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Accounting professionals' perceptions concerning the influence of information technology in decision-making process

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Accounting role today as a primary provider of information to organizations becomes more and more prominent; its agent executor, the accountant, makes extensive use of information technology both in generating information and in decision-making. The aim of this study consists of mapping out accounting professionals' perceptions regarding the influence of information technology on the individual decision-making process. An online questionnaire was developed. It replicated the Decision-making process instrument along with questions to characterize the respondents, as well as the application they had been using in their professional activity and in their organization. 362 (three hundred sixty-two) answers were obtained back. Factor Analysis was used to have them validated, and *Cronbach's* Alpha coefficient to check their reliability of scale. Such a process made the main findings described here possible. Such findings show that the benefits of information technology are higher at the beginning, in Intelligence phase; smaller and equivalent to each other, in Design, Selection and Implementation phases. Accounting professional's role in the three levels of the decision-making process (operational, tactical and strategic) has also been examined by applying *Cluster Analysis*, which resulted in the conception of five groups of respondents: The Trainees, Operational Managers, Department Heads, Vice-directors and General-directors.

Key words: Information technology, accounting, decision-making process.

INTRODUCTION

In the twentieth century the dominant thinking was that the administrative reality should be rational, controllable and capable of being standardized. As a result, the decision-making process was essentially logical and centered in the chief executive officer (CEO) of the organization. It was thought that such an executive

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should possess a full knowledge of all alternatives and their consequences, since he did not need to explain the criteria he had been using to make his choices (Pereira, 2003).

From the 1960s on, according to Pereira et al. (2007), IT (Information Technology) began to be used, through mathematical models, to support the decision-making process. At the time, it was expected that the resources made available by IT would enable the analysis of several alternatives and their consequences. In the last decades, contrasting such expectations, according to these same authors, an increasing in complexity, hostility and unpredictability of the external environment on businesses organizations have been seen, thus turning the decision-making process difficult. Ruggiero and Godoy (2006) also say that the decision-making process in organizations has been changing, due mainly to the advancement speed of IT.

In recent years, the organizational environment is becoming more competitive and complex, causing greater difficulties for managers to make informed decisions. Therefore, information becomes of paramount importance for the present and future organizations: the main feedstock used at the operational, tactical and strategic levels of any decision-making process. Sacilotti (2011) says that organizations using information technology either to support their decisions or as a strategic tool of management are a step ahead of those which still do not use it.

It is true that technology alone is not capable of supplying all organizational needs. The human element, according to Santana (2004), plays a major role in the use of technology, and in the interaction with every other component. Its absence results in a non-functional and useless technology. It is therefore important for organizations to be attentive to the integration of IT with their users in order to ensure the flow of information in a safety way and in the right time in all their decision-making levels. In such a context, accounting has an important role to provide relevant economic, physical, productive and social information to help users judge and confidently take their own decisions.

Considering the importance of accounting, as a primary provider of information on transactions and / or business events, the accountant, as an agent, has a prominent role in organizations as he intensively uses information technology to carry out and perform his duties (Borinelli, 2006). In this sense, the AICPA (2011) considers the ability to use IT effectively and efficiently as one of the main competencies required from accounting professionals.

To understand how IT impacts on organizations, at individual level and on the professional activity of the actors, that is, accounting professionals, is not only challenging but a great opportunity for further studies. Torkzadeh and Doll (1999) say that the study of the impact of IT in organizations is wide and multifaceted because it provides many research opportunities and significant challenges.

Antonelli et al. (2010) have used some national and international journals, which were published from 2005 to 2009, as a database in order to investigate the thematic and methodological trends of researches on the impact of IT in organizations. One of their findings refers to the lack of research at the individual level, just two out of 38 selected articles. Such results are in accordance with Torkzadeh and Doll (1999) study which, at the time, revealed there was no research centered on the individual level.

Therefore, this article aims to answer the following research question: What are the perceptions of accounting professionals about the influence of information technology in the Intelligence, Design, Selection and Implementation phases of the decision-making process? Consequently, the aim of this study consists on mapping out such professionals' perceptions regarding the influence of information technology in the individual process of decision-making.

The study of the benefits of IT at the level of the individual, in the decision-making process, is particularly important due to accountants' need (1) to generate information to managers, (2) to consider the human factor in IT-related studies, and (3) to fulfill the absence of researches related to accounting professionals, approaching the individual.

Benefits of information technology in the decision-making process

Simon (1916-2001) is considered a groundbreaking in studies on the process of decision-making. For Simon (1960), decision-making is the most important and risky task for any executive agent, whose responsibility is not only making own decisions, but also making the organization itself to take decisions effectively. Following Simon (1960), other studies have come up with different approaches. Regardless of the decision-making model under consideration, all of them have common features. In this sense, the study of different approaches provides a more comprehensive view of the process since every author always brings some differentiated elements (Luciano, 2000).

