VIABLE MODEL OF THE ENTERPRISE – A CYBERNETIC APPROACH FOR IMPLEMENTING THE INFORMATION TECHNOLOGIES IN MANAGEMENT

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Abstract: The purpose of the current paper is to present the developed methodology of viable model based enterprise management, which is needed for modern enterprises to survive and growth in the information age century. The approach is based on Beer's viable system model and uses it as a basis of the information technology implementation and development. The enterprise is viewed as a cybernetic system which functioning is controlled from the same rules as for every living system.

Keywords: enterprise strategy, viable system model, enterprise model, neural network, artificial intelligence, cybernetics, business trends.

ACM Classification Keywords: I.6.3 Simulation and Modeling: Applications; I.2.6 Artificial Intelligence: Neural nets

Introduction

The enterprises in the information age need to be managed in different way. The traditional management techniques successfully applied in the industrial companies are not suited in the new economy. The reason is that the conditions from the past are changed rapidly. Thus the contemporary business is accomplished in highly dynamic environment and adaptation capabilities are needed. New business trends [Kovacheva, Toshkova, 2005] have to be taken into consideration. According to this, the traditional software technologies are limited in their effectiveness, as they are unable to discover and maintain the information, which is hidden, in large amounts of data. New kind of software [Kovacheva T., 2004] is needed and new information technologies must be applied.

The main challenge for the modern enterprises is to keep their viability. To do this and because of the environment complexity and the complexity of the enterprise itself, the enterprise must be managed as a cybernetic system. Thus the suggested in this paper novel approach for enterprise management is based on cybernetics and system theory. A viable model of the enterprise is developed where the needed information technologies are applied. It is based on viable system model (VSM) [Beer S., 1984] which is the basis for our methodology.

Viable System Model

Viable System Model is the "whole system" theory. It is developed from Stafford Beer [Beer S., 1956, 1959,1967, 1979, 1981, 1984, 1985] who is called the father of managerial cybernetics. He was inspired from the way the human brain organizes the operation of the muscles and organs and synchronizes all the activities in human organism. VSM is a new way of thinking about organizations based on system theory and viability. Beer considers the human organism as three main interacting parts:

- muscles and organs;
- nervous system;
- external environment.

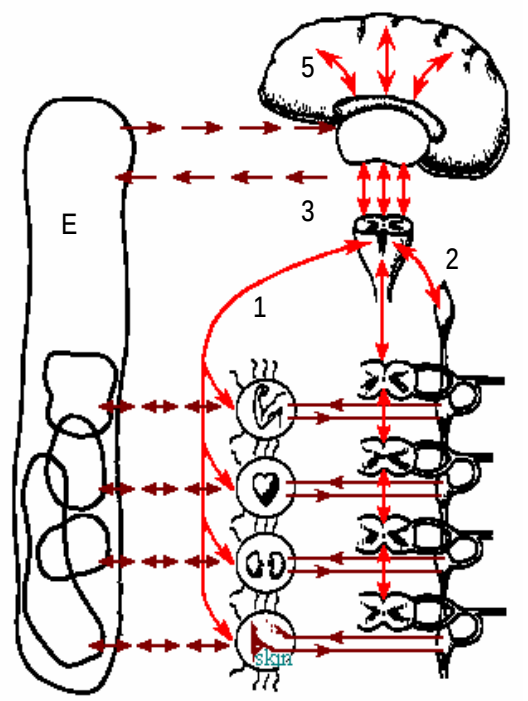
They are included in Viable System Model as follows:

1. The Operation: the units which do the basic work (muscles and organs);

2. The Metasystem: provide a service to the Operations units and ensures they work together in an integrated and harmious fashion (nervous system);
3. The Environment: all the environment elements, which are of direct relevance to the system in focus (external environment).

These three parts must be in balance. When the environment changes the enterprise must respond accordingly.

Figure 1 shows the five interacting systems in relation to the human system [Beer S., 1981]. These five systems are the basis of the Viable System Model. In Table 1, they are explained from a management point of view.



Cortex: higher mind/brain functions (5)

Diencephalons: sensory input and planning (4)

Pons & Medula: internal control (3)

Autonomic Nervous System: regulation (2)

Skeleton, Muscles & Organs: operations (1)

Environment: (E)

Figure 1: The Five interacting systems – neurophysiological approach

Table 1

System Number	*System Identification*
System 1 (S1)	Primary activities.
System 2 (S2)	Stability and conflict resolution.
System 3 (S3)	Internal regulation and optimisation.
System 4 (S4)	Sensors, adaptation, planning, strategy development.
System 5 (S5)	Policy, identity, goals

Using the Beer's Viable System Model we developed a methodology of viable model-based enterprise management where the needed information technologies for supporting business activities and keep the enterprise viable are applied.

Viable Model-Based Enterprise Management

The goal of Cybernetics is to understand and formalize the basic, underlying principles of systems, such as living systems and to study the problems of complex systems, adaptation and self-organization. The main characteristic of living systems is their viability. A viable system has the capability to successfully deal with the complexity of its

environment and is adaptable over time. Thus, the enterprise management must ensure that realization of the company strategy will keep it viable. Therefore, the relevant software is needed.

Operations are presented from the basic units in the enterprise. They do the actual work and could be departments, machines, people etc. according to the enterprise scale, activities and structure. These units need to be monitored continuously to ensure they work in the proper way. Thus, the real-time software must be implemented. Such kind are of software are the well known operational systems and OTLP systems.

