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IT investment management and information technology portfolio management (ITPM)

Brazilian case studies

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Abstract

Purpose – The purpose of this paper is to analyze some Brazilian companies' use of the information technology portfolio management (ITPM) technique as an aid to their information technology (IT) investments management.

Design/methodology/approach – It was carried out in five case studies in different Brazilian companies from several economic sectors which were using ITPM or were in the initial implementation phase. Eight interviews were conducted. The persons interviewed were high-level executives working in the IT department in the studied companies.

Findings – Different levels of ITPM use was found with respect to IT investment management (planning, control and evaluation). It was observed, in the analyzed cases, that ITPM is used most frequently in IT investment planning, which is the process most discussed and used in analyzed companies. The ITPM technique is used more frequently in Company 2 than in the other cases because the organization of the IT area in the company is structured according to ITPM dimensions.

Research limitations/implications – The ITPM technique has received little attention in IT research and research in this area identifying the use and applicability of ITPM in companies is still very limited in the information systems literature.

Originality/value – The paper presents IT investment management in different Brazilian companies and how ITPM was used to help companies in this process compose by planning, control and evaluation.

Keywords Case studies, Brazilian companies, IT investment management, ITPM

Paper type Research paper

1. Introduction

Information technology (IT) has become crucial for the support, sustainability and growth of businesses and vital for achieving competitive advantage (Weill and Broadbent, 1998; De Haes and Van Grembergen, 2009; Chang *et al.*, 2011).

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Consequently, companies are motivated to invest more in technology – acquiring systems, installing databases, and using the internet and electronic commerce in their business operations. A key challenge for business executives is how to appropriately allocate scarce resources to those investments and to evaluate their appropriateness and value.

Gunasekaran *et al.* (2006) point out that IT managers have used several methods and techniques to evaluate IT investments, ranging from simple computational formulas to complex techniques that combine quantitative and qualitative analyses. Information technology portfolio management (ITPM) is one technique for identifying, analyzing and managing IT investments (Maizlish and Handler, 2005). Organizations can use ITPM to manage IT from an investment perspective, aligned with a continuous focus on business (Peters and Verhoef, 2008). According to Burke and Shaw (2008), ITPM is an important research issue in the IT field. However, the concept has only recently begun to be widely discussed in IT research (Cho and Shaw, 2009). The importance of ITPM in business practice is illustrated by the fact that the Brazilian edition of *InformationWeek* published a ranking of the most innovative companies, using ITPM as one of the categories. But as Kumar *et al.* (2008) pointed out, few studies exist in the IT literature about the use of this technique in companies. It is considered an underdeveloped concept.

To summarize, high IT investment costs need to be justified and ITPM is a valid technique to assist with this, but there are few studies examining this technique. Given this, the following question arises: how does the use of ITPM help companies to manage their IT investments? The objective of this research is to analyze companies' use of ITPM as an aid to their management of IT investments. The analysis of ITPM use by the companies investigated three sub-processes of IT investment management: planning, control and evaluation. Our study was carried out in Brazil and involved five case studies (a pilot study and four other cases) in different large Brazilian companies from several economic sectors. The companies were either already using the technique or were in the initial implementation phase of applying the technique. Studying companies in Brazil is important because the country is increasing in relevance to the world economy. It is experiencing its fastest economic growth in almost two decades (*Businessweek*, 2010), achieving sixth place in global economic ranking in 2011, overtaking the UK (*Forbes*, 2011).

2. IT investment management

With investments in IT growing continuously over the past four decades (Ko and Osei-Bryson, 2006) determining ways to better manage this technology is a major concern for managers and researchers. Given the vast investments being made it is necessary to improve our understanding of IT investment management processes enacted by companies, taking into account costs and benefits, both short term and long term (Gunasekaran *et al.*, 2006). Also, the high level of uncertainty associated with IT use by companies confirms, by implication, the great importance of the IT investment management process (Irani and Love, 2002). Several studies were carried out as to the effect of IT investment in companies (Brynjolfsson and Hitt, 1998; Mahmood and Szewczak, 1998; Dimovski and Skerlavaj, 2003). Some authors believe that IT does not provide competitive advantage but simply prevents falling behind the competition, or being just another organizational cost (Carr, 2003; Tiernan and Peppard, 2004). However, other research point out that IT investment pays for itself and brings different benefits along with competitive advantage to companies

(Melville *et al.*, 2004; Chang *et al.*, 2011). Consequently, it is necessary to analyze the management of these investments.

