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THE IMPACT OF INFORMATION SYSTEMS ON MANAGEMENT DECISION MAKING

Abstract: Needs for different types of decisions change in time. The fundamental principles based on which managers make decisions evolve. In new organizations, information is no more a limited resource. Today there is a multitude of information so all of them cannot be processed and the challenge is to choose the right ones in order to make decisions. New competitive environment and the growing informatization of business processes influenced the focus shifting from data describing past events to predicting and managing the future.

Managers hold an important role in dealing with these changes. They use various tools to make and implement decisions and control the results. Information Systems have changed decision-making and quality of decisions. This has led to the change in the role and behaviour of managers. Management and organization changes that should be fulfilled for the improvement of decision making will be presented in this paper.

Keywords: Information Systems, management decisions, quality

1. INTRODUCTION

Development of new business environment changed with the influence of Information Communication Technology (ICT). As a result of this influence, different terms describe the new ways of doing business, like “digital economy”, “knowledge based economy”, and companies become “digital firms” or “virtual organizations”.

The business environment is a combination of social, legal, economic, physical, and political factors that affect business activities. Significant changes in any of these factors are likely to create business pressures on organizations. Organizations typically respond to these pressures with activities supported by IT. (Rainer & Cegielski, 2010, p. 15)

Information technology (IT) consists of all

the hardware and software that a company needs to use in order to achieve its business objectives. (Laudon & Laudon, 2012, p. 15) Information technology (IT) is often associated with data and information processing and computer-assisted decision support technologies. Changes in ICT have been more intensive in the last 20 years, related to the Internet and mobile technology, offering new services and equipment.

ICT offers support for organizations, management and employers to react rapidly to problems and opportunities arising through extreme dynamics conditions which keep modern organizations under pressure.

These changes in ICT cause changes in organizations and organizations create feedback for ICT development.

The interaction between information technology and organizations is complex and influenced by many mediating factors, including the organizations' structure, business processes, politics, culture, surrounding environment, and management decisions. (Laudon & Laudon, 2012, p. 81) The most important economic impacts are cutting down agency and transaction costs. Organizational impacts are a flattened organization, which means reduction of middle managers, networked organizations, and reorganization of business processes. These can have an effect on the behavior impact as decentralization of decision making and more inclusion of low-level employees.

ICT improves management processes with different information systems by supporting the decision-making needs of each management levels: operational management, middle management, and senior management. Managers affect development of IS by setting requirements to these systems and giving feedback for improvement. The relations between information systems and decision making, as well as the importance of improved decision making are the key topics of the following discussion.

2. PROBLEM STATEMENT

Decision making is a general process that every individual does on a daily basis. For organizations this process is entrusted to managers as agents of organizations.

Decision making is one of the five classic management functions according to Fayol: planning, organizing, coordination, deciding and controlling. (Arsovski, 2008, p. 71)

Decision making is defined as the selection of the future course of action from among various alternatives. A decision is a choice made from available alternatives. Decision making is the process of identifying problems and opportunities and then

resolving them by choosing the right solutions for that particular situation. (Manjunath & Nagendra, 2010, p. 55) For different levels of organizations there are different types of decisions and information that they are based on.

From a business perspective, information systems are part of a series of value-adding activities for acquiring, transforming, and distributing information that managers can use to improve decision making, enhance organizational performance, and, ultimately, increase firm profitability. (Laudon & Laudon, 2012, p. 25)

While only a few, mostly early, studies cast doubt on the economic power of IS, the vast majority of research papers on IS business value find empirical evidence and theoretical arguments in favor of both the operational and strategic relevance of IS. (Schryen, 2013, p. 139) Many empirical studies have focused on the relationship between IS investment and productivity and the impact of IS on competitive advantage. Bhatt and Grover (2005, str. 259), for instance, show that firms rated as having superior IT capabilities were found to have better profit and cost ratios compared to the industry average. But, these IT capabilities should be divided on IT infrastructure and IT business experience. Results shows that IT infrastructure has no significant impact on key performance indicators, but IT business experience does. This has an important effect on decision making in the field of investment in IT. This leads to the conclusion that IT business experience is important for better performance and decision making. Thus, systems should be changed when this experience is in conflict with new trends.

