2

Knowledge-Based Decisions in Tourism

Diana Târnăveanu
West University of Timişoara
Faculty of Economics and Business Administration
Department of Informatics and Economic Statistics, Timişoara
Romania

1. Introduction

"The world faces mounting changes and challenges which call for innovative strategies and policies. Governments, business and civil society need to devote attention to knowledge management in tourism, to better understand and act upon the forces shaping today's world, especially on the critical issues of development, climate change and governance" said UNWTO Secretary-General, Taleb Rifai.

In the past century, economic sciences have known an explosive evolution, passing from an intuitive, fact-based analysis to an abstract one, based on multi-disciplinary and complex theoretic constructions. It is the era of applying scientific mathematical methods as instruments of argumentation and decision, passing from intuitive axioms to more formalized ones.

In a competitive economy, the success of an organization depends decisively on the quality of their managerial decisions. Alongside the development of business information systems, the decision making process implies a large volume of data and a complex process of analysis and synthesis. This information gathering, processing and analyzing capability needed for the decisional process exceeds human capacity by a great margin.

In tourism, modern organizations are confronted by an ever increasing pressure to find new ways to compete effectively in a dynamic global market. Many are turning to e-commerce and virtual structures, such as virtual organizations and virtual team structures, to improve organizational agility and expand into the global market (Baggio&Caporello, 2005). Others adopted knowledge-based tourism business-to-business (B2B) communities solutions, requiring the adoption of a multidimensional, multilevel perspective on system design that incorporates knowledge creation and transformation processes and takes organizational stages of effective technology use into consideration (Gretzel&Fesenmaier, 2004). A recent paper proposes a model of a Knowledge-based System that makes it possible to evaluate an organization at a Knowledge Management Capability Assessment Maturity Level (Andrade, et al., 2010). Contemporary Information and Communication Technologies (ICT) increase efficiency, reduce costs, and improve customer care.

Among the great variety of applications developed for the tourism sector, Decision Support Systems (DSS) can play a fundamental role for their capacity to give organizations the possibility to base all the decisions concerning policies, infrastructure development and stakeholder's progress on sound and rational bases (Baggio&Caporello, 2005).

We noticed time and effort are wasted when information is not at hand. The decisional factor could use some help in making decision based on what-if predictions. Hybrid support systems are systems that result from integrating decision support systems (DSS) with other tools and technologies in order to maximize efficiency of the decisional process. Our proposal is a hybrid system which comprises a combination of a model oriented decision support system (spreadsheet based flexible systems, used in what-if predictions) and knowledge-oriented decision support systems (software modules based on knowledge manipulation) to reach these goals.

One of the main elements in building a knowledge-based system is the representation of knowledge, the quality of cognitive systems being essential to the proper function of a decision support system. Steps have been taken in order to transcend the natural language and achieve a symbolic axiomatic language. We believe that the main direction in reconstructing the economic theory is by using logic and semiotic tools (Târnăveanu, 2010b). The decision modelling system built by us uses the intelligence of a decision support system of an invariant nature. We proposed a formalized axiomatic system, using semantic decision trees. To build a generally valid system (a formalized one) it is necessary to create an interconnected system of variables. We divided this complex system into several trees and used production rules theory. We implemented it in Microsoft Excel 2007, using Visual Basic Application – a powerful tool that uses procedures in order to control Excel's objects behaviour.

We believe we found an original way of representing knowledge with mathematical tools (logic and axioms) in order to elaborate the axiomatic formalized system, using methods such as decision trees and transposing them into production rules, as well as building a decision support system capable of intelligent informing. One of the biggest advantages is the systems' flexibility through its invariant nature. The negative aspects are determined by the fixed form of the interconnected system of variables and the lack of implementing it using a web-based solution. We believe this could be a fertile ground for future research.

2. Knowledge and competitive advantage

Modern organizations worldwide are slowly discovering that controlling knowledge is a major component of strategic growth and creating a competitive organization. In the second part of the last century, tourism has become one of the most important economic activities in the world (Baggio&Caporarello, 2005). UNWTO expects international arrivals to grow by 4% in 2011, slightly above the long-term average. Information and communication technologies have profound implications for the tourism industry. Organizations use knowledge-driven applications in order to respond quickly to continuously changing market conditions and customer needs.

Knowledge based organizations are intelligent, complex and adaptive systems constituted by networked people, knowledge workers and intelligent agents that together are able to combine knowledge and solve problems, creating business value and adapting the function of that organization, adapting to changing enrivonments and increasing the competence of the organization (Niculescu, 2009, Scorta, 2009, as cited in Muntean&Târnăveanu, 2009b).

The study and practice of knowledge management has grown rapidly since the 90's, driven by social, economic, and technological trends. Tourism has been slow in adopting this approach due to not only a lack of gearing between researchers and tourism, but also to a "hostile" knowledge adoption environment (Cooper, 2006). The acquisition of this approach would close the gap and also provide both insights and potential applications for tourism.

2.1 Data, information, knowledge

Epistemology (knowledge theory) is a part of Gnosticism and studies the human knowledge in different sciences; it is a theory of scientific knowledge. Its purpose is the study of knowledge nature, structure and origin, whereas cognotics identifies the cognitive structures and the processes that influence human performance and their embedment in intelligent systems.

Knowledge is the basic concept in knowledge management. To better understand the concept of knowledge we will present the concepts of data and information, both of which are often confused with knowledge.

Data can be considered rough facts than can be processed in different types of information. The most important problems are related to the volume and the nature of information. Without **logic** and **reasoning**, data can be completely useless. Therefore quantity is not a determining factor, even if without data an organization can't exist. Most often data is obtained by measuring and observing the system's variables. Processing of data implies organizing, sorting, recording and classifying the data in order to perform calculations and make decisions.

Information is data with meaning, usually processed and formatted. Unlike data, information makes understanding relationships possible. They have meaning, purpose and relevance and can be organized and analyzed from a statistical point of view so that the documents, reports and messages make sense. It is important to notice that information has a semantic content that is not dependant on the physical support through which it is transmitted.

Knowledge represents a group of information, processes and experiences focused on a particular subject. Knowledge refers to the way people understand a specialized activity domain acquired through study and experience. They are based on learning, thinking and familiarizing with a domain inside a department, division or organizations in general. Knowledge derives from information much like the way information derives from data, including aptitudes, training, perception, experience and common sense. Knowledge implies people interacting with reality and confers intelligence to objects that incorporate it, most of the time reducing their size and making them easier to handle.

Concluding on the differences between data, information and knowledge, we can underline the following:

- **data** is an objective and static resource;

- **information** is an ensemble of meaningful data and has a value related to the purpose;
- **knowledge** is subjective, dynamic, created in the context of the social interaction between an individual and the organization, connected to the context and is relative (being derived from the creative capacity of the individual);
- **information** differs from **knowledge** through size, nature and intelligence;
- **information** is smaller than **knowledge**, being a component of knowledge (like pieces of puzzle);
- **knowledge** always contains **expertise**, elements that generate solutions, with economic substance;
- **knowledge** has a longer life than **information**, sometimes unlimited.

Meta-knowledge (wisdom) represents the highest level of abstraction, encompassing vision and the ability to see beyond the horizon. It is the accumulation of a person's professional experience in an activity domain. Some authors refer to meta-knowledge as being synonym with wisdom.

2.2 Knowledge management

Knowledge management is a new organizational model, constantly improving itself, inter-disciplinary and based on knowledge [Dănăiață et al., 2006]. It is the sum of all activities that have the purpose of discovering, coding, storing, disseminating, improving and using of knowledge inside an organization. Any organization, regardless of the size or activity profile, can increase its success rate if it uses the intellectual resources of its member adequately. Knowledge management exploits human resources in order to fulfil the objectives of the organization. It involves three factors: human resources, technology (IT infrastructure) and organization's processes.

Globalisation takes place in the context of the information society and offers the partakers involved in the business environment vast opportunities. Under these conditions, organizations should develop new business models to stay competitive. Therefore, adopting a knowledge management solution in an organization requires different types of software, intelligent and conventional, systems, tools and the usage of adequate techniques. Knowledge management will become the basic activity on all levels of organizations. An important aspect will be that of **moral** usage of knowledge at the global level, so that we will develop a conscious society.

