Abstract

The growing importance of Information Technology (IT) in organizations enhances its overall performance. However, top management has the perception that IT costs are high due to the lack of transparency in its control because the IT budget is, usually, the only financial data resource available. The problem that this research aims to solve is the fact that the IT budget, per se, does not provide the necessary information to support decision making about the cost optimization strategies. The proposal for solving this problem is the definition of performance indicators taking into account the IT budget data to justify IT cost optimization strategies. In order to evaluate this investigation, a prototype was developed in OutSystems which supports the proposed methodology. The prototype was tested with real data from an organization of the health sector, where important results were achieved from the decider’s viewpoint. Therefore, this dissertation’s proposal can contribute to the resolution of the problem.

1 Introduction

Information Technology plays an important role in competitiveness and business growth. For example, according to the study, conducted in 2010, 70% of Chief Executive Officer (CEO) believes that IT can enhance value creation for organizations (Gartner, 2010b).

There are several references that the increased investment in IT improves the overall performance of an organization (McAfee & Brynjolfsson, 2008; Mitra, 2005; Ravichandran & Lertwongsatien, 2002). For example, per 0,1 % increase in IT budget you get an increase of 950 000 USD of profit for an average company in the health sector, (Thouin & Ford, 2008). Consequently, most current business models and future ones benefit from the correct use of IT resources (Picot, 2009).

Gartner’s predictions indicate that the overall costs (operational maintenance and investment) in IT are expected to increase 4.6 % in 2010, reaching 3.6 billion U.S. dollars,(Gartner, 2010c). However, the increase in IT costs does not imply is mostly done in investment. These costs are associated with items in the IT budget that is typically a financial tool available to Chief Information Officer (CIO).

There are several factors affecting the financial performance of organizations, in particular regarding the return on investment which can be internal (e.g. organizational growth) or external (e.g. shareholders expectations) (Gartner, 2010a). The use of capital and proper justification for their use in IT are needed to ensure an adequate financial performance.

Thus, CIOs remain under heavy pressure to be able to IT to add value to the business at the lowest possible cost (Maurer, 2010). Cost optimization thus becomes a critical success factor for these managers and the organization. Given this value creation, an essential part of IT management passes through the control of its assets, resources and associated costs, (Krcmar, 2009).

The implementation of strategies to optimize costs implies a revision of a cost structure in order to identify whether the costs are aligned
with business objectives, (KPMG, 2009a).

The growing importance of IT affects, therefore, the strategic, tactical and operational decisions of the organizations, (Gunasekaran & McGaughey, 2006). However, the CIO lacks management information on the financial performance of IT for supporting the implementation of IT cost optimization strategies.

To resolve this issue, this research proposes to identify the costs of IT and complete this analysis with IT indicators in order to decide the most appropriate strategies to optimize their costs.

This research presents indicators and the interconnection between them and the data sources and IT cost optimization strategies. The proposal was later implemented in a prototype and evaluated in practice.

1.1 Problem

In the current economic climate, there is a growing concern for organizations to control costs. The lack of transparency in this process of control can lead to top managers have the idea that the costs are high (Gadatsch, 2009). The IT department is suffering major pressures to optimize their costs. According to KPMG, the strategies for IT cost optimization must be based on four aspects, (KPMG, 2009b):

1. Business Alignment - Align IT investments with business priorities.
2. Operational Efficiency - Reduce IT service delivery cost.
3. Operational Effectiveness - Improving business performance through IT.
4. Efficiency of Investments in IT - Increase return on IT investments.

The implementation of strategies to optimize costs include operational actions (short term), tactical (medium term) and strategic (long term) designed to achieve these four objectives. Moreover, these actions need to be based on data that support them.

The analysis of investments and operating costs of IT (information available in the budget) may indicate areas where it is feasible to reduce them immediately by comparing the historical values of the items in the budget. As an example, the analysis of the outsourcing cost may indicate the need to reduce its value through the renegotiation of service level. However this measure may lead to a decrease in business efficiency and / or effectiveness.

This research aims to address the problem of the IT budget, per se, does not provide the necessary information to support decision making regarding cost optimization strategies to be implemented.

2 Related Work

In the previous sections various concepts were referred in order to explain the problem encountered. In this section the concepts will be characterized in detail in order to show that the problem is not resolved.

2.1 ITIL Financial Management

The financial management of a department should allow a transparent analysis of how the capital is applied in the organization’s IT resources (Silva, 2008). ITIL is a framework which brings together a set of concepts and best practices in managing IT services that can be tailored to each organization. The current version of framework is the third version, published in May 2007. ITIL is divided into several books, each covering a topic of IT management. Financial management is embedded in the Service Strategy section consisting in raising the capital required for business and its prudent use (Sottini, 2009). In this context, we define three activities: budgeting, ac-
counting and cost allocation.