Weill and Olson (1989) argued that the first step in managing IT investment is to know exactly what that investment is; measuring and tracking this expenditure over time against a convenient base. In many cases the general definition of IT investment is too broad, as different investments in IT are often made with very different objectives. More recently, Tan and Theodorou (2009) pointed out the necessity to examine the strategy to invest in IT more efficiently, in a more planned way and with a focus on achieving company goals. One way to do this is to analyze the IT investment processes presented by Stewart (2008). We have adapted these in this research (Figure 1). The processes are divided into three phases, planning, control and evaluation. This model was chosen because it allows us to take a more comprehensive view of these investments. It involves all the phases necessary to ensure that the investments in IT achieve the goals set, while applying adequate resources, and providing feedback to improve similar investments in the future.

According to Figure 1, the first phase focusses on analyzing how the investments to be made by the company, based on its objectives and needs, are defined, prioritized and selected. This provides a detailed analysis of the investments with regard to costs, return and risks. The control phase means monitoring and tracking investments with regard to costs, schedule and designed performance. The use of management tools can help IT and business executives to better manage the investments. Finally, the evaluation phase involves pre- and post-implementation reviews and, where necessary, making adjustments. It is important to verify if the investments achieved the objectives initially proposed and if they are fulfilling all the investment requirements.

According to Irani (2002), ITPM can be understood as an analysis and evaluation technique. It should include involvement, analysis and definition by stakeholders, evaluation of risks associated with different investment strategies, and understanding of the scope and impact of IT infrastructure development. Furthermore, Datz (2003) argues that ITPM can be applied in the planning, control and evaluation comprising the IT investment management process, which is the subject of the next section.

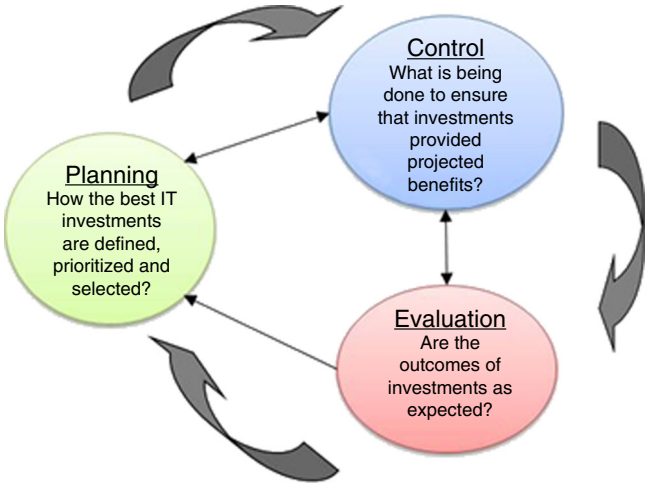

Figure 1.
IT investment management

Source: Stewart (2008)

3. ITPM

Jeffery and Leliveld (2004) define the ITPM technique in terms of managing IT as a portfolio of assets similar to a financial portfolio and striving to improve the performance of the portfolio by balancing risk and return. In addition, ITPM is related to the attainment of IT investment synergy, where this synergy affects IT portfolio return and risk (Tu and Shaw, 2011). According to Maizlish and Handler (2005) the eight general stages for IT portfolio building are:

(1) game plan;

(2) planning;

(3) creating;

(4) assessing;

(5) balancing;

(6) communicating;

(7) governance and organization; and

(8) assessing execution.