Simon (1960, 1977) says that decisions may be programmable or non-programmable, and arranged in stages. Such decisions make up a continuum, from highly programmed to extremely unplanned ones. Programmable (or structured) decisions are repetitive, routinely,

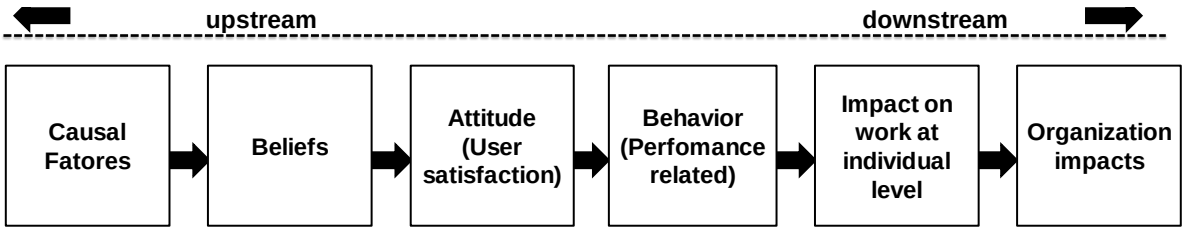

Figure 1. System of value chain. Source: Torkzadeh and Doll (1991).

involving an already known procedure, requi-ring from the decision maker fairly simple procedures. Non-programmable (or unstructured) ones result from new situations, without any established procedure to be followed and the decision maker needs taking some sort of judgment of greater complexity.

The decision-making process, according to Simon (1960), encompasses three phases or stages, which are carried out at different times: (i) intelligence or investigation, (ii) design or drawing and (iii) choice. In the intelligence phase, the process starts with the exploration of the environment. The goal is to identify the problem and its variables, and to collect information on which the decision should be based. In the design phase, creation, development and analysis of possible alternatives take place in order to choose an alternative from the available ones in the third stage.

It is worth noting that, to Laudon and Laudon (2007), the phases of the decision-making process are not performed at the same time, and they do not follow a standard path either. Simon (1965) extends the initial model by adding a fourth phase to it: (iv) implementation. According to Luciano (2000), between the phases of the model Simon proposed (1965), constant feedback, takes place, allowing to return from any of them to the previous ones in case the decision maker does not feel comfortable with the available information he has got at any of the previous phases.

Pereira (2003), with such theories in mind and aware of the role of IT in any decision-making today, developed and validated the construct “individual decision-making process”. It has been developed from Simon’s studies (1960; 1965). In Pereira’s view, the decision-making process is a managerial function which is susceptible to the use of IT. The main objective of his study was to investigate bank employees’ perception regarding the impact of IT on their work.

In conducting his research, Pereira (2003) used a strategy grounded on the cognitive process of the individual, who presents a scheme of his own to understand the outside world. This cognitive process is based on the Administration Behavioral Theory as well as in Torkzadeh and Doll’s study (1999). It is represented as a system to value chain in order to explain the relationship between the use of IT and its impacts (Figure 1). For the authors, the impact of IT is a key concept that incorporates downstream effects; studying it at the individual level is a direct reflection of the use of technology which precedes organizational effects.

Other researchers have also studied the importance of analyzing IT impacts on individual work, preceding organizational impacts. Delone and McLean (1992; Frezatti and Aguiar, 2007), for example, have researched the success of Information System in the organizational environment and, like Torkzadeh and Doll (1999) proposed a taxonomy with the following dimensions (i) quality of the system and (ii) quality of information, affecting (both individually and as a whole) other two dimensions, (iii) use of the system and (iv) user’s satisfaction. These last two interdependent dimensions affect managers’ individual behavior, and, consequently, the behavior of the organization, or organizational performance.

Torkzadeh (1999) and Delone and McLean (1992) models have a commonality: both of them consider the effects of IT on the individual (on people) prior to the ones on the organization. Such an understanding enhances the appropriateness and importance of researching the relationship of IT at professionals’ individual level, specifically those from the accounting area.

Due to the importance of the individual, Pereira (2003) formulated 15 questions for checking the respondents’ perception related to the phases of the decision-making process, according to what had been proposed by Simon (1960). The 15 questions were pre-tested with elements from the survey sample. Though the results showed a very high value for *Cronbach's* Alpha - 0.90, the *survey* proceeded being implemented without any modification for the questions of this module.

To provide a better possible accuracy for the statistical analyses employed here and to verify the validity of the constructs, to the instrument proposed by Pereira (2003), Exploratory Factor Analysis (EFA), and Confirmatory Factor Analysis (CFA) have been performed in this study

as well as an adaptation of the method MTMM (multi-trait/ multi-method). The author's final survey resulted in ten of the fifteen questions originally formulated, representing a percentage of the variance explanation equals to 77.7% in the AFC.

Later, other studies also make use of the decision-making process instrument, such as: (i) Ruggiero and Godoy (2006) tried to identify and analyze human-resource managers' opinions regarding the issues related to IT use in their work;];(ii) Lucht *et al.* (2007) extended Torkzadeh and Doll´s (1999) model, including aspects related to the decision-making process from Pereira's instrument (2003), and to information security, in order to build a conceptual model able to measure such impacts in individual work users of an information system.

Given the above, one can observe the importance of the individual decision-making process for organizations, and of more researches related to the issue, as Ruggiero and Godoy (2006) quoted it, since studies in decision-making reflect the need for continuous search to improve the ability to decide.

