THE CONSTRUCTION OF A SCORECARD OF INFORMATION TECHNOLOGY IN A COMPANY

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Reception Date: 04/17/13 Approval Date: 07/02/13

ABSTRACT

The balanced scorecard is a popular enterprise level tool widely used to evaluate the performance of an organization, and has even become a management system to implement business strategies. Its application to the field of information technology (IT) has also spread widely as an instrument of strategic alignment and performance evaluation. However, companies often know how to design and effectively implement this valuable tool. This paper proposes a method to guide the construction of a balanced scorecard of IT in an organization that is in line with the business strategy, achieving necessary strategic alignment. The feasibility of application of the procedure was proven through the case study in a software company.

KEYWORDS: Technologies Information; BSC IT; IT Balanced Scorecard; Balanced Scorecard.

INTRODUCTION

The balanced scorecard (BSC) as a management control tool was introduced in the business since 1992 by Kaplan and Norton and its application to the field of IT was initially described by Van Grembergen & Van Bruggen (1997) and Van Grembergen & Timmerman (1998). The adaptations made by these authors generated a generic scorecard for IT known in the literature as BSC IT for its acronym in English (IT Balanced Scorecard).

Oriented perspective user evaluation represents the IT user. The Operational Excellence perspective represents the IT processes used to develop and deliver applications. The future orientation perspective represents the human and technological resources that IT

need to deliver services. The business contribution perspective reflects the business value of IT investments.

Each of these perspectives according to Van Grembergen & De Haes (2009) has to be translated into the corresponding metrics and measures that assess the current situation. These assessments should be repeated periodically and have to be confronted with the objectives that have to be fixed in advance and benchmarking figures. Very essential is that within the BSC IT are established and causal relationships are clarified the connections between the two types of measures, result and performance.

Numerous advantages have been identified on the use of BSC IT, such as: according Borousan (2011) allow for the integration of business and IT governance minimizing the distance between them, ensuring strategic alignment between IT and the business (Van Grembergen & Saull, 2001), show how IT organization add value to it to justify the investment in IT (Narbonne, 2006), prevent sub-optimization of IT performance (Amado, 2012), managing e-commerce strategies (Van Grembergen & Amelinckx, 2004), evaluate the performance of IT departments (Lee & Wen-Chin, 2008), evaluating IT projects (Asosheh, 2010), among others.

To design a traditional BSC numerous methods and procedures have been proposed and each methodology has its specific proposal relating mainly to the characteristics of the types of organizations for which they were designed. However, it can be said that generally there are the following common elements: the review of the strategic plan, identifying key success factors, determination and design of indicators, strategic map design and the formulation of strategic projects, through feedback.

A search of the literature found no specific methodological proposals that will guide the design and implementation of an BSC IT; for as it has been explained it has its own characteristics. This is why taking as starting point good practices on the design of traditional BSC from the theory consulted about a specific procedure is proposed to build an BSC IT at a company. The constructed tool should allow measuring performance against objectives, determine whether the objectives are appropriate and determine if the IT strategy or metrics should be modified.

DEVELOPMENT

1. Procedure for construction of a BSC IT

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ISSN 1668 – 8708 – Versión en Línea
ISSN 1669 – 7634 – Versión Impresa
E-mail: revistacientifica@fce.unam.edu.ar

The specific procedure proposed is divided into four stages as shown in Figure 1. The first stage is devoted to the preparation of the initial conditions for the design and achievement of necessary strategic alignment. In the second stage comes to BSC IT design from high-level strategic design to fit in the waterfall display scoreboards. Stage 3 allows to carry out the implementation of the tool designed and finally in step 4 proposes the definition of a comprehensive indicator of IT management control that summarizes the results of the BSC IT.

