IT projects portfolio management: a Brazilian case study

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Abstract: The aim of this paper is to analyse, through a case study, the portfolio approach for selecting Information Technology (IT) projects, considering both efficiency (use of resources), effectiveness (achieving better results for the organisation) and also estimating their risks. This study was performed in a leading Brazilian manufacturer of building materials, where a new proposal for selecting IT projects was tested, based on the portfolio approach. The Critical Success Factors (CSF) method was the main tool for assessing IT projects effectiveness. The results showed that the formalisation of the process and the definition of the criteria for building a IT projects portfolio helped to improve IT strategic alignment understanding. Besides, users and IT professionals assumed new responsibilities on building this portfolio, since they started to share key roles on estimating costs, risks and contributions of each IT project on the CSF.

Keywords: Information Technology (IT); project management; strategic alignment; IT projects portfolio.

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1 Introduction

There is a general consensus about the relevant increase in Information Technology (IT) investments in the last decade (Brynjolfsson, 1993; Brynjolfsson and Hitt, 1998). The role of IT in organisations can vary from a simple administrative support to a strategic function (Henderson and Venkatraman, 1993; McFarlan, 1984). The strategic function of IT has achieved an important status in the leading companies in the increasingly competitive market (Porter, 2001). Two basic points can be used for understanding IT: the acquisition of a competitive advantage at the value chain and the creation and enhancement of core competencies (Duhan et al., 2001; Porter and Millar, 1985). On the other hand, there is still an important discussion about the difficulties in finding evidence for returns over the investments in IT, called the 'productivity paradox', although there are convincing explanations for this fact.

The decisions about which Information Systems (IS) projects should be implemented are frequently determinant of business performance and are not only able to change the competitive positioning of the companies but also can modify the competitive structure of the industry, like it happened in financial and airlines industries (Laurindo, 2002).

Project management is another very important issue for many competitive companies of different industries, encompassing a large spectrum of concepts, tools and techniques to improve project performance and organisational effectiveness and efficiency. IT projects, in special, have been increasingly studied to improve their evaluation in terms of efficiency (regarding cost, time frames and quality) and effectiveness (considering companies results and competitiveness), as highlighted by Laurindo et al. (2003).

The strategic impacts of IT applications and their effects on enterprises and industries were analysed by McFarlan (1984) through the Strategic Grid that allows the visualisation of the relationship between IT strategy and business strategy. McFarlan (1981) also analysed the selection of projects of new IT applications, considering the risks associated with each project and also the risks of the projects portfolio. Jiang and Klein (1999a) studied the selection of IT projects, considering the different possibilities of the Strategic Grid.

The aim of this paper is to analyse the portfolio approach for selecting IT projects, considering both efficiency (use of resources) and effectiveness (achieving positive

results for the organisation) issues, and also analysing their risks. These criteria are very important in the highly competitive market of the globalised economy. For this study, IS projects are considered as Research and Development (R&D) projects, using the idea of portfolio management. This approach allows managers to have a broad view of alternatives of projects that could maximise results of the whole portfolio (Cooper et al., 2000; McFarlan, 1981).

In order to investigate these concepts, the adopted methodological approach was case study (Claver et al., 2000; Yin, 1991), performed in one of the most important building materials industry in Brazil.

In the first phase of the case study, the problems that the company faced in the process of managing IT projects backlog were analysed. In the second phase, a proposal for solving these problems was developed and studied. The main points of this proposal were:

1 structuring and formalising the decision process for selecting IT projects, including the participation of both IT and business managers

2 adopting a portfolio approach for selecting IT projects, taking into account risks, efficiency (use of resources) and effectiveness (achieving better results for the organisation) issues of IT applications.

The following concepts were adopted in this proposal: Critical Success Factors (CSF) method, (Rockart, 1979), strategic Grid (McFarlan, 1984), strategic alignment (Henderson and Venkatraman, 1993), uncertainties (Archibald, 1976), type of project (in terms of complexity and experience with technology – Farbey et al., 1995), time and budget. A specific taxonomy for IT projects was developed, in accordance with company practices and culture.

The results of the second phase of the case study showed equilibrium between theory recommendations and company practices and characteristics. The formalisation of the process and the definition of the criteria for building a IT projects portfolio helped to improve the IT strategic alignment understanding among managers, especially in user areas. In addition, user perception of IT area performance was improved through this process.

Hence, this paper intends to contribute with a systematic and broad approach for managing IT projects portfolio, bringing new alternatives and insights for the discussion of this issue that is increasingly more important for organisations competitiveness.

2 Theoretical background

The theoretical basis for this paper begins with an overview of the role of IT projects in the strategies of the organisations (Farbey et al., 1995; McFarlan, 1984; Rockart, 1979). The next subject is concerned with project selection (especially IT projects, McFarlan, 1981) and the related risks that affect the probability of success of these projects (Archibald, 1976; Jiang et al., 1996; Jiang and Klein, 1999a,b). It also discusses the influence of ongoing projects (Cleland and Ireland, 2000; Maximiano, 1997) over the selection of new projects, since they compete for the same resources. This revision finishes discussing the question of the follow-up of ongoing projects (Archibald, 1976; Dinsmore, 1992; Farid and Karshenas, 1988; Moraes, 1999).

