

Development of a Balanced Scorecard Tool to Restructure the Information System at CENC

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The Centro de Electroencefalografia e Neurofisiologia Clínica (CENC) is a small health care organization operating in sleep disorders. Due to the growing strength of its rivals and problems caused by previous managers, the company is now facing a need for organizational changes.

This thesis has developed a management support tool based on the balanced scorecard (BSC) framework with four perspectives to define the CENC's strategy and to re-design its information system (IS). This application also aimed at testing the appropriateness of the framework for a small and medium enterprise (SME), given that previous literature has not addressed this subject.

The implementation of the BSC required the definition of the organization's mission, visions, values and strategy, strategic objectives and the choice of measures for each perspective, as well as the design of a strategy map. Results from the application of the BSC framework were used to propose a change in the current IS at CENC, and it was proposed a IS architecture based on data warehousing and on online analytical processing.

The BSC proposed might be useful and flexible, as it deliver more information in a faster way, helps the strategic management of the company and helps to overcome some flaws in the IS. Nevertheless, the implementation of this approach is expected to demand major changes in the clinic's working culture and procedures in the first years of its application. As consequence, the BSC can be applied, with certain limitations to a SME, giving them a competitive edge against their rivals.

Keywords - healthcare, balanced scorecard, information system, management support system, performance measures, SME

1. Organizational Context

1.1. Internal Environment

The *Centro de Electroencefalografia e Neurofisiologia Clínica, Lda* (CENC) was founded in 1983, by Dr. Teresa Paiva who currently owns and manages it.

The CENC is a small health care organization operating in the area of sleep disorders, located in Lisbon, although its patients come from all parts of the country.

Dr. Teresa Paiva is one of the most successful and well-known specialists in her area of expertise. Since she is the most important physician in the clinic, the CENC is one of the most respected sleep disorder clinics in the country.

This fact enables this organization to have a great number of patients interested in procuring the services that CENC provides.

As a health care provider, the CENC places a large amount of effort in satisfying most of the patients' needs, and therefore, can be considered a customer-intimate organization. This approach reflects on the clinic's work culture, and also on its infrastructure.

To manage the clinic's activities, the CENC has an information system (IS) composed of a database and a financial spreadsheet.

The database system is very fragmented, providing poor qualitative and quantitative information without giving relevant management information. In addition, CENC's manager uses two separate software applications, which fragment even more

the IS. The financial spreadsheet has all the information present on a normal financial report.

Since there is no easy way to retrieve a summarized report of activity from the databases and there is no interaction between the database system and the financial spreadsheet, the clinic's manager gives more relevance to the financial information.

CENC's staff still books appointments and patient satisfaction surveys on paper, which makes it impossible to gather timely information about it. The clinic also needs to clearly define its strategy.

1.2. External Environment

As an health care provider in the area of sleep disorders, the CENC main competitors are the Santa Maria Hospital, the Pulido Valente Hospital, the British Hospital, the CUF Hospital, the Air Force Hospital, the S. José Hospital, the neurologist Manuel Gonçalves, and some other sleep laboratories that are about to open.

Due to a high incidence of sleep disorders in the Portuguese general population and an increase in the prevalence of insomnia with age, reported in Ohayon et al. (2005), the clinic's activities have been growing in the past years.

Although the CENC is one of the most respectful clinics in the country, this may change due to the appearance of new sleep laboratories associated to hospitals with financial groups supporting them.

To compete with its rivals and to provide access to private patients to consultation and medical exams, the clinic has protocols with some health care subsystems and some health insurance companies,

which enable access to the clinic at most advantageous conditions.

Despite this fact, and considering that the clinic provides a regular quality-price service, there are still some patients that cannot afford the services provided by the CENC.

Given the fact that many exams and consultations are made using health care subsystems and health insurance companies protocols, there is another external factor to take in account when managing the clinic, which is the fact that the money covered by the protocols is paid with a four to six month delay.

2. Objectives

This thesis aims at developing and analyzing a decision aid tool to improve the management a SME such as the CENC.