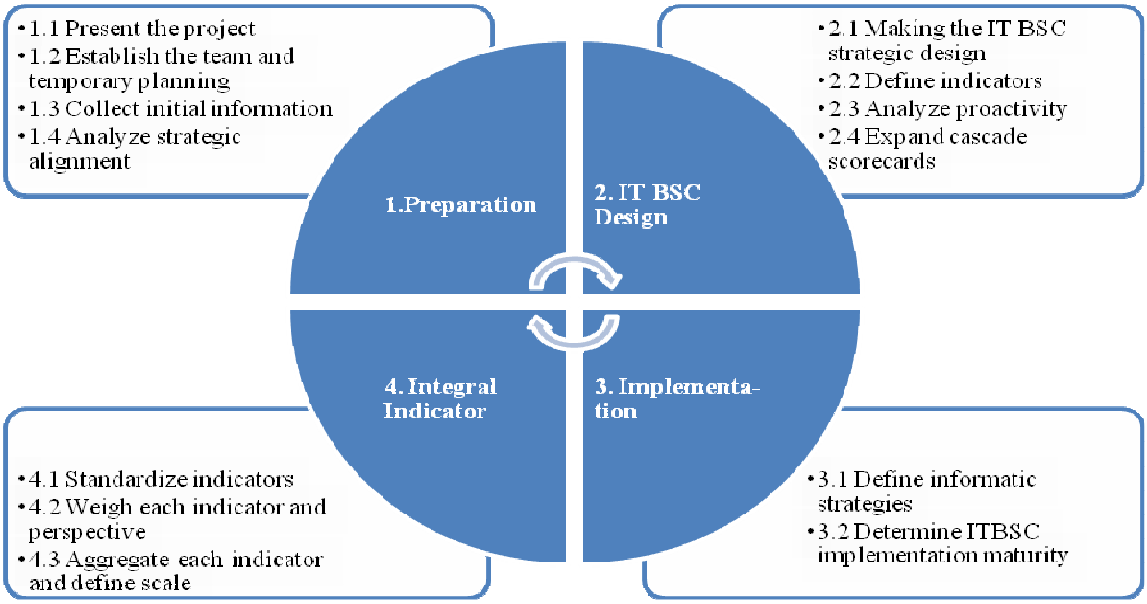

Figure 1: Specific procedure for the construction of an BSC IT
Source: Own Elaboration

Stage 1: Preparation

The preparation stage is to lay the groundwork to ensure proper design from alignment with business strategy and commitment of senior management. Includes the following stages:

1.1 Presentation of the project to top management

It is very important to ensure the support and involvement of senior management of the business and IT management to successfully achieve the design and implementation of this tool. Therefore, this is an essential initial step, when to submit the project goals, emphasizing the benefits expected from the use of this tool of management control in the company.

1.2 Establishing the project team and temporal planning

It will define the team members who work on the project, assigning responsibilities and planning necessary prior to preparation that may be required. Also in this step there should be drawn a timetable for implementing the remaining phases of the procedure.

1.3 Gathering initial information

First there should be a review of the company's strategic planning and the existance of the BSC in the organization. Also to review IT strategic planning defined. If there is no explicit IT strategic planning it is not possible to carry out the project as this is the most important starting point for the design of the tool. From the review of these items which should also be collected (if any) IT metrics are used for performance measurement.

1.4 Analysis of IT strategic alignment and business

IT strategic planning is required to manage and direct all IT resources in line with business strategy and priorities. IT strategic planning must be derived from the strategic planning of the company, explaining how IT can contribute to achieving the objectives planned in the company. This is why business strategies and IT must be integrated, clearly linking business goals and IT goals and recognizing the opportunities and limitations in current capacity. This step must be analyzed in detail whether the IT strategy is aligned with business strategy, and if it is not well proceed to its redefinition.

Analysis is proposed to perform matrix crossing the strategic objectives of each plan, determining the interrelationships. It should assess the percentage of IT objectives in the IT strategic plan, that support the strategic business plan.