2.1 The strategic role of IT projects

In the early stages of the use of computers in business, the limited capacity of both hardware and software strongly restricted the possibilities of IT applications. Thus, just well structured and less complex applications could be implemented, like payroll, inventory control and payments control. As technology evolved, the range of possibilities was amplified, and a list of new possible alternatives of IT applications became possible. Thus, uncertainties arose about the decisions of selecting projects that should be developed and implemented (Laurindo et al., 2003).

One of the first proposals to solve the problem of choosing and prioritising IT projects was the CSF method developed by Rockart (1979) and it is still widely used nowadays. This method aimed at especially management and executive IS and it was based on the definition by top executives of their current needs, expressed by the CSF. Rockart defines CSF as the areas where satisfactory results 'ensure successful competitive performance for the organisation'. The author states that CSF prime sources are structure of industry, competitive strategy, industry position, geographic location, environment and temporal factors. Although primarily conceived for IS design, this method had an important impact on managerial and strategic planning practices. It is usual to define CSF for different functions of the company, such as marketing CSF, manufacturing CSF, projects CSF, among others.

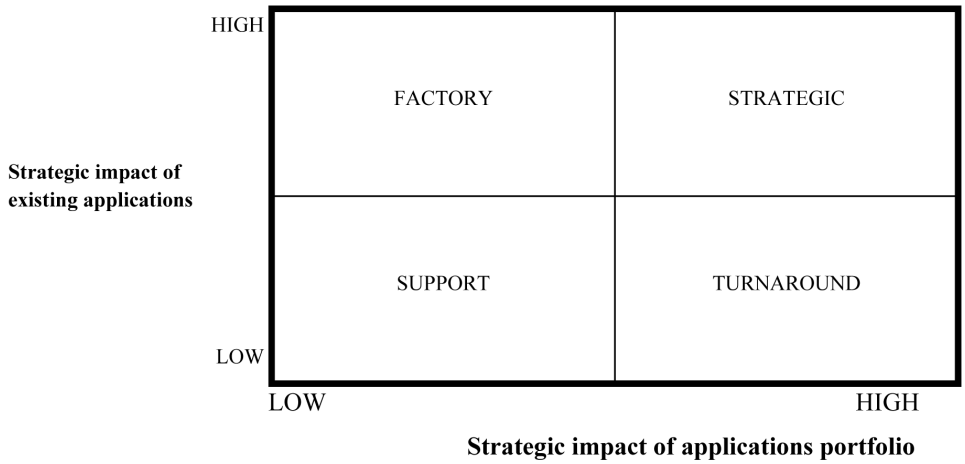
Porter (1979, 1996) emphasises the importance of positioning a firm in its industry, to achieve a sustainable competitive advantage through the choice of one of the three generic strategies: cost leadership, differentiation and focus. The competitiveness of an industry results from five forces: clients, suppliers, substitutes, new entrants and present competitors.

McFarlan (1981) analysed the selection of projects of new IT applications considering the risks associated with each project and also the risks of the projects portfolio. These risks encompasses costs, time, technical performance, overestimation of IS benefits and incompatibility of hardware and/or software for the IS. The same McFarlan (1984) proposed the Strategic Grid that allows the visualisation of the relationship between IT strategy and business strategy. This model analyses the impact of IT existent applications (present) and of applications portfolio (future), defining four boxes, each one representing one possible role for IT in the enterprise: 'Support', 'Factory', 'Turnaround' and 'Strategic' (see Figure 1).

- 'Support': IT has little influence in present and future company strategies
- 'Factory': existing IT applications are important for company's operations success, but there is no new strategic IT application planned for the future
- 'Turnaround': IT is changing from one situation of little importance ('support' box) to a more important situation in business strategy and
- 'Strategic': IT is very important in business strategy in the present and newly planned applications will maintain this strategic importance of IT in the future.

To assess these strategic impacts of IT, McFarlan proposed the analysis of the effects of IT applications on the five competitive forces (Porter, 1979). If at least one competitive force is affected, the IT application (or a set of IT applications) can be considered strategic.

Figure 1 Strategic grid of impacts of IT applications



Source: McFarlan (1984).

Different IT applications, according to their characteristics, the reach and extension of required modifications, can cause different impacts on an organisation.

On the basis of these considerations, there are different proposals for classifying IT applications.

Among many different taxonomies about IT applications, Farbey et al. (1995) proposed a classification of eight different types: mandatory changes, automation, direct value added systems, Management Information Systems (MIS) and Decision Support Systems (DSS), infrastructure, inter-organisational systems, strategic systems and business transformation.

