

Devising Multidimensional Assessment Integrated (MAI) Model of Business Decision Support Software Systems

Bekim Fetaji

*Department of Informatics
Mother Teresa University, Skopje, North Macedonia*

Majlinda Fetaji

*Department of Computer Sciences
South East European University, Tetova, North Macedonia*

Izet Zeqiri

*Department of Economics and Business Administration
South East European University, Tetova, North Macedonia*

Abstract- The focus of the study is to analyze the decision making process in decision support software systems and to devise a model that can be incorporated into Business decision support software systems. Decision support systems (DSS) in general is information systems that is used by managers to assist them in their decision-making process. In order to investigate the decision supporting process and to gain knowledge, ideas and understanding of the decision support systems, literature review of published research in the field was realized. Based on the insights from the realized background research devised is a Multidimensional Assessment Integrated (MAI) Model for decision support software system. The research study presents an in-depth analysis of decision support systems, analyses of the decision process, business psychological and other specifics, and their implementation into DSS. The main motive for this research is to analyze the implementation of decision support systems, and its impact on employee, managerial and organizational performance. The devised model is proposed and insights and recommendations are argued and discussed.

Keywords – MAI methodology, Mobile m-Commerce, decision support system, business model

I. INTRODUCTION

Decisions making process is crucial in many fields and especially in the business. Depending on the situation they can be interpreted as choices that are aimed to complete certain goals, tasks, or selections. The decisions made for these questions are endless and vary between individuals. In a business environment decisions are made on a daily basis and by form are different depending on the sector as discussed by [1]. Every decision is the same in nature and its function applies everywhere. Despite the aspect of decision making, a decision is a reasoned choice among alternatives.

Decisions are part of, and are frequently made, in the process of problem solving. In this process, the goal is to recognize and remove the problems and obstacles that prevent the problem from being solved. Techniques such as brainstorming are used to achieve the wanted results. Brainstorming is usually performed by a group of people and each of them presents different approaches of problem solving. After this is performed, one or more of the approaches are accepted, refined and implemented. If the implementation is not successful, the process will be repeated. Each decision is characterized by a decision statement, a set of alternatives and a set of decision-making criteria [2].

The decision statement serves as a guide for what to decide. It is of great importance to have a clear decision statement [5]. This way every decision maker whether individual or part of a group will have a clear understanding of the decision that must take place, and promotes greater focus on relevant subject rather than on irrelevant ones.

The alternatives present all potential decisions. In some situations, alternatives are limited, but in others they are in the thousands. In these cases, special decision tools for information retrieval are used. The criteria of a decision are what decision makers tend to optimize for making a better decision. Optimization might not be possible for

every criterion; thus compromises are made [4]. These compromises cannot be defined mathematically by the decision maker [8].

II. LITERATURE REVIEW OF DECISION SUPPORT SYSTEMS

Decision support systems are used in different work environments and are used for different purposes. Because of this, many definitions for DSSs have arisen. The following definition gives a general view: Decision support systems are computer-based information systems that provide interactive information support to managers and business professionals during the decision-making process. Decision support systems use (1) analytical models, (2) specialized databases, (3) a decision makers own insight and judgment, and (4) an interactive, computer-based modeling process to support the making of semi-structured and unstructured business decisions [9].

Companies today see greater accuracy and speed in decision making through DSS [8]. These systems, which are different from the standard transaction processing and management systems, are capable to tackle immediate and obscure managerial decisions, and meet company needs. For nearly fifty years decision support systems have developed and constantly improved to assist managerial work. The first Managerial Decision System (MDS) was built in 1966 by Michael Scott Morton [4]. His work presented an attempt to build a model-driven decision support application with second generation computer technology and had studied how analytical models could benefit in planning decisions. Because this Management Information System (MIS) was used for structured decisions only, the term “Decision Support Systems” was suggested for systems that support semi-structured and unstructured decisions.

According to [9] between the early 1970’s and late 1980’s decision support systems gained greater popularity in use and attention from academics that contributed to its research and development. Compared to MIS for report-generating and planning, DSS had developed into more sophisticated computer-based systems that supported on-demand analysis for marketing, production, pricing, logistics, etc [3]. Due to increase of the framework, new DSS emerged.

The framework consists of data-driven, model- driven, communication-driven and knowledge-driven DSS.

