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BUSINESS PROFESSIONALS' PERCEPTIONS RELATED TO THE INFLUENCE OF INFORMATION TECHNOLOGY IN INDIVIDUAL WORK

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ABSTRACT

According to the literature, much has been said about the impact of Information Technology on organizations, but little about its impact on the individual. This study aims to identify Information Technology benefits in individual work, choosing as a proxy some "latu sensu" post-graduation students, from a federal university in the south of Brazil. For data collection, a questionnaire based on the studies by Torkzadeh and Doll (1999) and Pereira (2003) was prepared. Torkzadeh and Doll dealt with the process of working; Pereira, with the four phases of the decision-making process. The final instrument, after being validated and tested, amounted to 21 questions to detect the potential benefits of Information Technology. The results demonstrated that users are satisfied, by pointing an average of 2.69 on a scale of "1" (little satisfied) to "5" (very much satisfied). The framework, work process, got an overall average [2.82]. Managerial control [3.10] and productivity [3.06] had the highest ratings; innovation [2.34], the lowest one. With technologies fully implemented, greater satisfaction was observed for all constructs of the survey, with statistically significant differences. Such differences were also proven in the Information Technology solutions that use Enterprise Resource Planning technology, the best-evaluated one. When comparing age, it was found that younger users were more

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satisfied with the benefits of technology. Concerning the number of employees, small business users were less satisfied with Information Technology.

Keywords: Information Technology. Benefits on the Individual. Work process. Decision-Making Process.

1. INTRODUCTION

The many improvements which have been witnessed in the different areas of knowledge in recent years have led organizations and people to constantly adapt to them. Information Technology (IT) has been one of the important factors to induce change in the environment. Fetzner and Freitas (2007a) argue that since the mid-twentieth century, organizations have experienced a period of intense innovation and use of technologies, critical elements to the pursuit of higher levels of performance and competitiveness; and they also say that there has been a corresponding recognition of the IT potential contribution to organizational success.

In the early 60's, IT set out the first benefits for organizations, specifically contributing to the automation of operational processes. In the 70's, IT started a new stage of contributions by providing customized management reports to support the decision-making process, and using the data stored in databases of information systems. The 80's were marked by the emergence of PCs, causing a revolution in the organizations of that time. Borges, Parisi, and Gil (2005) believe that, due to computers, data, which used to be centralized in mainframes, became then available to users and managers at their desks. Thus, IT made it possible to improve internal efficiency as well as personal productivity. As a result of such a new way of seeing and using information, many information systems were recognized as strategic because they presented positive impacts on the competitiveness of companies that used them.

The evolution of IT kept developing in the 90's, when other major advances came forth: the beginning of the Information Technology Age, the strategic importance of IT in business, and the popularization of the Internet, primarily responsible for the birth of e-business. Nowadays, the involvement of organizations in IT is obvious, with minimal chances of survival for those [companies] that do not use it (Borges, Paris, & Gil, 2005). In this evolutionary technological process, changes in focus and paradigms in organizations have been taking place continuously, and also been incorporated by IT. Parallel to these developments, the definitions and concepts of IT have also been changing. Therefore, it is important to define the concept used in this work, as it has been discussed, for example, by Henderson and Venkatraman (1993), by Walton (1994), by Laudon and Laudon (2000), by Laurindo (2002), by Padoveze (2007) and by others. Some authors have considered IT consisting only of machines, while others have defined it more broadly, including people in the technological context. For the present study, the definition considered was taken from Laurindo (2002), who conceptualizes IT in a more comprehensive way, including data processing, information systems, software engineering, software and hardware set, as well as human, administrative and organizational aspects.

Understanding how IT impacts on an organization and its staff is not only a challenging experience, but also a great opportunity for deeper studies. Torkzadeh and Doll (1999, p. 107) explain that the analyses of IT impact on organizations, besides being wide, provides research opportunities and significant challenges. In similar ways, Fetzner and Freitas (2007b) believe that the process of implementing technology is

complex and multifaceted, and can be approached from different perspectives and in ranges of analysis from the individual to interorganizational areas.

In Antonelli, Espejo, Almeida, and Longhi (2010) bibliometric study, an extensive research both in national and international journals has been carried out in order to examine thematic and methodological trends of publications dealing with the impact of IT, between the years 2005 and 2009. One of the researches tried to verify the point of view where the impact of IT was being analyzed from. Just two, out of the thirty-eight articles selected, studied IT at the individual level, emphasizing, therefore, the lack of research in this area. Such verification also supports other studies over the last decade by Torkzadeh and Doll (1999), who said that researches about the impact of IT has not yet been developed at the level of individual work.

In this context, the study of the impact at the individual level is important for two main reasons: (i) first, due to the lack of research with such an approach, and (ii), second, due to the need to consider human factor in IT studies. Rezende and Abreu (2000) think that the human element - peopleware - should be included as an IT component. According to them, people should also be responsible for the integration of technological tools. In this sense, Pereira (2003) says that without the human interference, IT would have neither functionality nor utility. According to these considerations, the guiding question of this study is: **Which are the perceptions of business professionals related to the influence of information technology in individual work?** It follows the aim of this study is to verify such business professionals' perceptions related to the influence of IT in individual work. It is still needed to validate the research tools to be used in this survey.

This study is divided into five sections, beginning with this introduction. It is followed by the theoretical and empirical basis, and by the methodological procedures. The analysis of the results and the conclusions with recommendations for further researches are discussed in the fourth and fifth parts.