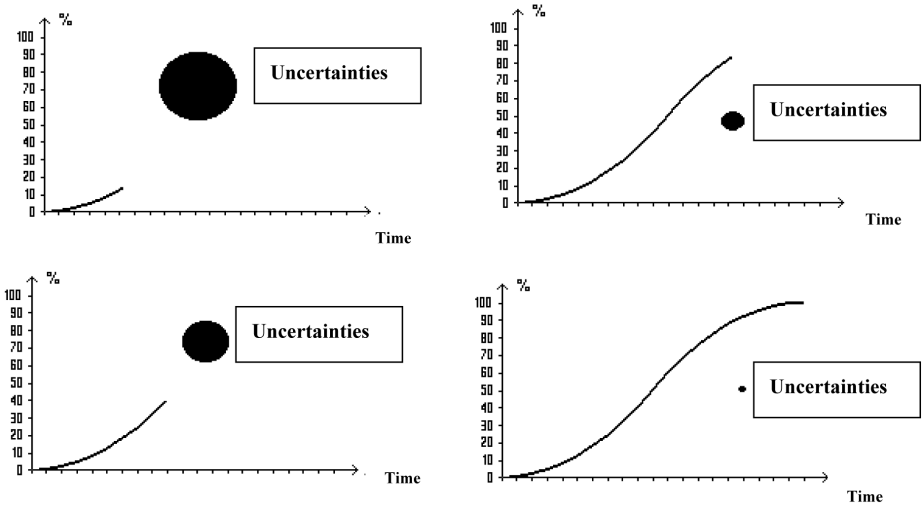
2.2 IT projects selection and project success probability

Jiang and Klein (1999a,b) studied the selection of IT projects taking into account the four different possibilities of the Strategic Grid. Enterprises classified in the 'strategic' and 'turnaround' categories usually are more prone to assume risks and have more rigorous controls for IT projects. The enterprises classified as 'support' consider costs as the primary criterion for selecting and conducting IT projects.

The selection of IT projects should consider both efficiency (use of resources) and effectiveness (achieving positive results for the organisation) issues, and also analyse their risks. These criteria are very important in the highly competitive market of the globalised economy. In this paper, IT projects are considered as R&D projects, using the idea of portfolio management. This approach allows managers to have a broad view of alternatives of projects that could maximise results of the whole portfolio (Cooper et al., 2000; McFarlan, 1981).

The uncertainties can be found in different ways during the development of a project. In this paper, it will be considered the uncertainties related to the achievement of expected results in terms of cost, time, quality of the final product of the project and impact on the organisation. According to Archibald (1976), project uncertainties diminish as the project development advances (see Figure 2).

Figure 2 Uncertainties versus project advance



Source: Archibald (1976).

Jiang and Klein (1999a,b) and Jiang et al. (1996) associated the risk factors of IS projects to the success of these projects. Through an analysis of 86 projects, they identified the main risk factors that explain the success of IS projects, as follows:

- technological newness
- project size
- lack of team's general expertise
- lack of team's expertise with task
- lack of team's development expertise
- lack of user support
- resources insufficient
- lack of clarity of role definitions
- application complexity and
- lack of user experience.

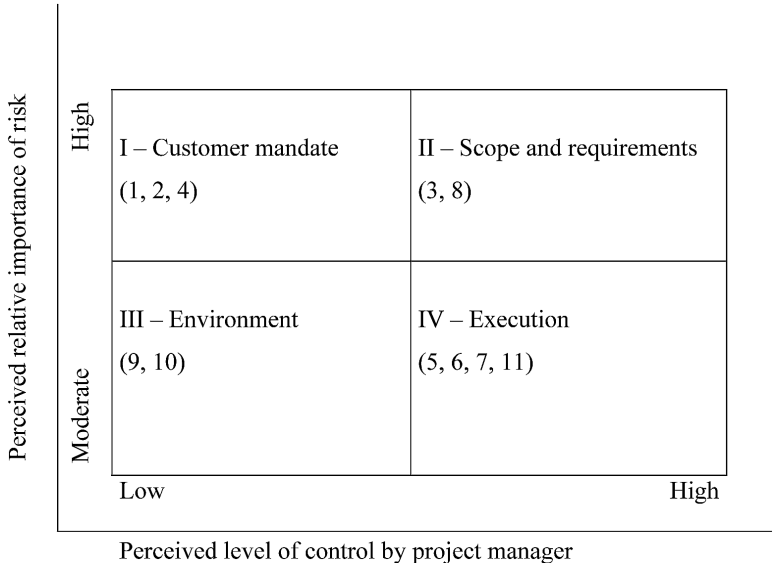
Keil et al. (1998) studied the risks of IS projects using DELPHI techniques, and as a result, obtained a list of risk factors given below, in decreasing order of importance:

- lack of required knowledge/skills in the project personnel
- lack of top management commitment to the project
- failure to gain user commitment
- misunderstanding the requirements
- lack of adequate user involvement

- failure to manage end-user expectations
- lack of frozen requirements
- introduction of new technology
- insufficient/inappropriate staffing
- changing scope/objections and
- conflict between user departments.

