, and they can also monitor the pattern of use of the service and the pattern of channel use by analyzing their data warehouses (e.g., transaction and log files) (Moe and Fader, 2001).

We next present the literature review and derive the propositions depicted in the proposed research model.

INSERT FIGURE 2 ABOUT HERE

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3. Literature Review and Research Propositions

Several studies have indirectly suggested a relationship between pattern of service use and the importance placed on different web site quality dimensions (Relationship 1). In particular, the level of experience with the service and the frequency of use have emerged as potentially important variables. Hammond et al (1998) conducted a controlled experiment with web users exploring the extent to which experience with the use of the Internet affected user attitudes towards the web. Among other results, the study found that experienced users placed a higher value on the information found on the web compared to those with less experience. This suggests that the information quality dimension may be more important to an experienced user than to an inexperienced one. Novak et al (2000) found through structural equation modeling that consumers who have more recently started using the web are more likely to use it for experiential activities, while those who have been using the web for a long time are more likely to use it for task-oriented activities. In addition, Wolfinbarger and Gilly's (2001) focus group study reported that task-oriented and experiential shoppers are attracted to online shopping for different reasons. The former value convenience, availability of information, selection capability, and lack of sociality, while the latter value surprise/excitement/uniqueness, positive sociality, availability of deals and product involvement. All these attributes are closely related to web site quality dimensions. Similarly, Cai and Jun (2003) found that while for online buyers the reliability and responsiveness of an e-service's web site have a significant impact on the overall perception of service quality, this is not the case for information searchers (a less experienced group in using the Internet). Prior research has also shown that as Internet experience and usage increases, perceived online purchase risk decreases (Miyazaki and Fernandez, 2001). This suggests that more experienced users, and users using a service

more often, may value the privacy/security quality dimension less strongly. Finally, Patricio et al´s (2003) focus group study found that customers with different patterns of use of an e-banking service (e.g., frequency of use and type of operations performed) tend to value different web site attributes, several of which are related to web site quality. Hence, we formulate the following proposition:

> *Proposition 1*: Pattern of service use (in terms of frequency of use and experience with the service) is directly related to the importance attached to different web site quality dimensions.

Other studies have indicated the possibility that pattern of channel use may impact on the importance of web site quality dimensions (Relationship 2). Exploratory research has found that online customers use different channels for different purposes (Black et al, 2002; Burke, 2002; Patricio et al, 2003), and that they are in a different frame of mind and have different informational needs depending on the channel of service delivery (Burke, 2002). Iqbal et al's (2003) discrete choice experiment demonstrated that consumer preferences for features of transaction-based e-services differ between offline and online consumers. This suggests the possibility that customers with different relative use of the Internet versus other alternative channels value different web site quality dimensions differently. For example, a customer who uses an Internet channel to carry out all purchase transactions, including order placement and payment, may value security more highly than a customer who uses the same web site to search for product/service information and then uses a physical outlet to actually make the purchase. Hence, we formulate the following proposition:

Proposition 2: Pattern of channel use is directly related to the importance attached to different web site quality dimensions.

The relationships between customer demographics and pattern of use of the service (Relationship 3) and pattern of channel use (Relationship 4) have been examined in several studies on the use of technological innovations. Relevant demographic variables typically include age, gender, and education. Numerous studies have examined the effect of differences between individuals, including demographic variables, on the acceptance and use of general, new information technologies (Agarwal and Prasad, 1999; Harrison and Rainer, 1992). For the specific case of technological innovations in retailing, Zeithaml and Gilly (1987) found that the level of use is affected by the age and education of the users. Several researchers (e.g., Darian, 1987; Eastlick, 1993; Fram and Grady, 1997; Hitt and Frei, 2002; Stevens et al, 1989) have investigated the impact of demographic factors on the use of technology-based self-services and found that typically young, educated males are more likely to use such service options. This is also the typical profile of Internet users (e.g., Allen, 2001; Clemente, 1998; Fram and Grady, 1995; Sexton et al, 2002). Thus, these groups are expected to be more experienced in the use of Internet services, use them more frequently and rely more heavily on the Internet channel in comparison with alternative channels.

Hence, we formulate the following propositions:

Proposition 3: Customer demographics (in terms of age, gender and education) are directly related to pattern of service use.

Proposition 4: Customer demographics (in terms of age, gender and education) are directly related to pattern of channel use.

Finally, there is support for a direct relationship between customer demographics and the importance attached to different web site quality dimensions (Relationship 5). Spathis et al (2004) found that male and female customers of traditional (i.e., non-Internet based) bank services attribute different levels of importance to different service quality dimensions. More specifically related to technology-enabled services, Venkatesh and Morris' (2000) empirical examination of the adoption of new data and information retrieval technologies found that men value more strongly perceived usefulness, while women value more strongly perceived ease of use. These two attributes are related to different web site quality dimensions in an e-service context (e.g., Loiacono et al, 2001). Gender differences have also been found in the perceptions of risk of buying online (Bartel-Sheehan, 1999; Garbarino and Strahilevitz, 2004). This suggests that there may be gender differences in the importance attached to the security/privacy quality dimension. Finally, there is evidence that different age groups use the Internet for different purposes (Gervey and Lin, 2000; Teo, 2001). Hence, we formulate the following final proposition:

Proposition 5: Customer demographics (in terms of age, gender and education) are directly related to the importance attached to different web site quality dimensions.

