

CREATING INTEGRATED DATA WAREHOUSE SYSTEM WHICH SUPPORTS RISK MANAGEMENT OF BUSINESS ORGANIZATIONS

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—Abstract —

Business organization's security is a complex state between its internal and external environment, in which threads against organization's survival and development are minimized and necessary measures are taken to compensate harm of possible losses.

This paper focuses on creating data warehouse by using database management system called "Cronos". The aim is to help managers in protecting information, by providing them integrated information needed for complex management of economic, legal, social, political, technological risks. Integrated information means information about processes within the organization and information about outside environment such as competitors, state of industry, market changes etc. Created system provides opportunity for proactive management and possibility to adequate response to negative processes.

Key Words: *Data mining, Data warehouse, Information security, Risk Identification, Quantitative Risk assessment*

JEL Classification: C81, D81

1. INTRODUCTION

1.1. Importance of information

A recently published Virginia Commonwealth University (CU) study – the first comprehensive look at how data management is practiced worldwide – reveals

that most organizations do not manage information well. And there's more: despite organizations recognizing that data is the lifeblood of their businesses, "Measuring Data Management Practice Maturity: A Community's Self-Assessment" also concludes that businesses face significant data management challenges. The study, published in the April issue of *Computer*, the publication of the Institute of Electrical and Electronic Engineers Computer Society, assessed the data management practices of 175 public- and private-sector organizations between 2000 and 2006. A vast majority scored far too low for their own good. According to lead study author Peter Aiken, associate professor in VCU's Department of Information Systems, fewer than 10 percent of the organizations studied are using documented processes to manage data, which means that more than 90 percent are ineffective in this area (Aiken, 2007:42).

Although data is a critical asset for organizations, the VCU study is an indication that organizations don't fully appreciate its value (Swartz, 2007:28). This means that the risks of losing the crucial information are also neglected.

Theft of trade secrets and the loss of information can cause businesses to lose their commercial advantage. The CGI/FBI Computer Crime and Security Survey states that total losses in the United States in 2004 as a result of computer security breaches reached \$141,496,560 (Saint-Germain, 2005:60).

1.2. Security management

Security management seeks to establish controls and measures to minimize the risk of loss of information and system resources, corruption of data, disruption of access to the data, and unauthorized disclosure of information. Security management is achieved through effective policies, standards, and procedures that will ensure the confidentiality, integrity, and availability of corporate information, applications, systems, and networks for authorized users only (Killmeyer, 2006:30).

The ISO 27000 series of standards have been specifically reserved by ISO for information security matters. First stage of implementing information security policy, according to ISO 27001 is: "identification of information which should be protected".

The value of data is neglected, which means that it can easily leak outside of organization. The aim is by using competitive intelligence tools to gather all that information and show it to managers in order to protect it.

Fragmentation of organizational data is another problem which should be considered, because it can cause unintended leakage of crucial information. By implementing data warehouse system the dispersion of information can be eliminated. Through the addition of intelligence information, the vital organizational information easily will be identified and majors for its protection can be taken.

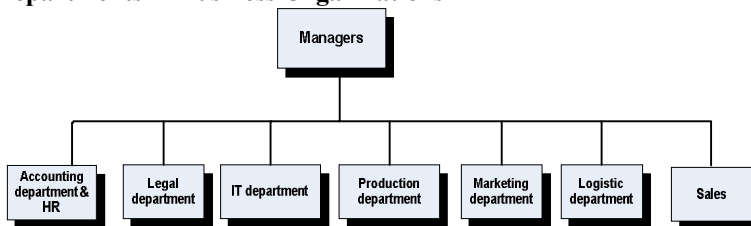
2. CREATING THE STRUCTURE OF INTEGRATED DATA WAREHOUSE

The term integrated data warehouse is used, because it contains information about processes within the organization and information from “outside” about organization.

According to Michael Hernandez, the structure of data warehouse should be close to the physical structure of the organization. Therefore, in designing process the "data mart" concept is used - information from each department is stored in a separate database.

First step in creating data warehouse system is analysis of the business organization structure:

Figure-1: Departments in Business Organizations

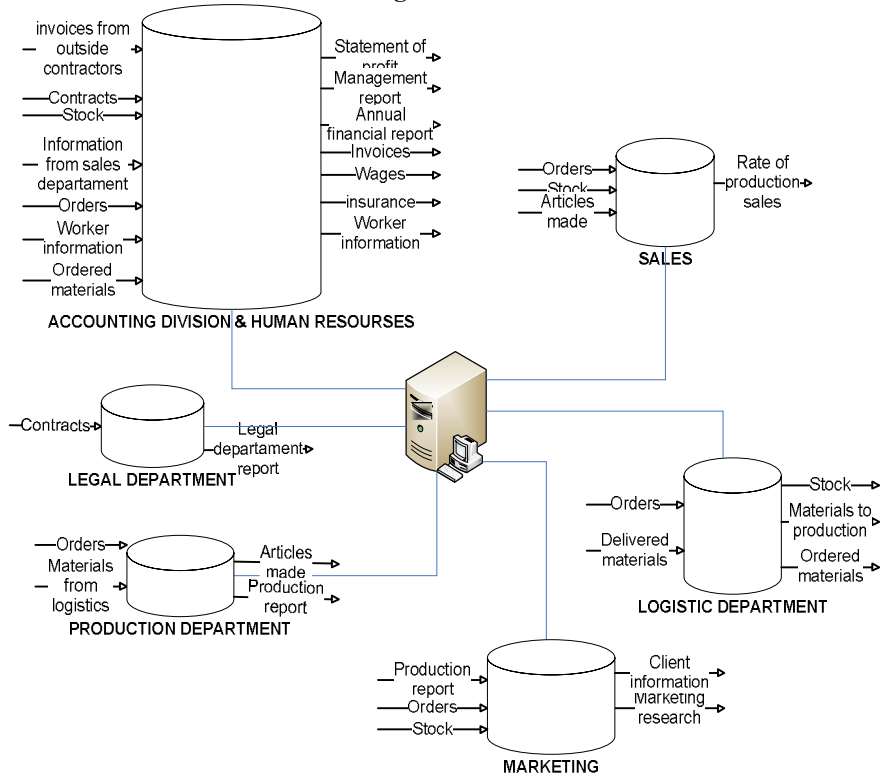


2.1. Structure of internal data warehouse

Using system analysis and approach, each unit shown in the figure 1 is decomposed in order to track incoming and outgoing information flows. These flows are used to create databases for each department. They form a data

warehouse which will be stored on a server that manages exchange of information. Figure 2 illustrates incoming and outgoing information from each division inside of business organization.

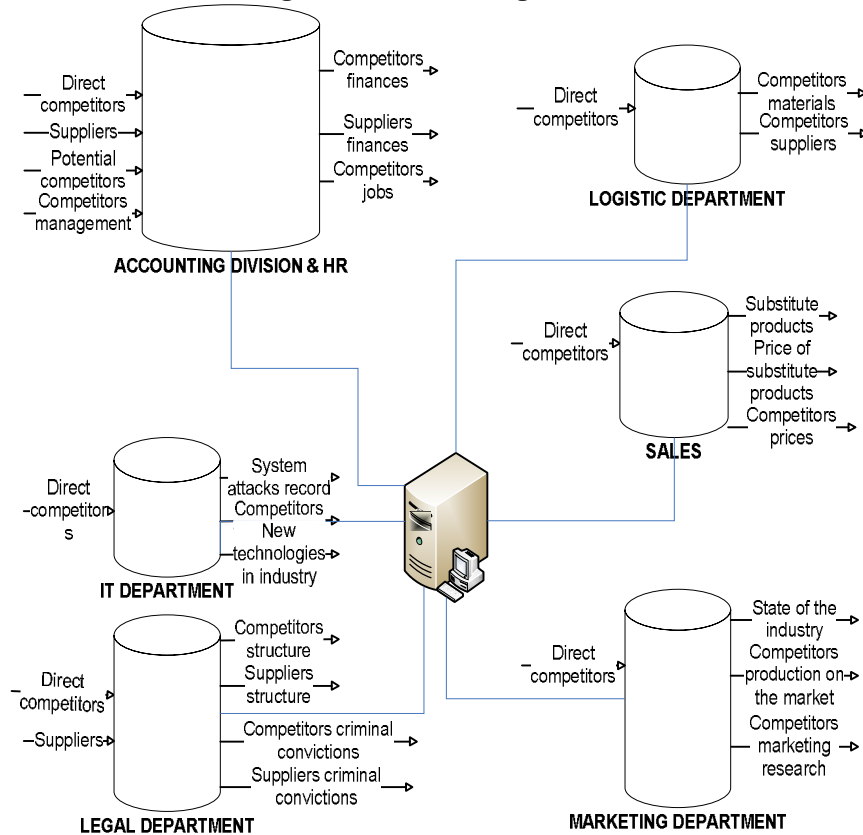
Figure-2: Information flows inside of organization



2.2. Structure of external data warehouse

The next part of designing process is gathering information from “outside” about organization in competitor’s point of view. According to Michael Porter’s methodology, knowledge about the intentions of company, suppliers, customers and contractors; the strengths and weaknesses of organization; the position of opponents during negotiations; possible occurrence of crisis situations, is organized and stored into data warehouse shown on fig.3.

Figure-3: Information flows gathered from intelligence



To create data warehouse model a program called “Cronos” is used. The information about meat producing company was collected.

2.3. Risk management and risk assessment

After identifying and protecting company’s important information, periodically risk assessment should be provided (Semerdjiev 2007:78).

It was chosen to work with fuzzy rule-based expert system. It is suitable for problems which cannot be solved by using quantitative analysis. Experts are managers from each division, because they know in depth processes in company. Experts, using data warehouse system to identify risks and to describe them according to their significance. In the risk assessment model shown in figure 4, experts can rate risk as: “very low”, “low”, “medium”, “high”, “very high”.