2.1.1 Critical Analysis

As stated in this subchapter, the ITIL framework presents a set of best practices to implement the financial management of IT services. However, the process of implementing these best practices becomes costly and complex because there are elements (e.g., Service Catalog) that are difficult to define. Consequently, it appears that there aren’t many companies with this type of management realized.

2.2 IT Cost Control

The current definition of IT cost control is linked to the concept IT-Controlling which will be explained and then related to the problem identified in this investigation.

2.2.1 IT Controlling

The discipline that seeks to control costs and IT performance management is referred to as IT-Controlling. There are several interpretations of this concept from the most specific that emphasize the role of IT, its measurement and evaluation and also the more general related to decision-making ensuring that organizations achieve their objectives, (Gadatsch, 2009). Based on the objectives and tasks, “IT-Controlling” can be structured through an operational perspective, tactical or strategic, (Hamel & Brenner, 2010). In this context, the strategic business objectives align with IT objectives. The coordination between the tasks of planning, governance and control of information belongs to the tactical perspective. The evaluation of the profitability of IT investments and budgeting can be examples of the operational perspective.

2.2.2 Critical Analysis

As stated in this subchapter, the various definitions of IT cost control have several tasks related to accounting and control of IT costs. However, these definitions do not refer to how the control is implemented. Thus, it was important to define the link between the objectives and how these in practice can be achieved.

2.3 Balanced Scorecard

This subchapter explains the concept, multiple perspectives arising from its definition, its use as a strategic tool and how this is linked to performance indicators and targets. Later, their suitability to solve the problem identified in this investigation will be assessed.

2.3.1 Concept

Balanced Scorecard (BSC) concept was introduced by Kaplan and Norton in 1992, (Kaplan & Norton, 1992) with the premise that using only financial metrics in a management system is insufficient. The financial metrics are related to indicators that report the results of past actions. The exclusive use of financial metrics can sacrifice the future value creation, (Porter, 1992).

Its authors define it as a set of metrics that provide the top management a fast but comprehensive view of the business. The BSC complements financial metrics with operational metrics related to customer satisfaction, internal processes and learning activities and innovation. These operational metrics support the future financial performance and try to reflect the value of various tangible and intangible assets of the organization.

2.3.2 Performance Indicators

Due to the Balanced Scorecard high flexibility, the various objectives and performance indicators need to be contextualized in each organization. After reviewing the organization, there are possible targets and indicators for each of the perspectives.
The performance objectives describe what is required to execute the strategy, acting as liaison between the high-level strategy and performance indicators that assess progress.

The indicators may be: output indicators (outcomes, lag indicators) and trend (drivers, lead indicators) (Kaplan & Norton, 1996). Output indicators represent the consequences of past actions, or measure results of events that have occurred. However, do not reveal how the goals were reached. To this end, there are leading indicators that attempt to predict the results achieved. As an example, a lead indicator such as training of IT staff is an indicator of productivity as a result of a programmer.

2.3.3 Critical Analysis

As stated in this subchapter, the BSC concept describes the relationship between the objectives to be achieved with the various indicators that measure performance. However, the concept does not define the indicators, metrics, and strategies to use. Thus, it is necessary to adapt the method to the context in which it will be applied.

3 Proposal

The proposal to solve this problem consists of the mapping between the IT budget, performance indicators and strategies of cost optimization. Figure 1 describes the relationship between the various parties.

To achieve the objectives described above, the proposal must include the following characteristics:

1. **Objective** – definition of the target

2. **IT Cost Optimization Strategies** – definition of the strategies should take into account the various aspects: alignment with business, operational efficiency and effectiveness and efficiency in investments.

3. **Indicators** - definition of indicators, in a financial perspective, based on the concepts of Balanced Scorecard, in other words, it is necessary to define indicators with an associated cause-effect relationship. Moreover, it is necessary to define the metrics that make up these indicators and their relation to sources of data

4. **IT budget** - evaluation of different existing budget items (e.g. staff costs) which support the indicators to be used.

5. **Questionnaire** – creating a questionnaire that provides the data that does not exist in the budget to support the selected indicators.

In short, the proposal aims to identify a set of performance indicators supported metrics whose information necessary for their calculation is derived from items in the IT budget and other organization information sources. These indicators and the relationship established with the strategies to optimize IT costs intends to support the manager in decision making and implementation of organizational goals.

4 Action

This chapter describes the existing practice of this dissertation and the two research cycles that have taken place.
4.1 Context

This investigation included the creation of a prototype that supports the proposal described above and allows a practical evaluation.

The prototype and scoring methods were tested in a real context. Data is from an organization of the health sector whose main objectives are the creation of management tools necessary for the proper operation of the organization regarding IT.