4. Methodology

The study investigated customers of a retail e-banking service. We opted for selecting a single type of e-service in order to control for service type, thus maximizing the power of the tests applied to the model in Figure 2. E-banking was chosen for several reasons. First, it is a mature and one of the most widespread types of e-services, with high adoption levels among both service providers (e.g., the majority of banks now offer such a service) and users. According to Forrester Research, 30 million households in the US were using e-banking in 2003, and it is predicted that 35% of households with Internet connections will bank through the web by 2008. Similarly, over 60 million Europeans now bank online, equivalent to 37 per cent of all Internet users on the continent (Forrester Research, 2003). Second, in e-banking the web site plays a major role in service provision. Finally, the range of services offered at e-banking sites tends to be similar across different service providers and countries, enhancing the generalizability of our findings.

The e-banking service that was chosen is located in Portugal, a country representative of the European Internet context that exhibits an Internet penetration ratio equal to the average ratio of the European Union EU-15 countries, i.e., 36 Internet users per 100 inhabitants (Eurostat, 2003). The service is the largest (about 600,000 customers at the time of the study), one of the first to be set up in this country, and is considered a "best practice" service, being ISO9001 certified and having won, among other awards, the "Best Consumer Internet Bank 2003" award by the *Global Finance* magazine. The study was based on triangulation of data collected from multiple sources in this e-service setting. The next sections discuss the measurement of the main research variables (i.e., customer profile variables and the importance attached to different web site quality dimensions), as well as the method of data collection.

4.1 Importance of web site quality dimensions

The importance of web site quality dimensions was measured via an online questionnaire administered to customers of the selected e-service. Although several studies have offered instruments for assessing the quality of web sites (e.g., Aladwani and Palvia, 2002; Barnes and Vigden, 2000; Loiacono et al., 2001; Wolfinbarger and Gilly, 2002; Yoo and Donthu, 2001; Zeithaml et al, 2000, 2002b), the measurement of web site quality is in its early stage and there is no universally accepted and tested scale (Zeithaml et al, 2002a). Zeithaml et al (2002a) provided an excellent review of most of these studies and summarized the main dimensions of web site quality as: i) information availability and content (information quality); ii) ease of use; iii) privacy/security; iv) graphic style; and v) fulfillment.

For the purposes of our study, we took special care to arrive at a parsimonious set of items to measure the importance attached to different dimensions of web site quality. The reason for this was twofold. First, respondents have been found to be especially sensitive to lengthy questionnaires when they are administered online (Fram and Grady, 1995). A large number of scale items can lead to participant fatigue, boredom and inattention, which, in turn, can lead to inappropriate response behavior (Drolet and Morrison, 2001). Second, we needed to maximize the sample size for increasing the statistical power of the proposed analyses. Hence, considering the absence of a generally accepted and tested instrument, we opted to use single items as point estimates for the different quality dimensions. Effectively, the choice of single-item measures constituted an explicit choice for maximizing the amount of information that could be obtained, i.e., being able to ask respondents about all the relevant web site quality dimensions in the context of an online survey whose length needed to be kept short.

Single-item measures can be as good as multi-item measures as long as the reliability and validity issues are addressed (the way these and other measurement issues were addressed in the study is discussed below). Drolet and Morrison (2001) argued that single items can avoid many disadvantages of multiple-item scales, which can violate across-item error term correlations and undermine respondent reliability. In particular, single-item measures have been used extensively in past research for measuring the importance attached to competitive priorities, including quality (e.g., Frohlich and Dixon, 2001; Miller and Roth, 1994; Safizadeh et al, 2000; Verma and Young, 2000), as well as in general service and quality management research (e.g., Bolton, 1998; Rust et al, 1995; Voss et al, 2004).

The selection of the measurement items was as follows. We compiled a list of items from existing instruments that would capture the five broad dimensions of web site quality identified by Zeithaml et al (2002a) i.e., information quality, ease of use, privacy/security, graphic style and fulfillment. Where theory is less well developed, it is beneficial to use both academic and practical perspectives (Hensley, 1999, p. 348). Therefore, using this base list of items, we held several iterative focus group discussions with managers from the bank's quality and marketing departments with the objective of choosing one item to adequately represent each of the main quality dimensions in the context of an e-banking service. The procedure of selecting items from a broader set and associate them with hypothesized dimensions is a standard procedure for developing measures (Churchill, 1979) and has been generally used in quality management research (e.g., Samson and Terziovski, 1999). During these discussions, it was considered important in the context of an e-banking service to break the fulfillment dimension into two separate dimensions: reliability and responsiveness. In an e-banking context these two dimensions correspond to what is

typically defined as fulfillment and are both provided by the web site's back office systems. The discussions highlighted that deficiencies in these two areas require corrective actions of different nature, thus making it beneficial to treat them separately. For example, responsiveness problems may require an improvement in the processing capacity of back office systems, while reliability problems may indicate the need to revise back office processing procedures. Thus, we considered six main dimensions of web site quality in total, namely information quality, ease of use, privacy/security, graphic style, reliability and responsiveness. During this process, the wording of the items was also adapted to an e-banking context, a recommended method in empirical research (e.g., Boyer and Pagell, 2000), which has been performed extensively to study service quality (e.g., Blanchard and Galloway, 1994; Kettinger and Lee, 1994).