Step 2: Design of strategic BSC IT

The organization The Working Council for Chief Information Officers in 2003 conducted an extensive review of IT scoreboards and found that the most advanced shared six structural attributes, which in effect are mentioned by Van Grembergen & De Haes (2009), and are shown below:

1. Simplicity of presentation: The best IT scoreboards limited to a single page of 10-20 metric written in non-technical language.
2. Explicit links to IT strategy: Scoreboards must be strongly coupled to the process of IT strategic planning and assist in monitoring the progress of the key goals and IT goals.
3. Board executive commitment): Both, IT management and business, should get involved in the process of creation and implementation of the balanced scorecard.
4. Enterprise-standard metrics definitions: The consensus must be reached quickly in the

definitions of the metrics. Review meetings should focus on decisions rather than debate on the metrics.

5. Drill-down capability and available context: The scorecard senior IT should allow a detailed review of trends or variance, providing greater granularity into components.
6. Individual manager compensation: It must be linked to performance scoreboards.

This stage is broken down into the following steps:

2.1 Strategic Design of BSC IT

Usually the BSC IT is divided into four perspectives that correspond to the classical perspectives proposed by Kaplan and Norton. These are: user orientation, operational excellence, future orientation, and contribution to the business. The strategic design to be made in this step includes determining the mission and objectives of each perspective. We propose from the characteristics of the company to rely on their IT strategic planning, generic BSC IT and generic IT goals proposed by Van Grembergen & De Haes (2009) presented in Table 1.

Also in this step must be defined the map of relationships between the objectives as stated by Van considering Grembergen & De Haes (2005) to argue that if the expertise of IT employees is improved (future orientation), then this can result in better developed quality systems (Operational Excellence), then you must increase the user satisfaction (user orientation), thus leading to a greater contribution of IT to business value (Contribution to business).

Each of the strategic objectives within each of the perspectives may have a causal relationship with someone else in the same or in another perspective. These relationships should be identified and represented graphically in a strategic map.

Table 1: IT generic goals by perspectives

User orientation	Contribution to business
Ensure that IT services are available as required	Respond to business requirements in alignment with the business strategy
Ensure minimum business impact in the event of an IT service disruption or making changes	Ensure transparency and understanding of IT costs, benefits, strategy, policies and service levels
Securing end-user satisfaction with service offerings and service levels	Respond to governance requirements in line with the executive
Ensure seamless integration of applications within business processes	Ensure IT compliance with legislation, regulations and contracts
Ensure proper use of application functionality by providing documentation and training to end users	Improve IT cost efficiency and its contribution to business profitability
Ensure proper use and performance of applications and technology solutions	Take into account and protect all IT assets
Optimize infrastructure, IT resources and capabilities	Establish clarity of business impact of risks to IT objectives and resources
	Obtain commitment and support of executive management

	Protect the achievement of IT objectives
Operational excellence	**Future Directions**
Ensure that IT services and infrastructure can properly resist and recover from failures due to error, deliberate attack or disaster	Acquire and maintain IT skills that respond to the IT strategy
Ensure that critical and confidential information is protected from those who should not have access to this	Contribute to innovate new business processes using technology
Maintaining the integrity of information and processing infrastructure	Ensure that IT demonstrates cost efficiency of service quality, continuous improvement and readiness for future change
Ensure that automated business transactions and changes to information are reliable	Create IT agility
Deliver projects on time and within budget, meeting quality standards	
Define how business functional and control requirements are translated into efficient and effective automated solutions	
Reduce defects of solutions and services delivered, and re-elaboration	
Optimizing the use of information	
Acquire and maintain integrated IT infrastructure and standardized	
Acquire and maintain application systems integrated and standardized	
Ensure mutual satisfaction of relationships with third parties	

Source: Van Grembenger, 2007 cited by Baldeón and Pinoargote, 2007

2.2 Definition of indicators

The first time in the definition of the indicators is to determine the metrics for each objective in the perspective. Best practices suggest that indicators together should not exceed 15 or 20, to ensure the strategic utility of the tool. There should be selected enough based performance indicators to visualize how the IT strategy will be achieved and sufficient performance indicators to monitor whether the strategy has been successful.