METHODOLOGY

This survey has been carried out replicating the instruments developed by Pereira (2003). Babbie (2001) describes the three main purposes of a research *survey*: to describe, to explain and to explore. Therefore, this study aims to measure, following an ordering scale, the intensity of IT benefits in professional activity from the point of view of its own users' considerations; and it can be classified as a quantitative and descriptive research.

The selected population for this research consists of Brazilian accounting professionals, from the state of Paraná, who were asked to take part in it by the following institutions: CRCPR (*Conselho Regional de Contabilidade do Paraná*), SESCAP-PR (*Sindicato das Empresas de Serviços Contábeis e das Empresas de Assessoramento, Perícias, Informações e Pesquisas no Estado do Paraná*) and IPMCONT (*Instituto Paranaense da Mulher Contabilista*). In the survey date, there was in the State of Paraná, according to the CRCPR (2011), 20,228 accountants and 10,355 accounting technicians, totaling 30,583 registered and active professionals. Only accounting professionals with registered e-mails in the institutions mentioned above were invited to take part in this research.

These propagator institutions sent out e-mails to their contact lists in order to explain the survey aims, to ask for participation and to inform about the access *link*. For data collection, an on-line questionnaire was provided in the form Qualtrics ®, a specific software for web surveys. The e-mails to the possible respondents were sent out on the following dates: (i) CRCPR on 14/07/2011 and 28/07/2011, (ii) SESCAP-PR on 04/08/2011 and (iii) IPMCONT on 11/07/2011 and 29/07/2011. The filled in questionnaire should be back until 17/07/2011. Incomplete ones and those answered in less than five minutes were not considered. The total number of valid answered questionnaires is 362. The data collection instrument (see appendix) has ten questions originated from the instrument by Pereira (2003) *Likert*-type, with five levels, ranging from "1" (very little) to "5" (very much), aiming to measure the intensity of perception of IT benefits along the decision-making process. The ten questions are divided into four constructs, corresponding to the four phases of the decision-making process (Intelligence, Design, Selection and Implementation). To characterize the respondent, eight questions, fragmented into three groups, have been used.

The first group is related to the application being used, with three assertions to verify: (i) the trademark of the application, (ii) if the application is in its implementation phase, so that if the answer is affirmative, it is expected that its impact is smaller when compared to those which are not being implemented, (iii) if the application is or not part of an ERP (Enterprise Resource Planning), since studies in literature show that the ERP brings major changes in the environment where it is inserted, for example, the study by Newman and Westrup (2005), who said that the introduction of ERP systems represented a fundamental change for accountants.

The second group features the organization, with a question that inquires about the economic sector to which the respondent's organization is linked to. The third group is related to the individual, with the following assertions: (i) age of the respondent, (ii) professional experience, (iii) activity area, and (iv) intensity of decisions professionally taken in each one of the three levels: operational, tactical and strategic.

To analyze data statically, it has been used: descriptive statistics and univariate analysis, multivariate statistics, through *Cronbach's* Alpha, Confirmatory Factorial Analysis (CFA) and Cluster Analysis.

RESULTS AND DISCUSSION

The results are described in four parts. The first of them is about the sample characterization. The second one performs the validation and analysis of Pereira's instrument (2003). The third carries out Cluster Analysis to define groups of respondents in relation to the intensity they take decision at organizational level. Finally, the results of the instrument are related to the characteristics of the sample besides accomplishing the Crosstabs analysis (cross tabulations) to find important characteristics between the groups of the sample.

Sample characterization

From the 362 answered questionnaires the following characteristics were observed:

1. The most used application in the respondents' professsional activity is the software *Cordilheira*® [16%], followed by *Dominio*® [9.9%]. Despite the high diversity of applications on the market, the sample shows that those two ones and other five of them are used by more than half [53%] of the respondents: *SAP*®, *Viasoft*®, *Oracle*®, *Questor*® and *Totvs*®;
2. The software being used by accounting professionals is fully implemented [74%] for the most part of them, which allows to assume that these applications can offer all of their functions;
3. The ERP technology is available in 43% of all the applications being used; only 30% do not have it, and

Table 1. *Cronbach's* Alpha of the surveys decision-making process.

Constructs	Survey	Pereira (2003)
Intelligence	0.74	0.78
Design	0.87	0.90
Choice	0.81	0.74
Implementation	0.87	0.72
Total	0.94	0.89

Source: Research.

27% did not know how to answer the question;
4. The organization economical sector to which the respondent is bound to is essentially the private one, with 84%. Then, the public sector, with 11%; the mixed one, with only 3%; finally, the third sector, just 2%;
5. 66% of the respondents are between 19-35 years of age, an essentially young sample;
6.In relation to professional experience, respondents with up to five years of work account for 35%, the largest group; those within the range 6-10 years are 24%, the second largest group. Interestingly enough, the ones within the range 16 to 20 years of experience are 9%, the smallest group; the ones over 21 years amount to 14%;
7. The sector "responsible for the accountability of the company" had more answers with 38%. It's followed by the "management accountant", with 7%; and the "responsible for the human resources department", 6%. Several other areas of practice have been mentioned, but with low representation.