This process resulted in the items described in Table 1. This table shows the six dimensions of web site quality, their general descriptions, and the single-items that were chosen to measure each of them. A final verification of content validity was performed by asking a group of ten OM academics to associate each of the six randomly ordered measurement items to the general descriptions of the six web site quality dimensions given in Table 1. All ten academics associated the items and dimensions according to the scheme in this table. These items were the base for the design of a questionnaire soliciting customers to rate on a 1-5 Likert scale the importance that they attribute to different dimensions of web site quality for a general e-banking service. The questionnaire was pilot-tested with a group of managers from the bank and general users of e-banking services.

INSERT TABLE 1 ABOUT HERE

The reliability of the measures was ascertained by employing the test-retest method, a method recommended for measures comprised of single indicators (O´Leary-Kelly and Vokurka, 1998). With the assistance of the Quality Service Manager of a different bank, we contacted about 150 customers of that bank who had e-banking accounts, inviting them to participate in an "e-banking quality study". We did not inform them at this time that this was a test-retest study. Of the contacted customers, 50 agreed to participate. We sent the questionnaire to these customers by several channels (e-mail, fax and post) and since they had all agreed to participate, we were able to obtain 47 valid questionnaires. Approximately three weeks after the customers returned the first questionnaire, we sent them the same questionnaire through the same channel, and obtained 38 valid responses. This time, we explained that the objective of the second questionnaire was to obtain more reliable data. The correlation matrix of the six indicators across the two sets of measurements is shown in Table 2. This table shows that the correlations between the measures of the same items at different times are all high and significant, which demonstrates that the items are reliable.

In order to further assess the quality of the measures, we employed Campbell and Fiske's (1959) multitrait-multimethod logic. Table 2 shows that the correlations between the measurements of the same items at different times are all significant and substantially greater than the other correlations in the matrix, which indicates the absence of common method bias and supports the discriminant validity of the items. We also compared the mean of the correlations between the same items measured at different times (the six correlations in the diagonal of the lower left quadrant of Table 2) with three other means: the mean of the correlations between different items measured in the first time (the 15 correlations shown in the upper left quadrant of Table 2); the mean of the correlations

between different items measured in the second time (the 15 correlations shown in the lower right quadrant of Table 2); and the mean of the correlations between different items measured at different times (the 30 correlations outside the diagonal of the lower left quadrant of Table 2). We found that the mean of the correlations between the same items measured at different times was significantly greater ($p < 0.001$) than the other three means, which reinforces our conclusions about discriminant validity and the absence of common method bias.

INSERT TABLE 2 ABOUT HERE

4.2 Customer profile variables

The demographic variables, i.e., age, gender, and education level, were obtained from the bank's customer database. For pattern of channel use, we considered four variables representing the proportion of total transactions that a customer performed through each of the four available service delivery channels, namely physical counter, phone, ATM and the Internet. These variables were obtained from the bank's back office IT systems, which record all the transactions of a customer with the bank across the different available channels. The pattern of service use variables were obtained from the e-banking service's transaction and log files. These files use codes to identify users because web site access is subject to user authentication, and automatically record information about exchange of data between servers and clients (Wiedmann et al, 2002). Table 3 describes how the variables were measured and the associated data sources.

INSERT TABLE 3 ABOUT HERE

4.3 Data collection

The data for customer profile variables were directly extracted from the bank's customer database and the bank's IT systems. The data extraction was performed by the bank's staff according to the researchers' instructions. The data concerning the importance attached to the different web site quality dimensions were collected via an online questionnaire administered to customers of the e-banking service. In this process, we drew on the overall customer database to exclusively target customers fulfilling the following criteria: active customers (customers having made at least two logins to the service in the previous three months), age over 18 years old, excluding bank employees and customers with any pending conflicts with the bank (e.g., having made out checks without provision). This screening resulted in a pool of 51,125 eligible customers. The actual target sample for our study consisted of a subset of 30% of this pool, generated through random extraction from the pool. This resulted in a final target sample of 15,338 customers.

The questionnaire was posted on the e-banking service web site, right past the login stage. After the targeted customers logged in, they were asked whether they would like to fill in the questionnaire, in which case they were directed to the respective web page. The questionnaire software application kept track of the identification of all targeted customers, recorded respondents and non-respondents and, for the respondents, recorded their actual responses to the questionnaire. The software also ensured that customers who declined to fill in the questionnaire as well as those who did fill in the questionnaire were not asked again. The questionnaire was active on the site for one month, resulting in 2,394 valid

responses, yielding a 15.6% response rate. We conducted a non-respondent bias analysis employing independent sample t-tests to compare the profiles of respondents and non-respondents. The analysis showed no significant differences, indicating the absence of non-respondent bias.