The different kinds of risks were disposed in a matrix (see Figure 3). The first dimension is the perceived relative importance of risk, considering both their occurrence probabilities and their impacts. The second dimension is the perceived level of control that project manager is able to do over a specific factor.

Figure 3 Risk factors



Source: Adapted from Keil et al. (1998).

2.3 The influence of ongoing projects

New IT projects compete for the same resources with ongoing IT projects. Meanwhile, as explained above, ongoing projects usually present less uncertainty than the new proposed ones (Archibald, 1976).

Thus, follow-up of these projects can take advantage of this condition to obtain more accurate estimates to be used on the analysis and building of the development project portfolio. In this approach, project follow-up activities should consider only the resources necessary to conclude these projects, not considering what have already been invested. This is important to avoid some common mistakes in the decision-making process. This is the point of view of Cleland and Ireland (2002) in the use of the net present value, since they highlight the importance of just considering the future cash flow in the decisions relative to ongoing projects.

On the other hand, a project in which a great investment had already been done and that cannot achieve the proposed objectives can continue, depending on the analysis of the feasible results it can still obtain. Maybe the outcomes could be much more restricted than that had been planned, but the level of investments could also be much lower. Hence, it is a matter to analyse costs and benefits.

The idea of not considering the investments that have already been made is to diminish the probability of occurrence of the 'Sunk Cost Trap' in the decision of continuing or not a project (Hammond et al., 1998). This situation happens when managers try to save a project, even if they have to take some unnecessary risks and spending uselessly more money, in an unconscious attempt of not admitting some previous mistakes or misjudgements.

Thus, ongoing projects compete for the same resources with new projects, especially for human resources.

Project managers should evaluate all through the time if ongoing projects present the desired strategic alignment, acceptable risks and appropriate level of designed performance. The control over these projects should also be able to find problems and identify their causes (Maximiano, 1997). In this way, follow-up activities (*excursus* analysis and control) are linked to the *exante* evaluation.

Finally, as ongoing projects present less uncertainties, they are in a better position for disputing resources with new projects and this situation should be taken into consideration and the planning of IT project's portfolio and respective budget.

2.4 Project control and follow-up techniques

Moraes (1999) highlighted four techniques generally used for project control and follow-up:

- percentage completion and remaining duration
- 'S' curve and trend analysis
- earned value and
- status report.

A quantification of *percentage completion* of an activity needs a previous criterion for measuring this activity, which is not always easy. For example, in a case of software with 5000 lines of code, if 2500 lines had already been written, it is possible to say that 50% of the estimated work was performed, but it is not possible to state that the remaining 2500 lines of code would need the same time, cost or efforts. Hence, it is more cautious to estimate the *remaining duration* instead of the percentage completion of an activity. The remaining duration is related to the activities that have not been performed, which is more useful concept to evaluate project progress.

'*S*' *Curve* is a graph that shows project evolution (percentage completion or cumulative use of resources) plotted against time. Projects start to be executed slowly, and then they speed up during the execution until they approach the final phase, when they decelerate. This curve is useful to notice when a project presents a trend to be late before it actually happens; so it is possible to make some corrective actions or, at least, to predict a new postponed date to the end of the project (Dinsmore, 1992).

Earned Value technique allows comparing how much work (or activities) was performed with the use of the budget so far. It allows noticing if the project presents a trend to cost less or more than it was foreseen. In this way, it is a good tool for controlling both financial and material aspects of project evolution (Farid and Karshenas, 1988).

Finally, *Status Report* is a procedure for formalising the status of development of a project in a certain instant. This kind of report should emphasise elements for project identification (name or code), objectives, costs, schedule, technical performance, scope, project manager names and key personnel involved. It also can bring a brief history of the project until the time of the report elaboration, besides the main problems faced. Optionally, it can present some recommendations and expectations for future activities. (Archibald, 1976).

Hence, considering these concepts, the portfolio approach adopted in this paper is based on the following concepts: CSF, strategic positioning, uncertainties, type of project (in terms of complexity and experience with technology), time and budget (Archibald, 1976; Farbey et al., 1995; Rockart, 1979).

3 Research design and execution

3.1 Methodological aspects

This paper intends to investigate some aspects regarding IT projects selection:

1 How to select IT projects considering the link between them and the strategic goals of the organization?

2 How IT projects selection can be performed using the portfolio approach, instead of just evaluating each single project?

To investigating these concepts, the adopted methodological approach was case study (Claver et al., 2000; Yin, 1991).

The case selection criteria were: the presence of a formal project management process in IT area and the existence of an expressive and diversified mix of IT projects.

On the basis of these criteria, it selected an enterprise whose competitive strategy relies on differentiation and that is one of the most important in the building materials industry in Brazil. Information was gathered through semi-structured interviews held with many players from different hierarchical levels, considering IT and different user areas.

The research was developed in two phases. In the first phase, the problems that the company had faced in the process of managing IT projects backlog were analysed. Some deficiencies were detected: no systematic process for linking IT projects with company business strategy and no project risks considerations. Besides, each project was individually evaluated, without a project portfolio approach.