2. THEORETICAL AND EMPIRICAL BASES

Considering the many possible studies of IT impacts on organizations, inquiries have been undertaken with several outbreaks either in Brazil or abroad. Shang and Seddon (2002), for example, investigated the benefits organizations can get from their investments in ERP (Enterprise Resource Planning). They suggested a framework of benefits originated from the analysis of 233 corporative systems and interviews with 34 organizations. Focusing on a specific economical sector, Spathis (2006) studied the positive impacts of ERP systems in the field of accounting organizations in Greece. Hyvonen, Jarvinen, and Pellinen (2006) carried out a case study in a European company with the purpose of analyzing the use of ERP systems to help in ABC (Activity-Based Costing). Fawcett, Magnan, and McCarter (2008) – due to issues relating to barriers that prevented the success of an application – used a "quali-quanti" methodological approach to investigate the achieved benefits with the successful implementation of SCM (Supply Chain Management) in U.S. companies.

In Brazil, some studies are usually quoted, for example: (i) Mascarenhas, Vasconcelos, and Vasconcelos (2005) who discussed the impacts of IT and its strategic role in the context of personnel management transition; (ii) Silveira and Zwicker (2006) who analyzed the use of IT as a source of sustainable competitive advantage for industry organizations, (iii) Ferreira and Silveira (2007) who studied 27 supermarkets of

different sizes, trying to assess the impacts of computerization in the management of these institutions; (iv) Nascimento and Reginato (2007) who evaluated the contribution of IT tools, more specifically, BI (Business Intelligence) in the area of controlling, and its function is to provide the decision-making process with useful information; and (v) Albertin and Albertin (2008) who showed the relationship between IT benefits and business performance, as well as its application in managing technological projects through a specific instrument developed for this purpose.

Given the diversity of the aforementioned studies, the considerations of Torkzadeh and Doll (1999) and Freitas and Fetzner (2007b) are corroborated by the finding of different approaches to the impact of IT, such as cost reduction, competitive advantage, providing information for decision making, organizational strategy, time reduction, improvement in relationships with customers and suppliers among others.

The theoretical and empirical bases of this study is essentially grounded on empirical researches analyzing the benefits of IT in individual work developed in the working-process (Torkzadeh & Doll, 1999) and in the decision-making process (Pereira, 2003).

2.1. Benefits of Information Technology in individual work

IT can affect individual work in different ways. Torkzadeh and Doll (1999) in their seminal study, argued for a framework able to measure the impact of IT at an individual level, and based on four constructs: **productivity, innovation, customer satisfaction and management control.** Later, Torkzadeh, Doll, and Koufteros (2005) validated that instrument. Pereira (2003) studied the impact of IT on the individual work process, using Torkzadeh and Doll (2003) framework with the addition of another construct: **decision-making process.**

Both such studies make use of the user's perception of IT to measure its impact. Pereira (2003) argued that this strategy is based on the individual cognitive process that has its own scheme to understand the external world. The cognitive process is based on Behavioral Theory of Management, and, on a study by Doll and Torkzadeh (1991), it is represented by a "system to value chain" to explain the relationship between the use of IT and its impacts (Figure 1). For these authors, the impact of IT is a key concept that incorporates downstream effects; to study it, at the individual level, is a direct reflection of the use of technology which precedes organizational effects (Doll & Torkzadeh, 1991).

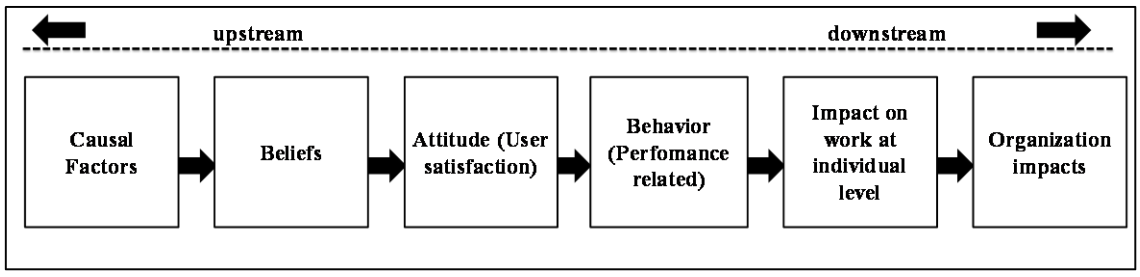

Figure 1: System to Value Chain

Source: Doll and Torkzadeh (1991)

It should be noted that most studies referenced herein analyzes the impact of IT on individual work. As it will be described hereafter, the instrument used for this measurement examines the possible positive impacts on the individual by means of the above five constructs. Considering that the word "impact" may lead the reader to think

about both positive and negative aspects, the word "benefit" is sometimes used here to emphasize IT positive aspects.

2.1.1. The benefits of IT in the perspective of the Work Process

In a seminal study, Torkzadeh and Doll (1999) drew up a framework to measure the impact of IT in individual work. In order to create such an instrument, they carried out an extensive literature search to identify the points which should be dealt with.

Torkzadeh and Doll (1999) listed definitions for the four constructs that describe "how" the impact of an application at the individual level is within an organizational context. Application should be understood as the use of IT to perform the work. The definitions and the literature are described in Table 1.

Table 1. Definitions of the impact of IT on work

Construct	Short definition
Productivity	To the extent that the user's performance improves, per time unit.
Innovation	To the extent that an application helps users to create and test new ideas in their works.
Customer satisfaction	To the extent that an application helps the user to add value for internal or external customers of the company.
Management control	To the extent that the application helps to regulate work processes and performance.