Our aim is to build and analyze a management support system that integrates a restructured and more complete IS which enables the manager to have a better perception of the strategy of the clinic and how to improve its business activities.

The management tool proposed is based on an executive information system based on a second generation balanced scorecard framework. This tool aims to improve internal and external communications, and helps to monitor the organizational performance against strategic goals.

In order to develop the IS, we have developed an EIS architecture based on data warehousing and online analytical processing (OLAP), so that the BSC framework can be effective.

3. Method

There are many types of computer-based information systems, such as decision support systems (DSS), group support systems (GSS) and executive information systems (EIS) (Martinsons et al., 2007).

The one we consider that best fits the CENC's requirements is the EIS because, as Martinsons et al. (2007) point out, it helps "the decision maker to make decisions quickly without encountering too much cognitive complexity".

To debate whether we should choose a specific management support system framework for an EIS, we must first assess how the clinic is currently being managed.

The CENC is currently being managed based on financial information, which as Niven (2002) points out, "isn't well suited for organizations that live in a rapidly changing environment", such as the health care environment.

He also points out that sometimes the "information provided by a financial report is not relevant to many levels of the organization".

Given that the old system is not well suited for the CENC, we need to assess what kind of frameworks can help the management process, and chose the one we want to analyze.

Bergin-Seers (2007) made an extensive research on performance measurement frameworks and points out several frameworks available in the market, but for them to be implemented in a SME they need to meet some requirements, such as provide financial and non-financial results, provide information about the internal and external environment, provide an integrated approach and provide relevant management information.

The models that fit these requirements are the BSC, the Malcolm Baldrige National Quality Award, the European Foundation for Quality Management's Excellence model, the Results and Determinants Matrix and the Performance Prism.

After analyzing all the five options and comparing them, we decided to use the BSC because it is a flexible tool, it helps with the formalization of the strategic vision and associated strategic objectives and priorities of the organization and it focus on a long-term management scope.

3.1. The Balanced Scorecard

The BSC is a "strategic planning management tool and information system used to align business activities to the vision and strategy of the organization, improve internal and external communications, and monitor organizational performance against strategic goals" (Balanced Scorecard Institute, 2007b).

To achieve this, the BSC framework takes in account, not only financial measurements, but also "operational measurements on customer satisfaction, internal processes and the organization's innovations and improvement activities" (Kaplan et al., 1992), always bearing in mind the organization's vision and strategy (Niven, 2002).

Although in Kaplan et al. (1992) there were only four perspectives, in some studies such as Niven (2002), Kaplan et al. (2001), Gao et al. (2006) and Osama (2006), it is mentioned that, in certain organizations, the implementation of the balanced scorecard is made using more or different perspectives.

According to the literature there are three generations of BSC (Gao et al., 2006) (Wikipedia, The Free Encyclopedia, 2008a) (Wikipedia, The Free Encyclopedia, 2008b).

The first generation BSC combines financial and non-financial indicators with the four perspectives, but the indicators could or could not have cause-and-effect linkage.

The second generation BSC emphasizes on cause-and-effect relationships between measures and

strategic objectives. As a consequence the BSC became a strategic management tool, utilizing a strategy map to illustrate the linkage between measures and strategies.

The third generation BSC concentrates on developing strategic control systems by incorporating destination statements and optionally two perspective strategic linkage models (“activity” and “outcome”).

3.2. Can the Implementation of the BSC Framework be Unsuccessful?

It is true that the BSC has been a success in many organizations (Kaplan et al., 1992) (Niven, 2002) (Santiago, 1999), but it is also true that in some organizations the implementation of the balanced scorecard has been a failure. Von Bergen et al. (2004) and Wicks et al. (2007) point out several factors that can justify the failure of the implementation of the BSC framework:

1. Inconsistent or half-hearted application of the BSC or unwillingness to consider the BSC a dynamic process of self-improvement;
2. Measures that do not focus on strategy;
3. Existence of organizations that might do better by focusing on one or more measures, rather than having a balanced emphasis in each of the four areas;
4. The BSC assumes employee commitment but does not emphasize the employee perspective;
5. The BSC is founded on a management philosophy that is based on control rather than commitment;
6. The BSC assumes that trade-offs are necessary to solve problems, rather than emphasizing win-win solutions;
7. The BSC is developed at the executive level, but not communicated or cascaded down through an organization.