2.1. The role of Managers in Organizations

Many authors tried to define managerial work, and there were many empirical

studies on that topic. Mintzberg analyzed managers' behavior day-to-day and classified 10 roles in 3 groups. For most of the roles there are supporting information systems. The aforementioned groups are: 1) interpersonal, 2) informational, and 3) decisional.

Interpersonal role of managers is the effect of their position in an organization. They represent the organization as a figurehead for external and internal stakeholders. They are responsible for the work of others, and so they must act as leaders to them. The influence of a manager is the most visible in the leader role. In liaison role they communicate with other units they are not responsible for. This role is important for the organization as a whole. On Picture 1 it can be seen that systems supporting these roles are the systems for closer face-to-face contact between stakeholders. Within these systems, beside telepresence systems used before in various forms, the rising usage of social networks is evident.

In their informational role, managers act as the nerve centers of their organizations, receiving the most concrete, up-to-date information and redistributing them to those who need to be aware of them. Managers are therefore information disseminators and spokes persons for their organizations. (Laudon & Laudon, 2012, p. 459) Systems supporting informational role developed earlier because of the enormous contribution of information in every manager activity. Lately, these systems include even knowledge of experts.

In decisional role managers as entrepreneurs initiate new kinds of activities, search for new opportunities, methods, handle disturbances arising in the organization as a consequence of an unanticipated problem, allocate resources and negotiate between conflicting groups. In this role managers have to balance interests of different stakeholders. This role is poorly supported by the systems, but lately they have been developing,

especially business intelligence.

Roles of managers are not separate, as the systems which support them. Every activity requires more than one role and combination of ICT support.

2.2. Types of Decisions

In decision-making and problem-solving processes, it is obviously preferable to have complete, consistent, and accurate information. However, unfortunately, all too often, the information available to us is necessarily less than perfect. There may be missing or unknown elements that are of significant importance. The "facts" we have may or may not be fully correct, or may be ambiguous. Measurements and data may be less than precise. Some decisions involve complex systems, where what happens in one part impacts other parts, which can introduce complications. (Mead, 2007, p. 1245)

As we can see, uncertainty is inevitable in reality of private and business life. However, managers need to make valuable decisions.

Management decisions typically fall into one of two categories: programmed and non-programmed. Programmed decisions involve situations that have occurred often enough to enable decision rules to be developed and applied in the future. Programmed decisions are made in response to recurring organizational problems. Non-programmed decisions are made in response to situations that are unique, are poorly defined and largely unstructured, and have important consequences for the organizations. Many non-programmed decisions involve strategic planning because uncertainty is great and decisions are complex. (Daft, Kendrick, & Vershini, 2010, p. 314) Programmed and non-programmed decisions are linked with problems they try to solve. These problems can be classified on a scale between structured and unstructured problems. Semi-structured

problems that have characteristics of the mentioned types fall between. This typology is often linked with decisions, so programmed decisions are called structured and non-programmed unstructured decisions.

In this context, information systems can be classified as those supporting structured and those supporting unstructured decisions.

MIS – Management Information Systems offers the required support for structured decisions. Management Information Systems or IS for supporting the management appeared as a result of managerial needs for the more effective handling of essential processes to ensure the achievement of the objectives, strategies and plans of the organization. (Arsovski, 2008, p. 30) MIS combines knowledge from computer sciences, management sciences and operations research to help managers provide support for decision-making.

Systems supporting unstructured decisions are DSS – Decision Support Systems. DSS systems support managerial decision-makers in unstructured or semi-structured decision situations.

Due to a lack of information and management involvement in decision-making, the growing trend towards expert systems as a solution for better use of available information in order to solve the problem is an understandable result. (Arsovski, 2008, p. 76) An expert system (ES) attempts to act like a human expert in solving complex problems.

2.4. Information Systems for Different Management Levels

Organizations are usually hierarchical. Hierarchical levels of management in all the relevant topic-related literature are divided on: operational, tactical, and strategic level. Information technologies that support each of these levels follow this hierarchy. Levels and information

systems are organized in a pyramid model. Organizations have different functions as sales and marketing, manufacturing and production, finance and accounting, human resources. Different types of systems exist to deal with different kinds of problems on management levels in organizations, as it is shown on Figure 1.