Source: Adapted from Torkzadeh and Doll (1999, p. 329)

With the constructs set out and the literature review completed, Torkzadeh and Doll (1999) made 39 closed questions of the five-point Likert-type scale to measure the impact of IT in all four dimensions considered above. For initial validation of the instrument, a pilot study was conducted, by applying the factorial analysis, with the purpose of purification, verification of unidimensionality, reliability, concision and simplicity of the structure of the factors.

While developing the pilot study, 89 interviews were made, though 24 of them were excluded at purification. In the analysis of reliability, by applying Cronbach's Alpha test, three other questions were also excluded. So, the final version had just 12 questions, which were applied to 409 technology users belonging to 18 different organizations from different industries and sectors. The authors pointed out that the wide diversity of the sample contributed to the generalization of the results and made the questionnaire application in different realities possible.

Torkzadeh and Doll (1999) successfully concluded their study not only for having conceptualized the impact of IT, but also for developing valid and reliable measurements to evaluate it. The suggestions to apply their framework are: (i) to compare users of the same software, by identifying their differences and training needs, (ii) to use parts of the instrument to assess the different kinds of applications, and (iii) to use the instrument to facilitate the identification of situational factors and processes which determine the implementation effectiveness, and also to evaluate the degree to which individuals learn how to apply new technologies.

Later, Torkzadeh, Doll, and Koufteros (2005) carried out another study in order to revalidate the instrument mentioned above. They proposed a new validation approach by using confirmatory techniques and tests of factorial invariance. Data were collected

from two samples. One with IT users, in the U.S., the other one, in Mexico, both of them with respondents from different management positions in the organizational hierarchy. The results clearly illustrated that the initial four constructs adequately measured the impact of IT on individual work. Reliability was high, and the factorial invariance tests showed that, generally speaking, the evaluation model was invariable regardless the countries being studied or the levels of management.

The authors thought that the proposed framework should be confirmed with the replication of the study in order to test its stability and to develop appropriate standards to evaluate specific applications. In this sense, there are the following studies: (i) Maçada and Borenstein (2000) measured the users' satisfaction from a Decision Support System (DSS), and they concluded that the four dimensions of the model are enough to analyze a prototype in a public organization. (ii) Lunardi, Correa, and Borba (2004) evaluated the ERP implemented in a university hospital from a Federal Institution of Higher Education, through the perspective of the user's satisfaction.

2.1.2. The benefits of IT in the perspective of decision-making

In the twentieth century, it was thought that the management of organizations should be rational, controllable and likely to be standardized. Such a view represented an essentially logical decision-making process, centered on the chief executive officer, who was expected to possess extensive knowledge of all alternatives and their consequences. Therefore, he did not need to give explanations about the criteria he had adopted for his choices (Wijnberg, Ende, Van Den, & Wit, 2002).

Pereira, Becker, and Lunardi (2007) say that from the 1960s on, IT began to be used to help in the decision-making process by means of mathematical models. The expectation, at the time, was the possibilities of using IT, through algorithms, to analyze all the alternatives and their consequences. In contrast to such expectations, the authors argue that in the last few decades, the complexity, unpredictability and hostility of the external environment have made business decision-making difficult. Ruggiero and Godoy (2006) say that the decision-making process in organizations has been changing over the years, particularly due to the speed of IT advancement.

Considering the importance of IT, nowadays, in supporting the decision-making process, Pereira (2003), besides adapting and validating such an instrument for the Brazilian context, also expanded it with the addition of the construct "decision-making process" at an individual level. The main aim of this study is to evaluate the perception of bank employees related to the impact of IT on their work.

The construct decision-making process is grounded on Simon's (1960) study, and has three main stages which are performed at different times: (i) intelligence: search for situations requiring a decision-making process; (ii) design: creation, development and analysis of possible alternatives, (iii) choice of an alternative amongst those available. Later, the author added a fourth stage to the process: (iv) implementation. In Table 2, the concept of the construct decision-making process comes in detail.

Table 2. Definition of the impact of IT on decision-making process viewpoint

Construct	Short definition
Decision-making	It is understood as a synonym of management, which encompasses not only the final act of a choice amongst alternatives, but the whole process of decision making, including the four stages of the process: (i) intelligence: is there a problem? (ii) design: which are the alternatives? (iii) choice: which alternative to choose? (iv) implementation: is the choice working?

Source: Adapted from Pereira (2003)

While adapting Torkzadeh and Doll's (1999) instrument, Pereira (2003) emphasized the care he had in the translation, back translation and adaptation phases, which made it possible to validate the questionnaire for the Brazilian banking environment. She explained that great care had been taken in performing these stages in order to maintain the original sense of the questions and, at the same time, to adapt them to Portuguese.

In the questionnaire designed by Pereira (2003), Torkzadeh and Doll (1999), questions were kept, and another 15 ones included, all of them related to the decision-making process. They were also pre-tested with elements from the sample, and obtained a very high value for Cronbach´s Alpha - 0.90 – proceeding to implement the survey without any question modification for that module (Pereira, 2003). The final version of the questionnaire, which was developed and validated by Pereira (2003), had 27 questions: 12 of them adapted from Torkzadeh and Doll (1999), and other 15 ones included.

To emphasize the statistical analysis power in his discussion of the final results, Pereira (2003) used Exploratory Factor Analysis (EFA) procedures, Confirmatory Factor Analysis (CFA) and an adaptation of the method MTMM (multitrait-multimethod). The author also said that the aim of using such statistical techniques was to check the validity of the constructs. The final instrument for the decision-making process left five questions out, keeping only ten from the original instrument, with the percentage of variance explained through EFA, of 77.7%.