For the purpose of examining the proposed model, we chose to focus on "professionally active adults" in order to avoid the non-linear effects of age. Thus, we curtailed the set of valid responses by excluding from the analysis customers at both ends of the age spectrum. On the one hand, we excluded respondents below 25 years old in order to eliminate potential full-time students and ensure that the registered level of education was an accurate reflection of a customer's profile. For example, a 19-year old person who was taking an undergraduate degree at the university would have a registered education level which was only secondary education. It has been shown that for people over 25 years old the positive association between age and education is virtually eliminated (Smith, 1993). On the other hand, we excluded customers over 60 years old, as they would probably be retired and have a very different lifestyle (60 years old is the average effective retirement age in the European Union EU-15, http://www.bionetonline.org/English/Content/ll_leg1.htm, 2004). This resulted in 1,718 usable cases. The final sample is characterized in Table 4. The table shows that the predominant demographic profile in the sample was that of a male, young and educated customer. This pattern is in line with the patterns observed for general Internet users in the European Union and the US, as well as for e-banking users (SIBIS, 2003a, 2003b; Eurostat, 2003).

INSERT TABLE 4 ABOUT HERE

5. Data Analysis

In order to examine the proposed model, we employed path analysis (Li, 1975), a classical statistical technique for exploring complex empirical relationships. Other similar methods, such as structural equation modeling, are essentially confirmatory techniques and are more appropriate for verifying a few well-defined and simple models. Using structural equation modeling to develop new and complex models will always lead to the rejection of these models, regardless of their validity (Baumgartner and Homburg, 1996; Bentler and Chou, 1987).

Path analysis works by building a diagram that summarizes and generalizes the relationships between the research variables, on what can be seen as a theory building and testing process (Bradley and Schaefer, 1998; Flynn et al, 1995). Path coefficients (P) are represented by standardized partial correlation coefficients, which measure the strength of the relationship between a dependent and a predictor variable when the predictive effects of the other independent variables in the regression model have been removed (i.e., stepwise regression). In our study, we built the path diagram depicted in Figure 3. This diagram embodies all the pair-wise paths corresponding to the research model in Figure 2. For example, Relationship R3 in Figure 2 corresponds to six pair-wise paths in Figure 3 relating each of the three variables "education", "age" and "gender" to each of the two variables "experience with the service" and "frequency of use".

In the analysis, we adopted the standard criteria for retaining paths, i.e., a significance level of 0.05 (statistical significance) and path coefficients greater than 0.10 (size effects) (Asher, 1983; Hair et al, 1998). This corresponds to retaining only those paths that are found to have practical significance (Asher, 1983; Hair et al, 1998). Given the large

sample size used in the analysis (n = 1,718), practical significance is a particularly relevant criterion (Hair et al, 1998) because statistical tests may become overly sensitive, indicating that almost any relationship is statistically significant (Parasuraman and Zinkhan, 2002, p. 293). In the analysis, most of the paths that were rejected were because of the lack of practical significance (path coefficient < 0.10), rather than the lack of statistical significance. The path analysis results are presented in Figure 4, which depicts only the retained paths.

INSERT FIGURE 3 ABOUT HERE

INSERT FIGURE 4 ABOUT HERE

Figure 4 shows that there are no practically significant relationships between customer profile variables and the perceived importance of different web site quality dimensions (all path coefficients for relationships 1, 2 and 5 were less than 0.10). The adopted research design tried to maximize the power of the tests that were performed. Indeed, the study has controlled for type of service and has relied on a large sample size. Therefore, the fact that the relationship paths 1, 2 and 5 were not of practical significance strongly suggests that these indeed do not hold or are of negligible strength. Hence, there is no empirical support for propositions 1, 2 and 5.

On the other hand, Figure 4 shows some practically significant relationships between customer demographics and pattern of channel use, as well as between customer

demographics and pattern of service use. Hence, there is empirical support for propositions 3 and 4.

6. Discussion and Conclusions

The results suggest that customer profile - demographics (gender, age and education), pattern of service use (frequency and experience), and pattern of channel use – has no influence on the importance attached by customers to different web site quality dimensions. This suggests that heterogeneity in personal customer profiles does not translate into heterogeneity in the valued e-service quality design attributes. An important implication of this finding for the operational design of e-services is that service providers may not need to employ customization at the level of web site quality dimensions. That is, the design quality priorities of web sites in terms of individual quality dimensions (for example, whether to emphasize visual appeal or response time) may be the same across users. Thus, the mass customization approach generally advocated by Marketing may not apply as far as the web site quality dimensions from the OM perspective are concerned, or at least, not universally. This finding also supports the existence of the concept of an "optimal" web site design for quality, i.e., the existence of a combination of priorities in individual web site quality dimensions that is likely to satisfy all the customers equally well. For service providers, this suggests that substantial effort should be invested in uncovering this optimal combination rather than in the pursuit of customization. Quality is often considered the basis of a pyramid of OM capabilities (e.g., Ferdows and De Meyer, 1990; Voss, 2000). Our results are particularly interesting in that they suggest that service providers may develop a single set of quality capabilities for this basis that can be deployed across all the customers.