To solve these problems and to enhance IT project selection process, a new proposal was developed and tested, based on a portfolio approach.

Thus, in the second phase of the research, this new approach was studied, to better understand how it impacts the organisation.

During this case study, it must be noted that decisions about implementation of IT applications could encompass internal development or outsourcing, and issues related to IS functionalities were not considered.

3.2 Case study

The enterprise selected for the case study, hereafter COMP 'A', is one of the most important in the building materials industry in Brazil (revenue about US$ 400 millions per year and 6000 employees). It is organised in four different business units, with different operative characteristics and are geographically dispersed. Information was gathered through semi-structured interviews performed with many players from different hierarchical levels, considering IT and different user areas. Companies of building materials industry in Brazil have been adopting different competitive strategies to face the growing market share of lower cost foreign competitors. Two major competitive approaches have been detected: the first one is the cost leadership strategy and the second one is the differentiation approach (Porter, 2001). Over the years, COMP 'A' has kept leadership in its market through the differentiation strategy (Porter, 1979), since its products are well known by their superior quality and design. Another important differentiation factor is the technical assistance, providing repair services and allowing customers to buy and replacing parts easily.

In COMP 'A', according to its IT and business executives of the corporation and of business units, CSF were:

1 new product design and time-to-market

2 process and final product quality

3 product quality image

4 after sale services

5 costs

6 flexible and large product mix and

7 product delivery lead-times.

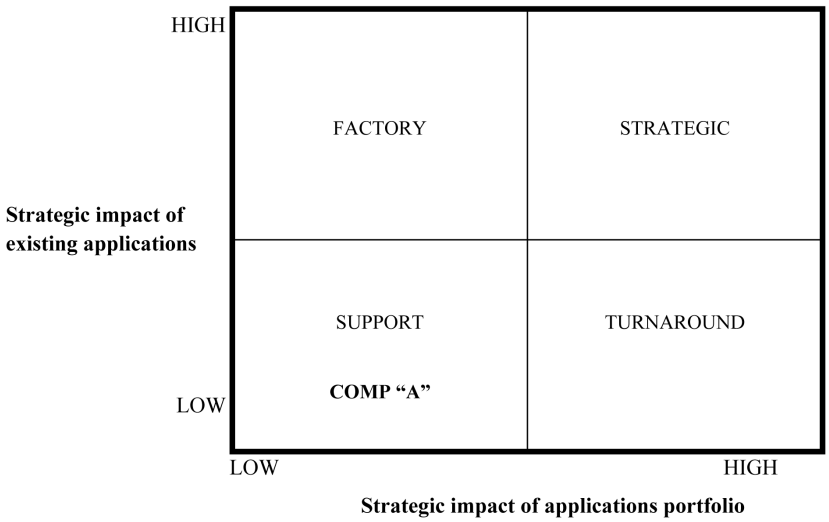
The first four CSF are closely related to the traditional strategic differentiation approach adopted by this company. Meanwhile, the other three CSF are representative of the responses to growing market changes and pressures, the increasing number of competitors, especially foreign manufacturers of low cost products. The importance for short lead-times also reflects this situation, as well as the importance given to flexibility and large product mix. These initiatives present a new kind of differentiation, in which the company tries to use its strong points to face competition. Finally, it can be observed, especially in the first CSF, a trend towards growing pressures for products with more technological and sophisticated characteristics.

COMP 'A' can be considered as a traditional manufacturer in terms of IT utilisation. In these circumstances, its IT area presents a support role and there is no perspective of changing this situation in the near future. The existing IT applications and also those planned to be implemented do not present strategic impacts. So, COMP 'A' can be classified in the 'Support' box of the Strategic Grid (see Figure 4).

In the 1990s, COMP 'A' had undergone changes in guidelines and the top management body. The new leadership started a centralisation process due to a cost reduction policy in management areas, with a dramatic reduction in the number of employees in the corporate IT area (from 200 employees in 1990 to about 40 in 2002). The range of attributions of the IT teams of the business units was reduced to user support and they had to follow patterns and priorities defined by a corporate IT. The

culture of the company favours internal development, but this behaviour is slowly changing. Some software packages have been acquired to complement specific points of the internally built IS architecture. The corporate IT does not have systematic approaches to plan and control costs and resource requirements, nor to evaluate applications performance. There is also neither systematic or formal process to 'exante' evaluation of IT projects, nor to evaluate the results of the decisions about IT projects backlog.

Figure 4 Classification of COMP 'A'in the Strategic Grid



Source: Adapted from McFarlan (1984).

The criteria adopted by the CIO for selecting IT projects to be developed are: fixing 'bugs', modifications required for legal reasons, corporate projects (directly determining of the CEO) and business unit projects (at least one of each business unit). There are also 'technology projects' whose initiative is from IT area. The purpose of these projects is mainly build or enhance infrastructure.

There is no formal forum or process to allow CIO or other IT managers to participate directly in the discussions about the business strategy of the company. A summary of IT area characteristics in COMP 'A' is given in Table 1.