3.3. Building a BSC for a Health care Enterprise

The first paper that related the balanced scorecard with health care was published in 1995 (Zelman et al., 2003), and since then several papers have been published on the subject.

Shutt (2003) states that, “during the 21st century the success of a health care organization will depend on the ability of top executives to balance quality and customer satisfaction, with adequate financing and long-range goals”. As it should be clear by now this can be attained by the usage of the BSC.

Pineno (2002) has the same line of thought, but he finds “cost managing to be one of today’s most important challenges in health care”, and points out that the BSC can be very useful in this area, since it can help decision-making in both strategic and operational roles.

In addition, the growing adoption of IS in health care organizations can also be a fact to consider,

since it helps the BSC framework to become an effective tool (Syed et al., 2007).

As a consequence of the qualities of the BSC framework, it has been adopted in several health care settings such as hospitals and medical centers in the United States, Canada, United Kingdom, Sweden, Australia New Zealand, and Taiwan (Balanced Scorecard Institute, 2007a) , (Robertson, 2007), (Gao et al., 2006), (Kollberg, 2007) (Sriratanaban et al., 2004).

Despite all the positive aspects presented previously, the implementation of the BSC has not always been successful (Syed et al., 2007). Each health care organization has a different approach to the BSC, but all authors agree that the first step in its implementation is the clear definition of the organization’s mission, vision, values and strategy.

After defining the organization’s mission, vision, values and strategy, it’s important to choose the perspectives that will be used.

For example Gao et al. (2006) in their research found that most health care organizations use four perspectives, as Kaplan and Norton initially proposed, but chose to change their names to best represent the health care environment and the organization’s strategies.

Since the most common approach to the BSC in health care is the one with four perspectives, it is important to find what kind of information those perspectives give the manager.

3.3.1. Financial Perspective

In this perspective the financial performance of the organization is intended to be evaluated, and how this is affecting the goals required to fulfill its mission and vision.

The financial perspective of the BSC yields a snapshot of the organization’s past and present bottom-line. To better develop this perspective, it is important to analyze historical financial data and to understand the organization’s goals, so that managers are able to determine if specific financial changes would improve the position of the organization in the future (Shutt, 2003).

3.3.2. Customer Perspective

In this perspective, managers have to identify the customer and market segments in which the organization will compete (Kaplan et al., 1996).

In the ever-changing world of health care, identifying the customer becomes more complex each year, but fortunately, many customer satisfaction surveys are available (Shutt, 2003).

3.3.3. Internal Business and Processes Perspective

Here management is required to target processes in which continued excellence has an impact on

customer satisfaction and is instrumental in achieving financial objectives.

As Shutt (2003) points out, the BSC “differs from traditional strategies” because it compels the organization to “monitor and improve established business processes and to identify entirely new processes needed to meet customer and financial objectives”, because as Kaplan et al. (1996) states, the reengineering and/or initializing of new processes may be required to meet the goals of the organization.

3.3.4. Learning and Growth Perspective

While the customer and internal-business process perspectives identify the critical factors for the current and future success (Kaplan et al., 1996), the learning and growth perspective aids the organization in determining what capabilities will be required to meet the value demands of future customers.

Kaplan et al. (1996) identifies three principal sources of organizational learning and growth: employee re-skilling, information technology and systems and organization procedure and routines.

3.3.5. Data dictionary

When the measure selection process is complete, a data dictionary should be created, which provides the background information needed to quickly defend the measure chosen and answer any questions (Niven, 2002).

3.3.6. Strategy map

After creating the data dictionary, and since all the measures have been chosen, a strategy map should be created. This diagram should have not only a graphical map but also a short narrative articulating the map (Niven, 2002).

The creation of a strategy map provides a vehicle to discuss the organization’s strategy fully, and develop it systematically.