We did find significant relationships between different customer profile variables, namely demographics has influence on pattern of service use and on pattern of channel use. This is consistent with existing theory in Marketing and contributes to a deeper understanding of e-service use behavior. First, education has an effect on how early a customer starts using the service (with higher educated customers starting earlier), but not on the actual frequency of service use, nor on pattern of channel use. This seems to suggest that education plays a role in the adoption decision, but not afterwards. Potential explanations for the role of education in the adoption decision include higher educated customers having better access to information about new services, having been using the Internet for longer in their professional activities, and being financially better off, reducing the cost barrier to Internet access. Second, older customers tend to be less frequent users and tend to use the physical channels more often. However, age does not influence how early a customer starts using the service. Hence, it seems that, although older customers are likely to adopt the e-service as early as younger customers, they tend to use it less intensely, probably as a complement to traditional channels. On the contrary, younger customers, once they adopt the service, seem to be more intense users, at the expense of physical channels. A potential explanation for this may be that, after adoption, older customers still keep some of the habits of using traditional channels that existed prior to the emergence of e-services. Younger customers, free of these habits, embrace the Internet channel more fully. For service providers, these results suggest that to increase the degree of use of the Internet channel by existing users, they may need to pay special attention to changing the habits of older customers.

Overall, our results did not validate the part of the exploratory model in Figure 2 related to the e-service quality operational design attributes. We put forward two possible

explanations for this. First, most of the literature underlying the non-confirmed relationships addresses them from a perspective other than OM. Second, many of these studies have been exposed to the drawbacks of common method variance and the single key informant approach. This might have led to the reporting of significant relationships between research variables that may be artificial. Common method variance is variance that is attributable to the measurement method rather than the constructs the measures represent, leading to systematic measurement error (Campbell and Fiske, 1959) and substantial effects on the observed relationships between measures of different constructs (Podsakoff et al, 2003). Our study avoids such effects by drawing on different data sources for measuring the three main sets of research variables (Table 3). The single key informant approach relies on surveying one individual who provides data on his/her company or location (Parente and Gattiker, 2004) and is a threat to validity (Golden, 1992; Philips, 1981). Often times, studies have also relied on convenience samples of students or general technology users. Our study, by having surveyed actual customers in a real business setting and by having employed objective behavioral data rather than self-reported data, has avoided the pitfalls of the key informant approach.

This article contributes to research in e-services in two main ways. First, it answers calls for an increased understanding of the design of high quality e-services (e.g., Hill et al, 2002; Sousa and Voss, forthcoming), as well as for a wider range of service research, in particular, incorporating the OM perspective (Rust, 2004). Second, it has contributed to integrating two research streams that have largely evolved independently, namely e-service operations/quality research and research examining the use of information technologies and the associated customer behavior. We are confident that it has led to a deeper understanding

of customer profile contingencies associated with the operational design of high quality e-services.

7. Limitations and Future Research

The carefully controlled research design that was used – in particular the examination of a single type of e-service, namely e-banking – restricts the scope of generalizability of the results. However, given that the most relevant results of our study have been of a disconfirming nature (i.e., the absence of expected relationships between customer profile and web site quality dimensions) we consider this limitation not to be critical. In fact, one disconfirming instance is sufficient to disprove a theory. Strictly, the study's findings apply directly to general e-banking services, which are a very important type of service in today's e-service landscape. We believe that the findings can be generalized to other task-oriented e-services. It may be important for future research to test the developed propositions in other types of e-services, in particular, types of e-services that are more strongly associated with experiential/hedonic use (e.g., entertainment services). In addition, although cultural effects have been found not to be relevant in service settings (Youngdahl et al, 2003), future studies should examine customers of other countries. Future research might also study customers at the extreme ends of the age spectrum who may have specificities of their own.

The present study's research design was oriented towards maximizing the sample size and the associated power of the tests for the developed propositions. In this connection, the study employed a parsimonious instrument made up of single-item measures for the importance attached to different web site quality dimensions. Future studies, with different

emphases and benefiting from forthcoming developments in the creation of reliable web site quality measurement instruments, might employ multi-item scales for these dimensions.

Finally, future research should examine other operational e-service design attributes besides quality.

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INSERTS

Table 1. Dimensions of Web Site Quality and Associated Measurement Items for an E-Banking Service.

Dimension of Web Site Quality	General Description (*)	Measurement Item for an E-Banking Service
1. Privacy/ Security	Protection of personal information, risk of fraud and financial loss.	I1. Safety in performing transactions.
2. Information Quality	The suitability of the information to the user's purposes.	I2. Correct and up to date information about the bank's products and services.
3. Ease of Use	Effort of the end users in using the web site.	I3. Ease of performing banking operations and accessing information.
4. Graphic Style	Presentation of graphics and text on the web site.	I4. Visual attractiveness of web site.
5. Reliability	Ability to perform the promised service dependably and accurately.	I5. Requests/ instructions correctly processed.
6. Responsiveness	Speed of response.	I6. Speed in delivering the services.

(*) Adapted from Zeithaml et al (2002a).

Table 2. Correlation Matrix of Test and Retest Measurements.

	I1_a	I2_a	I3_a	I4_a	I5_a	I6_a	I1_b	I2_b	I3_b	I4_b	I5_b	I6_b
I1_a												
I2_a	.21											
I3_a	.09	.17										
I4_a	-.15	.35	.39									
I5_a	**.46***	.07	-.03	.16								
I6_a	-.02	.21	.23	.26	.21							
I1_b	**.80***	.25	.11	-.19	**.47***	.15						
I2_b	.19	**.87***	.28	.37	.04	.20	.32					
I3_b	.08	.21	**.74***	.54	.09	.20	.16	.33				
I4_b	-.16	.28	**.51***	**.64***	.10	.14	-.16	.30	.23			
I5_b	**.46***	.14	.17	.16	**.66***	.29	**.59***	.23	**.42***	.05		
I6_b	.08	.27	.38	.43	.32	**.70***	.20	.36	**.52***	.19	**.54***	

- "a": first questionnaire (test); "b": second questionnaire (retest).
- * Significant correlations (0.01 level).