Romania's chance is in developing technologies based on multidisciplinary scientific knowledge. Some of the European Union's objectives are collaboration, attraction of new resources, forming human resources, promotion of technology transfer on regional level among other such milestones. The competitive advantage in the knowledge based economy will be determined by the continuing capacity of acquiring new abilities (for members of the organization and therefore for the organization itself) and the promptness in effectively exploiting the top knowledge acquired.

In the future economy, an economy based on knowledge, intelligent decision support systems will experience an exponential growth. Technological and organizational knowledge will become as important as scientific knowledge. The first direction is developing programs that assist the economic specialist in choosing the most plausible decisional alternative from many possible ones. These programs are called **Decision Support Systems** (**DSS**) and their results are precise if all hypotheses are well grounded. The second direction is simulating the thought process of the specialist with the help of a **Knowledge Based Systems** (**KBS**). An evolved KBS should incorporate knowledge pieces capable of explaining the economic phenomenon in all its complexity. The evolution of DSS and KBS depends on the evolution of knowledge representation. In the near future, the problem of unconscious knowledge based on intuition and imagination will be of great importance.

2.3 Knowledge representation

Researchers concentrated their efforts in finding techniques of representing knowledge as a way to formulate a problem so that it is easy to solve, and the ways to search for the solutions so that the results could be displayed in real-time.

The fundamental problem of artificial intelligence is not identifying some efficient techniques, but discovering methods to represent vast quantities of knowledge in a form that allows its efficient usage (Goldstein&Pepert as cited in Zaharia, 2003). The techniques of knowledge representation imply specialized manipulation routines that allow intelligent **inference**. Inference mechanisms refer to the most adequate processing of knowledge with the purpose of deriving new knowledge pieces which are most relevant to solving the problem. **Representing knowledge** implies designing a class of data structures to store the information and developing procedures that allow their intelligent manipulation in order to perform inferences. But a data structure is not knowledge, in the same way that an encyclopaedia does not mean knowledge. We can say that a book is a resource full of knowledge, but without a reader to understand it, it is just ink on paper (Tacu et al., 1998).

Most researchers in the artificial intelligence domain start by assuming that **what is needed to be represented is known**, so the programmer's job is to figure out **how to code the information** and **the procedures to follow**.

The ability of the system to provide useful information depends on the quality and the volume of knowledge that is owned and can be used in reasoning processes.

There are many knowledge representation methods; they have been developed over time and they use problem specific aspects. They all have two common characteristics:

- they permit usage of many programming languages or expert system generators, and the result is stored;
- the results obtained can be used in reasoning mechanisms.

2.3.1 Binary trees

In order to study economic phenomenons and processes, they have to be organized within a logical structure. This organization could be done with the help of trees (Băileşteanu, 2005).

A **binary tree** is a data structure in which each node has, at most, two child nodes, usually distinguished as "left" and "right". Nodes with children are parent nodes, and child nodes may contain references to their parents. Any node in the data structure can be reached by starting at root node and repeatedly following references to either the left or right child.

A binary **tree** is a structure T={X,r}, where X is the set of nodes within T, and r is a binary relation within X so that:

1. if x, y ∈X and x r y, then x is called the **predecessor node** of y and y the **successor node** of x;
2. there is exactly one node in T does not have a predecessor. This node is called the **origin** or **root** of T;
3. each node that is different than T's root has exactly one predecessor.

The line that links together each node with its successor is called an **arch** of T. A **final node** is a node without successor. The sequence of arches that link the root with a final node is called a **branch** of T.

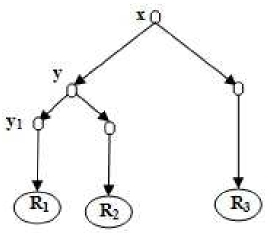


Fig. 1. Semantic tree T_1

We can notice that x is the root of tree T_1, y_1 is the successor of y and R_1, R_2 and R_3 are the branches of T_1 tree (figure 1).

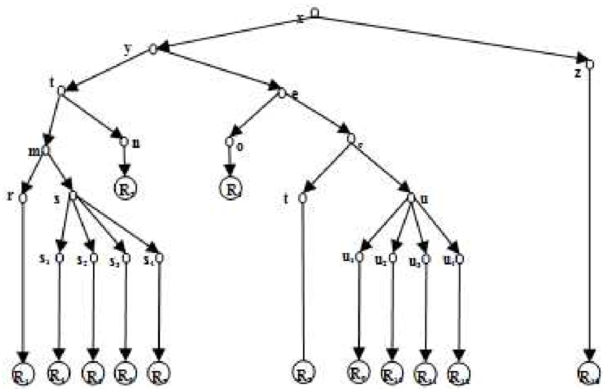


Fig. 2. Semantic tree T_2

In figure 2 – x is the root of T_2, t is the successors of y and the predecessor of m; and r, n, o, t, s_1, s_2, s_3, s_4, u_1, u_2, u_3, u_4, z are final nodes of T_2; (y, t) in an arch in T_2 and R_1...R_{ij} are the branches of T_2.

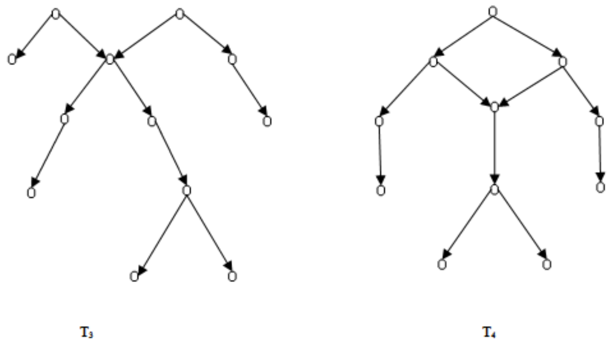


Fig. 3. Semantic trees T_3 and T_4

T_1 and T_2 are binary trees. The branches of these trees are oriented downwards. T_3 is not a binary tree because it has two roots, and there is a node with two predecessors. T4 is not a binary tree either, because it has a node with two predecessor nodes.

The **semantic tree method** is an automatic method of semantic analysis, which consists of determining the logical values of sub formulas of the given formula. It reduces complexity through the elimination of logical constants (truth-functional connectives and quantifiers) and places sub forumulas of a considered formula on branches of a binary tree. The semantic tree method is a very interesting and universal method. It forms an important part of the mechanization of reasoning (Bondecka-Krzykowska, 2005).

2.3.2 Production rules

One of the most efficient of the representation methods is called **production rules.** The idea behind this method is to separate the common calculation components with the purpose of correctly and efficiently handling the processes in which they are involved.

In 1943, E. Post suggested what he called **rewriting rules**, derived from formal languages. Production rules were built based on those rules. Knowledge is based on three fundamental concepts: **facts**, which is the primary information that describes the elements of the considered domain, **rules**, which describe the how facts can be used and **reasoning strategies** or heuristic methods that express the way in which rules can be used.

A **production rule** has two parts: establishing the condition (IF) and the action (THEN). Sometimes an implication symbol (→) is used to describe a production rule as an equivalent of IF-THEN.

The general form of a production rule is:

$$\text{IF condition (premise) THEN action (conclusion)} \tag{1}$$

or

$$\text{Condition (premise)} \rightarrow \text{action (conclusion)} \tag{2}$$

where both conditions and actions are facts.

A production rule can be interpreted as: if the premise is true (the facts that compose the premise are confirmed or verified by the facts database), then the fact (or facts) from conclusion are also true and can be added to the facts database.

A more general **production rule** can be written as:

IF
Condition 1 ◊
Condition 2 ◊
...
THEN
Action 1 ◊ (3)
(3)
Action 2 ◊
...
ELSE
Action 1′ ◊
Action 2′ ◊
...

where:

- condition 1, condition 2, … are the premises (the hypotheses);
- action 1, action 2, … are the conclusions (the consequences);
- ◊ represents the logic connector (AND, OR, NOT et al.);
- action 1′, action 2′, … are the conclusions (the consequences) when the premises (the hypotheses) are false (Andone&Ţugui, 1999).

As in the definition of information, rules are usually deduced from other rules, so that the action (conclusion) from one rule can be found in the premise of another rule. In this case, the final action will imply rule linking based on reasoning. Splitting knowledge in fragments or knowledge pieces makes the knowledge database to be organized in a modular way, so it can be **easily updated**.

One of the largest **disadvantages** is that while the system accumulates knowledge, its performance diminishes, and the response time grows exponentially (because of the large number of rules accumulated).