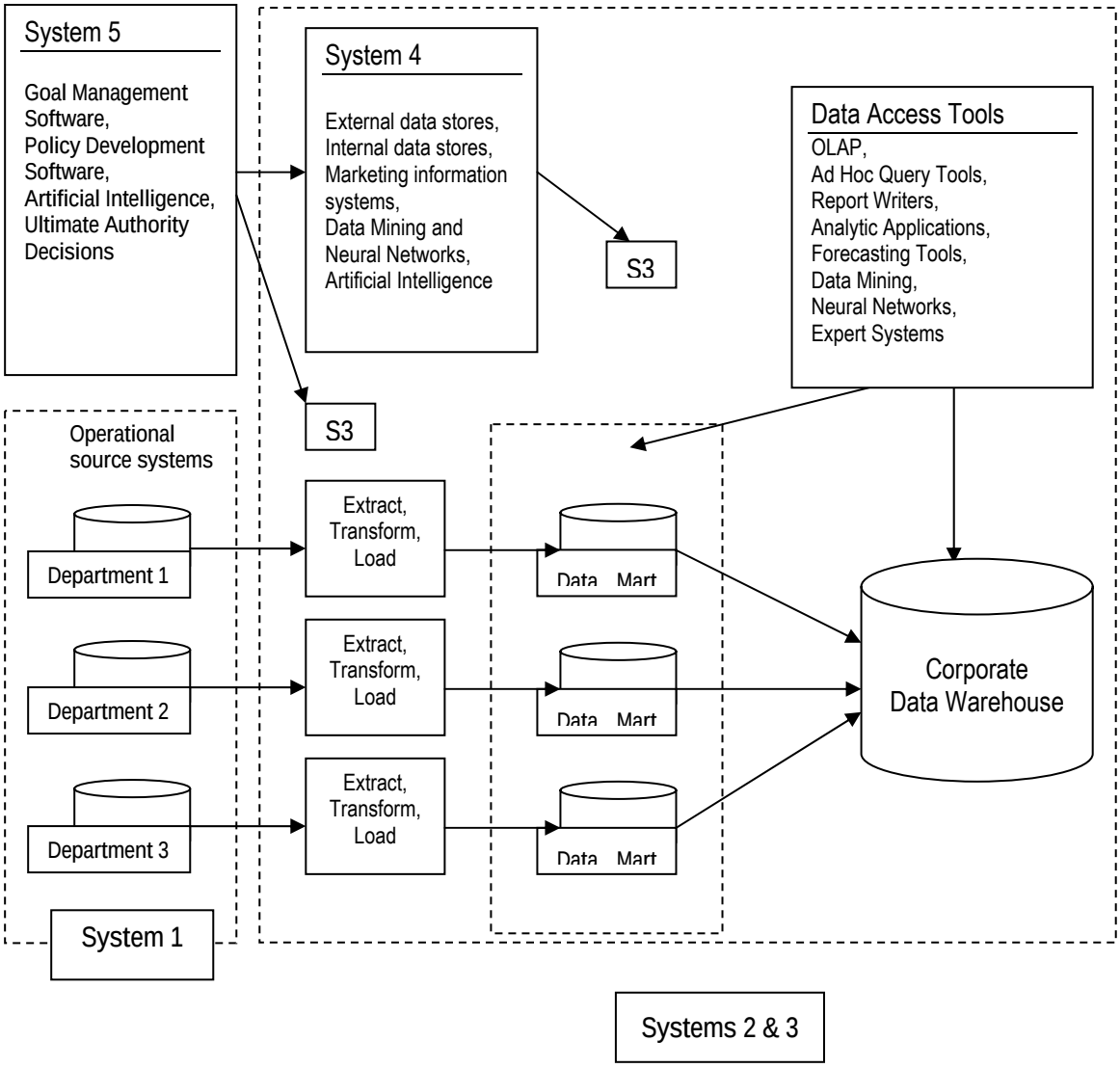


Figure 2: The Interconnections between the five systems and their elements

The daily operations in every enterprise department are registered in specific software and the department database is built. It stores all the data from the everyday activities. This information is useful for the detailed analysis of the enterprise data. This kind of software must be present in System 1.

System 2 function is to prevent and resolve conflicts. Applying the proper software the conflicts can be early recognized and prevented. The main principles of building such kind of software are given in [Kovacheva, 2004]. At this level, we need detailed and granulated data for the neural network learning process. This information than is analysed, compared and managed according specific rules, included in a conflict resolution and stability preserving expert system. The data can be organized in traditional data based as well as in data marts.

System 3 needs all the data for the enterprise everyday operations. Thus, we use the data warehousing approach, which integrates data from the operational systems into one common data store, known as data warehouse. It is optimized for data analysis purposes and decision making. We use different tools to access the data in the warehouse and discover hidden information in them.

System 4 is responsible for the enterprise adaptation. Therefore, it needs information about the external environment so it can produce strategies. It also needs a good model of the internal capabilities so it knows what tools it has at its disposal. We use different tools for forward planning and strategy development with combination of expert system, neural networks and marketing information systems (MIS). MIS [Недева В., 2003] maintain data from internal and from external sources. Both could be integrated in a big corporate data warehouse. On its basis, the external environment is analysed and the adaptation capabilities are developed.

System 5 is compared with the higher human brain functions. It is responsible for policy development, goal settings, ultimate authority and identity. At this level, a special kind of software is needed. The Artificial Intelligence is now applied. Goal definition must be done in accordance with the main Neurolinguistic Programming principles.

The interconnections between the five systems and their elements are given in figure 2.

Conclusion

The developed methodology of viable model-based enterprise management helps the modern enterprises to survive and growth in a highly dynamic environment. It uses the last achievements in the information technology at the current moment. To make this project complete we need to build a new type of Neural Networks which can work in a multitasking mode with dynamic weights generation, short and long term memory management properties and high adaptation and transformation capabilities. Such kind of networks is viable and can survive in an environment with a high degree of complexity and uncertainty because of their ability for self-development.

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