In order to achieve the research process, was defined as the method of inquiry Action Research. Thus, the investigation followed the steps of the method chosen, starting with the identification of a problem. Subsequently, we prepared a proposed solution to solve the problem encountered. In order to perform the evaluation of the proposal, developed a prototype to be applied in a real context. After evaluation, the results were analyzed and specified that knowledge acquired over the cycles.

4.2 First Cycle

This chapter describes the first cycle of Action Research and the various steps into which it is divided. Given the request for anonymity by the organization, it will referred as Y.

4.2.1 Diagnosing

The IT department of the organization Y is seeking knowledge about IT costs in order to make decisions to optimize them. However, the budget, per se, can not provide the necessary data to support such decisions. The organization complies with the described problem identified earlier.

4.2.2 Action Planning

In order to resolve the problem identified, the following tasks were planned:

- Meetings with KPMG for monitoring and validation of the proposed solution.
- Collecting the data needed for the organization Y to the evaluation.
- Meeting with the CIO at the Y organization in the evaluation phase of each cycle in order to validate the results.

After planning, a proposal was developed in order to solve the problem identified. This proposal was the definition of performance indicators that allow linking between budget data and IT cost optimization strategies.

4.2.3 Action Taking

After defining the proposal, the next step was to define a strategy that allowed evaluating the investigation that was carried out. To this end, it was necessary to ensure that the data was available.

As the Y organization’s budget information contained lines with no connection between them, it was necessary to define the indicator for each strategy that supports it. Next, we defined the metrics that were based on data from the IT budget or other sources of easily accessible information (e.g., Reports or short questionnaire to the CIO). These metrics were grouped taking into account the indicators that supported with the objective of creating the link between the information sources and IT cost optimization strategies.

During the instantiation of a strategy that would support the proposal defined, the problem arose of how to evaluate the performance of each metric. Consequently, we defined scoring method for the metrics. This method is described in Figure 2.

This figure describes the process of evaluating the performance of each metric. This performance is analyzed through the colors of a traffic light in order to facilitate visual interpretation. To this end, it was decided that a certain
range of values correspond to a particular color (e.g. variations of less than ten percent over the target implies a performance metric - green).

However, the large number of existing metrics on the screen made it difficult to analyze. For that reason, we decided to group the metrics. This created the need to evaluate also at the level of the indicator. This is shown in Figure 3. This figure describes the process of performance evaluation, at the level of the indicator, which was first used in this research cycle.

In this calculation, it was decided that the metrics have their weight distributed evenly. That is, given the number of metrics for each indicator, the weight would be equal for all. Additionally, it remained the color code of the semaphore to allow a consistent view.

The calculation for the colors, at the level of the indicator, was determined by an assessment of the percentage of the metrics. As an example, a number of metrics more than twenty percent at red would imply a red level indicator.

The organization’s scorecard Y can be seen in Figure 4:

As the number of metrics classified as yellow is more than 20%, the performance level of the indicator is yellow. As noted in the section of the interface prototype, the details on the metric only appear on the screen when you press the indicator, not to hinder the analysis.

4.2.4 Evaluating

In order to proceed to the evaluation of the work, a presentation was held with the CIO of the organization Y, where the context of the problem, the solution proposed and the prototype created were described. Scoring methods were explained in terms of metrics and indicators as well as the Scorecard. Additionally, the results were subjected to a detailed analysis to ascertain the suitability of the proposal for addressing the problem. This analysis consisted of a validation with the decision maker about the connection between data, metrics, performance indicators and IT cost optimization strategies.

During this stage, some questions arose:

1. How to realize the distance that the organization is from the color with better perfor-
2. With more strategies instantiated, how do we realize the best strategy to implement?

3. How to tell if the objectives agreed by the organization are well aligned with the market?

4. Is it correct to assign equal weight to all the metrics?

5. How to get an overview of the IT department over the organization where it belongs?

These questions underlie the learning that goes on in this cycle.

Finally, it is important to note the acceptance of the paper submitted to CISTI 2011 which allowed an additional validation by the reviewers of the conference.

4.2.5 Learning

Through the feedback received and issues raised, is an acquired additional knowledge that allowed:

1. Refine the scoring method to determine the organization’s performance (e.g. classification between 0 and 100% and its visualization). Additionally, we created a fourth color, a dark green, assigned to a rating of 100%, highlighting the state of optimization achieved.

2. Despite being given a rating to the indicators of the strategy, it was not possible to understand what was the best strategy to implement. Thus, it was suggested to create a new page with a ranking of strategies to implement and also an aggregation of indicators.

3. Because the objectives are defined by the organization, there was no knowledge of their degree of suitability to other organizations in the same sector. The comparison with reference values (benchmark) from other organizations within the same sector of activity was the suggested path to solve this problem.

