Measuring Perceived Quality and Satisfaction of ERP Systems: an Empirical Study with Customers of a Brazilian Software Company

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Abstract

The main objective of this research is to develop a scale to measure perceived quality of ERP (Enterprise Resource Planning) Systems. The exploratory stage of the research involved in-depth interviews and focus groups and the descriptive stage comprised a survey with 684 valid cases. The study revealed that the scales to measure quality of ERP systems were valid and reliable. A structural model was used to verify antecedents of satisfaction of ERP users, and the impact of satisfaction on loyalty of ERP customers.

1. Introduction

In a competing environment, it is increasingly costly to obtain new customers, making the retention of existing customers a more attractive prospect. It is estimated that it costs between three and five times less to keep an old customer than to obtain a new one [1].

For this reason, it is important to identify the factors that lead customers to keep buying from the same company for a long time. Various studies [2, 3, 4, 5] have shown that there is a positive relationship between satisfaction and tendency to loyalty.

National indexes of satisfaction have appeared in response to these issues. These indices are intended to measure customer satisfaction and tendency to loyalty, considered as latent variables. In 1998, the European Foundation for Quality Management and the CSI University Network, with the support of the European Commission, specified the bases for launching a project for the European Customer Satisfaction Index (ECSI).

The present paper empirically investigated the structural model used by the ECSI in a Brazilian software company that develops ERP (Enterprise Resource Planning) systems. The paper’s purpose was to analyze, in the ERP context, the relationships between the constructs of image, expectations, product and service quality, value, satisfaction and customer loyalty, based on the work done by [6, 7, 8, 9].

2. Background

2.1. Image

Image plays an important role in the relation between customer and supplier. All customers begin the buying process, implicitly or explicitly, with an evaluation of image [10]. In addition, an institution’s positive brand or name image is the most powerful way of differentiating a product/service, since it is almost impossible for a competitor to copy it [11]. The perception that the target public have of a particular company is a reflection of image [12]. In the same way, an image that is in line with a company’s strategic positioning is an important factor of strategic support.

2.2. Expectations

Before buying, customers have expectations about the quality of the product or service, in relation to individual needs, past experiences, recommendations from third parties and suppliers’ advertising. After purchasing and consuming the product or service, customers compare expected quality with they actually received. The performance of products and services that were above expectations are considered to be of superior quality. If the product or service is seen to be in its zone of tolerance, customers tend to consider it to be adequate. However, if quality falls below the level of acceptable service that the customer expects, there will be a discrepancy – or a quality gap – between the supplier’s performance and the customer’s performance [13].

Expectation is a perception of the probability that a particular event will occur [14]. On the other hand, other authors, such as [9], argue that the concept
should be widened to include a positive, negative or neutral evaluation of the expected event.

2.3. Quality

Since it is a topic that has been widely taken up by many scholars, the concept of quality has many different definitions. Quality may be conceptualised as the level of excellence that a company chooses to attain in order to satisfy its target customers and, at the same time, the extent to which it manages to reach this level [15].

On the other hand, quality may be understood as a consistent compliance with customer expectations [16]. This concept adopts a user-centred definition of quality, that is, the user’s perception.

However, perceived quality is the consumer’s judgement about the general excellence or superiority of the product or service [17]. Perceived quality is divided conceptually into two elements: product quality, which consists of the quality of the physical product’s attributes, and the quality of the services. This latter aspect represents the interactive association between the customer and the elements of the service, such as, for example, the behaviour of the company’s employees [17].

2.3.1. Software Quality. In the specific case of software industry, it is emphasised by [18] that different efforts have been made to develop precise measurements of software quality and that these have sometimes been unsuccessful due to the subjective nature of the activity. According to [18], “it is necessary to create methods for quantitative measurement in order to allow objective analysis.”

In order to provide help on this question, the International Organization for Standardization (ISO) and the International Electro technical Commission (IEC) joined forces to publish international standards. The ISO/IEC 9126 international norm [19], published in 1991, defines software quality as “the total set of characteristics of a software product that gives it the capacity to satisfy explicit and implicit needs”.

Explicit needs are the conditions and objectives proposed by those who produce the software; therefore, these needs are factors related to the quality of the process of product development and these factors are only perceived by the people who work on its development. Implicit needs are the subjective needs of the users (including operators, those who receive the results of the software and the product support personnel). These needs are also called external factors and can be perceived equally well by both developers and users.