Most times, when solving a problem, an expert will use knowledge that supervises the process in obtaining the solution. This is a superior knowledge and makes use of the problem solving domain in order to determine the best way to solve the problem. Its name is meta-knowledge. Meta-knowledge is represented with the help of **meta-rules**. So a meta-rule represents a rule that describes how other rules can be used. It determines strategies of usage of specific rules within an applicative domain and ir does not establish any conclusions.

A very important issue is the one of the ratio between **relevance** and **precision**. From the general system theory we know that a system divided into a smaller number of sub-systems has greater relevance but lacks precision; whereas adversely, relevance is diminished and precision frows.

We consider that the area of production rules should to be extended in order to create axioms for economic sciences. This fact was suggested by experience when we observed that the production rule sphere is much more extended than what we found in the available literature. From our point of view, even the calculation of an indicator is a production rule. We consider that when axiomatic research focuses on a problem, all the necessary rules for solving the problem should be presented. In this chapter we present a system of production rules that we consider the principal core that exists in all axiomatic systems (Băileșteanu&Târnăveanu, 2006).

3. Decision support systems in tourism

The decision and the context of decision making are two key aspects that characterize the utility of the decision models. Data, information and knowledge are used in the decision making process, corroborated with the manifestation of reasoning based on the intelligence and experience of the decisional factor.

Starting with the five managerial functions; crowning decision as the umbrella above all other managerial functions, we will detail different types of decisions and the utility and importance of each of these decisions.

In the managerial practice of an organization, in the context of intense and comprehensive computerization, decisions and decisional processes are conceived and performed more often with a systemic vision. One of the most important characteristics of a successful manager is its ability to make **quality decisions**.

3.1 Decision

Decision can be defined as a line of action, consciously chosen from multiple possible alternatives, in view of an objective (Dănăiață et al., 2006).

We can outline the following characteristics: it is a volitional act that always has an ending (its purpose is the fulfilment of an objective); it is a conscious thinking process based on evaluation criteria made by an individual or by a software program, but which requires specific knowledge; it is referring to a future state, even if it is based on information from present or past; is the object of all managers, from superior hierarchical organisms to the ones situated at the bottom of the organizational pyramid; it is the mechanism that turns the organization around and assures integration of all efforts in order to fulfil the objectives.

Lately decision is observed as a passing from methods and procedures based on experience, intuition and empiric methods to methods based on science.

Managerial decision can be defined as the decision that has direct consequences on decisions and actions of at least another person. It is different from the personal decision in that: managerial decision implies at least two persons: the manager that decides and one or more employees that apply in practice the decision; managerial decision has influences at the group level, does not affect the action of just one employee; managerial action determines effects at least at the level of an organization department.

To be **useful**, the decision has to fulfil some requirements:

- to be **scientifically postulated**, to take into account the actual conditions and the environment to which it refers to, to follow the tendencies of economic systems and their laws, to pay attention to the particularities of the organization in which it will be implemented, and all the internal and external information referring to the decisional problem;
- to be **empowered** – the decider should be that entity (individual or collective) who has the legal right or at least the necessary authority. Best decisions are taken by the people closest to the place of action. Only in extreme cases, when necessary information is required or the gravity of the problem surpasses the competence of the decider, managers from a superior hierarchical level should step in;
- to be well **delimited** to avoid misinterpretation;
- **correlated** with the previous decisions regarding the same issue – so it will not create confusion and contravene to prior decisions, to integrate with the strategies and policies of the organization;
- to be **well-timed**– to be taken exactly when the situation imposes its necessity. Managers should solve multiple managerial problems in a very short time due to the rhythm of the organizational changes. Finding a quick solution to the organization problem doesn't imply that the decision is timely. By decisions' **opportunity** we mean obtaining the results in useful time;
- to be presented in a clear and concise form, easy to understand for the person who will perform it.

Decision is a result of information and knowledge processing made by a person or a group of persons that constitute a decisional organism. They have the necessary authority and are in charge of the efficient use of resources in certain situations and are called **deciders** (Filip, 2007). They need information that is supplied in an efficient and pertinent way by the information system.

3.2 Information systems

Information systems play three fundamental roles in assuring the success of an organization:

- support the organization's activity and operational processes;
- decision support systems (for employees and their managers);
- support for strategies related to competitive advantage.

In any moment, information systems designed to support the organization's activity and operational processes send and/or receive data from decision support systems or support for strategies related to competitive advantage systems (Figure 4).

Therefore, organizations take constant care of integration of all their information systems, allowing information to travel freely from one system to another, assuring a greater flexibility and a better support than any individual role.

The concept of Information System is used frequently in the day-to-day speech because of the expansion of using calculation systems in economic and social organization activities.

A modern manager has to make decisions based on a large volume of information, so the Information System is used for storing, processing and generating the information necessary in order to sustain decisions.

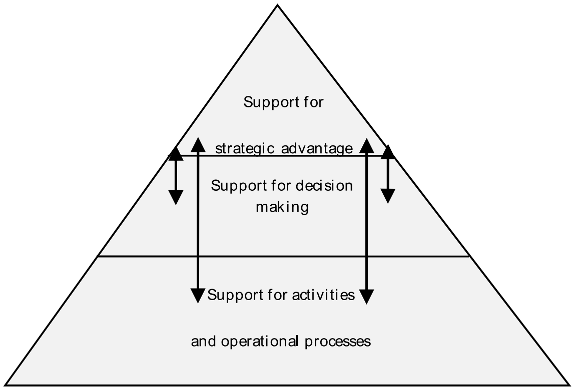


Fig. 4. The three fundamental roles of information systems (Dănăiaţă, et. al., 2007)

In the middle of the 1950's, **Electronic Data Processing** systems appeared, especially in accounting (because it uses large volumes of data). Their main objective was processing information from a specific area. Data, once stored, started to be processed in order to fulfill managerial demands, adding a new role to the Information System. **Management Information Systems** were born – being oriented to giving information to tactical leadership, in the form of reports and other predefined situations (at the beginning of 1970's). Later, they tried to ease the decisional process, taking over a part of the decisional factor's effort, being obvious that predetermined information products didn't properly respond to all of management's needs. So **Decision Support Systems** appeared. The new role of the Information System is to give managers a prompt and interactive support in their processes of decision making. This help was adapted to decisions and decisional styles of managers and to respond to practical problems in the real world. The 9th decade marks an important progress in developing and applying Artificial Intelligence techniques an in **Business Information Systems**. So, in the middle on the 1980's, **Expert Systems** become popular, from which developed at the end of the century **Knowledge Based Systems**, processing human knowledge. Recent systems include intelligent software agents that can be programmed in order to act when the user desires and functions that adapt to his needs, virtual reality application, advanced robotics, natural language processing and a lot of other applications where artificial intelligence eliminates the need of human intervention, allowing personnel to fulfill more complex tasks. These systems can overtake some of the activities from the older systems, being consultants for users and offering professional advice (with a high level of expertise) in some practical areas. In the middle of the 1990's **Enterprise Resource Planning** appeared. This is a strategic information system adapted to an organization that integrates all the aspects of its activity, including planning, production, sales, resource management, customer relationships, financial management, human resources, marketing – in theory, every function of the organization. ERP's main advantage is the common interface for all the computerized organization functions, their full integration and data sharing necessary for a flexible strategic decisional process. Lastly, the Internet, extranet and the booming development of other interconnected networks , have further determined another change in the role of Information Systems. Therefore, Web-ready Organizations, based on Internet and Trading Global Systems and E-business are the common denominator of operations and modern organization management.

3.3 Decision support systems

The concept of Decision Support Systems (DSS) was defined at the end of the 60's, when everybody used computers without the help of specialists. It defines any information technology focused on supporting the decision process (Târnăveanu, 2010b).

Herbert Simon considered that the main problem in management is organizing the decision making systems on different levels and decisional cores, acknowledging that organizational problems depend on the quality of the relationship between cores, of the pertinence of the established objectives, on the transmitted information and the strong convergence of the behaviours (as cited in Harmon&King, 1992).

Developing support information systems for leaders was determined and favoured by the conjugated action of many influential factors (Filip, 2007): changes in the decision-making environment, acknowledgement of the limits of human deciders, the shape of the behaviour of decisional assistants, the developing of a set of tools specific to decision support and the transposing of these tools into commercial computer products, the evolution of the concept of design for management information systems, information technology and progress in communication, specially the extended use of the Internet and the experience gained from using Information Systems created for decision support.