This definition is a team work supporting the participation of experts. This research agrees with the proposals made by Mamaghani (2011) and Baldeón & Pinoargote (2007) to rely on the indicators defined by processes in COBIT framework (2012). In this sense they can use Appendix B which shows the detailed mapping of business goals with IT goals and Appendix C that maps generic IT goals and processes defined in the framework. This analysis will identify which processes are taxed at each perspective and thus facilitate the selection of indicators. If necessary you can propose new metrics based on other standards or the development itself.

Later one goes on to build the architecture of the indicator system. It must be defined for each indicator: name, type, unit of measure, measurement frequency, responsible, calculation expression, aim (comparison of criteria levels), data source and measurement tool if necessary. This information should be tabulated for ease of use.

Finally in this step it is important to establish the causal relationships between

indicators. These relationships clarify the connections between the two types of metrics, result and performance; giving the subsequent analysis of their behavior.

2.3 Proactivity Analysis

A well-built scorecard needs to achieve an appropriate mix of the two types of metrics. Outcome metrics such as programmer productivity (e.g. number of function points per person per month) without performance indicators such as education IT staff (e.g. number of training days per person per year) failure to communicate how the results will be achieved. Performance metrics also without metrics result can lead to significant investment without a measurement of the effectiveness of the strategies Van Grembergen & De Haes (2005).

This step is proposed to calculate the ratio of proactivity of each perspective given by the expression 1. Proactive ideal value would be 1 (100%), which means that they have the same amount of performance indicators of outcome, however it is considered acceptable that the ratio exceeds 60%.

$$KPI\ PP\ i = i / KGIi * 100 \quad (1)$$

Where:

PP i: Ratio of proactivity of perspective i

KPI *i:* total key performance indicators (Key Performance Indicators) of perspective i

I *KGI:* key indicators total goals or outcomes (Key Goals Indicators) from the perspective i

i: IT WCC perspectives: user orientation (UO), Contribution to business (CB), future orientation (FO), Operational Excellence (OE)

2.4 Deployment scoreboards cascade

In this step, depending on the characteristics of the company and the intention of granularity in controlling IT management can deploy cascade IT scoreboards as shown in Figure 2. This involves building the BSC IT and the IT Operational BSC Development.

The IT Operational BSC is focused on the delivery of services, and to define their indicators can assess the Hildebrandt proposal (2009) that combines KPI ITIL with BSC IT. The IT Development BSC is mostly applicable to those companies which perform IT application development projects. Also interesting is the mapping between COBIT and scoreboards cascade that Sallé makes (2004) shown in Figure 3.