After Pereira (2003), other analysts started using questions related to the decision-making process along with the ones developed by Torkzadeh and Doll (1999). (i) Ruggiero and Godoy (2006), for example, in order to identify and analyze the opinions of human resource managers concerning the aspects of the use of IT in their work, and (ii) Lucht, Maçada, and Hoppen (2007) who extended the model of the work process including issues related to decision-making process and information security in order to build an expanded conceptual model to measure such impacts in users' of an Information System individual work.

2.1.3. Conceptual model of the research

Figure 2, the conceptual model of this research details the constructs and investigates variables. In the first group, we have the information technology of the individual's work consisting of two other constructs. The first is the work process, based on Torkzadeh and Doll (1999) and Torkzadeh, Doll, and Koufteros (2005). It is composed of the following constructs: **productivity, innovation, customer satisfaction** and **management control**. The second one is the **decision-making**

process, based on Pereira (2003) and composed by the constructs: **intelligence, design, selection** and **implementation phases.**

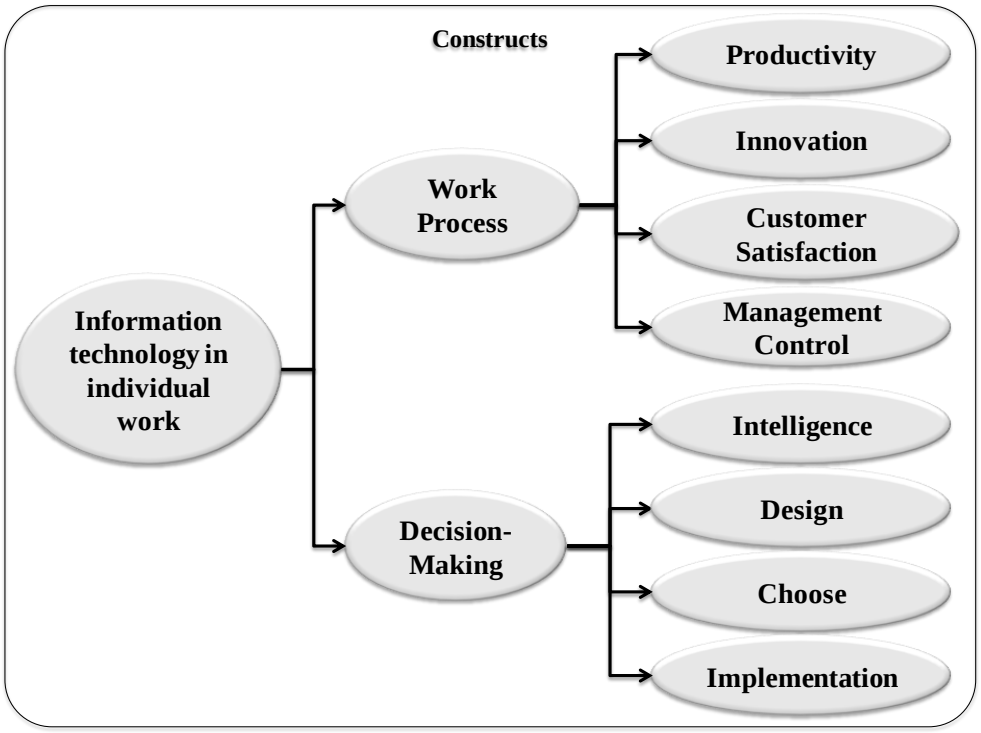

Figure 2: Conceptual model of the research

3. METHODOLOGY

This survey has been carried out replicating the instruments developed by Torkzadeh and Doll (1999) and Pereira (2003). A survey, according to Babbie (2001), has three main purposes: to describe, to explain and to explore. Therefore, this study aims to measure, following an ordering scale, the intensity of IT benefits in professional activities from the point of view of its own users' considerations. According to the criteria of Hair, Babin, Money, and Samouel (2005), it can be classified into quantitative, exploratory and descriptive research.

Torkzadeh and Doll (1999) said that the results they obtained have support for generalizations, because they had got several answers from a wide variety of applications and organizations. In this study, we have tried to set a diverse population frame, comprising people from different kinds of organizations (private ones, public and mixed ones, and from the third sector), from different sectors (trade, industry and service), from different-sized companies (small, medium and large ones), from different departments (inventory, financial, commercial, etc.), from different ages, different length of professional experience, etc.

Considering the diversity of samples, the population frame was set with business students, classes of 2008, 2009 and 2010, from Federal University of Paraná (UFPR), enrolled in the following "lato sensu" post-graduation courses: Business Management, Controlling, Accounting and Finance, MBA in Integral Audit and People Management. The instrument for data collection had twelve questions originated from Torkzadeh and Doll (1999); another ten, from Pereira's (2003) instrument, both of them of the Likert type, with five levels each, ranging from "1" (very little) to "5 "(very much). They

intended to measure the intensity of perception of the IT benefits in the work of the individual.

To characterize the respondent, 14 questions were used, either closed or open. It is Important to note that of two questions from the characterization block, one asks whether the application used by the respondent is in the implementation phase. If the answer is yes, it is expected that the impact is lower than those that are not being implemented. Another question checks whether or not the application is part of an ERP. Some studies, in the literature, also observe that ERP brings great changes in any environment it is inserted, like the study by Newman and Westrup (2005). According to these authors, the ERP systems have represented a fundamental change for accountants. Turban, McLean, and Wetherbe (2004) also think that ERP systems have provided solutions that benefit and improve the efficiency, quality and productivity of enterprises, improving their results as well as customer satisfaction. Finally, the instrument comprises, at first, 22 Likert-type questions to measure the benefits of IT in the work of the individual and, then, other 14 questions to characterize the respondent, amounting to 36 questions.