Expert's method can be developed if statistical accident data is collected, causes of their occurrence is analyzed and the factors on which they depend are discovered. Based on this information threats and vulnerabilities can be assessed (Tzolov, 2003).

Mamdani method for building fuzzy system is used, because of its advantages:

- It is intuitive.
- It has widespread acceptance.
- It is well suited to human input.

This method is combined with multi-objective decision making criteria.

Multi-Objective Decision Making involves the selection of one alternative a_i , from many alternatives A , given a collection or set, say $\{O\}$ objectives which is important for a decision maker. Define universe of "n" alternatives, i.e.,

$$A = \{a_1, a_2, \dots, a_n\}$$

And "r" objectives:

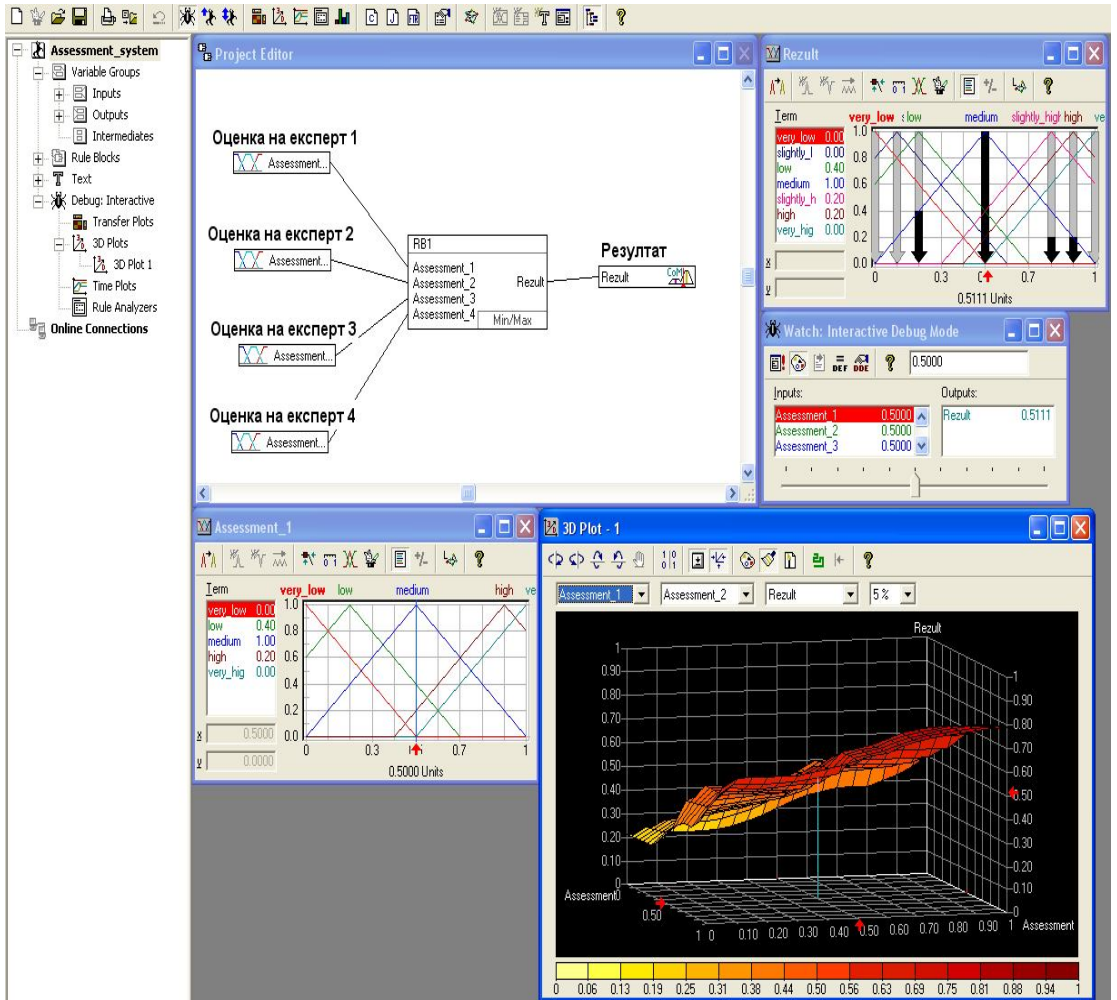
$$O = \{O_1, O_2, \dots, O_r\}$$

Decision function is given as intersection of all objectives.

$$DF = O_1 \wedge O_2 \wedge O_3 \dots O_r$$

(Sivanandam, Sumathi and Deepa, 2007:154).

Figure-4: Risk assessment model



3. CONCLUSION

Information is crucial for company's activities. Often its value is neglected which leads to leak of information and its use by competitors. In order to show what information can be gathered about some organization the data warehouse system is created. After understanding what competitors can know about investigated company, the measures for protecting important information should be taken. Protection is not a single event. It should be performed periodically by identifying and assessing the risk for this important information. In order to help risk

assessment process, a fuzzy interference system, by using “fuzzy tech” program, is created.

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