Cho and Shaw (2009) point out that in building an IT portfolio, realizing the strategic value or strategic alignment of IT is one of the most critical factors determining the success of the portfolio. However, many IT managers have difficulty achieving this in practice. It seems that most IT managers are aware that investments for strategic IT are important, but major projects often do not have high strategic value. Thus, the application of ITPM can assist companies in managing IT investments, enabling them to: first, maximize the value of IT investments while minimizing the risk; second, provide increased visibility and evaluation into IT spending; third, improve communication and alignment between IT and business leaders; fourth, provide increased transparency into IT decision making; fifth, reduce costs, improve control and facilitate agility; and lastly, allow planners to schedule resources more efficiently, helping to prioritize the investments (Datz, 2003; Symons *et al.*, 2005).

The application of ITPM to the planning, control and evaluation steps of the IT investment management process (Stewart, 2008) helps reduce the number of redundant investments. Further, it is necessary because it enables analysis of the biggest IT investment with regard to business objectives (Datz, 2003). However, the IT literature contains several different ITPM models or frameworks (Maizlish and Handler, 2005; Zheng, 2007), though most take a more general view of portfolio and fail to clearly define what is meant by a portfolio, while others focus on selecting the IT portfolio (Cho, 2009), or on general rules to be applied when planning an IT portfolio (Karhade *et al.*, 2009). In these studies, the topic was addressed within the wider managerial context or that of the management of IT investments as a whole without focussing on the specifics of each one, which would allow further exploration of the topic "IT portfolio" and its dimensions. Taking into account the stages for IT portfolio building (Maizlish and Handler, 2005), companies can structure the IT portfolio using the four dimensions (infrastructure, transactional, informational and strategic) proposed by Weill and Broadbent (1998) and later studied by Aral and Weill (2007) and others. These dimensions are described below.

IT infrastructure is the basis of the portfolio, since it is the foundation for the IT capabilities which refers to the technical and managerial expertise required to provide

a reliable IT services to the organization. Investments are shared with IT services used by several applications such as: servers, networks, laptops and customer database. They provide benefits such as business integration, business flexibility and business agility, reducing the cost of IT in the business units and reducing the cost of IT over time and as a result of standardization.

The transactional dimension is related to the processes that automate the repetitive and basic transactions of enterprises. The goal is to cut costs by substituting labor with capital, or work with larger volumes of transactions with greater speed and at a lower unit cost, or increase productivity. Transactional systems are built on and are dependent on the reliable capacity of the infrastructure.

The informational dimension is another IT portfolio facet, which relates to providing information for the management and control of the company. Typically, it supports management control, decision making, planning, communication and accounting. Investments in this dimension provides information for purposes such as accounting, reporting, compliance and analysis. It also is expected to provide benefits such as increased control, better intelligence, better integration, better quality of information and information cycle timing within the company.

The last dimension is strategic, in which the objectives are slightly different from the other parts of the portfolio. Such investments are made in order to gain competitive advantage by supporting entry into new markets or by helping to develop new products, services or business processes.

So far, we have pointed out the necessity for a greater understanding of IT investment management and argued that ITPM and its dimensions are suitable to help companies to manage their investments. We raise the following question: how does the use of ITPM help companies to manage their IT investments? To answer this question we carried out qualitative case research, involving several different Brazilian companies. The research and findings are presented in the following sections.

4. Research method

This research is qualitative and exploratory; it was carried out as a case study of five different companies. A qualitative approach is suitable for this research because it seeks to describe the complexity of a situation, understand dynamic processes and analyze variable interaction (Richardson *et al.*, 1999), all of which pertain to ITPM use in the Brazilian organizations.