Data were collected in two ways: (i) visits were made to "lato sensu" post-graduation students, classes 2010, during their lessons, in order to explain to them the research and to hand out the printed questionnaire: 145 valid responses were obtained back; (ii) to the other classes, 2008 and 2009, an electronic version of the questionnaire was sent by e-mail, along with a presentation of the research and a request for collaborating. Another 76 valid answers came back; amounting to 221 when added to the above ones.

Data statistical treatment was performed in three stages. At first, techniques of descriptive and univariate statistics were used; and then, multivariate statistical techniques, in the case of Cronbach's Alpha and EFA (Exploratory Factor Analysis). At last, to test data normality, the tests of Kolmogorov-Smirnov and Shapiro-Wilk were employed, followed by the group analyses of by using the Mann-Whitney Test of hypotheses.

4. RESULTS AND DISCUSSION

The results of this research are described in four parts. The first one characterizes the sample. The next two validate Torkzadeh and Doll's (1999) and Pereira's (2003) tools respectively. The last one crosses the answers.

4.1. Characterization

In the block of the instrument, concerning the characterization of the sample, some questions were highlighted. The first one asked about the application(s) the respondent had been using in his professional activity. According to the 221 responses, more than 50 different types of software were in use, with the highest reference for "Excel" with 16.7%, "SAP" with 16.2%, "Cordilheira" with 5.88% and "Datasul" with 7.0%.

Concerning to the respondents' main functions performed in the organizations, more than 25 different functions were mentioned. About 56.5% of the respondents carried out more than one function. From the ones with a single function, 37 [16.7%] there were just financial functions; 21 [9.5%], accounting ones; 7 [3.16 %], human resources; among some others.

In relation to age, it was observed that most respondents are young people aged between 20 and 30 [64%]. The time length of the respondents' professional experience was also analyzed, along with age. Most of them do not have more than a decade of professional experience: 26.7% up to five years, and 41.6% six to ten years.

Working time in the current organization was also observed, so that employees with up to four years are the majority with 61.9%.

To characterize the working environment in which the respondents are in, some of the questions dealt with the organizational characteristics. It was observed that 84.7% of the respondents were working in private companies; 7.2%, in public ones; 6.3%, in mixed organizations; only 1.8%, in the third sector. Such figures show that the sample covers IT users from all business sectors, in spite of the different proportions.

Also respondents from private and mixed organizations were asked to sort them, according to their main activity, into commerce, industry or service providers: 73 out of 201 are service providers; 56, industries; 31, commerce companies; 41 no specified activity. The number of employees was used to rank companies by their size, according to the SEBRAE[1] (2011) methodology, as it can be seen in the fragmented sample in Table 3. Large organizations are more common in the sample.

Table 3. Size of companies

Classification	Size	Total	Percentage
Industry (56)	Micro (up to 19 employees)	02	3,6%
	Small (from 20 to 99 employees)	03	5,4%
	Medium (from 100 to 499 employees)	11	19,6%
	Large (more than 500 employees)	40	71,4%
Trade and Services (104)	Micro (up to 9 employees)	12	11,5%
	Small (from 10 to 49 employees)	24	23,1%
	Medium (from 50 to 99 employees)	15	14,4%
	Large (more than 100 employees)	53	51,0%

Source: Research based on the classification of SEBRAE (2011)

With the characterizations discussed so far, the intention of having a sample with a high degree of diversity seems to have been achieved, due to the variety of softwareused; the age groups of respondents; the different time length of their professional experiences; and the organizational characteristics of the companies.

4.2. Validation of the Work Process Instrument (Torkzadeh & Doll, 1999)

Exploratory Factor Analysis (EFA) was used to validate the Instrument; at first, because it had been employed in the original studies, and also for the intention to verify the correspondence of the factors with the theoretical basis. The relationship with the basic studies is grounded on Field's (2009) considerations. He argues that Factor Analysis can help to identify groups or clusters of variables as well as to reduce the data set, and does not require that the researcher has prior knowledge about the dependence between variables.

[1] a private non-profit organization established in 1972 with the mission of promoting competitiveness and sustainable development of micro and small enterprises.

Factor Analysis was carried out with the method of principal components by assuming the sample corresponds to the population. For a better explanatory power of the factors, the Varimax orthogonal rotation was used. According to Field (2009), it consists in trying to add a smaller number of variables toeach factor resulting in more clusters of interpretable factors. EFA was initially performed with a number of factors with eigenvalues greater than one, generating three factors for the instrument [5.5; 1.50; 1.32]. Similarly to Pereira (2003), there was the proximity to the fourth factor [0.87], opting to carry out another round for the extraction of four factors. Originally, Factor Analysis was performed with a number of factors with eigenvalues greater than one, generating three factors for the instrument [5.5; 1.50; 1.32]. Similarly to Pereira (2003), the proximity to the fourth factor [0.87] was observed, and then it was decided for another round to extract a fourth factor.