3.3.1 Characteristics and requirements

At the organizational level, the impact of new information technology affected the most important area of managerial activity: the decision-making process.

A Decision Support System is an information system based on a set of procedures for data processing and reasoning, with the objective of helping the manager in the process of decision-making, coupling intellectual individual resources with computer capabilities. The **objective** of a DSS is to support decisions for all management areas: strategic planning, managerial control, operational control, etc. Its aim is to decrease the effect of the limits and restrictions of the decider through computerized implementations of some of the decision support functions.

We will present the ideal model, defined by a set of characteristics and requirements (Turban as cited in Shahua&Salvolainen, 1994):

- to solve manager's problems when dealing with weakly structured or unstructured data;
- to offer support by combining reasoning and human judgment with computer processing;
- to assist all the managerial levels within an organization;
- to support individual and group decisions;
- to be adaptable and flexible;
- to combine modules and analytical techniques with traditional functions;
- to have a user-friendly interface, interactive communication with user;
- to facilitate learning processes– offering new ways to interpret information;
- to be prompt, accurate, clear and to reduce organization's costs;
- to assure total control for the human factor;

- to constantly accumulate new knowledge necessary for developing, analysing and perfecting itself;
- to embed both information and models.

For 30 years, researchers and IT specialists have studied and built a great variety of systems that offer decisional support. Lately, new concepts have emerged, such as business intelligence, on-line analytical processing, knowledge management and technologies such as Cloud Computing, taking the theory of decision support system to a new level.

3.3.2 Benefits and limitations

From the advantages of using a Decision Support System we underline:

- the quality of decisions (the solution is a result of deep analysis, based on analytical models, considering a large number of alternatives in a short period of time);
- improvement of individual decisional abilities: learning new concepts and methods, deeper understanding of the phenomenon, the transfer of knowledge from costly or unavailable deciders (experts);
- cost reduction;
- improved communications;
- objectivity and impartiality;
- better productivity based on better time-management (the period of time in which a decision is made is shortened);
- better client and employee satisfaction.

From the limitation, we took into account:

- the lack of human qualities such as: creativity, intuition, imagination, sense of responsibility, self-preservation instincts;
- depending on the cost allocations, the hardware resources can be limited or of insufficient quality;
- can't solve randomly generated problems – it has a specific purpose, with a restricted domain and solves a well-defined and delimited range of problems;
- compatibility issues can appear when integrating it in the global informatics system;
- confusion and differences can appear in the significance of some terms due to cultural differences;
- insufficient or badly structured documentation.

3.4 Decision support systems in tourism

The perception of Romania as a tourist destination is unclear; it does not enjoy a good reputation as an alluring trusting destination for occasional tourists. The re-launching of tourism in Romania as a tourist destination and the attraction of a larger number of foreign tourists could bring supplementary benefits, but would require many necessary changes, in the tourism manager's opinion (Cândea et al, 2009).

We found a good example in a paper that presents the main capabilities of a Customer Relationships Management software developed and applied for the customers' portfolio of a Romanian hotel. The multidimensional analysis of the sales applied to the information about customers stored in the software's database using OLAP (On-Line Analytical Processing) technique provides a real support for the marketing managers' decision making process. By testing the functions of that software, they revealed the possibility to create a personalized CRM strategy, to determine customers' profitability and to determine the best offer positioning, taking into account the distribution of sales according to the most important segmentation criteria, using OLAP (Micu et al., 2009).

Information and communication technologies have profound implications for the tourism industry. They are being used extensively in a great variety of functions and acount for innumerable applications. Among these, Decision Support Systems can play a fundamental role for their capacity to give organizations and people managing tourist destinations the possibility to base all of the decisions concerning policies, infrastructure development and stakeholders' progress on sound and rational bases. We found a paper that presents an overview of DSS usage in tourism management organizations and portrays a general framework for the design of an effective practical implementation (Baggio&Caporarello, 2004).

Another project (SFIDA) –funded by the European Commission within LIFE – Environment Programme and co-financed by DG Environmental Quality of Regione Lombardia (Italy) has as a main objective to develop a Decision Support System suited to integrate environmental concerns into the definition of a plan for sustainable tourism for three municipalities located close to Lake Garda. The DSS is used to generate information and stimulate participation, making the decision transparent, repeatable and participatory. The components of the DSS support several phases of the planning process, including the environmental and socio-economic analysis, the definition of the plan procedure, the impact representation, the evaluation and comparison of the alternatives, and the management of the conflict among decision-makers (Laniado, et.al, 2004).

One of the articles presents the Illinois Tourism Network (ITN) as an example of inter-organizational, knowledge-based tourism information system/community that successfully integrated the management of information and knowledge flows in a way that appeals to tourism organizations in different stages of effective technology use and fosters capacity building among community members (Gretzel&Fesenmaier, 2004).

Another paper presents a Fuzzy based decision support system for E-Tourism investment risk analysis. In general terms, E-tourism is the use of information and communication technology (ICT) in tourism which may allow operating tourism in least variable cost, least time and increasing work efficiency. To demonstrate the effectiveness of the system, factors like investment, human IT skills, E-tourism infrastructure and stability of the regions are considered. (Paudel&Hossain).

Cause and effect analysis influences the effectiveness of decision-making and the consumer behaviour. The complex relationship between cause and effect as well as the fuzzy nature of human life make the cause and effect analysis difficult. This research applies to fuzzy DEMATEL method for group decision-making to gather group ideas and analyze the cause and effect relationship of complex problems in a fuzzy environment. An empirical study applies to the fuzzy DEMATEL method in the service quality of Taiwanese leisure farms. This study used purpose sampling, a total of 215 valid instruments collected from Beijing tourists' perception on service quality (Lin et al., 2009).

A marketing decision support system (MDSS) can be of particular importance as it supports organizations in collecting, storing, processing, and disseminating information and the decision-making process by providing forecasts and decision models. Insights into a successful implementation of a MDSS in tourism can be found in the literature (Wöber, 2003). He created TourMIS, an on-line accessible decision support tool for tourism and hospitability management which has been successfully used by more than 1000 users for three years.

From another point of view, the acquisition of knowledge management level may imply a considerable amount of audits. Another article proposes a Knowledge-Based System that makes it possible to evaluate an organization at a Knowledge Management Capability Assessment maturity level. It is very interesting to minimize the cost by paying only for the truly indispensable authors (Andrade et.al, 2010).

Operators in tourism management, compared to other management sectors, are confronted with a vast field of complex aims, requiring different plans of action. The major reason for the poor application of management science is insufficient education of practitioners and the inadequacy of problem solving features of standard software solutions. We consider the development of simple, affordable programs, downloadable for every tourism manager, is the first step in a new era of dialog between research and practice. We noticed different approaches in the literature, all having their benefits and some disadvantages.

3.5 An example of a decision support system implementation in tourism

It is crucial to design and implement Decision Support Systems to assist the manager because of the large quantities of diverse data stored in an organization. For a manager, informatics and the use of information technologies always means formalizing routine activities, those laws of existence and manifestation that can be described. The “casualty” fact is transformed into one that is “standardized”, elaborating behavioural conducts possible to use depending of the specificity of the situation occurred. The importance of interpretation is vital, from the information dimension to the strategic one. Information technologies are applied, separately and together, in management and decision modelling. They offer modelling instruments being able to automate the processes. The use of the decision and the context of decision making are two key aspects that characterise the utility of the decision models. In the decision making process are used data, information and knowledge corroborated with the manifestation of reasoning stated by the intelligence and experience of the decisional factor. Artificial intelligence proved its applicability using specific technologies such as expert systems (capable of offering expertise in a specific knowledge domain) and decision support systems (a system that brings together the intellectual resources of a person with the capabilities of a computerized system in order to improve the quality of the decisions).

We will present an implementation of decision support systems. Based on the knowledge provided of the expert and some historical data, we used binary trees in order to build a formalized axiomatic system. The axioms were transposed into production rules, as modules of the decision support system.

3.5.1 Premises

Information and knowledge technologies are two essential tools for the modelling and developing of interactive solutions. Therefore, we focused on identifying their use in decision modelling. We created an intelligent decision making system with the main purpose of providing intelligent informing. Hybrid support systems are systems that result from integrating decision support systems with other tools and technologies in order to maximize efficiency of the decision processes in an organization. Our proposal is a hybrid system, a combination of a decision support system model oriented (flexible systems that use spreadsheets, used in what-if analysis) and decision support systems knowledge oriented (software modules based on artificial intelligence).