The subjects of this study are companies that are beginning to use or are using ITPM techniques to assist the planning, control and evaluation of IT investments. The persons interviewed were high-level executives working in the companies' IT departments (e.g. chief information officer (CIO), chief information manager, IT director, IT infrastructure supervisor). These IT managers had knowledge of the ITPM concept and showed a lot of interest in the topic as well as in the relationship between academic research and their companies. Factors taken into account included characteristics of the respondents regarding the time they spent working in the IT area, time as employees of the company and knowledge of ITPM. This last factor was further broken down into knowledge acquired in courses at the Massachusetts Institute of Technology in the USA with the authors of the model used in this research; through lectures conducted in Brazil; and through papers and books from the cited authors. The companies studied also spent large amounts on IT, more than five million dollars per year and had IT budgets between 0.6 and 1 percent of revenue.

The case study protocol was developed based on the literature review and was validated in a pilot case study. The protocol contained all the information necessary to guide the researchers in collecting the data (Yin, 2003). The research instrument was divided into four sections:

(1) General characteristics of the company (name of the company, sector, annual revenues and IT annual expenditures).

(2) Respondents' characteristics (name, position in the company, background, time working in IT, time working in the current position and how they know about ITPM).

(3) IT investment management, using questions such as: how are IT investments defined? Which are the factors that influence IT investment decisions? Are there evaluations of IT investments?

(4) IT portfolio, with questions such as: how ITPM helps the company to justify the IT investments? How ITPM helps the company to control the IT investments? Do you believe that investment in IT infrastructure help integrate the company? Which IT investments for transactional processes help reduce costs? How do IT investments help the company to improve the quality of the information? What IT investments are used for strategic purposes?

After the pilot case study and following the refinement of the research instrument, case studies were carried out in companies that met the requirements of this study: large companies with high IT investments and companies starting to use or already using ITPM. The identification of the companies and contact with the companies and managers were conducted with the help of a CIO with knowledge of the executives and their cognizance of ITPM. Other sources of evidence included semi-structured interviews in addition to secondary evidence provided in document form such as investment sheets, corporate web sites and other relevant documentation released for research, while respecting the information security policy of the organizations. All interviews were recorded and later transcribed. The cases, sectors, respondents and the duration of the interviews are summarized in Table I.

The study used content analysis, which consists of discovering the core of meanings that comprise the communication and observing the presence and frequency of terms that can mean something to the chosen analytical objective (Bardin, 1977). Categories were determined based on the (units) core meanings, which were separated into three categories: final (planning, control and evaluation) that had already been set, intermediate (items in each dimension – e.g. definition, prioritization, tools and process) and initial (definitions, characteristics, examples and how ITPM is related), that had emerged from the analysis itself; examples of which are presented in each case separately.

The pilot case study was conducted in a business group in the south of Brazil, which ranks among the 120 largest companies in Brazil, according to its web site. The organizations of this group have operations in the agricultural, food and commercial sectors. The company was making efforts to use ITPM techniques to assist in IT investments. Information about its ITPM implementation was obtained through an interview with the IT group corporate manager, who had prior experience with the technique. This pilot case study allowed for adjustments in the data collection instrument, such as changes in the questions to improve clarity and changes to the order of some questions. This instrument, validated in this pilot case

Case	Sector	Respondent	Working in IT/current company	Duration of interview
Pilot	Many	IT corporate manager of the group	24 years/ 8 months	1 h and 20 min
1	Petrochemical industry	Chief information manager – one of the top 40 CIOs in the Brazil	25 years/ 1.5 years	2 h and 30 min
		IT infrastructure supervisor	22 years/ 1 year	
2	Financial services	Managing and IT director – one of the top 40 CIOs in the Brazil	25 years/ 8 years	1 h and 40 min
		IT specialist	26 years/ 4 months	
3	Steel	IT management and planning executive	9 years/ 6 years	1 h and 45 min
4	Automotive	CIO – one of the top 40 CIOs in the Brazil	25 years/ 7 years	2 h
		IT coordinator Project Management Office	15 years/ 3.5 years	

Table I.
Cases, sectors, respondents and duration of the interviews

study, was then changed and reviewed prior to use in the other cases presented in the next section.