The strategy map might also help avoiding the trap of creating a strategy that exists more in words than in execution, it can help make the strategy that drives the entire organization and it helps the employees to identify powerful assets that are vital sources of value creation.

It might also show how to align those key intangible assets with critical processes, including: operations management, customer management, innovation, and regulatory and social processes (Kaplan et al., 2004).

There are several examples of strategic maps, such as the ones from the Alaska Native Tribal Health Consortium (Alaska Native Tribal Health Consortium, 2005), the Northern Sydney Central Coast Health (Northern Sydney Central Coast Health, 2008), the Rural Health Resource Center (Hill et al., 2005), and the US Veterans Administration (Process Design Consultants Inc.,

2007), that can prove useful as examples to elaborate a strategy map for a health care organization.

3.4. Using the BSC Framework in a SME

After discussing the way to build a BSC framework for a health care organization, there is still one aspect of the BSC that we need to address, which is its implementation in a small and medium size enterprise (SME), such as the organization where we propose the implementation of this tool.

Andersen (2001) points out that, “the link between an organization’s approach to strategic planning and business performance exists on both big and small organizations”. So it is reasonable to assume that, since the BSC is a tool meant to support strategic management, it is should be possible to implement such a tool in a SME.

Another aspect that makes this kind of tool appropriate for a SME is the fact that the scorecard can be used at different levels. For each level, the BSC approach identifies the key components of operations, sets goals for them, and finds ways to measure progress toward achieving these goals (Von Bergen et al., 2004).

Atkins et al. (1997) point out that, the implementation of a strategic management tool, such as the BSC, may facilitate the development of more complex management structures that are needed as small firms grow.

As Andersen (2001) states, the implementation of a BSC framework in a SME should be done in the same manner as in a big enterprise, the only difference being is the duration of the process, which should be quicker due to a less complex organizational structure and to a small number of employees.

3.5. The CENC's Balanced Scorecard

We propose the implementation of a second generation BSC to CENC, with four perspectives, namely, the finance perspective, the community and providers’ perspective, the clinical and business perspective and the learning and growth perspective.

Its implementation starts with establishing the organization’s vision, mission, values and strategy, followed by the definition of the main objectives for each perspective and respective measures and creation of the data dictionary. In the end we design the clinic’s strategy map with the cause and effect linkage between measures.

The process, as is shown in Figure 1, is iterative with a double-loop feedback mechanism. This mechanism, allows the manager not only to see if the measures used are the best ones to monitor the clinic’s performance, but also helps the analysis of the organization’s mission, visions, values and strategy, in order to see if it is still adequate to the clinic’s environment.



Figure 1 – Blueprint for the implementation of the BSC at the CENC

To gather all the information needed to develop the BSC framework, we used participatory methods such as a series of meetings, e-mail exchanges and phone calls with the clinic’s manager.

4. Results

In this chapter we present the results from applying the BSC framework to CENC. To this end first we define the CENC's mission, vision, values and strategy. According to these aspects we define the main objectives and measures for each perspective. Afterwards we design the organization's strategy map with cause and effect linkage of the measures. In the end we explain the changes the IS has to have so the BSC system might be effective.

4.1. Mission

Opened since 1983, the *Centro de Electroencefalografia e Neurofisiologia Clínica, Lda.* (CENC) is a multidisciplinary clinical center that integrates the latest medical trends, with a humanistic and humanitarian style of developing health care services. In other words, the CENC tries to make the patient feel unique and special, while being diagnosed and treated according to international clinical standards.

4.2. Values

The CENC is committed to:

- Keep patients' satisfaction as high as possible;
- Give patients a warm and pleasant atmosphere;
- Provide the best medical service;
- Give a quick and complete diagnosis.

4.3. Vision

The Centro de Electroencefalografia e Neurofisiologia Clínica, Lda. aims to be:

- A clinical and teaching center of reference, in the sleep disorder area;
- A place of innovation;
- A growing medical center, that not only provides service in the sleep disorder area, but

also in other areas, such as cognitive processing, pneumology, obesity, fibromyalgia and neuro-feedback.