Table 1 IT area organisation in COMP 'A'

IT analysis item	*COMP 'A' characteristics*
IT structure	By systems
IT operation	Decentralised
System development	Centralised; internal
Reasons for IT decentralisation	Local dispersion; business units; wish for control
Efficiency models	No formal model
IT projects control	Ad hoc

3.3 A proposed method for selecting IT projects

After discussing the main points in the case study with the CIO, besides IT and business managers, a new method for selecting IT projects was proposed and tested in COMP 'A'.

This proposal was based on a portfolio approach and not just on the evaluation of each single project.

The main points of this new proposal were:

1 structuring and formalising the decision process for selecting IT projects, including the participation of both IT and business managers and

2 adopting a portfolio approach for selecting IT projects, taking into account estimation of risks, efficiency and effectiveness of IT applications.

As mentioned in Section 1, the following concepts were adopted: CSF method (Rockart, 1979); strategic Grid (McFarlan, 1984); strategic alignment (Henderson and Venkatraman, 1993); uncertainties (Archibald, 1976); type of project (Farbey et al., 1995) and time and budget.

The first point was to consider the differences among IT projects and choose a taxonomy to classify them.

Since the eight different types of IT projects presented in Farbey et al. (1995) taxonomy were considered too complex by the IT managers of the studied company, a new classification was proposed, considering just four different types of IT projects, as follows:

- *Mandatory*: for this kind of projects, there is no 'not to do' option. For instance, the case of many applications related with the Y2K problem, since companies were obliged to modify their IS to avoid serious problems. Modifications in legislation can have the same effect of inevitability of changing IS projects.

- *Infrastructure*: in these projects usually there are few significant immediate benefits, but they provide new and important opportunities. Examples of this category are the implementation of a new corporate database, a new local or wide area network, the implementation of intranets or a new organisational structure.

- *Incremental*: projects that encompass well-known technologies and/or business process, whose impacts can be previously imagined. They promote incremental gains in efficiency and/or in effectiveness.

- *Exploratory*: projects linked to new technologies (considering the companies knowledge), to new business strategy or to new organisational structures or processes. Intrinsically, these projects present a great uncertainty. However, if they are successful, they can bring high gains (in efficiency and/or in effectiveness) to the organisation.

The development lead-time is the time from the formal beginning of the project until this project generates the expected benefits. The planned budget is related to the amount of investments necessary to produce these benefits.

In the proposed method, there is no heuristic involved, but it emphasises the need for an overall evaluation of the projects of the backlog, considering this different kind of projects, the need for strategic alignment (Henderson and Venkatraman, 1993). Although this method enables participation of many project stakeholders, it is based on

subjective judgements by the managers. However, it leads these managers to ponder on projects scope and on the benefits to the organisation in a more comprehensive and qualitative way.

Managers (both from IT and business) must seek for a project portfolio aiming the best possible trade-off with many criteria that sometimes are mutually conflictive. This process leads to an evaluation of the importance of different effective contributions that IT area can bring to the entire organisation.

The proposed method intends to interconnect the concepts previously presented. The first step in this method is the list of the projects that are candidates to be part of the IT portfolio. The scope of these projects can vary from maintenance of existing systems or hardware substitution to a strategic new IS. Projects already in development should not be interrupted.

This first list of IT projects, with the estimation of success and classification for each project is given in Table 2. The description of each project is omitted due to confidentiality reasons. IT managers subjectively estimated both costs (based on the data of previous projects) and success probability (based mainly on subjective considerations).

Table 2 COMP 'A' IT projects information

Project	*Estimate cost*	*Success probability (uncertainty) %*	*Type*
A	US$ 210.000	90	Incremental
B	US$ 320.000	75	Incremental
C	US$ 360.000	50	Incremental
D	US$ 250.000	90	Incremental
E	US$ 250.000	85	Incremental
F	US$ 280.000	60	Exploratory
G	US$ 250.000	85	Mandatory
H	US$ 180.000	50	Exploratory
I	US$ 210.000	40	Exploratory
J	US$ 320.000	60	Exploratory
K	US$ 360.000	75	Incremental
L	US$ 280.000	70	Incremental
M	US$ 140.000	95	Infrastructure
N	US$ 70.000	97	Infrastructure
O	US$ 30.000	92	Infrastructure
P	US$ 100.000	93	Infrastructure
Q	US$ 70.000	98	Infrastructure
R	US$ 250.000	70	Infrastructure

Figure 5 shows the estimated contribution (in terms of the increment of achievement, in a % basis, of the CSF) of each project to each CSF; these estimates were also subjectively made by IT managers. It must be noted that each project can contribute with more than one CSF. CSF (2) *process and final product quality* and CSF (5) *costs*, seem to be the most impacted by the list of IT projects. This fact agrees with the traditional

managerial practices of the company. But this graph does not show properly the combined effects of IT projects on CSF. To understand these combined effects, the next step is to evaluate the overall effect of each possible portfolio. The portfolio with the greatest overall contribution would be the chosen candidate. Figure 6 presents the result of an IT projects portfolio including all the projects of the list of Table 2. The small area surrounding the great central polygon represents the effective gains with this specific portfolio.