4. In the first cycle, the metrics contained the same weight. However, during the meeting with the CIO has emerged the need to classify the metrics with different weights, each metric may have a different importance depending on the strategy that supports.

5. During the analysis of a department, the need to obtain an overview of its status (e.g. overall costs vs. cost of IT in the organization, cost of projects with the greatest influence) was identified. It was therefore decided that it would be important to add a screen to support this analysis.

After this first cycle, we observed that the proposed solution responded to the identified problem because the definition of performance indicators using data mostly from the IT budget support strategies that allow IT cost optimizations. This validation was performed in a real context, where they raised several issues that have defined this learning cycle, improving the proposal previously submitted.

4.3 Second Cycle

This second cycle was held in the same organization of the health sector and was based on the knowledge gained in the previous cycle.

4.3.1 Diagnosing

The initial step of this second cycle of research aimed to insert the knowledge acquired in the previous cycle and redefine the problem if necessary. However, it was found that the proposal reached the proposed objectives, there were no changes regarding the definition of the problem.
4.3.2 Action Planning

Like the planning of the first cycle of investigation a meeting was held with the head of the organization’s IT department Y at the end of the cycle in order to validate the results.

After planning, they proceeded to the modifications necessary in order to apply the knowledge acquired in the first cycle of research and that will be described in next section.

4.3.3 Action Taking

After the initial cycle of investigation, changes were introduced to scoring methods of metrics and indicators. This decision was taken because it was not possible to obtain details regarding the distance that would be to the next color or a state of optimization.

Thus, it was decided to modify the scoring methods by introducing a fourth color, dark green, highlighting the state of optimization achieved. Figure 5 describes the new method of evaluating the metric.

![Figure 5: Metric scoring method](image)

As can be seen at the level of the metric, there were no changes of great importance. However, at the level of the indicator, we applied a weighted average taking into account the weight of each metric and its performance. Regarding colors, it remained the same procedure of the metric. The changes can be viewed in the figure 6.

![Figure 6: Indicator scoring method](image)

This figure reflects the changes made at the indicator level that allows a much greater detail compared to the previous proposal.

4.3.4 Evaluating

In this step of the cycle, a new presentation was held at Y, where the context of the problem was reminded, explaining also the changes to the solution. The results were subjected to a detailed analysis in order to verify the improvement in qualitative terms of the proposal of the first cycle. The changes suggested in the first cycle were evaluated in order to verify that their application in practice corresponded to the expectations of the CIO. During this stage, some questions arose:

1. The method of calculation, at the level of the indicator, can be improved through the use of more complex algorithms?
2. The definition of metrics and indicators could create a new structure for future budgets?
3. How to measure the impact in the medium and long-term decisions based on the solution presented?

These questions underlie the learning that goes on in this cycle and will be described in next section.
4.3.5 Learning

Through the feedback received and issues raised, the following knowledge was obtained:

1. The method of calculation, at the level of the indicator, provides a significant improvement on the first cycle of research. Although, here comes a path for future work.

2. The metrics are based mostly on IT budget lines. Thus, the IT budget can be the target of a future restructuring.

3. The available time did not allow for conclusions about the impact of decisions taken based on the solution presented.

After this second round, it was verified that the proposed solution presented qualitative improvements (e.g. more details on at the performance level of the indicator) and an increase in information available to decision maker (e.g. panel of macroeconomic indicators and strategies to implement).

5 Conclusion

This investigation identified a problem regarding IT cost monitoring and control. Information on these costs is in the IT budget. However, this information itself does not allow decision making taking into account higher directives. That is, there isn’t a method that can evaluate the budget lines and create indicators that support cost optimization strategies.

Thus, a proposal was defined for solving this problem. Therefore, related work was defined and criticized. Three main areas were defined: ITIL Financial Management, IT Controlling and Balanced Scorecard.

The proposal consists on mapping between the IT budget, indicators and cost optimization strategies. The evaluation of this proposal was made in two research cycles, with the development of a prototype and subsequent application in an organization. Moreover, it was validated through the acceptance of a scientific article in CISTI 2011.

The first research cycle began with the definition of a strategy. After this phase, it was necessary to ensure that all data would be available. To ensure a proper analysis, scoring methods were defined both in the metric and in the indicator. The results from the application of these methods have been validated through a meeting with the IT director of the organization. With this meeting the need to make improvements to the model proposed was proposed.

Thus arises the need for a second cycle of research. In this cycle, changes were introduced in the Scoring methods, both in the metric and in the indicator. New perspectives for the analysis were also defined in order to provide more and better information to decision makers.

In conclusion, it may be noted that the objectives of this thesis have been achieved. That is, it was possible to develop performance indicators, supported mainly on data from the budget in order to support decision making about strategies for optimizing IT costs.

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