Checking the table of communalities, the PROD_103 variable, which asked if "*this application allows me to accomplish more work than would otherwise be possible*", presented low value [0.61], when compared to the other ones. Then, a new round was held without this variable, trying to improve the model's explanatory power, which rose from 76.6% to 78.9%, culminating with the definitive withdrawal of the assertion. So, as a final result, EFA had four factors [Table 4], showing the strength of the model with the following details: (i) the correlation matrix had all its values close to zero, (ii) the KMO test was satisfactory with 0.860, and the one of sphericity validated the use of EFA, (iii) the anti-image matrix had all its diagonal values greater than 0.50, and (iv) in the table of communalities, all the indicators had a high explanatory power, with their values above 0.70.

Table 4. EFA of the Work Process survey

Rotated Component Matrix[a]	**Factor (Component)**			
Encoding - Description of the Issue	**1**	**2**	**3**	**4**
PROD_101 - This application saves me time.				0,792
PROD_102 - This application increases my productivity.				0,825
INOV_111 - This application helps me come up with new ideas.		0,785		
INOV_112 - This application helps me try out innovative ideas.		0,794		
INOV_113 - This application helps me create new ideas.		0,854		
SATIS_121 - This application improves customer service.			0,755	
SATIS_122 - This application improves customer satisfaction.			0,854	
SATIS_123 - This application helps me meet customer needs.			0,851	
CONTROL_131 - This application helps management control the work process.	0,818			
CONTROL_132 - This application helps management control performance.	0,850			
CONTROL_133 - This application improves management control.	0,839			

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

[a] Rotation converged in 5 iterations.

Source: Research

As the research variables behaved similarly to the baseline study, the interpretation of the factors remains the same as explained in Table 1. So Factor (1) from Table 4 relates to **management control;** Factor (2) relates to **innovation**; Factor (3) to **customer satisfaction**; Factor (4) to **productivity**. To check the reliability of the scale, Cronbach's Alpha of the instrument was calculated with eleven final variables, individually and by construct. Caution in relation to the estimated coefficient should be emphasized, so that no correlation was negative. Table 5 details the values found for Cronbach's Alpha and its comparison with previous studies.

Table 5. Cronbach's Alpha of the Work Process Survey

Constructs	Survey	Pereira (2003)	Torkzadeh and Doll (1999)
Productivity (4)	0,78	0,74	0,93
Innovation (2)	0,83	0,80	0,95
Customer Satisfaction (3)	0,84	0,81	0,96
Management Control (1)	0,88	0,82	0,93
TOTAL	0,89	0,82	0,92

Source: Research

The obtained coefficient was 0.89; higher than in Pereira's (2003) study, and slightly lower than Torkzadeh and Doll's (1999). Such amounts corroborate both the model acceptability and reliability. With the results obtained, either by EFA or by the Cronbach's Alpha, it can be said that the model is effective, just as mentioned by its creators.

4.3. Validation of the Decision-Making Instrument (Pereira, 2003)

The same parameters above for EFA validation were used here to validate the decision making instrument, resulting in the three factors further detailed in Table 6. The details of the generated EFA are: (i) the correlation matrix has all values close to zero, (ii) the KMO test was satisfactory with 0.924, and the sphericity test continues validating the use of the EFA; the anti-image matrix had all the diagonal values higher than 0.50; (iii) in the table of communalities, all of the indicators show a high explanatory power with values above 0.71, (iv) the model, at last, successfully explains about 78.4% of the variation of the indicators.

Table 6. EFA of the Decision-making Process survey

Rotated Component Matrix[a]	Factor		
Encoding - Description of the Issue	1	2	3
INTELIG_151 - This application helps me to sort the identified problems.		0,805	
INTELIG_152 - This application helps me to describe the characteristics of the problems.		0,791	
CONCEP_161 - This application helps me to describe alternatives to decision making.	0,880		
CONCEP_162 - This application helps me to consider the alternatives to decision making.	0,856		
CONCEP_163 - This application helps me to analyze the decision making alternatives.	0,830		
ESCOL_171 - This application helps me to select the most appropriate alternative to solve the problem.		0,654	
ESCOL_172 - This application helps me to choose the best alternative to solve the problem.		0,592	
IMPLE_182 - This application helps me to review an implemented decision.			0,683
IMPLE_183 - This application helps me to monitor a decision implemented.			0,826
IMPLE_184 - This application helps me to implement a decision.			0,761

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

[a] Rotation converged in 5 iterations.

Source: Research

In the study by Pereira (2003), the results obtained by EFA resulted in four factors corresponding to their constructs. In the present research, as it can be seen in Table 4, the EFA has generated only three factors, since the constructs **intelligence phase** and

selection phase are coupled in Factor (2), which indicates the variation similarity of IT benefits, either in checking any existent problem or in choosing an alternative. Factor (1) corresponds to the **designing phase** and Factor (3) to the **implementation phase**. The results of Cronbach's Alpha have been satisfactory (Table 7), with values higher than those of Pereira (2003). No correlation had negative results, which enabled the analysis of the coefficient at issue.

Table 7. Cronbach's Alpha of the surveys Decision-Making Process

Constructs	Survey	Pereira (2003)
Intelligence (2)	0,87	0,78
Design (1)	0,94	0,90
Choice (2)	0,87	0,74
Implementation (3)	0,83	0,72
TOTAL	0,93	0,89

Source: Research

The final results of the validation of the instruments demonstrated their high reliability and strength. The framework of Torkzadeh and Doll (1999) remained with four constructs, though a question has been taken from it, resulting in eleven ones to measure the benefit of IT in the process of individual work. Pereira's (2003) instrument remained with the ten questions, but grouped into three constructs which measure the IT impact on the decision-making process.