5. ITPM cases

This section presents the analysis of four case studies carried out in this research. The goal here is to clarify how IT investments are managed and how the ITPM technique is used in this process. The analyzed companies are starting to use the technique or have already begun its implementation. Each case features a description of how (according to the respondents' answers) the ITPM technique is applied with regard to IT investment planning, control and evaluation. These cases are first analyzed separately and then presented as a joint analysis. A discussion about the cases is presented in the next section.

5.1 Case study 1

The first company analyzed is in the petrochemical industry sector. This organization was beginning to use the technique as well as ITPM concepts to improve its investments in technology. Four interviews were conducted with the chief information manager and the IT infrastructure supervisor, each of these lasting on average one hour and a half. In addition to the interviews, the researchers were informed about IT investment in the company by means of various data sources, including a document called capital expense proposal (CEP) as well as information and examples which helped in the ITPM analysis.

The content analysis of transcriptions of interviews yielded 21 initial categories (e.g. first source of IT investments, difference between IT investment and IT expense), eight intermediate categories (e.g. investments approval, evaluations before investments) and three final categories (e.g. planning). Planning was defined on the basis of three basic origins: dynamic nature, technological opportunities perceived by the IT area personnel and technology brought to the IT team by users in other businesses. The ITPM technique is beginning to be used to improve IT investment visibility and help the company in its IT investment planning. With respect to control, there is a committee

which meets regularly to monitor IT spending using CEP to control investments. ITPM dimensions have been used to define different IT investments and enable greater control and better alignment between IT objectives and organizational objectives. Moreover, there are evaluations of investments, using information contained in CEP, which can be accessed at any time to verify if the investments met proposed goals.

5.2 Case study 2

The second company analyzed is in the financial service sector. The respondents were the IT director, as well as the IT specialist. The ITPM technique has been used in the company, where the IT area, including the classification of its expenses and investments, are structured according to ITPM's four dimensions. IT infrastructure retains its usual nomenclature; however, the transactional dimension is called "solution," the informational dimension is referred to as "information management" and the strategic aspect is called "executive and strategic."

Due to company policy, the only data sources that could be analyzed in this case were the interviews themselves, although some additional informational items such as reports and documents about IT investments were viewed during the conversations, and these were used to illustrate the case and complement the interviews. Content analysis of the interview transcripts identified 21 initial categories (e.g. structuring of the IT sector according to ITPM dimensions, use of ITPM to follow-up on the investments), five intermediate categories (e.g. IT investments definition, existence of IT committee) and three final categories (e.g. control). The planning of IT investments in the company is accomplished as a part of the organizational strategic planning process. Because of the special characteristics of the financial market, IT planning must be flexible in order to meet business demand and to be able to classify IT investments and expenses quickly. For this reason, the company takes into consideration the IT portfolio structure. The ITPM technique is used in conjunction with information about each dimension to assist in IT planning; the whole of the IT area is organized and divided according to the ITPM dimensions, as already mentioned. There is no specific IT investment budget; rather, IT needs are anticipated within the budgets of other areas. The structuring of the IT sector according to ITPM dimensions also helps the company to better control the investments it makes, and the use of ITPM assists in monitoring these investments. Final evaluations of IT investments are still not made in a formal way, but the organization has undertaken initiatives to fill this gap. The ITPM technique was pointed out as a way to help the managers to accomplish this task.

5.3 Case study 3

The third case study was conducted in a business group belonging to the steel sector located in the south of Brazil. The interview was with the IT management and planning executive, who is beginning to apply the concepts of ITPM to IT investment management.

According to the respondent, the ITPM technique is known within the company but still not widely used. The additional documents presented during the interview could not be published due to the company's information security policy; instead, the respondent referenced some examples, using and letting them be consulted during the interview. The content analysis of the interview transcriptions identified 18 initial categories (e.g. information sharing between IT and its customers, IT committee composition), seven intermediate categories (tools to assist IT investment management, tools to assist IT investment control) and three final categories (e.g. evaluation).