We noticed that time and effort are wasted when the information is not at hand, therefore managers could use a little help in making decisions based on what-if predictions. We designed an application to help them simulate a real business situation and see the results immediately. We chose a hotel situated in the western part of Romania, in a beautiful resort called Băile Felix (http://www.bailefelix.net/). The manager wanted to invest and was open to new ideas and to implementing an information system that could help him deal with economic indicators and predict what could happen in the future. The system doesn’t take into consideration some indicators like inflation, but we consider it is a good starting point. Also, we want to expand it in the future, so we could apply it to the entire complex of hotels in Băile Felix.

3.5.2 The system of variables

To build a generally valid system (a formalized one) it is necessary to create an interconnected system of indicators, the advantage being that if the value of one indicator is changing, all the other values of the indicators depending on it will also be changed automatically.

The system sets the targets for three main variables: the income generated from the hotel activities, restaurant and treatment (Vrht); the expenditure for 1000 lei income (C/1000v); the total assets (Atotale). Circulating assets capitalization (rAC) and total asset capitalization (rAT) are the desired indicators, but they depend on these three main indicators.

For those main variables we used the semantic trees presented earlier in order to obtain the axioms which were translated into production rules, then into subroutines. The other variables change their value depending on these main variables.

The relationship between all the variables can be seen in figure 5, where: Vrht = income generated from the hotel, restaurant and treatment, NZT = number of tourist days, Vmzt = average income on a tourist day, Kf = using capacity, Go = occupying level, Kc = touristic built capacity, Cpf = putting to function coefficient, Cf/1000v = fixed expenditures for 1000 lei income, Cv/1000v = variable expenditures for 1000 lei income, aCf/1000v = fixed expenditures 1000 lei income, other than amortization, Cam/1000v = amortization expenditure for 1000 lei income, Cs/1000v = wages expenditures for 1000 lei income, Cfa/1000v = other expenditures for 1000 lei income, Afixe =fixed assets, Acirculante = circulating assets, N =average number of personnel, qzf = Af/N = degree of endowment with fixed assets Af/N, paf/A = Af/Atotale = weight of fixed assets in total assets, qza =

A/N = degree of endowment with total assets, Vagr = income from leisure, Valte = income from other activities, Vexpl = operating income, Vfin = financial income, VT = total income, WT = work productivity, rAC = circulating assets capitalization, P = profit, m= P/Vtotale = weighted profit, rAT = P/Atotale = total assets capitalization.

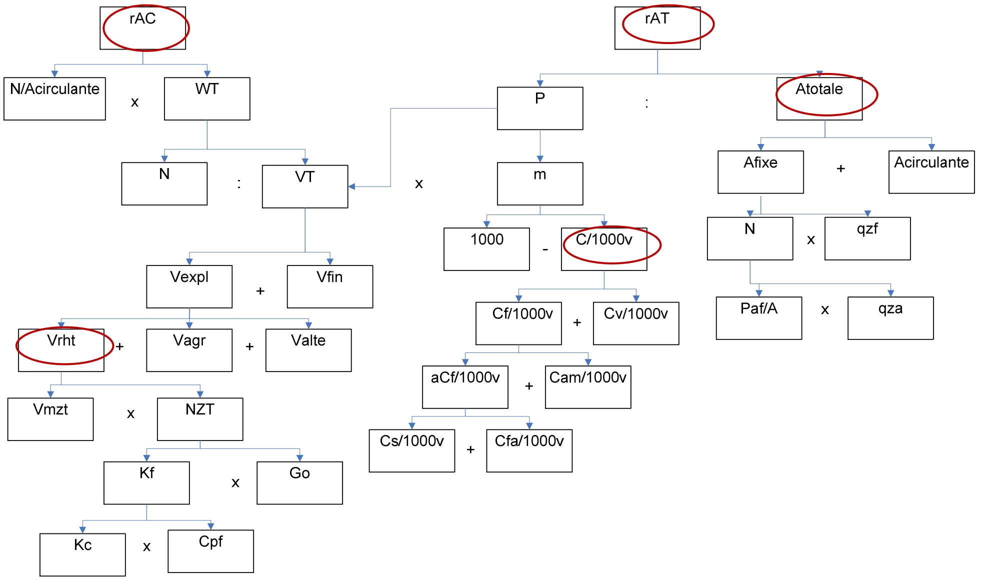


Fig. 5. The system of variables

As a reasoning method we used deduction (begun at the bottom level, if we change the value of building capacity, how that change affect all the variables until it reaches circulating asset capitalization) and induction (e.g. – setting a target for total asset capitalization, the system will determine the values for all the other variables in order to sustain that target).

One important feature is that the system behaves in a dynamic way.

3.5.3 The formalized axiomatic system

An axiomatic system is a system of propositions based on the distinctions between axioms (primary propositions) and theorems (derived propositions). The transition from the primary terms to derived ones assumes the existence of definition and deduction rules. When the interpretation of the symbols is not used, the system is called formalized axiomatic system. An axiom is an obvious proposition that requires no demonstration. Theorems are propositions obtained from axioms or other proposition, obtained using inference rules. Through deduction we understand applying to axioms or propositions initially considered true inference rules for a finite number of times.

The organization that we studied can be modelled using semantic trees. We used a left-decomposed semantic tree, as can be seen in figure 6.

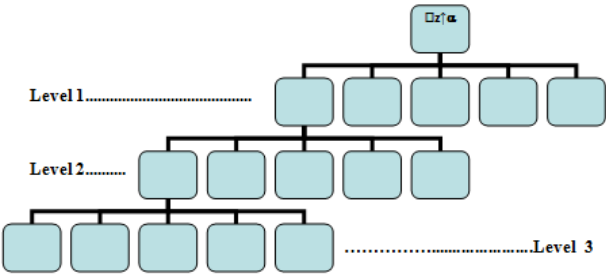


Fig. 6. A left decomposed semantic tree

The symbol □ represents "must", ↑ represents growth, and α the growth coefficient.

Two basic observations can be outlined: if the number of alternatives is reduced, the complexity of the system is also reduced, but the interpretation is easier; the right part of the semantic tree can be also interpreted, so the generality of the system is not reduced.

We chose to represent a product system $\times(\times(\times(x_{11},x_{12},x_1),x_2,x),y,z)$ where z is a very well determined target: $z = f(x_{11}, x_{12}, x_2, y)$ – figure 7.

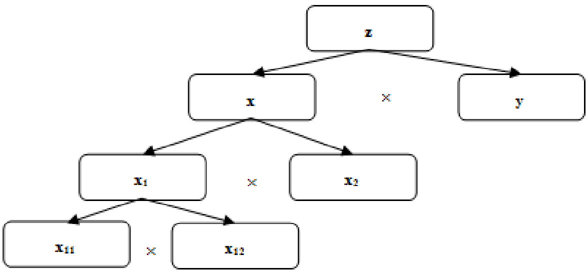


Fig. 7. Product system

A number of observations can be outlined:

- if the number of alternatives is reduced, the complexity of the system is also reduced, but the interpretation is easier;
- the right part of the semantic tree can be also interpreted, so the generality of the system is not reduced.

Using the formalized symbols we describe all the possible growth alternatives depicted in the following figure:

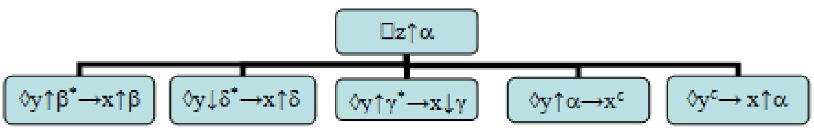


Fig. 8. The first level of the semantic tree

$$\Box z\uparrow\alpha \rightarrow \Diamond\, ((y\uparrow\beta^{*}\rightarrow x\uparrow\beta) \vee (y\downarrow\delta^{*}\rightarrow x\uparrow\delta) \vee (y\uparrow\gamma^{*}\rightarrow x\downarrow\gamma) \vee (y\uparrow\alpha\rightarrow x^{c}) \vee (y^{c}\rightarrow x\uparrow\alpha)) \qquad (4)$$

where $\alpha>1$, $\beta>1$, $\beta^*=\dfrac{\alpha}{\beta}$, $\beta^*>1$, $\delta>1$, $\delta^*=\dfrac{\alpha}{\beta}$, $\delta^*<1$, $\gamma<1$, $\gamma\neq 0$, $\gamma^*=\dfrac{\alpha}{\beta}$, $\gamma^*>1$, $\Diamond$ represents possibility, $\downarrow$ means decrease, $\vee$ stands for "or" (multiple choices), and the Latin letters are the change coefficients for each variable.

