

An Ontological Model to Support the Implementation of Balanced Scorecard in the Organizations

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ABSTRACT

The Electric Power Industry is changing rapidly. Utilities on deregulated markets are forced to focus on increased customer service on a very competitive market. In order to become successful the power companies have to utilize all their resources. One of such resource is the huge amount of information in different computer systems. This information can be refined and combined to show patterns and support decision-making that could be used to provide better service to the customers, gain market shares and increase profit. But most of the time this information is hard to find. It has also been suggested that performance measurement and strategic management should focus on the value creation process. In recent years, the balanced scorecard (BSC) has evolved to become a dominant strategic management mechanism and has been widely adopted in business sectors. However, a gap between business models and the BSC still hinders the usefulness and effectiveness of applying the BSC to the business domain. This paper aims at providing an ontological approach for linking the BSC to business models through ontological models. This approach allows us to provide the foundations for a semantic integration architecture.

1. INTRODUCTION

The Centro Nacional de Control de Energía (CENACE) is an organization created by the Comisión Federal de Electricidad (CFE) to administer the national electric power grid and has a variety of responsibilities like the operation of the system, the office of generation, the transactions of energy with external partners and foreign companies, and the access management to the network of transmission. All it directed to provide

the service of electrical energy with stability, quality, economy, and security.

The main product of the operation of the CENACE is the controlled energy and its decision-making is based on the knowledge and experience acquired on the environment to control. With this frame of reference we devise importance of reliable information systems, to share the knowledge and to keep an organizational memory that stores the knowledge and experiences of the people. The organization's quality driven management system defines that the information must be accessible, useful and provide an integral vision of the performance of the organization. It must reflect the impact of all the actions conducted in the processes and related activities and allow align the processes and activities of the organization with its objectives, strategies, mission and vision. Under this scheme the information in key area processes are diverse and they are classified according to its use as follows:

- 1) *Real Time Processes*: Those of critical mission that rely on instantaneous processing of information. These processes are the base for the decision-making in real time for the administration and control of the national electric system.
- 2) *Statistical and Support Processes*: Those in which planning is supported, statistic, quality assurance system. Frequently used for taking decisions in medium and long term.
- 3) *Administrative processes*: Process required for the management of human and material resources.

The information for these processes is classified in the following categories:

- 1) *Operative*: Information that reflects the state of the devices and measurements of the power grid. This information arrives at the processes from real time through remote terminal units or from communication links between control centers.
- 2) *Historic statistics*: Historical information generated by real time processes, statistical, and of support. The period of update of this information can be daily, weekly, monthly or annual.
- 3) *Administrative*: Information that reflects the management of the human and material resources of the organization. This information is confidential and has restricted access.

The electrical sector always has been characterized by very complex and specialized information systems that support the operations necessary to manage the electrical system. The system integration is a critical issue. The access to the information is considered confused and complex by the users; due to the existence of systems that operate in an independent way or partially integrated in the organizational IT infrastructure.

2. STRATEGIC PLANNING

To be competitive and successful, the organizations should understand how its own perception of quality in its products and services coincides with the expectations of quality of the clients for those same products and services. The strategic map of CENACE defines as strategic guideline to provide information with value added for the decision-making. Derived from this, two projects have special significance.

Information Integration Project

This project has as strategic goal establish a systematic information process for the organization. The specific objective is to acquire valuable information for strategic decision-making and improvement of operative processes. The processes to improve are the processes of operational information, transparency and impartiality. The justification is that it is necessary to rely on an executive information system about the operative conditions and the integrity of the national electric

system. This allows the executives to know the condition of the electrical system electrical and the elements that integrate it, such the conditions of operative security, events and conflicts, growth of demand and consumption, as well to identify necessary actions to integral improvement n in operations. A present situation analysis accounts of very valuable operational information, which in occasions it is not easy to obtain and it causes delays in taking some important decisions.

Economic Information Project

The strategic objective of this project is to provide financial information to the areas of CFE (generation, distribution, and transmission) of the different facets of the electrical system behavior useful for the decision-making. The justification is to provide a readily accessible mechanism for important decision making in the financial aspect in benefit of the institution. The actual situation analysis is the following: at the moment the information is dispersed in different systems with variable periods of acquisition. So, it is required to centralize it in an easily accessible system.