Planning is undertaken according to the users' and areas' necessity as well as to the annual expenses and investments budget. Problems arising from the expansion of the organization were highlighted, and the use of ITPM was suggested as an aid to organizational integration with other companies. The technique is used first of all to generate a preliminary IT portfolio. It also facilitates an overview of the IT area, helps keep the organization's members aware of the different systems used in the organization, and promotes an improvement in the alignment between IT strategy and organizational strategy. Moreover, the ITPM technique is used to assist in the monitoring of IT investments across the company, to ensure the use of the same systems throughout the organization and to diminish the heterogeneity created by the expansion. There are no systematic evaluations of IT investments, and the ITPM is only beginning to be used as a method for evaluating IT investments.

5.4 Case study 4

Case study 4 was conducted in a company in the automotive sector. An interview was held with the CIO and the IT coordinator – Project Management Office. Both respondents have knowledge of the technique and the concepts of ITPM, and the company has been using ITPM dimensions to assist in the IT investment process. The other documents presented in the interview could not be published because of the company's information security policy; instead, the respondents referenced some examples and allowed them to be seen during the interview. The content analysis of the interview transcripts identified 16 initial categories (e.g. IT investments defined by the global company, satisfaction research), seven intermediate categories (e.g. IT investments definition, previous evaluation) and two final categories (e.g. planning and evaluation).

With regard to IT investment planning, these investments are determined by the company's global organization, and the Brazilian subsidiary communicates its needs and priorities to the global company, which then analyzes them and weighs them against the needs and priorities of the other subsidiaries. ITPM, referred to as TISI (transactional, infrastructure, strategic and informational), is used to assist with IT investment, management, justification and prioritization. No evidence was seen of elements of a formal control of IT investment. IT investment evaluation occurs in two phases – before and after technology acquisition – and the ITPM technique is not used to evaluate investments in either of these phases.

5.5 Cross case summary

We present a cross case analysis summarizing the three processes (IT investment planning, control and evaluation) on the four cases and how ITPM was used in these companies. We also explore how this technique could help the companies in IT investment management.

In the cases analyzed, we observed that ITPM is used most frequently in IT investment planning, which is the process most discussed and used in the four companies. We also saw that there was a relationship between the planning stage and the strategic goals of the companies and found that the ITPM technique could help the companies in this aspect. Some organizations are making robust use of the technique while others have begun initiatives and are still in initial stages of implementation. These findings corroborate the suggestion of Kumar *et al.* (2008) that the ITPM technique is beginning to be used by organizations. We noticed that the ITPM technique is used more substantively in Company 2 than in the other cases because the organization of the IT area in the

company is structured according to ITPM dimensions. The planning of this organization is based on the four ITPM dimensions. This enables greater flexibility to respond to rapid changes in the market. In the other cases we observed that the ITPM process was used only in its early stages mainly to define the IT portfolio and thereby assist in investment management. Even in this initial phase, the respondents observed, ITPM is relatively accessible. This encourages its dissemination and utilization in organizations.

In terms of practical application, Case 3, identified the use of the ITPM technique from the beginning to generate a preliminary IT portfolio. In Case 4 we found that ITPM (or TISI, in the terminology of the respondents) is also used in an initial process to delineate the portfolios of individual IT departments that will lead to contributing to a final portfolio designed to help to achieve an alignment with the objective of the company and the other areas. In Case 1, ITPM is also being used, initially, to define the IT portfolio according to technology investments and expenses. In three companies (Cases 2, 3 and 4), we noticed that ITPM is used to assist IT investment prioritization, but it was pointed out that this process is still at an early stage. The organizations studied use other means to prioritize and justify the investments, such as a business case. In Case 1, ITPM has still not been used to prioritize the investments. It is more often being used to define the ITPM dimensions and provide investment visibility. ITPM is recognized as an indispensable communication tool that helps business executives better understand IT investment (Cameron, 2009) and, then, better manage it. While IT investment control is still a part of the process within every company, no formal process was in place to fill the gap. ITPM was seen as having the potential to aid the organizations in better controlling their investments. In Cases 2 and 3, market benchmarking was used as a reference for adjusting and improving the IT portfolio of the analyzed companies. However, few studies use this type of analysis due to the difficulty of gathering company data. The parameter used by the companies for analysis has been derived from American studies (Weill and Broadbent, 1998; Aral and Weill, 2007). These should be carefully analyzed because of contextual differences in the Brazilian instances. In Case 4, formal elements of IT investment control were not found; ITPM could help this company enabling the visibility and monitoring of this investments. In Case 1, ITPM dimensions have been used to classify the IT investments, allowing an analysis of IT resources expenditures within the company.