According to [8] during the 1990’s that a paradigm shift occurred in Decision Support Systems and more complex systems, which incorporated, advanced database technology and client/server capabilities, were emerging from many areas in business processes. As many organizations started to upgrade their network infrastructure, object oriented technology and data warehousing started to make its mark on Decision Support Systems. The rapid expansion of the Internet provided additional opportunities for the scope of Decision Support Systems and consequently many new innovative systems such as OLAP and other web-drive systems were developed [10].

Today’s business environment is more challenging for existing businesses to keep up with the working pace of bigger companies. This is due to technological advancements and their contribution to automation of existing business processes and creating new, better business processes altogether. With atomization in certain areas like accounting, finances, sales and production a business certainly will gain greater efficiency, increase revenue by cutting recourses spent for realization, and minimizing the chance of human error. These processes are mainly structured and routine work which is processed by systems such as Transaction Processing Systems (TPS) and Management Information Systems (MIS) [6].

III. ANALYSES OF DECISION CLASSIFICATIONS

Several categories for decisions exist. According to [1] categorization is found to be of use since some decisions that are from the same type in most cases have similar characteristics. In the process of planning a Decision Support System (DSS) determining the decision category is advisable for proper selection and functionality of the DSS. Following Gory and Scott Morton, we can organize decisions along two dimensions: the nature of the decision to be made and the scope of the decision itself [18, p. 42]. Decisions by nature can appear as structured, semi-structured and unstructured. The scope of a decision is characterized as operational, tactical, and strategic decision.

The following will explain the nature of decisions:

Structured decisions are decisions that are made based on previously defined decision procedures and decision rules. If a decision contains specified inputs, output, and internal procedures for all three decision phases (intelligence, design, and choice), then the decision is structured.

Semi-structured decisions possess structure in some parts of the decision process while the rest remains unstructured. These types of decisions besides using standard solutions and procedures have the capability to add minimal changes and individual judgment.

Unstructured decisions are not structured in any of the three phases in decision making. These types of decisions have no routine, and are made based on predicted data that are unknown and not fully understood. The explanations for decision scope are as follows:

Strategic decisions have effect on the whole organization. The effects have a long term impact on the organizational environment, resources and people. These sorts of decisions are usually carried out by top management of an organization.

Tactical decisions are made by middle managers based on the strategic policies of the top management. The aim of these decisions is to keep the company successful. They are used to ensure that the organization stays profitable, functional, and fulfill the strategic decisions.

Operational decisions are carried out for only one specific activity. The activity itself is previously determined by top and middle management in terms of recourses, tasks, and goals. These types of decisions have no long-term effect on the activity or the company.

IV. ANALYSES OF BUSINESS DECISION MAKING

The success and failure of a company relies mainly on the decisions made by managers and other decision makers. Because of its importance it has been a subject of study for recognizing the motive and method of decision making. The nature of the decision most probably will find place in one of the three dimensions in which decisions are generally made. Rationality of a decision maker is demonstrated through analyzing all possible data that can be collected in accordance to the task, create all possible alternatives of solving the task, and picking a alternative that most suites task needs for completion. When a decision maker takes a totally different approach in decision making, out of bounds of tradition and structure, the decision maker exhibits flexibility.

Decisions which involve other decision makers and assignment of organizational roles are known as political decisions. The rationality dimension classifies its decisions in two general models: normative models and descriptive models of decision making.

Decision makers that have to make the right decision based on statistical analysis, within range of the set norm, are decisions made with normative models. Descriptive models are used to explain how people really do make decisions. This model is different from the normative model as it does not have a quality norm, has limited time and resources for decision making and motivation that is hard to determine and approve.

V. PSYCHOLOGICAL AND CULTURAL EFFECTS ON DECISION MAKING

Our psychological traits define us for who we are. One explanation given by [3] states that every individual has personality traits that is constant. Other personality traits and behavior can be determined by knowing the previous reaction of the individual in similar situations. His claims on human behavior where later on reworked by [4] and state that humans poses four key behavior characteristics which are produced by a palette of behaviors. Based on the Myers-Briggs Personality Chart as discussed in [2] we can clearly see the relations between characteristics, which create the psychological type or personality. To find out a psychological type of an employee or decision maker a questionnaire is given to them, and after filling out all queries, is processed by a specialized team to give greater meaning and insight of the answers. The main four characteristics affect decision making. These are introversion/extraversion, sensing/intuition, thinking/feeling, and judgment/perception. The psychological type of the decision maker can give us an idea of the style and actions of a decision maker in working situations.