Figure 5 Estimate contribution of IT projects to each CSF

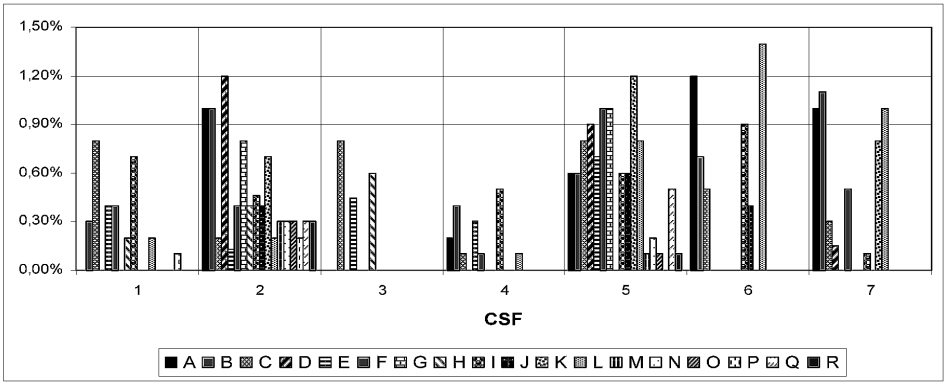
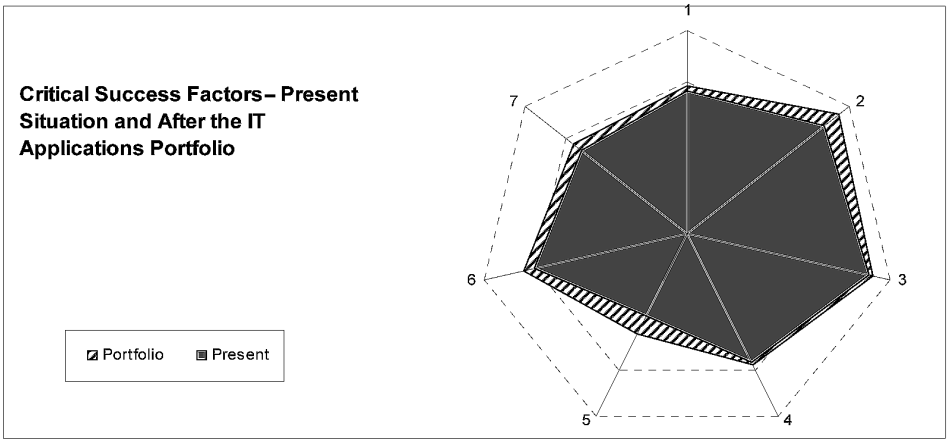
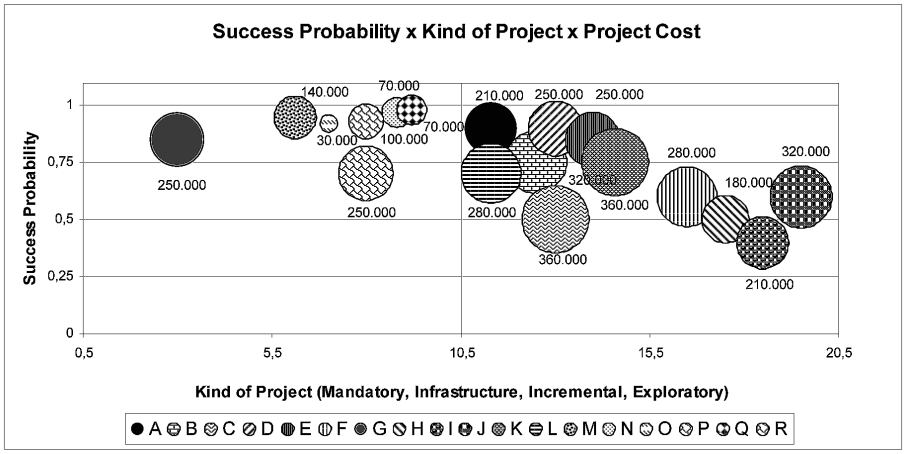


Figure 6 Effectiveness gain with one IT portfolio, according to the CSF



Another important aspect to be considered to select the project portfolio is the level of uncertainty involved that is impacted both by the characteristics of the project and its budget. Uncertainties can be overcome by greater resources availability, that is, by a greater budget (for instance, if you hire more analysts, the uncertainty concerned with time can be reduced). The success probability (that is related to the uncertainties) of the projects was related with the classification presented above; so, each project was properly classified and their uncertainties were estimated, as already mentioned. The area of the circle representative of each project indicates the respective estimate of the necessary investment (see Figure 7).