4.4. Strategy

The main strategic objectives of CENC are:

1. Provide a health care service with high quality;
2. Maintain the patients' satisfaction as high as possible;
3. Diversify the clinic’s medical activities;
4. Correct the management problems created by previous managers;
5. Improve the clinic’s IS and management system.

4.5. The CENC’s objectives and measures

After establishing the CENC’s mission, vision, values and strategy, and the names of the four perspectives, it is important to define objectives and measures for each perspective.

4.5.1. Finance Perspective

Table 1 – Finance perspective objectives and measures

Objective	Measure
Maintain financial sustainability	F01: Clinic’s Profit
	F02: Clinic’s debt
	F03: Clinic’s Operating Costs

4.5.2. Community and Providers Perspective

Table 2 – Community and providers perspective objectives and measures

Objective	Measure
Achieve high customer satisfaction	CP01: The number of recurring patients
	CP02: The level of customer satisfaction
	CP03: The number of complaints
Attract new customers	CP04: The number of new patients
	CP05: The number of media quotes
	CP06: The number of linked collaborators

4.5.3. Clinical and Business Processes Perspective

Table 3 – Clinical and business processes perspective objectives and measures

Objective	Measure
Provide high quality care	CBP01: The number of patients on the waiting list
	CBP02: The time a patient needs to get an appointment
	CBP03: The time on the waiting room

Enter in new areas of medical expertise	CBP04: The number of new exams
	CBP05: The number of patents created

4.5.4. Learning and Growth Perspective

Table 4 – Learning and growth perspective objectives and measures

Objective	Measure
Provide effective, integrated information support	LG01: The level of database integration
	LG02: The level of changes in the clinic's software
	LG03: The number of entries filled in the database
Promote continuous learning	LG04: The number of publications in journals of reference

4.6. Data Dictionary

After deciding the main objectives and related measures for each perspective, we created a data dictionary. This data dictionary is composed of a series of tables, one for each measure, that contain all the information needed to provide the background to defend the measure and to answer any questions that may arise.

For each measure, the data dictionary provides information about the perspective, the measure name and number, the objective, its description, the frequency, the unity, the polarity, the formula, the data source, the data quality, the data collector, the baseline, the target and the target rational.

4.7. Strategy map and cause and effect linkage

After defining all the clinic's objectives and respective measures, we designed a strategy map for the CENC with a cause and effect linkage, as shown in Figure 2.

4.8. Roadmap for a future information system

The objective of the integration of the BSC framework with the IS is to make it an autonomous IS.

The main objective here is to give a roadmap for this process so that this framework gets all the information it needs, in order to provide relevant management information.

To integrate the BSC in the IS, it is very important not only to solve the problem that affects the current IS, but also to be aware of the problems that the implementation of this framework will bring, such as making all the information needed to calculate all the BSC measures available, and creating a report system with all the output information of the BSC.

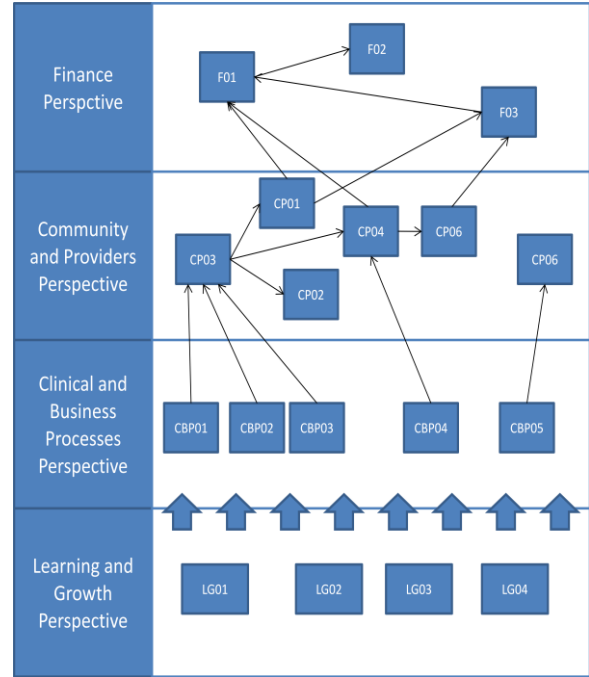


Figure 2 – CENC's strategic maps with cause and effect linkage between measures

All the problems and solutions regarding the implementation of the BSC in the CENC are summarized in Figure 3.