According to [10] suggests that one personality type can be part of more than one decision making techniques as discussed by [10]. In decision making, culture has great influence. Culture can be understood as a way of behavior, views and beliefs of a social group of people. Decision making is exercising a certain behavior of an individual in a group or the behavior of a whole group through the process of decision making. Culture can be divided into two aspects: organizational and national.

In organizations, the overall behavior between employee and employee and their approach to customers or other entities involved with the organization, is considered as organizational culture. Problem solving, decision making and goal achievement is also done in the fashion of the organizational culture. When it comes to decision making, some organizations tend to be more centralized about their decisions, and others make their decisions in every division separately.

The national differences are even greater. Different managerial approaches are practiced in different countries. Some decisions are made by few people and if necessary consult someone else, and some do not make a decision until every party involved agrees on the proposition. The above mentioned refer to American and Japanese managerial styles.

Decision support systems, with the latter in mind, might not serve all styles of decision making for managers. In this case, decision support systems which are used for faster decision making are more beneficial to the American style of management and have no value to Japanese management [4].

Before a DSS is to be designed, the designer must have a great understanding of organizational and national culture. This is acquired by thorough investigation of the organization, and getting to know the national culture via books, everyday conversation, etc. Any chosen approach is useful.

VI. ANALYSES OF BENEFITS AND ISSUES IN DECISION SUPPORT SYSTEMS

Organizations find use of decision support systems for different situations. Some of them are made specifically to the needs of a decision maker and give the support needed for improving decision making. Other systems are implemented for the purpose to automate and improve already existing operations. Often, the goal is to provide a better decision process. There are many ways in which a better process can manifest itself. A better process might result in the same decision but reach it faster or with less expense. A better process might increase understanding and insight. A better process may result in the same decision but provide benefits [1] when the decision is implemented.

The assessed benefits are listed below:

- Improving Personal Efficiency; The use of spreadsheet software used in financial work serves as an example. It speeds up the process of calculation and minimizes the chance of error. Efficiency has an impact on effectiveness and productivity.
- Improving Problem solving; DSS makes it possible for people to solve a problem faster or better than people without it. Depending on the nature of the problem, some decisions must be made faster than others.
- Facilitating Communication; Communication is facilitated in more than one way: When a DSS is used for convincing other people for the actions take by creating a common basis for decision making which is important for group decision making. A form of DSS called groupware provides these accommodations to the decision makers. Examples: electronic mail, computerized bulletin boards, and different forms of electronic conferencing.
- Promoting Learning or Training; Repetitive use of decision support systems is necessary for exploring all possibilities available for a decision. Experience of use and future outcomes of previously made decisions promotes learning and training.
- Increased Organizational Control; Decisions are made by organizational norms, guidelines, or requirements. DSS might also be used as a tool for management to monitor decisions made by other individuals and to compare the results of their actions.

The assessed limitations of DSS are listed below:

- Decision makers might lack technological knowledge; Decision support systems have evolved to be more easy to use. But still, in many situations, the lack of technical knowledge of users for performing analysis persists as a problem. This issue is commonly present in smaller businesses.
- Factor assessment is difficult; Decision support systems may help give a result for a certain query, but it does not mean that it is definite. Depending on the problem, more than one factor is needed to be analyzed before a decision is made. The end result is highly dependent of a decision-makers judgment.
- Model limitations; The decision support models are created to process data within the boundaries of the model. Results of these kinds of systems may be different than the results expected by a decision maker due to change of factors that the model is prohibited to take into consideration.
- Problems with data collection; Due to problems with data errors in recording and relations, decision support systems tools might have a problem with collecting the needed data for analysis.

- Resistance to change; Users and stakeholders of an organization are most likely to reject the idea of implementing a new system because of potential change of processes and fear of learning new tools and techniques. System might not meet user requirements.
- System design failure; The design of a system might not meet the requirements of a decision maker. If systems are not tailored to an individuals' style of decision-making, the user would find it more difficult to make decisions.