Table 3. Measurement of Customer Profile Variables and Respective Data Sources.

Variable	Measure	Data Source
Demographics		
V1. Age	Number of days elapsed since a customer's date of birth. (*)	Bank's customer database
V2. Gender	0-1 variable (0 – Female; 1- Male).	
V3. Education	0-6 variable, representing the following levels of education: 0 - Without any formal education; 1 - Primary education (4 years of education), 2 - Secondary education (5 to 7 years of education after primary education); 3 – Bachelor's degree (3-year higher education degree); 4 - Licentiate degree (5-year higher education degree); 5 – Master's/Postgraduate degree; 6 - PhD degree.	
Pattern of Channel Use		
V4. Physical Counter V5. Phone V6. ATM V7. Internet	Each variable represents the proportion of the total number of transactions that were performed by a customer through the respective channel during the month immediately after the questionnaire was removed from the web site.	Bank's back office IT systems.
Pattern of Service Use		
V8. Experience in using the service	Number of days elapsed since a customer's first login to the service. (*)	E-service's transaction and log files.
V9. Frequency of use	Number of logins of a customer in the previous 6 months. (*)	

(*) The "present" date (the end date for the period in question) was taken to be the last day on which the questionnaire was active on the web site.

Table 4. Characterization of the Final Sample (n=1,718).

Variable	%	Variable	Mean
V1. Gender		V4. Counter	4.2%
Male	73.7	V5. Phone	1.4%
Female	26.3	V6. ATM	28.5%
		V7. Internet	65.9%
V2. Age		V8. Experience	628.4 days
[25-35[	57.3		
[35-45[	24.0	V9. Frequency of use	85.3 logins
[45-55[	14.2		
[55-60[	4.5		
V3. Education			
Lower Education	48.0		
0	0.0		
1	2.6		
2	45.4		
Higher Education	52.0		
3	11.1		
4	39.5		
5	1.3		
6	0.1		

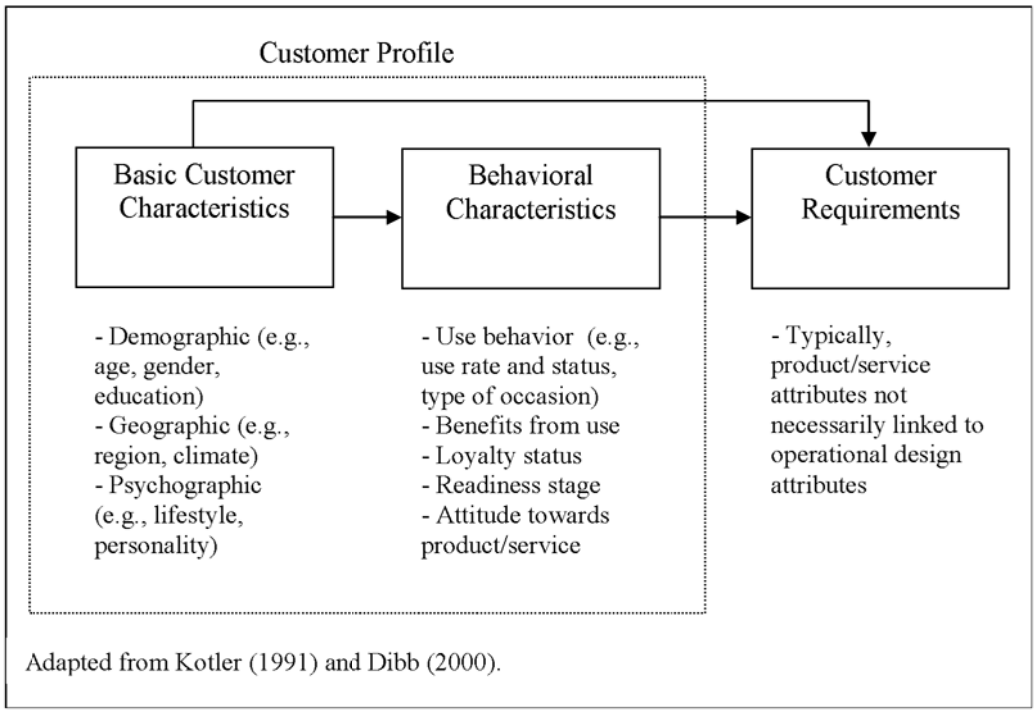

Figure 1. General Model underpinning the Market Segmentation Approach.