Going down on the left side of the semantic tree, we can depict Figure 9, and relation (5) can be obtained.

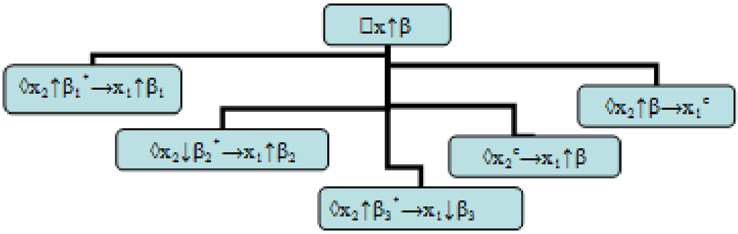


Fig. 9. Second level of the semantic tree

$$\Box x\uparrow\beta \rightarrow \Diamond((x_2\uparrow\beta_1^{*}\rightarrow x_1\uparrow\beta_1)\vee(x_2\downarrow\beta_2^{*}\rightarrow x_1\uparrow\beta_2)\vee(x_2\uparrow\beta_3^{*}\rightarrow$$
$$\rightarrow x_1\downarrow\beta_3)\vee(x_2\uparrow\beta\rightarrow x_1^{c})\vee(x_2^{c}\rightarrow x_1\uparrow\beta)) \qquad (5)$$

where $\alpha>1$, $\beta>1$, $\dfrac{\alpha}{\beta}>1$, $\beta_1>1$, $\beta_2>1$, $\beta_3\neq 0$, $\beta_3<1$, $\beta_1^*=\dfrac{\beta}{\beta_1}$, $\beta_1^*>1$, $\beta_2^*=\dfrac{\beta}{\beta_2}$, $\beta_2^*<1$, $\beta_3^*=\dfrac{\beta}{\beta_3}$, $\beta_3^*>1$.

Using the same method on the left side, we obtain relation (3):

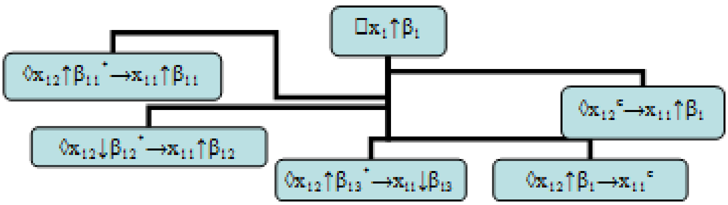


Fig. 10. The last level of the semantic tree

$$\Box x_1\uparrow\beta_1 \rightarrow \Diamond((x_{12}\uparrow\beta_{11}^{*}\rightarrow x_{11}\uparrow\beta_{11})\vee(x_{12}\downarrow\beta_{12}^{*}\rightarrow x_{11}\uparrow\beta_{12})\vee(x_{12}\uparrow\beta_{13}^{*}\rightarrow$$
$$\rightarrow x_{11}\downarrow\beta_{13})\vee(x_{12}\uparrow\beta_1\rightarrow x_{11}^{c})\vee(x_{12}^{c}\rightarrow x_{11}\uparrow\beta_1)) \qquad (6)$$

where $\alpha>1$, $\beta_1>1$, $\beta_{11}>1$, $\beta_{11}^*=\dfrac{\beta_1}{\beta_{11}}$, $\beta_{11}^*>1$, $\beta_{12}>1$, $\beta_{12}^*=\dfrac{\beta_1}{\beta_{12}}$, $\beta_{12}^*<1$, $\beta_{13}<1$, $\beta_{13}\neq 0$, $\beta_{13}^*=\dfrac{\beta_1}{\beta_{13}}$, $\beta_{13}^*>1$.

Five theorems can be obtained from relation (1), (2) and (3) using the method of poli-syllogism:

$$\Box z\uparrow\alpha \rightarrow \Diamond\ (x11\uparrow\beta11\ \&\ x12\uparrow\beta11^*\ \&\ x2\uparrow\beta1^*\ \&\ y\uparrow\beta^*) \quad (7)$$

where $\alpha>1$, $\beta>1$, $\beta^*=\frac{\alpha}{\beta}$, $\beta^*>1$, $\beta1>1$, $\beta1^*=\frac{\beta}{\beta_1}$, $\beta1^*>1$, $\beta11>1$, $\beta11^*=\frac{\beta_1}{\beta_{11}}$, $\beta11^*>1$

$$\Box z\uparrow\alpha \rightarrow \Diamond\ (x11\uparrow\beta12\ \&\ x12\downarrow\beta12^*\ \&\ x2\uparrow\beta1^*\ \&\ y\uparrow\beta^*) \quad (8)$$

where $\alpha>1$, $\beta>1$, $\beta^*=\frac{\alpha}{\beta}$, $\beta^*>1$, $\beta1>1$, $\beta1^*=\frac{\beta}{\beta_1}$, $\beta1^*>1$, $\beta12>1$, $\beta12^*=\frac{\beta_1}{\beta_{12}}$, $\beta12^*<1$

$$\Box z\uparrow\alpha \rightarrow \Diamond\ (x11\downarrow\beta13\&\ x12\uparrow\beta13^*\ \&\ x2\uparrow\beta1^*\ \&\ y\uparrow\beta^*) \quad (9)$$

where $\alpha>1$, $\beta>1$, $\beta^*=\frac{\alpha}{\beta}$, $\beta^*>1$, $\beta1>1$, $\beta1^*=\frac{\beta}{\beta_1}$, $\beta1^*>1$, $\beta13<1$, $\beta13\neq0$, $\beta13^*=\frac{\beta_1}{\beta_{13}}$, $\beta13^*>1$

$$\Box z\uparrow\alpha \rightarrow \Diamond\ (x11c\ \&\ x12\uparrow\beta1\ \&\ x2\uparrow\beta1^*\ \&\ y\uparrow\beta^*) \quad (10)$$

where $\alpha>1$, $\beta>1$, $\beta^*=\frac{\alpha}{\beta}$, $\beta^*>1$, $\beta1>1$, $\beta1^*=\frac{\beta}{\beta_1}$, $\beta1^*>1$

$$\Box z\uparrow\alpha \rightarrow \Diamond\ (x11\uparrow\beta1\ \&\ x12c\ \&\ x2\uparrow\beta1^*\ \&\ y\uparrow\beta^*) \quad (11)$$

where $\alpha>1$, $\beta>1$, $\beta^*=\frac{\alpha}{\beta}$, $\beta^*>1$, $\beta1>1$, $\beta1^*=\frac{\beta}{\beta_1}$, $\beta1^*>1$.

Through the same method a total number of 105 theorems can be obtained and grouped into one meta-theorem that contains all the possible cases for the growth of z if the operator between the variable is product.

Using meta-theorems deducted in this way, we built a decision support system.

3.5.4 The decision support system

The model was created based on semantic trees. We divided this complex system into several trees and built rules for each type of tree, based on the operators between the variables. For each of the three sub-modules, the application permits choosing between the following alternatives: we can set the target or we can see the history of the variables (the last three years) and follow the expert opinion. During each interval the user can correct the choice or the expert opinion, based on some external information.

A big advantage is the formalization of the system. That means that instead of income we can use any other variable or indicator, but the operators between the variable must remain the same.

We implemented these concepts in Microsoft Excel 2007, using Visual Basic Application – a powerful tool that uses procedures in order to control the behaviour of Excel objects.

The main advantage of the application is that the user can change the value of each variable, regardless of the moment or the position in the main system of indicators. The results are automatically being re-calculated and displayed right away.

Fig. 11. The DSS'menu

The application contains 9 sheets and 25 user forms, the interface being a Graphical User Interface (GUI). The DSS is divided into four modules that permit: gathering data, simulations, printing the results and exiting the application – Figure 11.

The first module is called "Introducere date" and permits gathering information or updating data about the last three years and the initial values of variables for the simulation.