4.4. Relationship between Characterization and Respondent Satisfaction

The descriptive analysis of both basic instruments was performed by assigning the degrees of awareness of the benefits through the use of the Likert scale, ranging from "1" (very little), "2" (a little), "3" (neither little nor much), "4" (much) and "5" (very much). In Table 8, the simple averages of the assertions can be seen as well as the weighted average of the constructs and instruments, which were calculated by multiplying the replies (scale 1-5) by the factorial weight of each assertion statement achieved from EFAs.

In the Work Process (WP), the overall average ($\overline{Xp}$) was 2.82, with respondents more satisfied with the benefits of management control [3.10] and productivity [3.06]. Innovation received the worst satisfaction average [2.34]. Analyzing by assertions, the PROD_102 question had the highest average [3.82], while INOV_113, the lowest one [2.83]. When comparing the benefits in the working process with the main functions performed by the sample (financial, accounting and human resources), one realizes that many tasks that were once carried out manually have been automated with the use of IT and hence more tightly controlled, for example, payable and receivable accounts, import of accounting entries, generating reports, payroll calculations, etc.

Table 8. Average of the sample perceived benefits

Symbolism: Simple average = $\bar{X}s$ Weighted average = $\bar{X}p$		**Analysis by→** **Questions**	**Question** $\bar{X}s$	**Construct** $\bar{X}p$	**Instrument** $\bar{X}p$
Work Process (WP)	Productivity	PROD_101	3,74	3,06	2,82
		PROD_102	3,82		
	Innovation	INOV_111	2,96	2,34	
		INOV_112	2,88		
		INOV_113	2,83		
	Satisfaction	SATIS_121	3,76	2,79	
		SATIS_122	3,14		
		SATIS_123	3,36		
	Management Control	CONTROL_131	3,68	3,10	
		CONTROL_132	3,74		
		CONTROL_133	3,70		
Decision-Making Process (D-MP)	Intelligence phase	INTELIG_151	3,38	2,64	2,56
		INTELIG_152	3,23		
	Design phase	CONCEP_161	3,75	3,14	
		CONCEP_162	3,62		
		CONCEP_163	3,64		
	Choice phase	ESCOL_171	3,06	1,92	
		ESCOL_172	3,11		
	Implementation phase	IMPLE_182	3,36	2,55	
		IMPLE_183	3,39		
		IMPLE_184	3,38		
General average of the instruments →					**2,69**

Source: Research

Customer satisfaction had a median average, so that it is possible to see, in any organizational department, the facility to generate information on-line for customers by using IT, which helps, above all, to satisfy customers. Another point concerns the applications that, in general, have more than one function, which allows detecting IT users' accumulation of functions and, therefore, without time to explore and investigate new ideas because they are more demanded than others. Such results show that the technological tools used by the sample are centered on an industrial model, aiming at improving productivity and management control.

The Decision-Making Process (D-MP) had an overall average of 2.56; the design phase being the best evaluated one [3.14], and the choice phase, with 1.92, the worst of all. By analyzing each question, all the assertion averages are higher than 3.00. It may be observed that IT usefulness in checking possible alternatives (design phase) is the most intense one in the decision-making process; its magnitude, however, is lower when choosing an alternative (choice phase). According to Pereira (2003), the choice and implementation phases are thought to be "practical" in the decision-making process, as direct people participation is more relevant than IT use. Therefore, the results of this study support the author's point of view, in the sense that the choice and implementation phases have been little noticed by the sample [1.92 and 2.55].

In the unified analysis of both instruments (WP + D-MP), an overall average of 2.69 was obtained. It demonstrates a satisfaction that ranges from "little" (2) and "neither little nor much" (3), the instrument WP has been slightly better rated than the D-MP.

In the respondents' characterization it was asked whether the IT used was fully deployed, because the benefits are expected to be higher in this case. With the data displayed in Table 9, it can be observed that fully implemented ITs had a higher average [2.77 against 2.50] in all the constructs of both instruments. To check whether the difference between averages was statistically significant, it was firstly checked for data normality by using Kolmogorov-Smirnov and Shapiro-Wilk tests. With a level of significance of 5% in both tests, in relation to the average of the instruments, the null hypothesis was accepted (H0), resulting in non-normal data, requiring the use of a nonparametric test.

The Mann-Whitney Test of Hypotheses was used in order to compare two sampling averages of unpaired data, with a level of significance of 5%. The null hypothesis, of the Mann-Whitney Test of Hypothesis, refers to the fact that there are no statistically significant differences between the sampling averages. When comparing the means of the users who have a fully deployed IT with those who do not have it, the null hypothesis was rejected, indicating the existence of statistically significant differences. Thus, on average, the difference of the benefits of IT for users who have a fully deployed technology is demonstrated, as it was expected.

Table 9. Average of the perceived benefits related to implementation and to ERP

	Fully Implemented IT?		**Is IT part of an ERP?**		
Constructs	**Yes**	**No**	**Yes**	**No**	**I do not know**
General Total (WP+D-MP)	2,77	2,50	2,80	2,55	2,65
WP – GENERAL	2,89	2,65	2,94	2,69	2,76
WP – Productivity	3,11	2,91	3,15	3,02	2,88
WP – Innovation	2,42	2,14	2,46	2,16	2,37
WP - Customer Satisfaction	2,86	2,61	2,90	2,61	2,82
WP - Management Control	3,17	2,93	3,24	2,96	2,98
D-MP – GENERAL	2,65	2,35	2,67	2,42	2,54
D-MP – Intelligence	2,69	2,50	2,73	2,55	2,54
D-MP – Design	3,27	2,80	3,21	2,99	3,19
D-MP – Choose	2,00	1,72	2,03	1,76	1,92
D-MP - Implementation	2,63	2,37	2,70	2,37	2,50
Total number of responses (221)	158	63	106	70	45

Source: Research

Another assertion referred to the IT tool used, whether it was part of an ERP, considering that in the literature, many studies highlight the benefits that ERP technology can bring when compared to other technologies (Turban, McLean, & Wetherbe, 2004). In Table 9, it is possible to observe that for those who knew how to answer this question, satisfaction is actually higher for ERPs [2.80] users. Similarly to the implementation, all constructs of ERP users got better averages than non-users of

such a technology. In the statistical comparison of averages, by using the Mann-Whitney Test of Hypothesis, the null hypothesis was rejected, which indicates the existence of statistically significant differences of the benefits for the users of ERP technology, thus agreeing with the above mentioned theories.