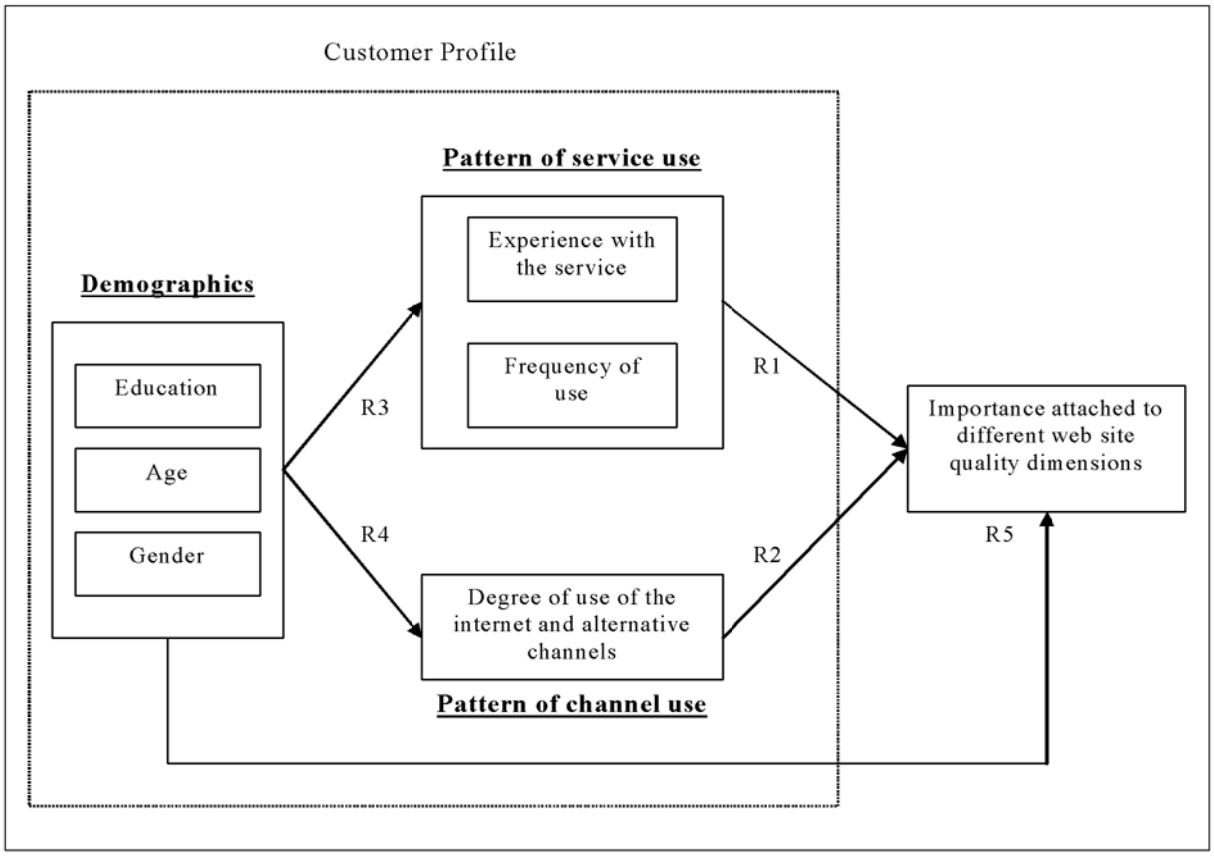

Figure 2. The Research Model.