Figure 7 Uncertainties of IT projects, classified in four different types



This graphic allows investigating investments that are undermined by great uncertainty. One important question would be: is it worthwhile to expend scarce resources in projects with great uncertainty? Projects 'C' an 'I', whose respective investments are US$360 million and US$210 million can be examples of this situation. On the other hand, if these projects were considered important according to other criteria, they should receive more resources or their scope should be re-discussed to achieve the desired results. In the same way, mandatory projects should not present great uncertainty because their failure would bring considerable troubles. The trade-offs involved in this process reflect industry structure and internal competences.

3.4 Case analysis

The analysis of the case study showed the difficulties of managing properly a large number of simultaneous IT projects. Some of these difficulties were analysed during the testing of the proposed method in the second phase of the case study. The proposed method encompassed effectiveness, efficiency and risk issues, considered in a portfolio approach. Nevertheless, some enhancements can be done.

The systematisation of the ideas about the process and the impact of selecting IT projects portfolio is a relevant detected benefit of the method, helping the managers to analyse this complex problem. Business and IT professionals could work together and have a common terminology to discuss and understand each other's needs and point of views, an important aspect of the strategic alignment process.

The proposed approach facilitated a strategic view of both business and IT, to analyse and evaluate productivity improvements and competitiveness gains for the business due to a more effective use of IT, aligned with operations and company strategies. On the other hand, it is still important obtaining efficiency in IT operations, as well as developing a technical qualification in managing IT projects processes (Laurindo et al., 2003).

The proposed method for evaluating IT portfolio was based on subjective judgements by IT and business managers. However, in the studied case, this subjectivism brought some positive aspects, since it has created a forum to discuss strategic needs of the

organisation, IT role on strategy, strategic alignment of IT projects, the risks and uncertainties of each project and of the projects portfolio. Besides, users and IT professionals assumed new responsibilities on building this portfolio, since they started to share key roles on estimating costs, risks and contributions of each IT project on the CSF. This fact enhanced commitment with projects' development and implementation.

The formalisation of the process and the definition of the criterion for building IT projects portfolio helped to improve IT strategic alignment understanding among managers, especially in user areas. In addition, user perception of IT area performance was improved through this process.

Even though IT role in COMP 'A' should stay in the 'Support' box of the Strategic Grid, this does not mean that the firm can neglect to adopt a more integrated management of IT and business, encompassing both the corporation and business units. It must be stressed that the situation of effective evaluation procedures, that are not well developed and formalised, is in agreement with IT role of just supporting operations in the company.

4 Conclusions

The results of the case study showed equilibrium between theoretical recommendations and company practices and characteristics. Therefore, this paper brought some implications for researchers and practioners, in IT and business area.

For researchers, this work indicates some points to be better investigated in future studies.

One point that needs revision and improvements is the classification of IT applications, since the one adopted in this study was based on the specific situation of the analysed company, according to the interviewed IT and business managers.

This study focused on the *exante* evaluation of IT projects; it would be necessary to consider the evaluation of ongoing projects and also of finished projects to implement a continuous improvement approach.

IT projects portfolio selection could be enhanced through the use of some widely used techniques for modelling and taking decisions, such as the Analytic Hierarchy Process (AHP) or Fuzzy Sets (Shimizu et al., 2001). These tools would help to estimate risks of the projects and the benefits of the projects on the CSF, for instance. In this case both risks and CSF benefits were subjectively evaluated, that can bring some biases to the result of the analysis.

The process for evaluating the strategic contribution of IT projects could use another models, instead of CSF method, The Balanced Scorecard (BSC) (Kaplan and Norton, 1992) and Importance-Performance Matrix (Slack, 1994) can be promising alternatives. However, if the company were not a BSC user, then there would be the extra task of implementing it.

Projects budget was considered as the total amount of investment necessary during all the phases of project development. Thus, another possible enhancement would be the budget deployment in terms of cash flow, providing a larger array of information for evaluating projects proposals.

For IT managers, this paper highlights the importance of formalising IT planning process, even with the use of subjective criteria. Another extremely important point is the need for top management and business managers' commitment and support to

IT portfolio planning process. This commitment is extensively mentioned in academic and business bibliography as a crucial point for projects' success. The adoption of a broader view should encompass effectiveness aspects through the concepts of project risks and projects' strategic impacts, besides considering efficiency issues, This focus on the analysis of IT impacts would be more important if IT plays a more strategic role in the company.

For business managers, this paper emphasises the importance of IT strategic role not only in the whole organisation, but also in isolated departments. These managers should find out, in their organisational and technological context, the best opportunities for allocating the frequently limited budget for IT projects.

Another important issue is that the estimates of risks in IT project depend on the actions of these same managers. Their performance is very important to elaborate on reliable estimate of project uncertainties in terms of technological fit to projects scope, of the specific characteristics of the problems to be solved and of their strategic contribution.

Finally, this paper can be the beginning of future researches exploring the above-mentioned improvements possible, as well as enabling to deepen the discussion about IT projects' management. Among them, expost analysis and evaluation of IT projects and the influence of maturity level of the organisation in the evaluation and selection of IT projects.

Thus, further studies should consider the points highlighted in this paper to bring new alternatives for the efficient and effective management of IT projects.

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