Validation and analysis of the decision-making instrument

The validation process of the instrument had two phases. In the first one, *Cronbach's* Alpha coefficient was used to carry out the scale reliability; then the validation with CFA. In order to implement the Factor Analysis, the following parameters have been used:

Method for extracting the factors: the method of principal components has been used due to concerns in determining only the linear components existing within the data, and the way in which variables can contribute to each component (Field, 2009);
Criterion for extracting the number of factors: the *a priori* criterion has been used. According to Hair *et al.* (2005), it is *a priori* because the researcher already knows the number of factors to be extracted before performing the factor analysis; and
Rotation of factors: the option was for the orthogonal rotation *Equamax*, aiming at minimizing the number of factors required to explain each variable, and also at maximizing the explanation of the variables within a single factor, besides ensuring the factors to remain unrelated (Hair *et al.*, 2005; Field, 2009).

The testing of *Cronbach's* Alpha coefficient was at first performed for each assertion, and later for each construct. In this analysis, much care has been taken with regard to the assumptions of the coefficient, so that there was no correlation with negative values. In Table 1, the values of the coefficients of *Cronbach's* Alpha test come in detail, and they are also compared to previous studies. The coefficient which has been obtained in the *survey* [0.94] is higher than all the previous ones, which demonstrates that such values are acceptable and also confirm the reliability of the model. The results of the constructs have as well been satisfactory, so enabling the CFA.

When implementing the Confirmatory Factorial Analysis in the instrument of the decision-making process, after due verifications, it has been found there were no need for a new generation of FA (Factorial Analysis), because: (i) the table of commonalities did not show any indicator with low explanatory level, (ii) the correlation matrix did not indicate any high level of correlation among the indicators, (iii) the KMO test, which indicates the data degree of explanation from the factors found in the FA, was 0.96, a value highly enough to make the FA possible, (iv) *Barlet´s* test of sphericity, which indicates enough existence of relationship between the indicators in order to implement the FA, was satisfactory and (v) the anti-image matrix, which indicates the explanatory power of the factors in each one of the analyzed variables, got high values in the lower diagonal, indicating the high explanatory power of all variables.

Table 2 details the distribution of questions and factors. The four factors which have been achieved with *Equamax* rotation [1, 2, 3 and 4] have got 81.86% of explanatory power, and they individually explain, respectively 22.88, 20.93, 20.11 and [19.93%]. The distribution of variable loads among the four factors obtained in the *survey* is similar to the work of Pereira (2003), except for the questions Q14 and Q17 with results not according to previous expectations. The Q14 (*this application helps*

Table 2. CFA of the survey decision-making process.

Rotated Component Matrix[a]		Component			
Constructs	**Question**	**1**	**2**	**3**	**4**
Intelligence (Factors 4 and 2)	Q13				0.880
	Q14		0.763		
Design (Factors 2 and 1)	Q15		0.588		
	Q16		0.575		
	Q17	0.531			
Choice (Factor 3)	Q18			0.823	
	Q19			0.676	
Implementation (Factor 1)	Q20	0.768			
	Q21	0.635			
	Q22	0.612			

Extraction Method: Principal Component Analysis. Rotation Method: Equamax with Kaiser Normalization. [a] Rotation converged in 7 iterations. Source: Research.

me to describe the characteristics of the problems), linked to the construct Intelligence phase, was allocated to the questions of Design phase, whose aims are to check the available alternatives in a decision-making process. Therefore, the assertion Q14 fits better in the Design phase than into the Intelligence phase, where the problem to be solved should be verified.

Another theoretical difference from the model, arising from this research, relates to the question Q17 *(this application helps in the analysis of decision alternatives),* originated from the Design phase, which has been allocated with Factor (1) from the Implementation phase. Thus, the assertion Q17 fitted better with the assertions related to the decision-making implementation. Somehow, according to the researched sample, the impact of using IT in the decision-making process presents similarities between the Intelligence and Design phases, as well as the Design phase with its implementation. It is noteworthy that Ruggiero and Godoy (2006) also found some theoretical divergences when applying the instrument of the decision-making process to human resource managers.

Table 3 details the response means for each question and factor. The means are within a scale of 3-4, so that the ones near three suggest a moderate assistance of IT in the decision-making process ("neither little nor too much"). In Factor (2), the IT assistance is slightly lower than in the other factors, but in Factor (4) it is higher. There is a similar standard deviation in the assertions; in the factors, a lower dispersion can be observed in the answers to Factor (4).

To check whether the difference between the means of the factors in Table 3 is statistically significant, at first, the normality of the data has been analyzed by means of the test *Kolmogorov-Smirnov*. The non-normality of the factors has been proved with the following results: Factor [1] $D(362) = 0.109$, $p<0.05$; Factor [2] $D(362) = 0.106$, $p<0.05$; Factor [3] $D(362) = 0.145$, $p<0.05$, and the Factor [4] $D(362) = 0.240$, $p<0.05$. Then, the nonparametric *Kruskal-Wallis* test with *Monte Carlo* extraction has been carried out to verify any statistical differences between the means of the factors. With a significance level of 5%, the null hypothesis has been rejected, and statistically significant differences have been stated between the means of the sample [$H(3) = 116.79$, $p<0.05$].