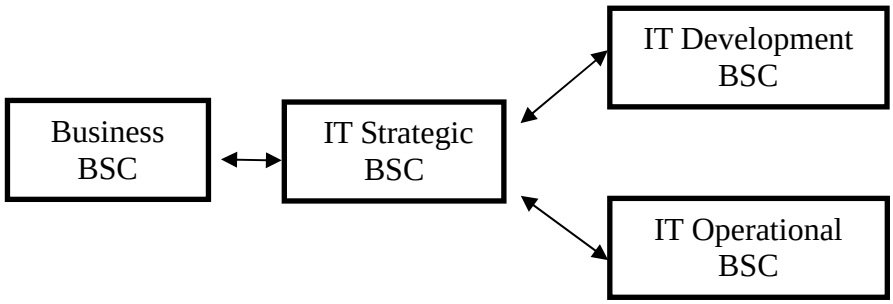

Figure 2: Cascade dashboard
Source: Van Grembenger, 2007

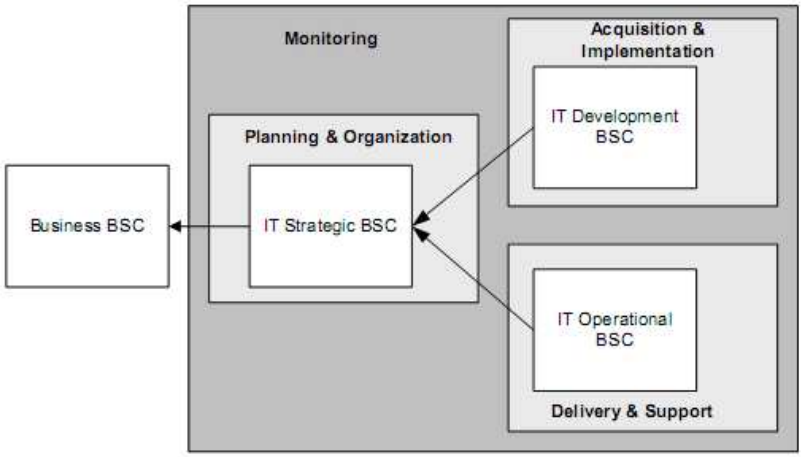

Figure 3: Mapping between COBIT and BSC IT cascade
Source: Mathias Sallé, 2004

Both scoreboards are facilitators of IT Strategic BSC, which in turn is enabling the BSC in the company. This cascade of scorecards becomes a linked set of indicators that may be useful in the alignment between IT strategy and business, and help determine how to create business value through IT. You can establish a link with the financial objectives of the company according to visualize how the IT strategy is improving the financial performance of the organization.

Stage 3: Implementation

3.1 Define strategies information

For optimal use of the benefits of this tool in view to achieve business and IT alignment is necessary to achieve the computerization of BSC IT. There is need for an application that can have control of the indicators, which allows the introduction of data and enable comparison with the desired values and achieve more control and to have a better view of

the performance of IT in the organization.

3.2 Determine Maturity Model of BSC IT implementation

To promote the development of BSC IT, you can take advantage of the implementation maturity model a BSC defined by Van Grembergen & De Haes (2009). This model allows the organization to identify the current and desired state of your BSC IT, to analyze differences and translate them into improvement initiatives.

Step 4: Defining a comprehensive indicator of IT management control

Having a single indicator that reflects the behavior of all prospects of BSC of IT can be a useful reference management control. In this step we proceed to construction.

4.1 Standardize the indicators

It is possible that the indicators defined for each perspective are represented in different units of measure. Therefore, before proceeding to add the selected indicators into one composite indicator, it will be necessary to prevent the congregation normalized indicators of different measurement units and the appearance of scale-dependent phenomena.

Several methods of normalization may be used. Among the main methods one includes: Employment rates or rates of change, Use of indicators among units of analysis, standardization (z-score), Re-scaling, distance to a reference unit of analysis, scale Categorization, Categorization of securities above or below average, linear normalization procedure, Min-Max method, Fuzzification.

The choice depends on the characteristics of indicators and expert judgment will be part of analysts working group.

4.2 Weigh each indicator and each perspective

Weighing a set of indicators to add them into a single indicator ends up being essentially a value judgment that should explain the purpose underlying the design of the indicator. For this reason, in addition to working from a consistent conceptual framework also often resorted to expert opinion and consensus building with stakeholders to synthesize the views. Some of the methods that can be used are: Establishment of weights team proportional, participatory of weighting methods, weighting by calculating the distance to objectives, calculation of regression weighting, principal component analysis, data envelopment analysis, joint analysis, unobserved components models, analytic hierarchy process (AHP), analytical network process (ANP).

The ANP was developed by Saaty in 1996, and provides a tool to deal with decisions without assuming independence of the elements of a higher level to a lower level elements and on the independence of the elements within a hierarchy level. The main advantage of ANP regarding AHP is to capture the main dependencies between criteria and alternatives achieving greater fidelity to real life model. Given these characteristics and considering that by its nature the indicators that make up the BSC IT are interrelated this is a highly recommended technique to use.

4.3 Add indicators and define scale

After determining the weighting factors (weights) have to add all the indicators into a composite index, in those cases where the weighting method used does not establish naturally subsequent aggregation method. Some key techniques are: Sum of rankings, Count Variables that exceed or exceed the given reference, multi-criteria approaches, weighted arithmetic mean, weighted geometric average.

After selecting the technique employed, the team must leave the calculation expression defined, the integral indicator of IT Management Control and the scale and its interpretation.