2.3.2. Service Quality. Products are increasingly becoming similar which means that services are becoming one of the aspects which differentiate one company from another. In contrast to quality of goods, which can be measured objectively, the quality of services can only be measured partially in terms of objectives, due to its more abstract nature, deriving from its intangibility and other unique features [20]. The quality of services is related to the ability of diminishing the discrepancies between expectations and perceptions of customers and suppliers.

A service only has quality when it equals or exceeds the customers’ expectations [17]; therefore, the evaluation of service quality should be made by comparing expectations of performance with perceptions of the service actually received. This is the parameter which best illustrates customer satisfaction or dissatisfaction and, consequently, the quality of the service received. This evaluation of service should be made actively by means of questioning and communications with customers.

The conceptual model of measurement of service quality developed by [21] is based on the concept that service quality is determined by comparison of expected service with received service. This difference is called “Gap 5” by the authors. It is normally evaluated on the basis of the following five factors of service quality: reliability, response capability, security, tangible elements and empathy. Customers do not award these factors the same importance. In general, the three first ones (reliability, response capability, and security) are the most valued when assessing a service.

The instrument used to evaluate service quality consists of a questionnaire designed specifically for the type of service it is intended to measure. These attributes should be collected beforehand from various sources but, most importantly, from the actual customers. The questionnaire should measure the expectations and the perceptions of each attribute.

2.4. Value

Perceived value is the value attributed by customers to products or services, based on customer’s opinion of the relationship between the benefits it will provide and costs incurred in acquiring it in comparison to competing items [22]. Value is the customer’s perception in relation to the preferences and evaluations of the product’s attributes, or the performance of these attributes and of the results arising from its use [23].
Customers see the product as a set of attributes and so, when they purchase and use a product, they develop preferences and desires for the particular attributes which provide the desired results in the situations in which the product is used (the concept of value in use) and which satisfy their aims and create satisfaction as a result of the value perceived.

2.5. Customer Satisfaction

Satisfaction is the most important result of marketing activity and serves to provide a link between processes that culminate in purchase and consumption along with such post-purchase phenomena as exchange attitude, repeat purchase and brand loyalty. Conceptually speaking, satisfaction is a consequence of purchase and use and results from the comparison made by consumers of the rewards and costs of the transaction in relation to the anticipated consequences [24]. On the other hand, dissatisfaction arises out of discrepancies between previous expectations and actual performance.

The comparison between expectations and performance is only one of the many processes of comparison that the consumer performs when evaluating a good or a service [9]. According to this author, the consumer carries out two processes: cognitive ones (comparisons) and psychological ones. This author states that performance can directly affect satisfaction and it is also the starting point for the processes of comparison and the psychological processes.

2.6. Loyalty

The development of long and lasting relationships between consumers and suppliers has provided innumerable benefits for both parties. In general, loyal customers lead to growth in a company’s revenue and are more likely to make additional purchases of products and services and create new business for the company [21]. This point of view is shared by [25] who says that loyal customers usually recommend their suppliers to other potential customers, this creating an additional source of revenue for these suppliers.

One of the principal factors that leads to customer loyalty is satisfaction with their suppliers products and/or services [3]. These authors also indicate other benefits in relations to satisfied and loyal customers: reduction of price sensitivity, immunisation against competitors, lower transaction costs, reduced costs to attract new customers and a better reputation for the company.

In order to analyse the relationships between satisfaction and loyalty, it was confirmed by [26] that the first is a temporal post-use state, deriving from a unique consumer experience or from repeated experiences that reflect how a product or service managed to satisfy its purpose. From the company’s point of view, satisfaction is delivered to the customer. Loyalty, on the other hand, is the lasting state of preference, obtained by means of a specific posture of the customer in relation to the company.

3. Research Methodology

3.1. Exploratory and Quantitative Stages

The research was divided into two stages. The first one was exploratory and was carried out by means of in-depth interviews and exploratory focus groups. In this stage, a non-probabilistic judgement sampling was made. Ten of the twenty organisations that have the most important and comprehensive maintenance contracts with the ERP supplier were chosen by convenience criteria (proximity of their headquarters). The selected organizations belong to the following industries: four construction and real state companies, one IT company, one mining industry, one car rental company, one college, one cleaning and security services company, and one sport club.