To identify factors with statistically different means, we applied *Mann-Whitney*'s test of hypotheses with *Bonferroni*'s correction for all effects with a significance level of 0.0083 [0.05/6]. The results revealed differences in two effects, accepting the null hypothesis of equality of means: of Factor (1) with Factor (3) and of Factor (2) with Factor (3). The first effect (1-3) essentially represents the Implementation and Selection phases; the second one (2-3) essentially represents the Design and Selection phases. Thus, it can be said that the benefits of IT are more intense at the beginning of the decision-making process, represented by the Intelligence phase [Factor (4)]; less intense and similar, in the Design phase [Factor (2)], Selection [Factor (3)] and Implementation [Factor (1)], with a slight difference between the factors (1) and (2).

In the search by Pereira (2003), a higher perception of

Table 3. Descriptive analysis of the decision-making process of the survey.

	Factor	Analysis by question			Analysis by factor	
		Question	$\bar{X}_s$*	S**	$\bar{X}_p$***	S
Decision-Making Process	Factor 4 (Intelligence)	Q13	3.34	0.96	2.75	0.79
	Factor 2 (Design + Q14)	Q14	3.27	0.93	2.21	0.55
		Q15	3.25	0.90		
		Q16	3.28	0.95		
	Factor 3 (Choice)	Q18	3.17	0.93	2.35	0.64
		Q19	3.22	0.96		
	Factor 1 (Implementation + Q17)	Q17	3.33	0.97	2.35	0.59
		Q20	3.31	0.96		
		Q21	3.32	0.93		
		Q22	3.34	0.96		

* $\bar{X}_s$: simple average; ** S: standard deviation; *** $\bar{X}_p$: weighted average calculated by weighting each statement with its weight factor. Source: Research.

impact has been found in the Design phase (the third one). It has been explained as a result of relevant technological developments which help the simulation of alternatives, making it easier to analyze different scenarios, for example, the use of a decision support system (DSS). The Implementation, Selection and Intelligence phases are similarly, and in a lesser degree of intensity, perceived. The first one has been expected due to its practical nature, so that implementing the alternative previously chosen increases people's direct participation, and reduces technological demands. According to the author, in the Intelligence phase, which is represented by the quest for situations that require decisions basically taken by people, the IT has just a "supporting" action. At last, Pereira (2003) refers to the Selection phase which, for being very practical, is the one needing less IT for its conclusion, so that this activity comes down to the act of deciding between yes or no or between this or that way. Therefore, it can be inferred that in the Selection phase, the perception of IT usage is linked with the earlier phases of the decision-making process (Intelligence and Design), because they prepare the way to complete the decision to be taken.

Unlike Pereira's findings (2003), this study identified the first phase of the decision-making process - Intelligence phase [Factor (4)] - as the best evaluated one, suggesting the most intense role of IT in the identification and categorization of the problems. While in the other three phases few benefits could be observed. The findings suggest that accounting professionals usually don't use much the support systems to take their decisions (DSS), for example, BI (Business Intelligence), so that once detected a problem, the process until implementing the decision is carried out with little technological assistance.

Clusters analysis

In order to describe data in a taxonomical way and with exploratory purposes, it has been asked, in one of the questions from the characterization block, about the degree of intensity the respondents took their decisions in their professional activity, related to the three levels: operational, tactical and strategic. To that end, Cluster Analysis was used, aiming to group the sample according to its hierarchical organizational level, marked by the intensity of decision making, which were measured in *Likert* adapted scale of the six points [(0) do not do; (1) very little, (2) little, (3) neither little nor much, (4) much and (5) very much]. This kind of reflection also was a target study by Torkzadeh *et al.* (2005), who organized the sample into two groups, "upper management" and "low management".

Initial frequency analysis consisted of eight clusters, being gradually reduced. It was observed that one of the groups, with 44 representatives, did not grouped together with the others, so that its gathering with another group came just in the analysis of four clusters, with 67 representatives. Because of that, a descriptive analysis of the clusters was performed in order to see if the decision-making means of the group with 67 representatives were similar to the ones of the group with 44, which would allow joining the two groups. Similar means were observed at strategic and operational levels, but quite different at tactical level [3.39 to 0.23]. Due to that, it was opted for five clusters to represent the study sample.