These two projects will permit to the organization to align the key area process and information technology with the strategy, in such way that reorganize all the aspects of the organization, in order to execute the strategy in effective way. Nevertheless, in some point between the definition of the perfect strategy and its execution, many organizations get lost, or at least they deviate from their strategy, and they fail at the moment of obtain their vision.

4. THE BALANCED SCORECARD AS A CONCEPTUAL MODEL FOR INFORMATION INTEGRATION

The Balanced Scorecard (BSC) [3] provides to the organization a strategic framework to identify the organization's drivers toward its objectives and make them converge toward them, defining the relations among the goals of performance from four different perspectives of the organization. Kaplan and Norton describe the BSC as a framework of action to translate the vision of an organization in its strategy, lending attention to the requests of the shareholders, the clients and the internal requests, that in joint way describe the strategy of the organization, and how this strategy can be achieved.

This technique identifies the economic value factors, to medium and long term, from four perspectives:

- Financial: To succeed financially, how should we appear to our stakeholders?
- Customer: To achieve our vision, how should we appear to our customers?
- Operational: To satisfy our customers and shareholders, at what business processes must we excel?
- Learning and growth: To achieve our vision, how will we sustain our ability to change and improve?

The BSC is an iterative process that takes as a foundation the strategy. Once it is defined, we define how to measure it. The metrics are key indicators of the performance, for example: if the strategy is the improvement of the relations with the customers, a key performance indicator could measure the time that the account executive spends with them. As we observe, the BSC is an information intensive task, and to meet its expectations, the information has to be identified from the different sources (i.e. databases, applications, XML documents, unstructured text files, etc.), and then to be integrated.

Information integration

Information integration involves people, processes, and applications. Different integration technologies are necessary for different kind of scenarios. Four distinct forms of integration are described in [2]:

- 1) Portals integration is the shallowest form, bringing potentially disparate applications together in a single entry point.
- 2) Business-processes integration orchestrates processes across application and possibly enterprise boundaries, such as those involved in a supply chain relationship. Web services and their derivatives are becoming important here.
- 3) Application integration, in which applications that do similar or complementary things communicate with each other, typically focused on data transformation and message queuing, increasingly in the XML domain.
- 4) Information integration, wherein complementary data are either physically (through warehousing tools) or logically

brought together, makes it possible for applications to be written to and make use all relevant data in the enterprise, even if the data are no directly under their control.

The goal of integration is to consolidate distributed information intelligently, free of redundancy, processed and operated by the right business logic to deliver the appropriate and condensed answer and offer the end user a simple access to it, without him needing knowledge about the underlying data structures.

The most common current solution to integration and translation is field-to-field mapping. Schemas from two data sources are imported and fields are mapped to each other [4]. This approach doesn't scale well as the number of maps grows exponentially with each new data source. Enterprises working with this technology often discover that creating correct maps is a challenge because it requires that the person doing each mapping has an in depth knowledge of both data sources, which is rarely possible.

Semantic Integration

Semantic technologies [5,10] offer a new way to integrate data and applications. Before making mappings, a model (or an ontology [1]) of a given business domain is defined. The model is expressed in a knowledge representation language and it contains business concepts, relationships between them and a set of rules. This representation of the knowledge enables the creation of structured information collections and rules of inference to facilitate the automated reasoning; in this manner, the intelligent agents interpret and exchange information with richer semantic content for the benefit of the users. By organizing knowledge in a discrete layer for use by information systems, ontologies enable communication between computer systems in a way that is independent of the individual system technologies, information architectures and applications.

The Balanced Scorecard Ontology (BSCO)

We believe that an ontological model built around the BSC domain concepts, allows us to achieve a conceptualization of the business processes, aligned to the strategy of the organization, to be captured, represented, disseminated and processed by the people and software systems. The main advantages that this would represent for the organization is a

transparent and secure flow of information/knowledge in the chains of services and supplies that carry it to a greater efficiency.