2. Applying the procedure

The feasibility of application of the proposed method was checked by the case study technique. Two companies were selected and two trading software. The following briefly highlights the results of the implementation of each stage in a software company Villa Clara province.

Stage 1. Preparation

To design the revised BSC IT Strategic Planning of the company for the period 2012-2014, as well as other policies and regulations. In these documents were analyzed strategic objectives and measurement criteria, the strategic assessment of the company's strengths, threats, weaknesses and opportunities. This is essential to define the IT strategic planning to manage and direct all IT resources in line with business strategy and priorities, achieving integration and relate the same business objectives and IT.

IT strategic objectives that were established from the strategy of the company were:

- Aligning IT objectives in line with the business strategy.
- Ensuring safety and security of information and IT resources.
- Regularly train IT staff.

- Delivery of projects on time and with the required quality.
- Improving the efficiency of IT costs and its contribution to business profitability.
- Prioritize delivery and support of IT services while minimizing the impact of each of the interruptions.
- Ensure the satisfaction of end users service levels provided.
- Acquire and maintain integrated IT infrastructure and standardized.
- Ensure that IT demonstrates cost efficiency of service quality, continuous improvement and readiness for future change.

Step 2: Design of strategic BSC IT

In order to get a better view of each of the prospects for the scorecard these were mapped to the strategic objectives in each perspective locating relevant objectives and representing their relationships, which provides a better understanding of BSC IT. This map is shown in Figure 4.