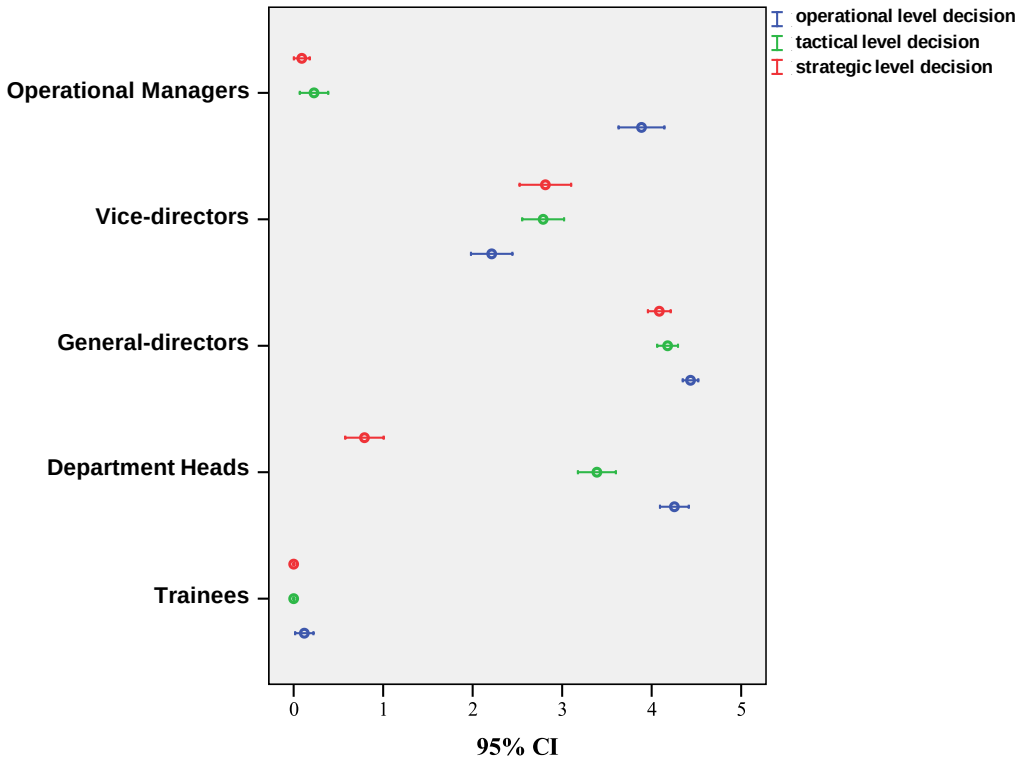

Figure 2. Clusters and their decision-making levels. Source: prepared by the authors.

To interpret the *clusters*, variance analysis ANOVA was applied. In its application, option was for *Turkey's post hoc* test of hypotheses for multiple comparisons, which is indicated when the sample sizes are equal, and to control the error of Type I. In analyzing the results of *Tukey*'s tests of hypotheses, it was possible to nominate the five clusters under consideration, as it can be seen in Figure 2.

The first group is called "Trainees"; it refers to those who hardly ever take any decision, either operational, tactical or strategic. "Department Heads" are those who usually take operational decisions; sometimes, tactical ones; and occasionally, strategic. "General-directors" are those who intensively take decisions at all three levels. "Vice-directors" are decision-makers at a medium level; "Operational Managers", responsible for taking operational decisions.

Relations of the instrument with the sample characteristics

In this block, the crossings of the factors arising from the replicated instrument (Pereira, 2003) with the characteristics of the sample were carried out. Following the sampling stratification, the mean of each one has been calculated, and also evaluated whether their means were statistically significant. To do so, when comparing two groups, *Mann-Whitney*'s Hypothesis Testing was used; for more than two groups, it was at first applied *Kruskal-Wallis*' non-parametric Test; when the statistically significant difference was found, *Mann-Whitney's* Test of hypotheses was applied in order to determine in which group(s) there was the difference which has been detected by the previous test. For every test, significance level of 5% was used and, when the subsample was considered large (Field, 2009), *Bonferroni's* correction.

In Table 4, the obtained means of the factors are compared with the characteristics of the sample. The first relationship refers to the benefits of the applications which are fully implanted or not. It was observed that in all the factors there are statistically significant differences. As a result, it can be stated that fully implemented applications are more useful to accounting professionals at all stages of the decision making process than the not fully implemented ones.

Another analysis tries to verify weather the applications which has been used were ERP systems or not. This assumption is important because many studies have reported the benefits from such a technology, like the one

Table 4. Relation of the mean factors of the instrument with the questions of characterization.

Factor (construct)	(a) Implantation			(b) ERP System			(c) Organization Sector			(d) Length of experience (years)		
	Yes	No	MW*	Yes	No	MW*	Private	Other	MW*	Up to 5 years	Over 5 years	MW*
F4 (Intelligence)	2.88	2.39	≠	2.76	2.68	=	2.76	2.80	=	2.68	2.79	=
F2 (Design + Q14)	2.31	1.91	≠	2.26	2.12	=	2.22	2.13	=	2.17	2.22	=
F3 (Choice)	2.47	1.99	≠	2.38	2.27	=	2.38	2.36	=	2.26	2.40	=
F1 (Implementation + Q17)	2.45	2.04	≠	2.44	2.20	≠	2.36	2.33	=	2.29	2.37	=

*MW → Results of *Mann-Whitney's* tests Source: Research.

Table 5. List of instruments with clusters.

Factor (construct)	Clusters answer means					Results of *Kruskal-Wallis'* Tests
	Trainees	Department Heads	General-directors	Vice-directors	Operational Managers	
F4 (Intelligence)	2.71	2.68	3.04	2.45	2.60	≠
F2 (Design + Q14)	2.09	2.11	2.43	2.05	2.10	≠
F3 (Choice)	2.20	2.27	2.63	2.12	2.20	≠
F1 (Implementation + Q17)	2.20	2.36	2.58	2.14	2.18	≠

Source: Research.

by Newman and Westrup (2005), suggesting that the use of ERP systems leads accountants to fundamental changes. The results of *Mann-Whitney's* hypothesis Tests (Table 4) demonstrate that the benefits of ERP systems are prominent only in Factor 1, the last phase of the decision making process. No different benefits have been found in any of the previous phases.