The BSCO is the conceptualization and formalization into elements, relationships, vocabulary and semantics of the essential subjects in the balanced scorecard domain. BSCO is structured into several levels of decomposition with increasing depth and complexity. The first level of decomposition of our ontology contains the four main perspectives organization, which are the products and services a firm offers, the relationship it maintains with its customers, the infrastructure necessary in order to provide this and finally, the financial aspects, which are the expression of business success or failure.

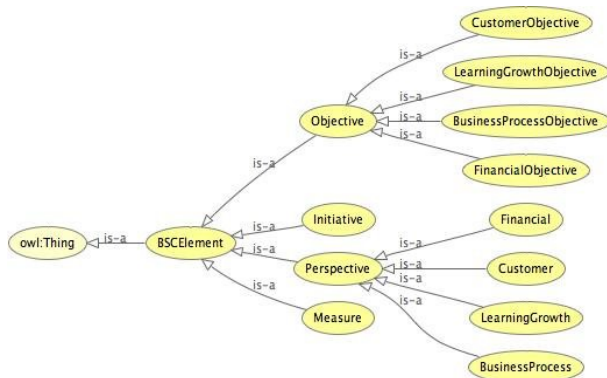


Figure 1. The Balanced Scorecard Ontology

Additionally, a BSC ontology can be used as conceptual model for semantic integration. The main benefits for an ontology-based approach are [8,9,10]:

- The ability to picture all occurring data structures, for ontologies can be seen as nowadays most advanced knowledge representation model.
- The combination of deduction and relational database systems, which extends the mapping and business logic capabilities.
- A higher degree of abstraction, as the model is separated from the data storage
- Its extensibility and reusability

Conceptual modeling still has a large potential in the domain of implementing organizational strategies and business models that has yet to be realized. An ontological approach to e-business models can be the foundation for the development of a variety of

tools that help companies create a blueprint for the realization of their business strategies. The use of formalized business models has the following advantages [6,7]:

- 1) The process of modeling business models helps identifying and understanding the relevant elements in a specific domain and the relationships between them
- 2) The use of formalized e-business models help managers easily communicate and share their understanding of an e-business among other stakeholders. This facilitates the exchange of business models between executives, but also with the people that design and implement business processes and Information Systems.
- 3) Mapping and using business models as a foundation for discussion facilitates change. Business models designers can easily modify certain elements of an existing BM.
- 4) A formalized BM can help identifying the relevant measures to follow in a business, similarly to the Balanced Scorecard Approach.
- 5) BMs can help managers simulate businesses and learn about them. This is a way of doing risk free experiments, without endangering an organization. Moreover, this helps companies prepare scenario planning.

Additionally, this will allow them to better understand, measure, change and sometimes even play around with and simulate their business models.

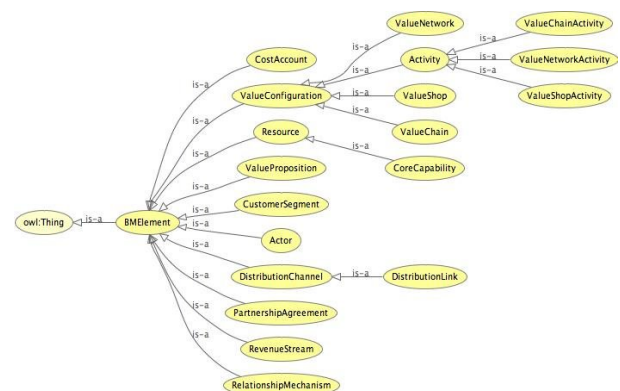


Figure 2. The eBusiness Model Ontology[6].

The BSCO ontology combined with the eBMO may facilitates the development of tools that allows us to understand, share, modify, measure and, simulate e-business processes in the organization [6,9].

6. CONCLUSIONS

In the present work we propose an ontological approach to support the implementation of BSC inside the organization. This approach facilitates the development of tools that allows us to understand, share, modify, measure and, simulate business processes in the organization. Future works will focus on validating the proposed model developing a framework to support decision making designing and implementing tools for dimensional analysis that allows to consolidate the information in a common interface.

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