When comparing the response averages with the respondents' age, it can be observed that the most satisfied are aged 36 to 40 years; the least satisfied are over 46. Regarding satisfaction as a result from years of professional experience, those who had experience of "16 to 20 years" [2.82] are more satisfied; those with less experience ["up to 05 years" (2.68) and "06 to 10 years" (2.66)] are less satisfied, possibly indicating a non-adaption to such a technology.

Regarding the size of the organizations/respondents satisfaction, it is observed that smaller and larger companies have satisfied IT users as well ("up to 09 employees" with 2.79 and "above 500 employees" with 2.64). The least satisfied ones are in companies of "50 to 99 employees", with 2.41.

5. FINAL CONSIDERATIONS

In order to verify the IT benefits at business professionals' individual work, the validation of the research instruments used here was performed by EFA with rotation Varimax and Cronbach's Alpha. The first one, related to the work process (Torkzadeh & Doll, 1999), had 12 initial assertions that turned into eleven, thus improving the model with an explanatory power of 78.9% and a Cronbach's Alpha of 0.88. The eleven assertions were fragmented into the four constructs of the original study, without requiring any new interpretation of the factors, which are, respectively: productivity, innovation, customer satisfaction and management control.

The decision-making process instrument (Pereira, 2003) remained with the ten questions of the original study, with an EFA explanatory power of 78.4%, and Cronbach's Alpha of 0.93. The difference for the baseline study is that in the rotation of EFA, the present study resulted in just three factors, not four. The first factor is the design phase, the second one corresponds to the choice and intelligence phases; the last one, to the implementation phase. It should be noted that both instruments had performed well in their validations, thus making it possible to go on with the research.

It is believed that the choice of the sample has been successful, and the issues of sample characterization proved their diversification, both in individual characteristics, as in the organization. Regarding the respondents' satisfaction level, the weighted average obtained was 2.69 on a scale of "1" to "5". The work process instrument [2.82] obtained a higher average satisfaction than the decision-making process [2.56], although the difference is negligible. The constructs management control and productivity were the best evaluated ones [3.10 and 3.06 respectively], indicating the biggest support of IT in labor income; in the control of work and performance processes. In contrast, innovation got the worst evaluation [2.34], highlighting the slightest help of IT for users to create and test new ideas in their offices. The construct customer satisfaction [2.79] had a median evaluation if compared to the other constructs in relation to the description of helping the user to create value for the customers of the organization.

In Pereira's (2003) instrument, the design phase was the best evaluated one [3.14], indicating the help of IT in checking what the possible alternatives to make a decision

are. On the other hand, the choice phase got the worst evaluation [1.92], indicating the low help of IT when it comes to choosing an alternative. The intelligence phase, concerning the checking of problems, as well as the implementation phase, concerning the operation of the choice, had an intermediate evaluation. With the characterization of the sample, some conclusions could have been made. Users using IT fully implemented tools are, on average, more satisfied, probably because they have more benefits available, which agrees with the statistically significant differences between the means.

Another aspect concerns the users using ERP technology. They are more satisfied than those who do not use it; with statistically significant differences between them, according to the Mann-Whitney Test of Hypotheses, confirming that the ERP technology can increase its users' benefits. Regarding age, the research has demonstrated that older users are less satisfied with such a technology, while middle-aged and younger people [36-40 and 25-30] are very satisfied. It has also been verified that users with more professional experience are more satisfied with IT than others as well, especially the ones aged from 16 to 20. Another conclusion refers to younger generations' greater familiarity with IT than older ones, due to their contact with technology since childhood.

Regarding organizational characteristics, it can be seen that greater user satisfaction is at the extremes, i.e., micro-companies (up to 09 employees) and larger ones (over 500 employees). Since the least satisfied are in small organizations with 50 to 99 employees. With the results surveyed so far, it can be effectively seen that, in case of decision-making, IT has been helping users both in operational and tactical tasks. At this point, it is possible another conclusion: big companies, which have higher technological needs, also require more financial resources to use IT; while micro ones, which do not have so many financial resources nor so complex processes, do not need IT that much to support their activities. Small companies, which are in the middle of the scale, have technology needs but not enough financial resources to be appliedto IT, resulting in less satisfied users with its benefits.

As a limitation to this research, it is important to point out: (i) the impossibility to generalize its results on account of the sampling method used, a non probabilistic one, in spite of the sample diversification; (ii) the researcher's absence when the questionnaire was being filled in; (iii) the questionnaire being applied in the printed form and online version.

Thus, considering the results, as well as the above restrictions, it may be suggested for further research: (i) replication of this research in a larger sample, (ii) implementation of the instrument across different cultures to check for their differences, and (iii) the use of the instrument within organizations before and after implementing a given technology.

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