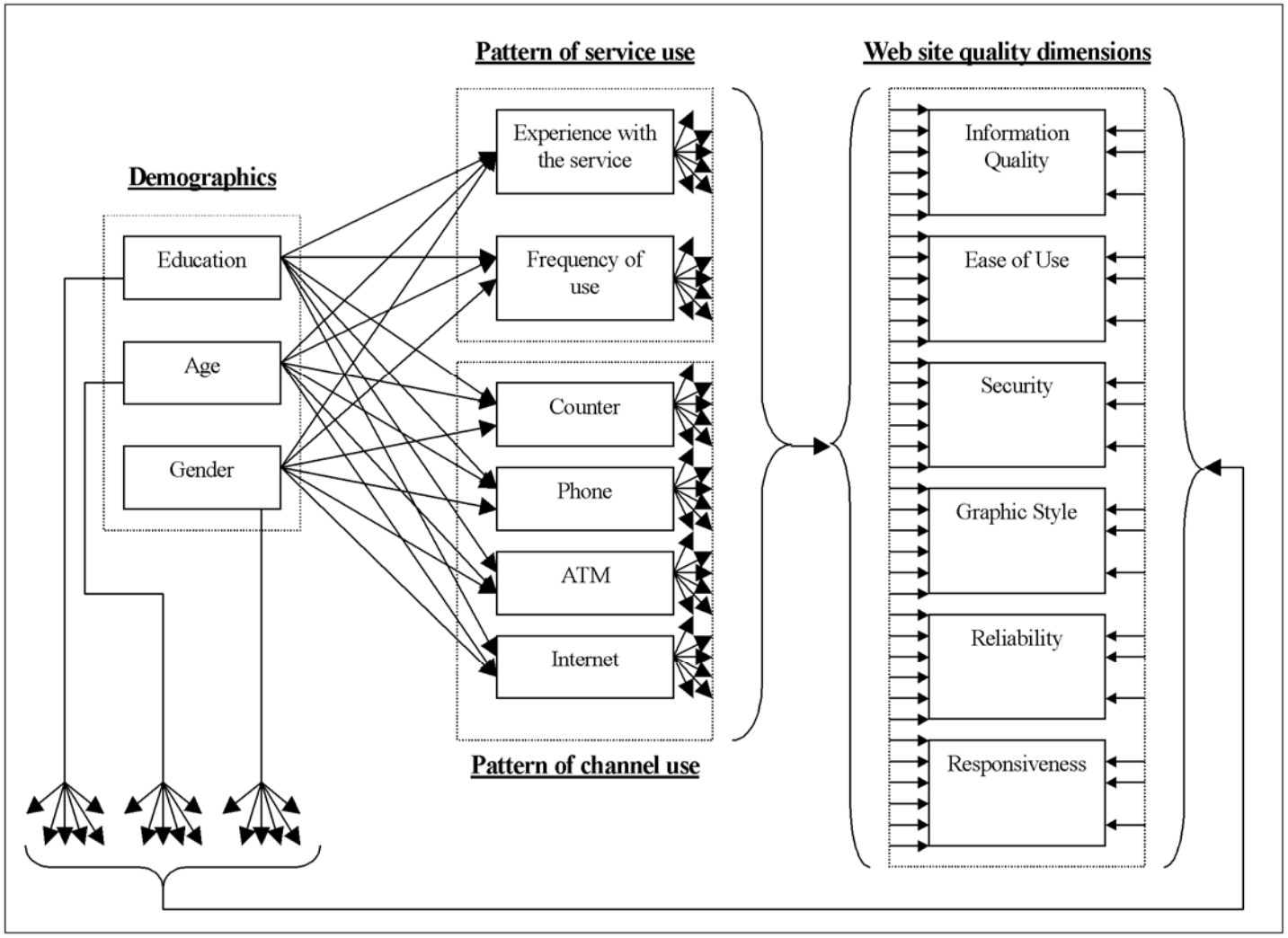

Figure 3. Full Path Analysis Diagram.

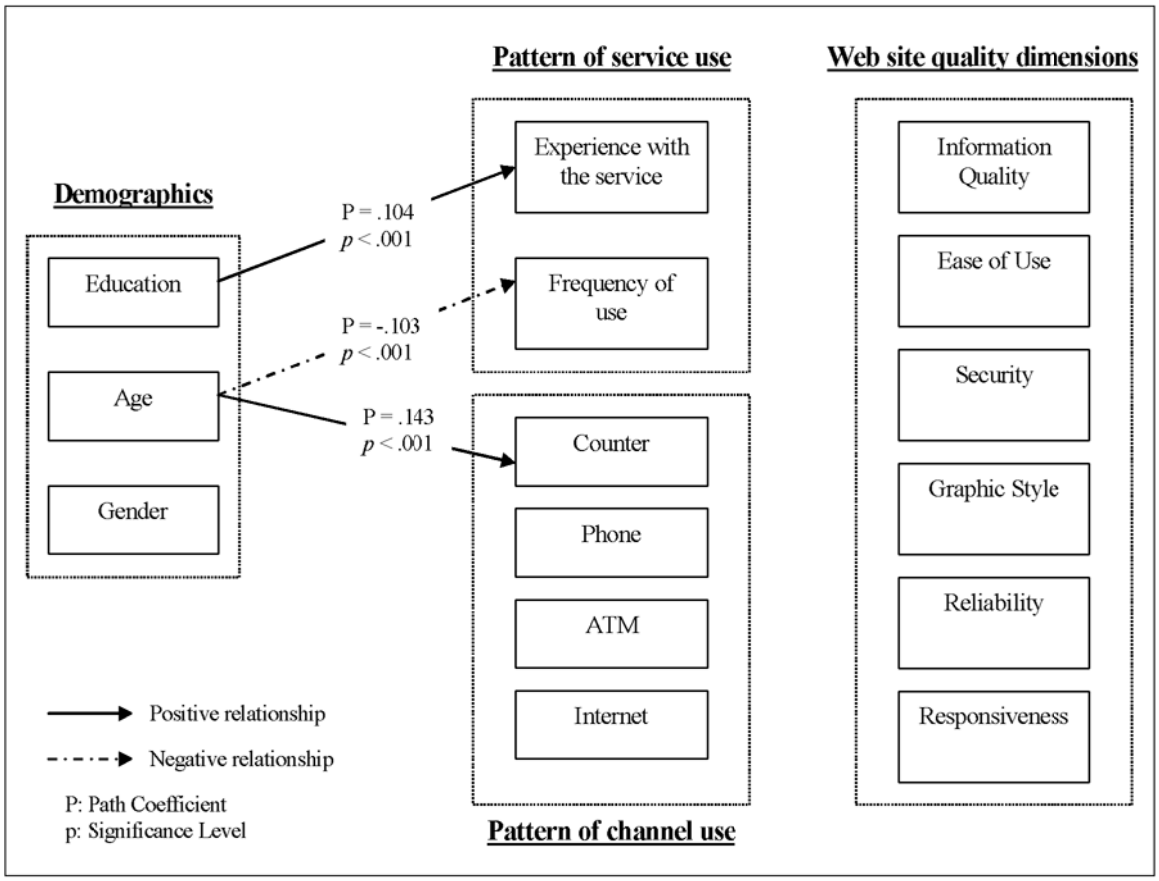

Figure 4. Path Analysis Results.