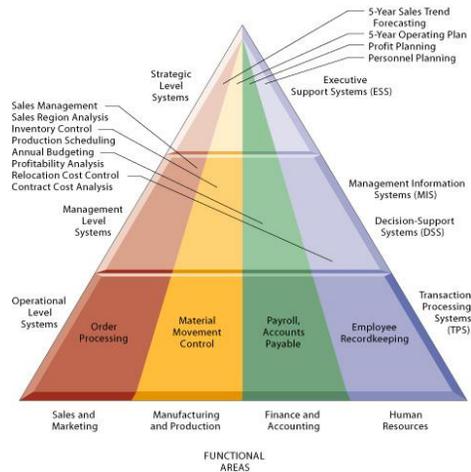


Figure 1: Information Systems for Different Management Levels

Source: http://accountingsoftwarecorner.blogspot.com/2010_06_01_archive.html

Operational management is responsible for structured problems. Low-level managers are responsible for structured problems on the operational management level. What offers support for this level are the Transaction Processing Systems (TPS). These systems support management by solving routine problems and processing transaction data from business events. Transaction processing systems provide speed and accuracy for all business operations for different management levels and functions and follow routine functions of the organization. Data collected on this level support systems on higher levels. Importance of this system for the organization is that it has a role in crossing boundaries (internal and external) and is oriented towards efficiency.

Middle management solves structured and

semi-structured problems on the middle management level. Information systems that offer support for this level are Management Information Systems (MIS) and Decision Support Systems (DSS). The first is used for structured and the second for semi-structured and unstructured problems. MIS produce reports summarized from transaction data for functional areas of organizations.

MIS provide middle managers with reports on the organization's current performance. MIS serve managers primarily interested in weekly, monthly, and yearly results. These systems typically provide answers to routine questions that have been specified in advance and have a predefined procedure for answering them. (Laudon & Laudon, 2012, pp. 47-48) In the phase of development it requires formal requests of managers for MIS. Decision Support Systems (DSS) is a computer-based system that supports choice by assisting the decision maker in organization of information and modeling of outcomes. (Sauter, 2011, p. 13) They are interactive and flexible.

The strategic level of organization is responsible for solving unstructured problems. Top managers and experts for various areas have the main role on this level. Executive Support Systems (ESS) or Executive Information Systems (EIS) offer support for this management groups.

An Executive Information System (EIS) is an information system that supports senior managers in their managerial activities with relevant information. Executive information systems are a strategic-level information system that helps executives and senior managers analyze the organizational environment, identify long-term trends, and plan appropriate courses of action. The information in this system comes from internal and external sources. This system is highly individualized for small groups of users and very flexible. Besides analyzing, it helps managers to predict the future.

A quality information system is usually flexible, efficient, accessible, and timely. (Stair & Reynolds, 2011, p. 50) Firms are heterogeneous in developing and nurturing IS capabilities, therefore they are likely to have different potential in leveraging IT for their competitiveness. (Bhatt & Grover, 2005, p. 5)

The important function of information systems supporting decision-making is to have organizational database. Information systems have to add value to the organization and support the organization to achieve competitive advantage by integration of data, information, and systems as are presented on different management levels.

3. INFORMATION SYSTEMS FOR IMPROVEMENT OF THE QUALITY OF THE DECISION-MAKING PROCESS

In research conducted in Central Serbia for companies in food industry, especially companies in frozen fruit industry, a low level of using the information systems generally and for decision making specially was observed. Companies in this sector use information systems mainly for internal information about production, costs and physical conditions of food saving. One of their representatives is analyzed and the results are shown in this paper.

Company does not integrative system for management support. Since there is data in multiple places, it is difficult to obtain them because information is not easily accessible and often arrives late to take decisions that would improve the competitive position of the company. The objectives of the company are related to the quality of the product, but the company's management recognizes that the quality is not sufficient, and decision-making should be more effective and faster. For this purpose, they need the

information that information system is able to generate.

Processes and data were analyzed in this company, and results of these analyses are corresponding models.

For the process of designing decision making supporting system the most important are managers' requirements for information and identification of input data. Efficient information system has to include managerial roles and follow the decision making process.

Requirements of stakeholders of the chosen company were analyzed at the

operational, tactical and strategic levels in order to create support for decision makers. The construction of application software for management support was a successful response to these requirements. New logical model of the process based on the activities of the company and a new logical data model applying structured systems analysis were designed.

The root diagram for the company is shown on Picture 2. This diagram shows the company and its relationships with stakeholders involved in procurement and production.