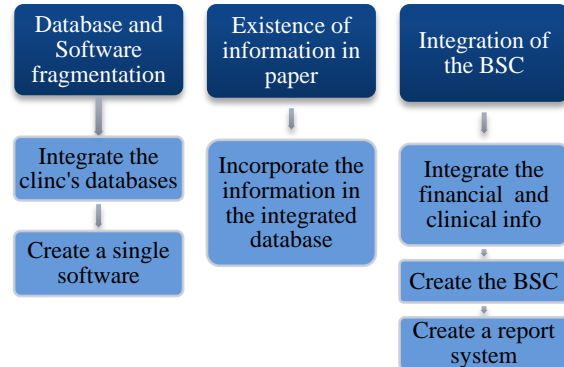


Figure 3 – Summary of the problems and respective solutions for the implementation of the BSC

4.8.1. Database integration

To address the first problem (the fragmentation of the database), we propose the creation of an integrated database system with a single software, which would aggregate key information of all four databases in a single database, giving the manager the possibility of accessing information in a fast and simple way.

We have gathered those databases and started by treating the information. Because of the sleep clinic's privacy policy, the first step in order to obtain the sleep clinic's databases was the encryption of the names of all patients in the databases. For this purpose we used a XOR encryption algorithm.

After the acquisition of the initial encrypted databases, we recommend that the integration

should be according to each exam, i.e. the database should be restructured in order to have all the information of the patient and all the information of the exams done by that patient aggregated.

This kind of approach has its benefits, since it enables the database user to have a quick access not only to the patient's information, but also to the information of the exams done by that patient and its outcome. For this to be true, the users interface should also be modified, so that when a user searches for a given patient, all the patient's information should appear on screen, together with a link to the patient's exams and results.

Although the changes proposed previously would improve the management quality of the clinic it should be clear that that would only be true if the clinic's staff gather all the information prompted by the system.

4.8.2. Incorporating the paper information in the information system

The second problem that needs to be solved is the existence of information in paper that does not exist in digital format. To solve this problem we propose the addition of new entries to the integrated database: the time the appointment or exam was scheduled; the time the patient was received by personnel staff; the time until the appointment or exam; the existence of any kind of complaint; and the level of satisfaction.

4.8.3. Integrating the BSC framework in the clinic's information system

The integration of the BSC in the clinic's IS is a much more complex problem than other problems discussed so far, because it implies a change of the database architecture, changes on the user interface and the creation of a software capable of extracting the information from the databases and creating a report with all the information about the BSC measures.

As mentioned before, the BSC cannot be an effective management system unless the information required is gathered in time and with a good level of quality. So to provide the BSC system the information needed, we propose the addition of two new databases one for the financial information and one with entries that will help the BSC system calculate the measures that don't have the integrated database or the financial database as source of the information.

The financial database should have the normal information that exists in a monthly financial report, and that currently can be found in the financial spreadsheet.

The other database should have the information of the names of the exams that are considered new, the number of patents created by the clinic, the number of monthly quotes on the press, the number

of collaborators working with the clinic and number of publications in journals of reference.

After integrating the existing databases, adding new entries to them and creating the new databases, it is time to create an EIS based on the BSC framework.

This system has to be able to interact with all the three databases and extract from them all the information needed to calculate all the measures that we propose.

For this purpose we propose the use of a contemporary EIS architecture, as shown in Figure 4, based on data warehousing technology and Online Analytical Processing (OLAP) techniques, as described by Cheung et al. (2007).