The interviews were held with the executives who were responsible for the ERP acquisition (most of them Information Technology (IT) managers) and were current top-management ERP users. The interview scripts were based on literature, and priority was given to historical-discursive and descriptive aspects of the items concerning relationships between these companies and the ERP supplier. The intention was to list the items that would appear in the survey questionnaire.

After filtering and consolidating features proposed by the interviewees, an initial questionnaire was prepared taking into account the items raised in the software quality literature. The items related to the other constructs were obtained from previous studies made by [7, 9, 21, 27]. The scales were altered by 11 points, with the aim of treating them as continuous variables and thus, possibly, obtaining better measurement. This questionnaire was then submitted to an exploratory focus group, composed of academics and professionals from the areas of marketing and information systems, who suggested changes in the questionnaire. After this, a pre-test was carried out on 50 respondents and, finally, the items were established.
The second stage was based on a quantitative strategy by means of a survey. This method allowed the use of techniques of scale validation and measurement which were consistent with the aims of the research. An analysis was made of the organisations that had maintenance contracts with the software company called Alpha in this research in order to preserve its identity. However, the unit of observation of the research comprised the IT managers and decision-makers of the customer organizations. The data were collected by means of structured questionnaires, posted from September to December 2007, at the ERP software company’s website as well as by sending the same questionnaire to approximately 19,500 of Alpha’s registered customers obtained from the company’s database. The customers were encouraged to participate by draws of a variety of presents offered by the ERP company.

Only previously registered ERP customers had the permission to enter a restricted website area in order to answer the survey. Registered customers are allowed to download new ERP versions from the ERP website, ask for support, present suggestions and track requests. In other words, registered users were considered key users of the ERP systems as they were responsible for the administration of ERP in their organizations. Unfortunately, by that time, the database did not have any information about the gender, age, educational level and years of experience of registered users. On the other hand, the ERP company was sure that the registered users were definitely the best ones to take part of this survey as they were the best informed about the system. According to the ERP company and based on the type of queries received, most of the registered users were IT people or middle-management users with good IT skills.

The majority (66.5%) of the 684 valid respondents belonged to 3 Brazilian provinces, all of them from the most developed region: Minas Gerais, Sao Paulo and Rio de Janeiro. The rest was quite distributed across the twenty-two remaining Brazilian states. Approximately 32% of the respondents worked for organizations with less than one hundred employees; 42% belonged to enterprises from 100 to 500 employees; and 26% worked for very large organizations with more than 500 employees.

3.2. Research Model

In line with a review of relevant authors, such as [3, 7, 9, 17, 28] among others, and with the aim of empirically testing the relationships of the ECSI model in a Brazilian software supplier, the research model was designed. The hypothetical relationships are shown in Figure 1:

![Figure 1. Structure of the Hypothetical Model](image)

Thus the following hypotheses were proposed:

- $H_1$ – Perceived Image has a positive effect on expectations;
- $H_2$ - Perceived Image has a positive effect on customer satisfaction;
- $H_3$ - Perceived Image has a positive effect on tendency to show loyalty;
- $H_4$ - Expectations have a positive effect on perceived value;
- $H_5$ - Expectations have a positive effect quality;
- $H_6$ - Expectations have a positive effect customer satisfaction;
- $H_7$ - Quality has a positive effect on perceived value;
- $H_8$ - Perceived value has a positive effect on customer satisfaction;
- $H_9$ - Quality has a positive effect on customer satisfaction;
- $H_{10}$ - Satisfaction has a positive effect on customers’ tendencies to show loyalty.

4. Data Analysis

Analysis of the data was carried out according to a series of stages with the aim of checking premises and the consistency of the data, checking the reliability and validity of the measurement instruments and scales and creating a basis for testing the suggested hypothesis.

4.1. Missing Data and Outliers

Fifty-four cases (questionnaires) were withdrawn from the sample of 862 respondents (response rate of 4.4%) because they had a significant percentage of missing data which would jeopardise the analysis of
the data. In regard to the multivariate outliers, 124 cases were withdrawn, since the Mahalanobis distance has significant values at the 0.1% level. Thus, the sample ended up with 684 (862 minus 178) valid questionnaires.