Fig. 12. Choosing which module to run in order to simulate a real situation

The second option from the menu is called "Simulare", where we used the rules obtained previously in order to generate a possible solution. The form Simulare allows executing the entire algorithm or just one or more modules.

The last module allows displaying or printing the results obtained when running the decision support system. The last button exits the information system.

We will present the construction of one of the main modules, the one that starts with the form **Income** – figure 13.

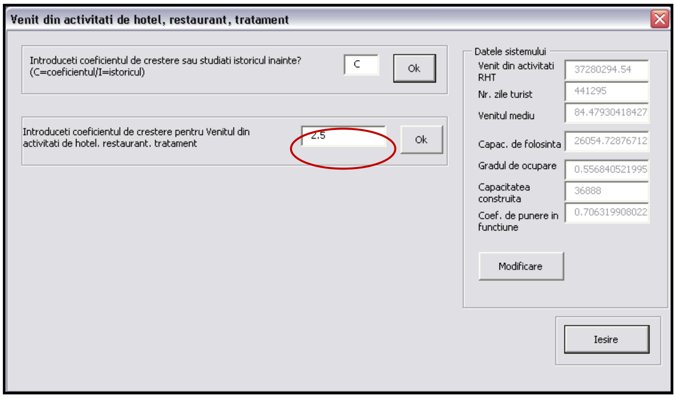


Fig. 13. Income form in design mode – choosing the growth coefficient for the income

On the right-hand side we can see the initial values, modifiable data that can be changed to reflect alternate initial conditions. The system calculates the related variables based on the values of the variable it already has, maintaining the economic relationship between the indicators.

This form allows data validations – the initial data must verify the relations (in our case, the economic relations) between the variables.

The user can follow the expert opinion or can insert a value based on his own opinion (C – inserting a value, I – be guided by the expert opinion, based on the firm's history); based on the history and some hypothesis introduced in the system by the expert, the application provides three scenarios: an optimistic one, a pessimistic one and the most probable one, suggesting the option to the user – figure 14;

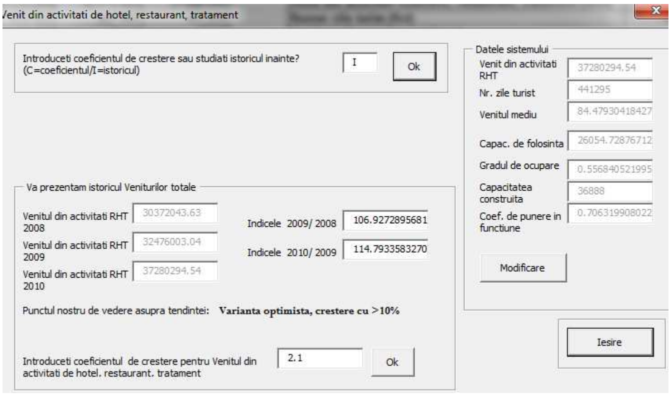


Fig. 14. The history for the Income variable

The user has to choose a growing coefficient for the income (>1). We present a part of the algorithm, the choosing of the growth coefficient for the Income resulting from hotel activities, restaurant and treatment in Figure 15.

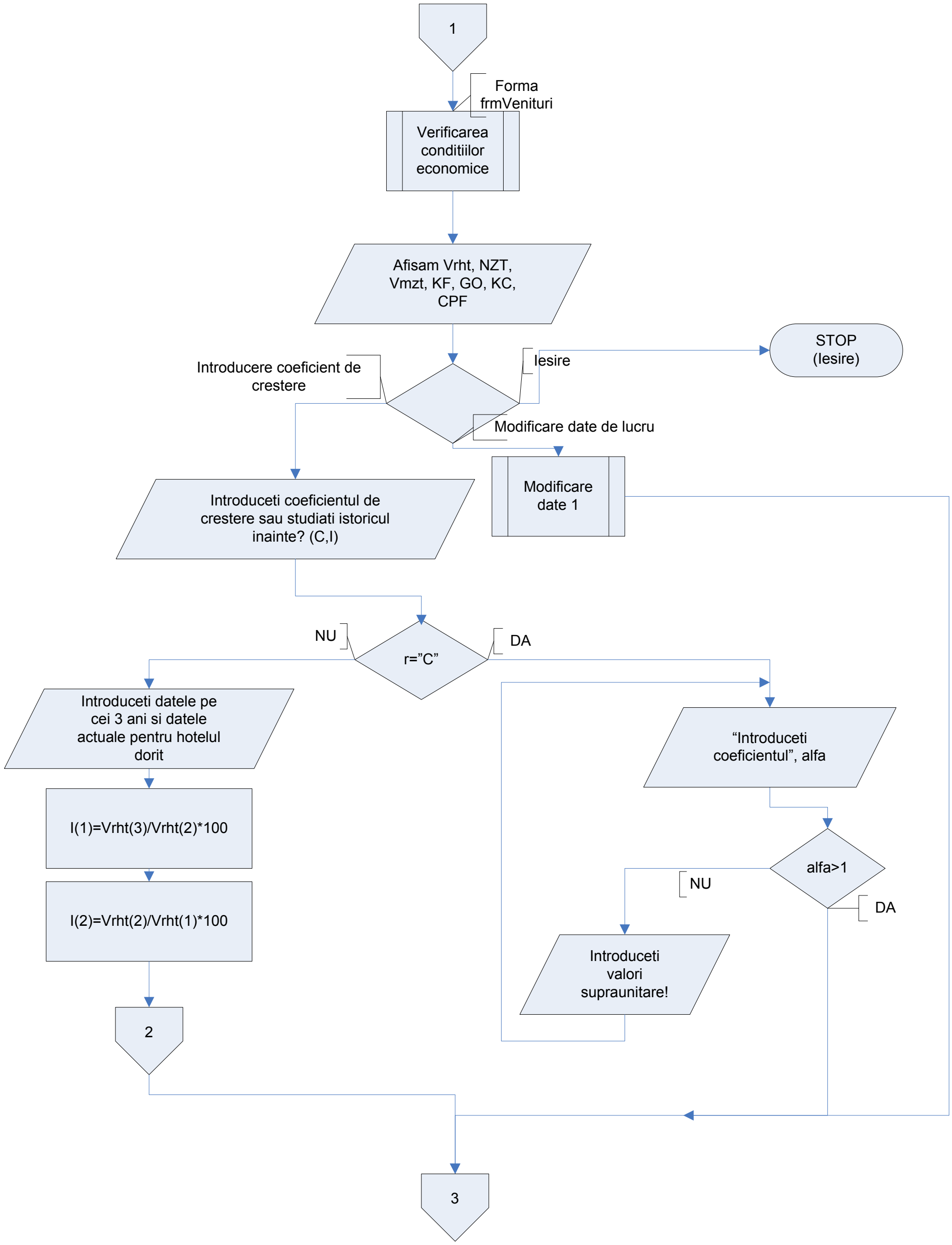


Fig. 15. Logical design of the process

Input of the desired value is validated pushing the Ok button, so the system displays the next form – Figure 16. For each variable we also have a history, like in the case of the

Income: e.g. a raise in the income from hotel activities, restaurant and treatment can be sustained only by either number of tourist days (numarul de zile turist), average income (venitul mediu) on a tourist day or both.

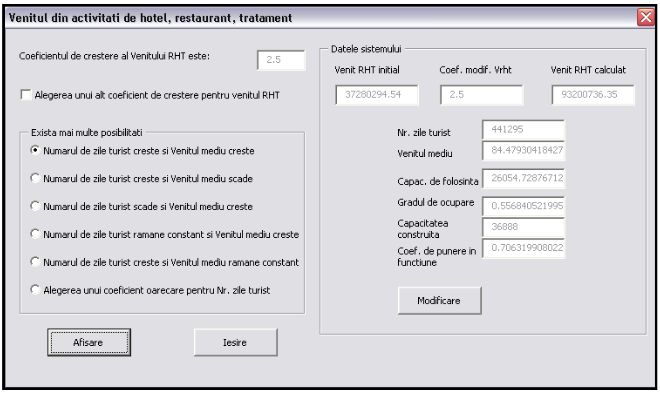


Fig. 16. All the possible alternative for this particular case

This form allows going back to the first form to pick another value for Income RHT by checking "Alegerea unui alt coeficient de creştere pentru veniturile RHT" check-box, or using the rules (7), (8), (9), (10), (11) – we can choose one the five options or the last one, inserting a different coefficient, with no help from the expert.