Cheung et al. (2007) states that, in this architecture a small program, known as a monitor or wrapper, is built for each data source. The major role of this program is to communicate with the integrator and extract data from the source based on the pre-defined data view. Data from different local data sources are extracted, cleansed, and transformed by an integrator that is based on an integrated data schema, and are subsequently stored in the data warehouse.

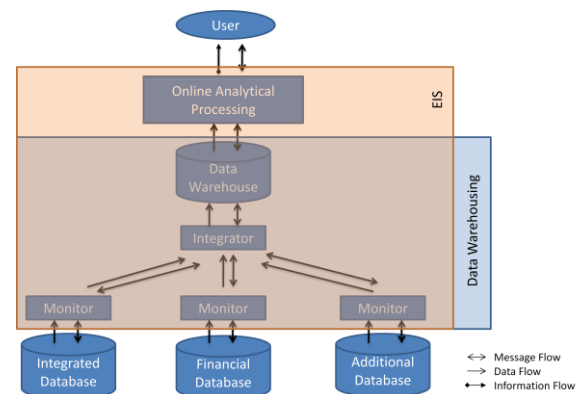


Figure 4 – CENC's EIS architecture

When using OLAP in data warehousing the information is stored according to a dimensional model, which is optimized for fast data access, and where queries can run without affecting performance of the clinical applications (Gray, 2004).

In the end the BSC system will query the data warehouse database, to attain the information necessary to calculate the measures.

As Niven (2002) points out, this system should have a reporting system able to provide relevant management information and capable of the following:

1. Use gauges, boxes, or color-coded dials;
2. Associate to every measure its description;
3. Permit all measure types;
4. Provide the information at the right time;
5. Provide past information about the measures
6. Provide easy to understand status indicator

5. Discussion

After conceptualizing the implementation of the BSC framework on the CENC, we will discuss how it relates to the ones in the literature, how it benefits the organization, what kind of limitations it has, how it points out the management weakness of the company, and what kind of new information it brings us.

5.1. How does the CENC's balanced scorecard approach relate to the ones available in literature?

As said before, we propose a 2nd generation BSC framework with the four perspectives like the one proposed by Kaplan et al. (1992). Although, like Pink et al. (2001), we changed the names of the perspectives so that the users can better relate each perspective with the health care environment they work in.

In the literature there are some authors like Von Bergen et al. (2004), Smith et al. (2007) and Bergin-Seers (2007) that address the implementation of the BSC framework in SME, However none of them focus on organizations neither with such a small number of employees, nor with such management limitations as the CENC. Also none of them give an explicit example of a case study where this kind of work was made or where this kind of solution of adopted.

Fernandes et al. (2006) points out that "there is very limited systematic research done on BSC applications in small and medium scale enterprises", consequently, most of the work done here results from adaptations of case studies found in the literature about large organizations.

To implement the BSC framework in the CENC, we proposed some changes in the current IS architecture. These changes involve integrating the four existing databases, by creating additional databases with relevant management information and implementing an EIS architecture based on data warehousing and OLAP techniques, as described by Cheung et al. (2007).

As Gray (2004) points out, this approach is common in health care organizations because it gives the managers the ability to analyze and to understand the care practices better based on information captured in patient charts. Nevertheless, the explicit referral of the method used in the adoption of a new IS is fairly rare in the literature.

5.2. Positive and negative aspects of the CENC's balanced scorecard approach

The development process of the BSC was not as easy as it could have been expected due to the CENC's small size and due to the poor management experience of the current clinic's manager.

As pointed out by Smith et al. (2007) and Bergin-Seers (2007), the CENC like any SME, had a poorly defined vision, mission, values and strategy,

which are the central aspects of the BSC framework. At the same time, it had a severe management constraint caused by the low quality quantity of information provided by the IS.

Although these facts pose a major limitation in the implementation of a management support system, it encouraged us to go forward, because the implementation of the BSC framework helps organizations to formalize these aspects, which helps the organizations to strengthen its identity and helps their staff to know where the manager wants it to go.