With regard to the organization sector, no statistically significant differences have been found; the benefits were similar in all constructs. In relation to professional experience, it has not been detected any statistically significant differences either between the respondents with less than five years of professional experience and the ones with more than that. The last relationship refers to the five *clusters* with the factors of Pereira's instrument (2003). Statically significant differences have been found when applying *Kruskal-Wallis*' non-parametric Test, as it can be seen in Table 5.

Because statistically significant differences have been found in Table 5, it has been necessary to try *Mann-Whitney's* hypotheses Test, aiming at establishing such differences. Then, in order to evaluate the results of *Mann-Whitney's* hypotheses Test, the significance value of 0.005 [0.05/10] was taken into account, due to *Bonferroni's* correction. In Table 6, such differences come in details.

The highest contrast of IT benefits are related to the clusters: (i) General-director with Vice-director (3-4) and General-director with Operational Manager (3-5): they have different IT benefits in all of the surveyed factors; (ii) the General-director have the greatest benefits in every factors; and (iii) the Trainees with the General-director (1-3) and the Department Head with the General-director (2-3) have differences in almost every phases of the decision-making process, except for the initial one (Intelligence).

Cross-tabulations were also performed. The first one was between the question about using an ERP system and the sector of the organization. The predominance of ERP systems in private organizations and enterprises became clear. In the government and in organizations of the third sector, there was the greatest number of accounting professionals unable to answer the question

Table 6. Results of *Mann-Whitney's* Tests in clusters combinations.

Factor (construct)	Results of *Mann-Whitney's* Tests in clusters* combinations									
	1-2	1-3	1-4	1-5	2-3	2-4	2-5	3-4	3-5	4-5
F4 (Intelligence)	=	=	=	=	=	=	=	≠	≠	=
F2 (Design + Q14)	=	≠	=	=	≠	=	=	≠	≠	=
F3 (Choice)	=	≠	=	=	≠	=	=	≠	≠	=
F1 (Implementation + Q17)	=	≠	=	=	≠	=	=	≠	≠	=

Clusters have been numbered as follow: Cluster 1: Trainees; Cluster 2: Department Heads; Cluster 3: General-directors; Cluster 4: Vice-directors; Cluster 5: Operational Managers. Source: Research.

about the use of an ERP. In the government, it was also observed a higher percentage of professionals who do not use ERP technology, suggesting its use in a lesser extend, either due to the Government's "disinterestedness" or to a lower supply of softwares with ERP technology.

The second cross-tabulation was about the relationship between the *clusters* and the respondents' age. Vice-presidents are aged from 26 to 30 years old; Department Heads, from 31 to 40; General-directors, and Vice-directors again, between 41 and 45; at last, Trainee, over 46 years old. Except for the respondents over 46, the results highlight the importance of professional experience (age group in this analysis) when in charge of a strategic and tactical job position. The last cross-tabulation refers to *clusters* related to the respondents' professional experience length. It can be seen that those taking few strategic and tactical decisions have less professional experience, like the Trainees and the Operational Managers. In contrast, the most experienced ones hold positions which are inherent to decision-making, in the case of the General-directors or Vice-directors, as it would be expected.

Final considerations

Mapping out accounting professionals' perceptions related to the influence of information technology on the individual decision-making process have been the aim of this study. To that end, the instrument which measures the relation of IT in Decision Making (Pereira, 2003) was replicated. To validate the instrument, two out of ten assertions were allocated in factors not corresponding to the theory. On the reasons for not having obtained the same distribution, a possible cause may be related to the fact that this research was applied to accounting professionals, while Pereira's one (2003) was applied to professionals from the financial segment (banks).

Thus, the understanding for some of the assertions of this instrument should be carefully taken, considering both the environment and the professional's interaction from one segment to another. Despite the differences, the four resulting factors represent, in essence, the theoretical constructs, so that, for accounting professionals, the benefits of IT are greater at the beginning of the process, in the Intelligence phase [2.75]; at similar levels, they are also observed in the following three phases of the decision-making process: Design [2.21] Selection [2.35] and Implementation [2.35].

The greatest benefits have been related to the Intelligence phase, showing that accounting professionals, in a decision-making process, use more technology resources when they need to detect a problem to be solved. In this sense, it can be seen that accounting softwares and the government systems, when discrepancies or errors are found in the information passed on, are able to warn the user, describing the problem(s) and requesting the necessary adjustments for the process continuity, which corroborates the largest IT support at the beginning of the decision-making process. In subsequent phases, the benefits are lower. The lowest one, in the Design phase, allows saying that accountants, generally speaking, hardly ever operate systems to simulate situations to increase their convictions in choosing an alternative.

The phases of the decision-making process which are regarded as "practical", when people's direct participation is more important than the use of IT (Pereira, 2003), have almost not been perceived either: the third one – Selection phase – where the alternative to be implemented is defined, as well as the last one – Implementation phase –which verifies the consistency of the expected results with those obtained. Such findings point out to accounting professionals who rely on their own expertise either when choosing their decision or when monitoring it, although there is a trend for softwares more and more tactical and strategic, as the Decision Support Systems (DSS), which, once a problem has been detected, assists in creating and developing possible courses of action and monitoring. Therefore, it is important that accounting professionals look for greater benefits in DSS, in order to be supported not only when

taking a decision, but also when analyzing alternatives, proposing solutions and researching the history of the decisions which have already been taken (Sprague and Watson, 1991).