4.2. Discriminant Validity

Discriminant analysis intends to check the extent to which the scales measure what they are intended to measure and it was made according to the procedure recommended by [29]. This means that the pair-by-pair construct correlation was tested by structural equation modelling.

The logic of this type of analysis consists of the fact that there is a comparison between two models that are tested for each pair of constructs; one model where the covariance is forced to 1 and another model where the covariance is left free. The difference between the chi-square statistics obtained for the two models is then calculated and, it this difference is greater than 3.84 (critical chi-square at 1 degree of freedom) than it is concluded that the constructs are different. The discriminant validity (Table 1) was confirmed, since the value for the difference between the chi-squares shown by the constructs exceeded the value of 3.84 for all the pairs that were compared.

4.3. Construct Dimensionality

Factorial analysis is a statistical technique that seeks to reduce and/or summarise the information analysed. Factorial analysis identifies the number of basic factors that justify the relationships that exist between many items [30]. In this paper, the aim of factorial analysis was to analyse the existence of underlying factors in the constructs investigated.

The existence of significant correlations between the items was measured by using the statistic known as Bartlett’s Sphericity Test. It is recommended by [31] 0.50 as the minimum value for the KMO statistic. Extraction by main axes is the method recommended when the main objective is to check the existence of latent factors [31]. The oblique method of rotation was used, because this method presupposes that there is a strong relationship between the factors. Five ways of deciding on the number of factors that should be taken into account are offered by [31]. This study was based on factors which have an Eigenvalue greater than 1 taken together with the quantity of explained variation.

<table>
<thead>
<tr>
<th>Table 1. KMO and Bartlett’s test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>KMO</strong></td>
</tr>
<tr>
<td>Measurement</td>
</tr>
<tr>
<td>Bartlett’s Test</td>
</tr>
<tr>
<td>df</td>
</tr>
<tr>
<td>Sig.</td>
</tr>
</tbody>
</table>

The KMO value for each construct (Table 1) was greater than the minimum necessary value required by [31]. In addition, it was noted that Bartlett’s Sphericity Test was significant for all the constructs, rejecting the hypothesis that there were no significant correlations between the construct items. These facts gave empirical backing for two arguments: (1) the number of respondents was satisfactory for the factorial analysis used and (2) there were correlations at a level which allows factors to be constituted.

It was also noted that the quality construct consisted of four factors: service quality; software quality; quality of technical assistance and quality of dealings with staff, which made up 73% of the observed variation. The image construct and the expectations construct were confirmed as one-dimensional. However, the value construct had two factors that accounted for 47.6% of the observed variation. Nevertheless, as will be shown in the following pages, the second factor was withdrawn because it did not have satisfactory reliability.

The satisfaction construct had two factors: general satisfaction and regret. These two factors accounted for 74% of the observed variation. The loyalty construct was one-dimensional and the extracted factor accounted for 54.86% of the observed variation.

4.4. Construct Reliability

Reliability is the extent to which the measurement instruments are free of variance due to random error [30]. Thus, high scale reliability will give confidence that the observed values derive from measurement instruments that represent the true values of respondents’ attitudes. To evaluate the psychometric properties of the scales used in this paper, the Cronbach’s Alpha mentioned by [31] was calculated. Apart from the coefficient value, it is suggested by [32] that the analysis of the extent to which each item of the scale correlates with the whole scale and with each of its individual items. For these authors, the researcher should follow the following practical rule: the correlation between a particular item and the
whole scale can be greater than 0.50 and the correlation between any two specific items should be greater than 0.30.

Table 2. Internal Consistency

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Factors</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>Factor 1</td>
<td>0.9714</td>
</tr>
<tr>
<td></td>
<td>Factor 2</td>
<td>0.8392</td>
</tr>
<tr>
<td></td>
<td>Factor 3</td>
<td>0.9420</td>
</tr>
<tr>
<td></td>
<td>Factor 4</td>
<td>0.9484</td>
</tr>
<tr>
<td>Image</td>
<td>Only One Factor</td>
<td>0.9229</td>
</tr>
<tr>
<td>Value</td>
<td>Factor 1</td>
<td>0.7225</td>
</tr>
<tr>
<td></td>
<td>Factor 2</td>
<td>0.4250</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>Factor 1</td>
<td>0.9544</td>
</tr>
<tr>
<td></td>
<td>Factor 2</td>
<td>0.8638</td>
</tr>
<tr>
<td>Expectations</td>
<td>Only One Factor</td>
<td>0.7828</td>
</tr>
<tr>
<td>Loyalty</td>
<td>Only One Factor</td>
<td>0.8532</td>
</tr>
</tbody>
</table>