One of the observations from this study is that IT investment evaluation has not been accomplished in a formal way in the cases analyzed, but initiatives have been advanced to close this gap. In Cases 2 and 4, ITPM was used as a means to perform evaluations of IT investments, providing greater visibility for these investments (Datz, 2003; Maizlish and Handler, 2005). Portfolio structuring is used to support business strategies and plans to improve the IT investments through feedback from these investments. This provides a consolidated source of information about investments in IT (Over, 2009).

In Case 3, ITPM is used to supplement IT investment evaluations. Moreover, structuring ITPM dimensions enables a greater understanding of IT investments and allows evaluation as to whether these investments are in agreement with expectations and proposals. In Case 1, ITPM has still not been used to evaluate IT investments; instead, technology investments are evaluated by means of formal documents created within the company for each new investment in IT area. The documents contain different sorts of financial and technical information, and ITPM could be included to help the managers to better evaluate IT investment and expenditures. Finally, in Table II we summarize major considerations about ITPM and the IT management process in the four analyzed cases.

	IT investments planning	IT investments control	IT investments evaluation
Case 1	ITPM is being used, initially, to define the IT portfolio according to technology investments and expenses. Because of this, it was not still used for the prioritization of investments, but to provide greater visibility of investments	ITPM dimensions have been used to classify the IT investments, allowing an analysis of IT resources expenditures within the company, enabling a better control. This technique assists to identify where the resources are being allocated	ITPM has still not been used to evaluate IT investments; instead, technology investments are evaluated by means of formal documents created within the company for each new investment in IT area
Case 2	ITPM is used more amply in Company 2 than in the other cases, which there are dimensions analysis, portfolio structuring using the dimensions, the IT sector is structured according to ITPM dimensions. ITPM use to prioritize the investments and improve the understanding of IT expenses and investments	IT portfolio benchmarking was used as a reference for adjusting and improving the control on IT portfolio	There are not formal IT investments evaluations and ITPM has been pointed out close this gap. ITPM was indicated as a means to perform an evaluation of IT investments, providing greater visibility and better understanding for these investments
Case 3	ITPM process was used only in its early stages, in order to define the IT portfolio using the ITPM dimension to elaborate an annual IT investment plan. ITPM use to prioritize IT investments, but in the initial phase	IT portfolio benchmarking was used as a reference for adjusting and improving the control on IT portfolio	There are not formal IT investments evaluations and ITPM is beginning to use to supplement IT investment monitoring
Case 4	ITPM use to structuring dimensions to assist in IT investment planning and prioritization. Initial process to elaborate the portfolios of individual IT departments for contribution to a final portfolio	IT was not found formal elements of control of IT investments and ITPM can help in this process	There are not formal IT investments evaluations and ITPM has been pointed out close this gap. This technique was indicated as a means to perform an evaluation of IT investments, providing greater visibility and better understanding for these investments

Table II.
ITPM and planning, control and evaluation in the analyzed cases

6. Research synthesis

As our cases demonstrate, some companies are using ITPM differently in some situations and in similar ways in other situations. We found that the planning of IT investments is the process that the case study companies spend more time and resources to accomplish. In these companies different forms and approaches were used to plan these investments. The use of techniques such as ITPM can help companies to plan their investments as pointed out in the literature (Tan and Theodorou, 2009) and identified in this research. Using ITPM could generate preliminary IT portfolios to help achieve alignment with other areas, providing visibility of the IT investments and a more efficient communication among companies.