As Papakonstantinou et al. (1995) pointed out, the development of the BSC framework also helps the organization to understand what kind of flaws exist in the IS. As consequence we were able to propose an alternative IS for the CENC. We propose the adoption of an EIS architecture based on data warehousing and OLAP techniques, which gives the managers the ability to analyze and to better understand the care practices based on information captured in patient charts.

Given this context, we think that the adoption of this approach could benefit the clinic's management. Also due to the low complexity of the architecture, we think that its implementation could be quick and with a low cost associated. This architecture might alleviate some of the data integration problems and might give more flexibility to the system, but it has some limitations. Cheung et al. (2007) point out that these techniques operate using a predefined database schema, restricting the type of data analysis that can be carried out, leading to a drawback when it comes to future changes in the measure system. Since the BSC framework approach will probably need readjustments in the near future, it is likely that some software changes might also be needed.

After discussing the problems found in the development of the clinic's information system based on the BSC framework, we need to discuss whether this system can or cannot be applied on the CENC's specific profile.

The first aspect that caught our attention was the fact that this approach causes drastic changes to the CENC's working culture and IS. This fact, as always, poses a major obstacle for the approval of any kind of proposal.

The lack of information could be a problem that deserves further attention, because the BSC framework, as any kind of management support system relies on information. We think that in the first year or so the this system would have to be closely monitored, because during that time lots of new information would appear, which would lead to adjustments and alterations to the original framework. This fact may also cause the rejection of the proposal since in the beginning the BSC framework and consequently the information

system would need constant maintenance and adjustments.

The low quality of information provided by the current IS makes the CENC's BSC framework approach very limited, without any kind of budget assignment, initiatives related with the measures or clearly defined targets. These three aspects are one of the virtues of the BSC for a large organization. But since we are dealing with a small/micro organization, the absence of the first two aspects can be minimized, but still might take some effectiveness from the BSC. On the other hand the lack of defined targets can pose a real threat to the effectiveness of the BSC framework, because without them the manager has no idea of how well the organization is doing.

The BSC framework proved to be a useful and very flexible tool, since it is able to adjust to new realities, whether they resolute from alterations on the clinic's strategic alignment, or whether they appear due to alterations in the clinic's internal or external environment. This is a consequence of the double-loop feedback mechanism, which was explained earlier.

Also, compared with the current system, the system we propose should be able to deliver an automated report system that will bring more relevant information to the manager. This was she has the opportunity to take action at the right time and in a correct and informed way.

To finalize we think that if the manager is willing to shake the ground, the new IS based on the BSC framework could prove to be a good solution, and above all a strategic edge against the clinic's rivals. If not, we hope that the ideas developed here can give the manager a better understanding of the organization's internal and external environment, and we also hope that this study can help the manager realize that the financial management system can be complemented with additional information.

5.3. The manager's feedback on the CENC's Balanced Scorecard

After a careful analyses of the management support tool proposed, the CENC's manager pointed out that without any kind of field test, it would be very hard to express any kind of commentary about the effectiveness of the tool. Nevertheless she was really interested on the ideas and method presented and was willing to implement them on the CENC. She recognized the improvement in the management quality of the clinic this tool could bring, and that the report system that the BSC has could help her identify critical aspects of the clinic, and help her improve those aspects.

5.4. Future work

To attain a better BSC framework for the CENC, the owner should promote the development of

management and information tools in the clinic. This could improve the strategic management of the clinic, thus creating better feedback and ideas for the conceptual framework.

Furthermore for a more effective BSC framework work should be developed in order to create a relative weight analysis of the BSC measures, to distinguish the critical measures from the other ones. In addition a way to categorize the level of achievement of the goals should be created, this way the BSC system may automatically notify the user when a critical measure is not performing within acceptable ranges.

We also think that a more careful analysis of the satisfaction survey associated with a different formula to calculate the customer satisfaction could lead to a more accurate and effective way to analyze the customer satisfaction.

For this method to work and provide valuable information to the BSC system, the customer satisfaction surveys should be promptly copied to the database so that the formula could be applied.

In case the CENC applies this tool and at the same time the organizational structure grows, it is important to point out that a more complete and sophisticated framework should be developed, in order to answer to the new organizational demands.

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