Source: Research Data

Table 2 shows that only Factor 2 of the value construct does not have an alpha coefficient greater than 0.60. The remaining values exceed the limit and vary between 0.7225 and 0.9714. These results support the argument that the scales are reliable, principally those developed specially for this study, i.e., the scales for quality, since the scales used for the other constructs were adapted from studies. It is also emphasised that Factor 2 of the value construct was rejected because it had a reliability level below the minimum limit set in this study.

In spite of the intensive use of Cronbach’s Alpha coefficient for the analysis of the reliability of scales, some of its limitations are pointed out by [32]. For these authors, the calculation of reliability by means of Cronbach’s Alpha does not take into consideration errors in the indicators. Consequently, they encourage use of Compound Reliability and Extracted Variance by means of a confirmatory factorial analysis. These authors consider as satisfactory values equal to or greater than 0.50, both for compound reliability and extracted variance, although they state that smaller values are acceptable, at the researcher’s discretion, depending on the nature of the research. With the exception of the satisfaction construct, which had close to acceptable values, all the other constructs reached values greater than 0.50. Thus it can be concluded that all the scales are acceptable. It is worth emphasising that the quality construct scale was developed for this study and, even so, it was the one that had the highest index – 0.968 for compound reliability and 0.885 for extracted variance (Table 3).

4.5. Model Analysis

After validating the research instruments, the application of structural equation techniques may begin. Structural equations have been used in many fields of study for two reasons: (1) they furnish a method for dealing simultaneously with multiple relationships, while providing statistical efficiency; (2) their ability to evaluate relationships in a wide-ranging manner and to allow the transition from exploratory to confirmatory analysis. For the test of the hypothetical model, it was decided to employ the process of direct estimate, and to use the covariant matrix as the input matrix, as recommended by [32]. The Maximum Likelihood (M.L) method of estimation was selected for this research, because it is a suitable method when the data are moderately non-normal, taking into account the possible sample size [32]. The structural relationships for validation of hypotheses and models were calculated using the SPSS AMOS 4.0 program.

Table 3. Analysis of Reliability and Variance

<table>
<thead>
<tr>
<th>Construct</th>
<th>Comp. Reliability</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>0.968</td>
<td>0.885</td>
</tr>
<tr>
<td>Image</td>
<td>0.944</td>
<td>0.770</td>
</tr>
<tr>
<td>Loyalty</td>
<td>0.865</td>
<td>0.686</td>
</tr>
<tr>
<td>Expectation</td>
<td>0.897</td>
<td>0.687</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>0.472</td>
<td>0.312</td>
</tr>
<tr>
<td>Value</td>
<td>0.750</td>
<td>0.510</td>
</tr>
</tbody>
</table>

Table 4. Tests of the Hypotheses

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Estim.</th>
<th>Std. Error</th>
<th>β</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1 – Image → Expectation</td>
<td>0.540</td>
<td>0.027</td>
<td>0.72</td>
<td>20.055</td>
<td>0.000</td>
</tr>
<tr>
<td>H2–Image → Satisfaction</td>
<td>0.498</td>
<td>0.029</td>
<td>0.56</td>
<td>17.484</td>
<td>0.000</td>
</tr>
<tr>
<td>H3–Image → Loyalty</td>
<td>0.325</td>
<td>0.038</td>
<td>0.36</td>
<td>8.508</td>
<td>0.000</td>
</tr>
<tr>
<td>H4–Expect. → Value</td>
<td>0.135</td>
<td>0.055</td>
<td>0.10</td>
<td>2.470</td>
<td>0.014</td>
</tr>
<tr>
<td>H5–Expect. → Quality</td>
<td>0.752</td>
<td>0.049</td>
<td>0.58</td>
<td>15.237</td>
<td>0.000</td>
</tr>
<tr>
<td>H6–Expect. → Satisfaction</td>
<td>0.122</td>
<td>0.045</td>
<td>0.10</td>
<td>2.718</td>
<td>0.007</td>
</tr>
<tr>
<td>H7–Quality → Value</td>
<td>0.627</td>
<td>0.042</td>
<td>0.63</td>
<td>14.979</td>
<td>0.000</td>
</tr>
<tr>
<td>H8–Value → Satisfaction</td>
<td>0.112</td>
<td>0.029</td>
<td>0.12</td>
<td>3.827</td>
<td>0.000</td>
</tr>
<tr>
<td>H9–Quality → Satisfaction</td>
<td>0.238</td>
<td>0.030</td>
<td>0.28</td>
<td>8.575</td>
<td>0.000</td>
</tr>
<tr>
<td>H10–Satisf. → Loyalty</td>
<td>0.656</td>
<td>0.048</td>
<td>0.64</td>
<td>13.650</td>
<td>0.000</td>
</tr>
</tbody>
</table>