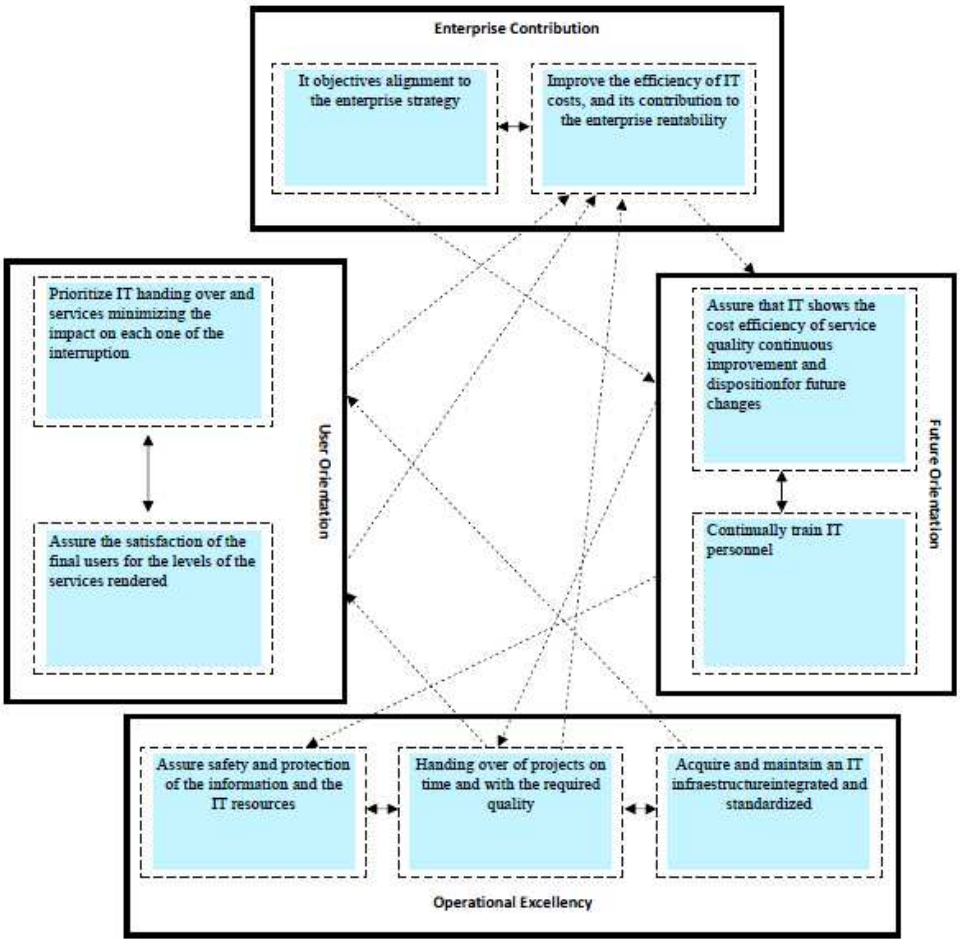

Figure 4: Map of relations of strategic IT objectives
Source: Own Elaboration

Figure 5 shows the BSC IT designed for this company, determining the mission and the indicators for each perspective, based on the characteristics of the company and what you want to achieve, given its strategic planning IT.

Table 2 Integral IT Scoreboard in the Enterprises

Enterprise Contribution	**User Orientation**
Mission: Obtain reasonable contributions to the enterprise from IT investors	Mission: To satisfy the final users requirements and increase their satisfaction for quality perceived in products and services
Objectives and Metrics 1. Aligning objectives with IT according with the enterprise - % of IT initiatives directed to the enterprise direction (CE1) - % of IT objectives in the strategic IT plans which support the strategic business plan. (CE2) 2. Improve the efficiency of IT costs and its contribution	Objectives and Metrics 1) Prioritize handing over and support of IT services minimizing the impact oneach one of the int eruptions - % of critical infrastructure components with disposition of automatized monitoring. (OU1) - # of business critical processes which depend on IT, not covered by a continuity plan. (OU2) 2) Assure the satisfaction of final users for the services rendered.

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to IT business rentability - % of projects with advanced business benefits: (CE3) - % of IT investors which generate the predefined benefits. (CE4)	- % of incidents/problems for which an analysis was carried out of cause/root. (OU3) - % of incidents/problems solved within a period of time acceptable/agreed on. (OU4)
Operational Excellency	**Future Orientation**
Mission: To assure effectiveness and efficiency in the handing over of projects en the processes development	Mission: to continually improve and prepare for future challenges
Objectives and Metrics 1 Acquire and maintain an IT infrastructure integrated and standardized - # and type of emergency modifications to infrastructure components. (EO1) - % of platforms which do not agree with the architectural and technology standards defined by IT. (EO2) 2 Handing over of projects on time and with required quality - % of projects which receive quality revisions. (EO3) - % of interested parties satisfied by the IT quality. (EO4) 3 Assure safety and protection of IT information and resources - Frequency and revision of kind of safety events to be monitored. (EO5) - % of satisfied users with information at their disposal. (EO6) - # of incidents impacting the enterprise (EO7)	Objectives and Metrics 1 Assure that IT shows the efficiency of costs in service quality, continual improvement and disposition for future changes - % of projects where information of development (of costs, plans and risk profiles) are at hand. (OF1) - % of investors in IT which exceed or satisfy the benefits predefined for the enterprise. (OF2) 2 Periodical training of IT personnel - % of IT personnel certified according to post necessities. (OF3) - % of IT roles with qualified backup personnel. (OF 4)

Source: Own Elaboration

The calculation results showed proactivity in Business Contribution prospects, facing the Future Orientation User and a value of 1, and Operational Excellence perspective of 0.75. These values demonstrate a proper relationship between the performance indicators and targets. The following was considered in the company, the initial implementation of strategic BSC IT, into a working system, then move the deployment of the cascade of scorecards and implementation.

Step 3. Implementation

This step is currently running on the company, projecting computerization BSC IT designed.