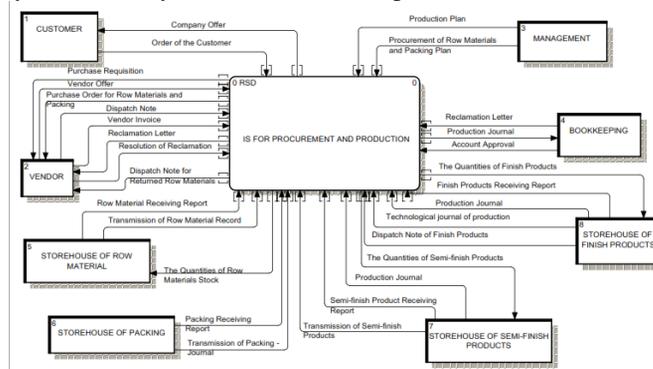


Figure 2. Root diagram of the company

Contextual diagram for procurement and production as one of the parts of the process model is shown on Figure 3.

This diagram includes a part of the analyzed company and its relationship with environment

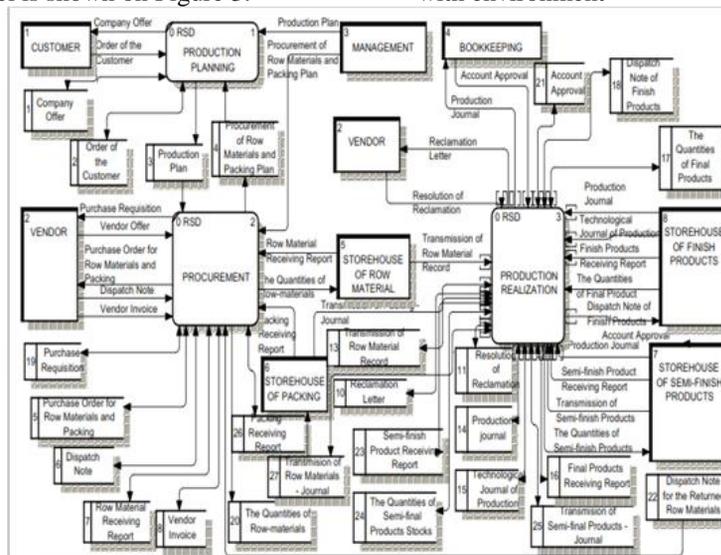


Figure 3. Contextual diagram of procurement and production

Process model elaborated on these pictures constructs the context for implementation of the solution that can improve decision making.

In accordance with the given management requirements, information on inventories of raw materials, semi-finished and finished products, information about procurement, production and delivery, information about suppliers, buyers, employees, and much other relevant information are available in designed application software. In the part of the application titled Information for management reports for operational, tactical and strategic management are generated.

Information systems as the one described above improve decision making by automating many decisions, especially for structured problems in procurement and production. This has a great influence on business value because these routine decisions have small individual value, but improving hundreds of thousands of “small” decisions adds up to a large annual value for the business, comparing with rare strategic unstructured decisions with large individual but small annual value.

Usage of information systems can diminish the time for making decision, use more sources of information, increase number of alternatives and disable imperfect decisions made by managers without using this system.

5. CONCLUSION

Introducing new and changing existing information systems usually involve many changes in organizations and management. Those who design and implement systems can be confronted with organization’s resistance to change. Information systems change traditional

roles and activities of managers. Activities of managers include numerous roles and tasks, and in this paper one of them is presented, decision making and impact of information systems on it.

Usage of information systems changes quality and the number of information available for decision making.

In the traditional approach managers make decision usually based on intuition and fragmented information mainly from company evidence and fewer from environment. The modern approach of information systems includes alternatives made by a system designed to support decision-making process and it consists of accumulated expert knowledge. On different management levels different information systems described in this paper assist in decision making. This depends on the type of problem that needs to be solved. The topic of this paper was, among other things, the designed solution for one company in food industry. In the company this system is in the implementation phase.

Based on the analysis of processes and data in the company, procurement process and production activities as critical success factors of the company are included. A database that provides timely and accurate information is created. This database was created for reports of the processes for all levels of management and data registering is facilitated by reducing the time and mistakes that may occur.

The application of management information system in this company facilitates business and allows faster access to data and information. This leads to more efficient and effective decision-making at all levels. Further work on these systems in the company will focus on all processes and results of implementation designed solution.

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