In Table 4, it can be seen that none of the hypotheses were statistically rejected at the 5% level,
that is, all the hypotheses were confirmed. Furthermore, it was confirmed that the critical t
value, at the 5% level, is greater than 1.96, which demonstrated that the path loadings were statistically
significant. The strong impact of image on expectations was also found ($\beta=0.72$). Quality is also
influenced by expectations ($\beta=0.58$) and has an important influence on perceived value ($\beta=0.63$). The
value of $\beta=0.656$ demonstrated the importance of customer satisfaction in obtaining customer loyalty
and confirmed other studies such as those carried out by [7] and [20]. The model fit indicators are shown in
Table 5.

### Table 5. Model Fit Indexes

<table>
<thead>
<tr>
<th>Chi-square</th>
<th>df</th>
<th>Chi-square/df</th>
<th>RMR</th>
<th>GFI</th>
<th>CFI</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1813.441</td>
<td>179</td>
<td>10.131</td>
<td>0.726</td>
<td>0.826</td>
<td>0.865</td>
<td>0.116</td>
</tr>
</tbody>
</table>

In Table 5, it was seen that absolute fit was not found, since the Chi-squared/Degrees of Freedom
relationship had a value greater than 6, GFI (Goodness of Fit Index) and CFI (Comparative Fit Index) less than 0.9 and, lastly, the RMSEA (Root Mean Standard Error of Approximation) was greater than zero.

It was therefore confirmed that the ECSI model did not demonstrate overall fit for suppliers of ERP. This demonstrates that modifications are necessary and that new studies should be made in an attempt to find a model that is appropriate to the specific characteristics of this sector.

### 4. Conclusion

The ECSI model of customer satisfaction was tested in this research. The sample size, the range of the research and the good results obtained in scale validation of the scales used to measure the variables under investigation allowed the model to be tested by means of structural equation modelling.

Testing the ECSI theoretical model in Brazil has offered a good opportunity to evaluate its generality, as well as certifying the validity of the measurement instruments used. The results justified that is necessary to consider the specificities of this sector. Therefore, the development of a scale for measuring software quality on the basis of work done by [21] was the most relevant side product arising from this research.

It was concluded that satisfaction, its antecedents and loyalty were adequately measured by valid and reliable scales as attested by the statistical tests used. All the hypotheses originally put forward were supported by the tests so that image, expectations, perceived value and quality were confirmed as antecedents of satisfaction and loyalty as a consequence. The same test could still be used for other software suppliers in an attempt to see if the scales can be adapted to other products than ERP.

Generalisation of the results of this research to all software companies is not justified due the fact that the product chosen, ERP, has specific characteristics. It is therefore suggested that this research should be widened to include companies that supply other types of software.

Another limitation which can be mentioned is the selection of the customer sample from only one company, even though it is present in all regions of Brazil and is one of the market leaders.

Another limitation of this research was the transversal nature of the data collected. They were collected at only one moment in time, whereas a longitudinal study, that can analyse the variation of the indices over time, would be more appropriate to determine the cause-effect relationships of customer behaviour. This is what is done by the organisations which use the ECSI in Europe and a study of this amplitude in Brazil would provide the basis for development of a Brazilian model. It would be important to do this in sectors of the economy that have already been investigated in Europe, since this would lead to comparisons of indexes between countries.

### 5. References