VII. THE DEvised MAI MODEL FOR DECISION SUPPORT SYSTEM

Based on the insights we have gathered and the previous analyses, we have devised our model as provided below in Figure 1. In order for the decision support system to bring proper decision it should have as input:

- 1) Data collection that is tailored to style of the specific decision making of the team
- 2) Realized is an assessment of the impacting factor of the business that we need to bring decision upon
- 3) Strategic Management Plan input and what is set as future goals
- 4) Key performance indicators and how we are measuring them for particular situation

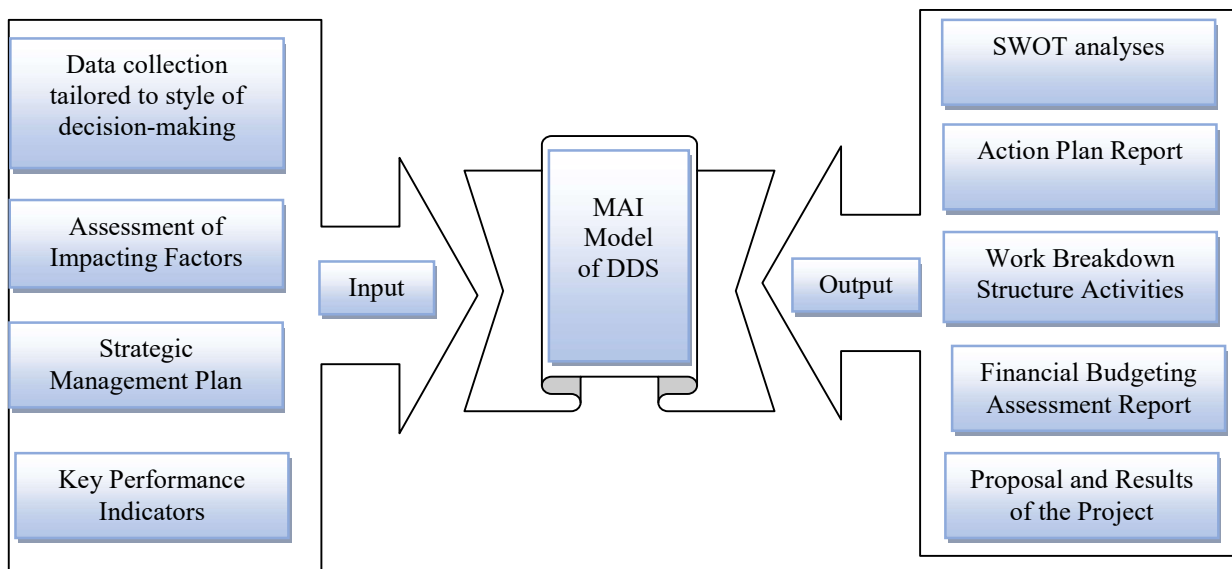


Figure 1. MAI MODEL FOR DECISION SUPPORT SYSTEM

As output of the developed decision support system should be: 1) SWOT analyses, with clear representation of strengths, weaknesses, opportunities and threats 2) Action Plan report with estimations of working groups and who is responsible for what activities, 3) Work Breakdown Structure Activities, 4) Financial budgeting assessment report to have a clear idea of the budgeting issues and possible bottle necks of the situation that we need to bringing decision upon, 5) Proposal and results details of the project.

IX. CONCLUSIONS

The research study investigated decision support systems, analyzed decision classifications in the process of problem solving and the classifications into Structured decisions, Semi-structured decisions, Unstructured decisions, Strategic decisions, Tactical and Operational decisions. Discussed the issues and benefits of each of the classifications, when they should be used and their importance. Also analyzed business decision making process and how it is currently realized explaining rationality dimension, political and financial dimension in the decision making process. Also the research study analyzed psychological and cultural effects on decision making by analyzing the psychological type of an employee introversion/extraversion, sensing/intuition, thinking/feeling, and judgment/perception.

Also an investigation into the analyses of benefits and issues in decision support systems was realized. Defined and listed the assessed benefits and the assessed limitations of DSS –decision support system.

Finally based on all the insights from previous analyses proposed is the Multidimensional Assessment Integrated (MAI) model for the decision support system which is discussed and explained in the figure 1.

Future research will focus on assessing the model with focus groups and questionnaire with 2 groups of users, customers and decision makers and later analyses the statistical covariance of the devised model.

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