Through the characterizations carried out here, it was possible to draw the sample profile. The respondents work mainly in areas related to their training in private organizations. In carrying out their professional activity, accountants usually employ ERP technology. The intensity of the three levels of decision-making (operational, tactical and strategic) has also been analyzed. Due to the differences of responses, Cluster Analysis was applied, naming five of the respondents' profiles according to the intensity in which they make decisions at the three levels.

Some speculations can be put forward for the sample taking part in the study. It has effectively been verified that users with solutions not totally implemented demonstrate lower benefits in the use of IT in the four constructs under consideration. Such a finding is important to guide forward researches, so that the researchers consider this variable in their study. It was also found that ERP systems have an advantage over the other ones (without such a technology) just when implementing a decision which has already been taken (final phase), so that in the three initial phases any advantage has been observed.

IT benefits within the five clusters have been evaluated. Considering the hierarchical positions according to the respondents' decision-making level, it has been observed, on the one hand, that distant posts, such as Trainee and Vice-Director, Trainee and Department Heads, have statistically equal benefits. On the other hand, posts hierarchically near, as General-director and Vice-director, have completely different benefits. Such findings show that the IT analyzed benefits do not follow a hierarchical line, so that an organizational post does not necessarily have similar benefits to another one with similar characteristics.

Some limitations to be pointed out to this study are as follow: (i) the use of non-probabilistic sampling method, which does not provide accurate estimates, therefore generalizations of the results cannot be done; (ii) the findings refer specifically to professionals working in accountancy, (iii) the study focuses on the perceived relationship of IT in accountant's activity from the perspective of the individual as a professional, not from the organizational perspective; iv) as geographical boundaries , the population sample comprises accounting professionals with email addresses registered in CRCPR, SESCAP-PR and IPMCONT; and (iv) finally, as time delimitation, the study took place within a pre-determined time during the year of 2011.

Taking into account, the results mentioned above, as well as this study limitations, it is suggested for other future researches: (i) replication of the instrument in a probabilistic sampling, (ii) dealing with a larger sample, like accounting professionals from other states and/or countries, in order to compare and verify possible differences and similarities among them; and (iii) dealing with other kinds of professionals (such as managers, engineers, economists, etc.) aiming at making comparisons between the IT impact rates, and also checking the practical/theoretical fitting and stability of the model Pereira (2003) created.

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Appendix. Instrument applied

Number	Questions		Response options
Q13	Fase Inteligência	Este aplicativo me ajuda a ordenar os problemas identificados	(1) Pouquíssimo; (2) Pouco; (3) Nem pouco, nem muito; (4) Muito; (5) Muitíssimo
Q14		Este aplicativo me ajuda a descrever as características dos problemas	
Q15	Fase Concepção	Este aplicativo me ajuda a descrever alternativas para a decisão	
Q16		Este aplicativo ajuda a ponderar as alternativas de decisão	
Q17		Este aplicativo ajuda na análise das alternativas de decisão	
Q18	Fase Escolha	Este aplicativo ajuda a selecionar a alternativa mais adequada para a solução do problema	
Q19		Este aplicativo me ajuda a escolher a melhor alternativa para a solução do problema.	
Q20	Fase Implementação	Este aplicativo ajuda na revisão de uma decisão implementada	
Q21		Este aplicativo me ajuda a monitorar uma decisão implementada	
Q22		Este aplicativo ajuda na implementação de uma decisão	
C01	Qual é a marca do aplicativo (ou módulo) mais utilizado em sua atividade profissional?		Várias
C02	O aplicativo (ou módulo) que você mais utiliza em sua atividade profissional está totalmente implantado (ou instalado), de forma que lhe possibilite utilizar todas suas funcionalidades?		(1) Sim (2) Não
C03	O aplicativo que você mais utiliza profissionalmente faz parte de um sistema ERP (*Enterprise Resource Planning*, ou no Brasil conhecido também como SIGE - Sistemas Integrados de Gestão Empresarial)?		(1) Sim (2) Não (3) Não sei responder
C04	Idade:		(1) até 19 anos (2) 20 a 25 anos (3) 26 a 30 anos (4) 31 a 35 anos (5) 36 a 40 anos (6) 41 a 45 anos (7) acima de 46 anos
C05	Tempo de experiência profissional:		(1) até 01 ano (2) 02 a 04 anos (3) 05 a 07 anos (4) 08 a 10 anos (5) acima de 10 anos
C06	Principal área de atuação profissional:		Várias
C07	Por favor, atribua o grau que expresse a intensidade das decisões tomadas por você em sua atividade profissional, considerando os três níveis de decisões, utilizando a escala abaixo: •Decisão de Nível Operacional •Decisão de Nível Tático •Decisão de Nível Estratégico		(0) Não realizo (1) Pouquíssimo (2) Pouco (3) Nem pouco, nem muito (4) Muito (5) Muitíssimo