Step 4. Defining a measure comprehensive IT management control

One proposed to use for the normalization of the function defined by indicators Medel-

Gonzalez (2012), shown below:

$$R_{ij} = \begin{cases} \dfrac{x_{ij}}{higher\{x_{ij}\}} & \text{If the indicator satisfies: at higher value the best} \\ 1 \text{ si } x_{ij} \geq higher\{x_{ij}\} & \text{at higher value the best} \\ \dfrac{lower\{x_{ij}\}}{\{x_{ij}\}} & \text{If the indicator satisfies: at lower value better} \\ 1 \text{ si } x_{ij} \leq lower\{x_{ij}\} & \text{at lower value better} \end{cases}$$

Where:

R ij: normalized value of indicator i j outlook

x ij: normalize indicator value: value between 0 and 1

i = number of perspectives: from 1 to 4

j = Number of indicators: from 1 to n

The minimum and maximum values indicated in the equation correspond to the desired values or goals of the selected indicators according to Medel-González (2012).

To carry out the weighting of indicators and BSC IT perspectives decided to use the ANP method. From expert discretion to determine the relationship between the perspectives and indicators, indicator constructed network using Super Decisions software (see Figure 5).

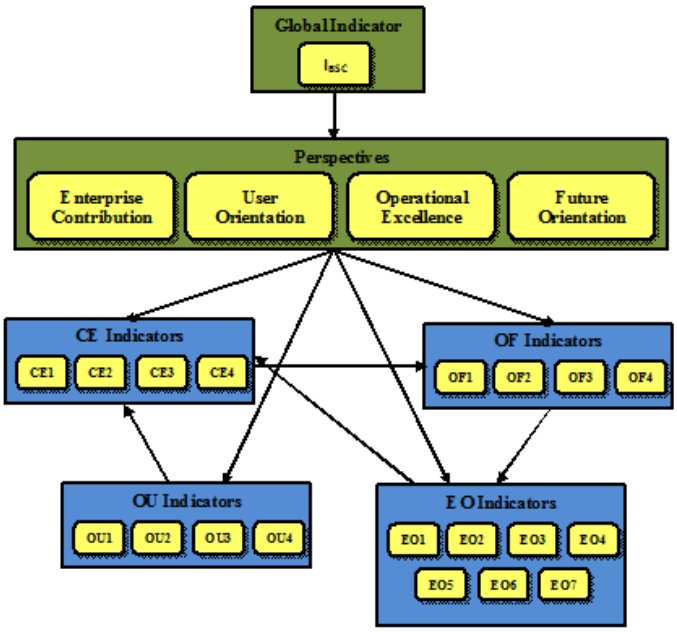

Figure 5: Red of the indicator ICMIn using the software Super Decisions
Source: Own Elaboration, prepared from SuperDecisions software

With this configuration and assessment by experts on the relative importance considering the Saaty scale, we proceeded to determine the weights of the indicators and prospects, taking into account the relationships between these.

The technique for calculating the integral indicator decided to be employed in the Company was in the weighted arithmetic mean, being the expression for the calculation as follows:

$$IWCC_{II} = \sum_{j=1}^{4} X_j * \left(\sum_{i=1}^{n} \sum_{j=1}^{4} Y_{ij} * P_{ij} \right) \quad (2)$$

Where:

IWCC : WCC comprehensive IT Indicator

X j: j weight perspective

Yi i: i weight of each indicator within the perspective j

Pij: I normalized value of each indicator within the perspective j

This indicator could not be calculated due to time of application of this tool as the frequency of review of some indicators is semiannual or annual, so it is impossible to carry out the calculation to this point of the research.

CONCLUSION

1. The method proposed in this paper is a new tool to guide the construction of a BSC IT in a company, as a tool for controlling IT management. Since its implementation is possible to design a BSC in line with business strategy, achieving strategic alignment necessary.
2. The proposal to obtain a comprehensive indicator expressed in a single value the behavior of BSC IT indicators corresponds to the need for the company to monitor the performance of their IT management process quickly, guaranteed adequate control.
3. The application of the procedure in a software company in the province of Villa Clara allowed to prove the feasibility of applying the proposed methodological tools. From the design of the IT strategic objectives of the organization, were established missions and the indicators for each perspective being established BSC appropriate IT strategic alignment.

BIBLIOGRAPHY

Please refer to articles Spanish Bibliography.

BIOGRAPHICAL ABSTRACT

Please refer to articles Spanish Biographical abstract.