All four companies pointed out that they use ITPM to help in the planning process of IT investments focussing on prioritization and justification of these investments. In this part of process is more evident the link between the strategic value of the tool ITPM in IT management process, because the executives plan their IT according the objectives of the company using a prioritization and visibility of their IT investments. Except for one company, all the others were on an initial phase using the ITPM technique to define and elaborate the IT portfolio. This accords with Maizlish and Handler (2005) who propose stages for IT portfolio building where the first stages are game plan and planning. This shows that it is necessary to first define and prepare the IT portfolio to advance to other stages and achieve a more mature use of the technique.

The companies are controlling and monitoring the IT investments to check if the resources are being allocated in the right place and in accordance of what was planned. ITPM was used to help companies accomplish this task and was used to compare how the companies are in relation to competitors. Some companies are using IT portfolio benchmarking (Weill and Broadbent, 1998; Weill and Aral, 2006) to improve and adjust the control. This benchmarking was carried out in foreign companies whose context and environment are different from Brazil. So, the executives in the companies analyzed did not find studies applying this technique and their dimensions to investigate the IT portfolio in different sectors to help these Brazilian executives to do a benchmarking using national data. So this study is a starting point to help these companies to better understand ITPM in this context and in the future to collect data from different companies and sectors to provide Brazilian metrics to compare.

In 2004, Jeffery and Leliveld carried a survey with 130 Fortune 1,000 CIOs: 89 percent of the CIOs polled were very aware of ITPM, 57 percent do not have criteria to define project success and 68 percent do not track the benefits of projects. Moreover, 59 percent of companies regularly calculate the return on investment (ROI) of IT projects before making an investment decision, but only 25 percent measure the realized ROI after a project's completion. These findings highlight that the executives worried more about the planning for the investments but they did not evaluate them after accomplishing them. Three cases in this study did not have a formal evaluation of IT investments and they did not evaluate the investments after they finished. The companies pointed out that ITPM could help in this process supporting business strategy to create feedback to improve this kind of investment and provide a tool to identify if they are in agreement with expectations and what was proposed.

7. Conclusions

The goal of this research, to analyze the use of ITPM as a help to the IT investment management of some Brazilian companies, was accomplished using case studies. This study helps to better comprehend the use of ITPM to better manage the IT investments of companies in terms of planning, control and the evaluation process. The ITPM technique has been identified as a new but little studied way to aid IT executives in better managing and justifying the investments in technology. Despite this, the technique has received little attention in IT research (Kumar *et al.*, 2008) and ITPM research is still very limited in the information systems literature (Tu and Shaw, 2011). However, from a practice perspective ITPM is considered a useful and accessible tool which provides increased visibility and evaluation into IT spending. It is also an important means for improving communication, and for providing alignment between

strategic plans and IT expenses. ITPM helps IT and business leaders to align their priorities. It is also important for providing increased transparency into IT decision making and allowing planners to schedule resources more efficiently (Datz, 2003; Symons *et al.*, 2005; Cho and Shaw, 2009). ITPM was developed as one of the Brazilian *InformationWeek Magazine*'s assessment categories for diagnosing the useful innovations in IT. This illustrates the importance of this technique and its utility in companies. Thus, this research can help companies to better manage their IT investments using ITPM.

Using a few case studies is a limitation of this research since it does not allow for generalization to the population of companies. The case studies, however, does allow for exploration and deepening of the theme. Since there were few companies using ITPM analysis had to be done across a variety of sectors. In so doing, comparisons within sectors become difficult.

There are several possibilities for future research. These include: first, analyzing ITPM in companies in the same sector to observe the differences and similarities; second, quantitatively analyzing the use of ITPM in Brazilian companies to detect how this tool is being used in the country; third, research using the model presented could be done in different contexts and countries to fully understand the use of ITPM in IT investment management and; lastly, analyzing how the specific characteristic of the countries (national, cultural, organizational contexts and technological requirements) could impact the use of ITPM in IT investment management.

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