If one of the five options that change the number of tourist days is picked, the system uses the rules built based on axioms and provides the user with an interval in which the value should be placed, so that the specific case selected will be valid. If this indication is not followed, the input is denied.

Finally – taking into account the organization specificity and the management point of view we chose six possible alternatives presented in Figure 17.

	A	B	C	D	E	F	I	K
1							2015	
2		UM	2008	2009	2010	V1	V4	V6
3	Venit din activitati hoteliere, restaurant, tratament (Vrht	Lei	30.372.043,63	32.476.003,04	37.280.294,54	35.307.928,47	32.567.571,00	36.627.485,00
4	Numar zile turist (Nzt)	Zile turist	458.652,00	447.957,00	441.295,00	396.718,30	397.165,50	441.295,00
5	Venit mediu pe zi turist (Vmzt)	Lei	66,22	72,50	84,48	89,00	82,00	83,00
6	Capacitatea de folosinţă (Kf)	x	30.242,89	27.645,67	26.054,73	24.593,99	31.265,67	26.054,73
7	Gradul de ocupare % (Go)	%	49,86%	53,27%	55,68%	53,03%	41,76%	55,68%
8	Capacitatea construita (Kc)	x	37.656,00	37.656,00	36.888,00	36.478,00	31.354,80	36.888,00
9	Coeficientul de punere in functiune % (Cpf)	%	80,31%	73,42%	70,63%	67,42%	99,72%	70,63%
10	Cheltuieli la 1000 lei (C/1000v)	Lei	804,87	817,20	828,79	825,32	699,21	555,64
11	Cheltuieli fixe la 1000 lei (Cf/1000v)	Lei	549,86	561,90	551,36	547,90	421,79	386,34
12	Cheltuieli variabile la 1000 lei (Cv/1000v)	Lei	255,01	255,30	277,42	277,42	277,42	169,30
13	Alte Cheltuieli fixe la 1000 lei (aCf/1000v)	Lei	482,14	498,12	469,82	513,23	410,34	371,56
14	Cheltuieli cu amortizarea la 1000 lei (Cam/1000v)	Lei	67,72	63,78	81,54	34,67	11,45	14,78
15	Cheltuieli cu salarii la 1000 lei (Cs/1000v)	Lei	308,26	324,60	319,00	478,56	398,89	356,78
16	Cheltuieli fixe rămase la 1000 lei (Cfa/1000v)	Lei	173,89	173,52	150,82	84,05	43,51	34,01
17	Active totale (AT)	Lei	92.929.393,00	177.156.309,00	181.457.027,00	1.224.102.842,17	181.578.817,14	411.700.864,97
18	Active fixe (Af)	Lei	77.198.070,00	152.456.601,00	169.480.220,00	1.212.126.035,17	170.483.061,54	368.403.867,57
19	Active circulante (Ac)	Lei	15.731.322,00	24.699.708,00	11.976.807,00	11.976.807,00	11.095.755,60	43.296.997,40
20	Grad de inzestrare cu active fixe (qzf)	Lei	92.452,78	192.010,83	200.568,31	1.286.758,00	200.568,31	449.273,01
21	Numar mediu personal (N)	Nr	835	794	845	942	850	820
22	Ponderea activelor fixe in activul total (pafA)	%	83,07%	86,06%	93,40%	104,61%	93,40%	93,40%
23	Grad de inzestrare cu active totale (qza)	x	111.292,69	223.118,78	214.742,04	1.230.080,76	214.742,04	481.022,18
24	Venituri din activitati de agrement (Vagr)	Lei	2.024.365,87	2.523.431,73	3.306.312,77	13.225.251,08	13.225.251,08	13.225.251,08
25	Venituri din alte activitati (Valte)	Lei	3.616.581,99	4.668.620,98	4.291.235,25	9.440.717,55	9.440.717,55	9.440.717,55
26	Venituri din exploatare (Vexp)	Lei	36.012.991,49	39.668.055,75	44.877.842,56	57.973.897,10	55.233.539,63	59.293.453,63
27	Venituri financiare (Vfin)	Lei	322.342,38	624.735,08	3.040.274,90	3.504.586,36	3.504.586,36	3.504.586,36
28	Venituri totale (VT)	Lei	36.335.333,87	40.292.790,83	47.918.117,46	**61.478.483,46**	**58.738.125,99**	**62.798.039,99**
29	Productivitatea muncii (WT)	Lei/salariat	43.515,37	50.746,59	56.707,83	65.263,78	69.103,68	76.582,98
30	Rentabilitatea activelor circulante (rAC)	Lei profit/lei active	2,31	1,63	4,00	5,13	5,29	1,45
31	Marja de profit (m)	%	19,51%	18,28%	17,12%	17,47%	30,08%	44,44%
32	Profit (P)	Lei	7.090.116,97	7.365.471,80	8.204.226,21	**10.739.061,49**	**17.667.840,92**	**27.904.937,05**
33	Rentabilitatea activelor totale (rAT)	Lei profit/lei active	0,08	0,04	0,05	0,01	0,10	0,07
34						Pesimist	Cel mai probabil	Optimist

Fig. 17. Possible alternatives – predictions for 2013

Our application is universally valid regardless of the considered variables. The only condition is that the relation between variables be one of sum, product, difference or division. The user can make any predictions for growth or decrease coefficients associated to the variables.

Sometimes we can come across a situation in which variable expenditure for 1000 lei income is negative, occupying level to be more than 100%, etc. Therefore, before making a selection of the alternatives to be considered, we have to apply the validation estimation, which includes among other rules: income, number of tourist days can't be negative, occupying level has to be more than zero and less or equal to 100, etc. If from these resulted alternatives this situation occurs, we consider them, from an economical point of view, unfeasable, and consequently we do not take them into consideration.

Because we consider that tourism managers could benefit from access to the Internet, we are considering an on-line implementation of the decision support system.

4. Conclusions

An evolution in tourism marketing systems is critical in meeting the increasing needs for accurate, reliable and up-to-date information and in supporting knowledge creation and learning process within the tourism industry (Gretzel&Fesenmaier, 2004).

Information systems studies are the confluence of many domains – information technology, management, marketing, accounting and organizational culture. They can be applied in different domains, one of them being tourism. Tourism has become an extremely dynamic system. In the last years, globalization enabled by technology development and by less expensive travel costs has greatly increased competition (Baggio&Caporarello, 2004). In the future economy, a knowledge-based economy, Decision Support Systems brings together the intellectual resources of experts with computer capabilities in order to improve the quality of the decisions taken (Târnăveanu, 2010a). Our goal was to present innovative concepts and techniques that can help us face mounting changes and challenges in the context of the new economy based on knowledge. Modern companies use knowledge-driven applications in order to respond rapidly to changing market conditions and customer needs. In recognition of the need to use information technology in order to implement Knowledge Management Systems and to transform their organization into a modern one, many organizations developed knowledge portals (Muntean&Târnăveanu, 2009a). This could be a direction to be followed.

In the future economy, a knowledge-based economy, decision support systems (DDS) are very rigorous and precise if the hypotheses are well grounded. An important direction of research is simulation of specialist thinking based on a Knowledge Based Systems (KBS). The evolution of DDS and KBS depends on the evolution of knowledge representation. Even though the research in economic knowledge representation is in progress, the cases in which theory is put into practice are very rare, and of limited complexity. An evolved KBS must incorporate knowledge pieces capable of explaining the economic phenomenon in all its complexity. In the near future not only the problem of rational, conscious knowledge will be an issue, but the one of unconscious knowledge based on intuition and imangination will join the ranks of isses to be resolved.

5. References

Andrade, J., Ares, J., Garcia, R., Santiago, R. & Suarez, S. (2010) – A Knowledge-based system for Knowledge Management Capability Assessment Model Evaluation, *WSEAS Transactions on Computers*, Issue 5, Volume 9, May 2010, pp.506-515, ISSN: 1109-2750, (http://www.wseas.us/e-library/transactions/computers/2010/89-567.pdf)

Andone, I., Ţugui A. (1999) – *Sisteme inteligente în Management, Contabilitate, Finanțe Bănci şi Marketing*, ISBN: 973-590-198-6, Editura Economică, Bucureşti

Baggio, R. & Caporarello, L. (2005) – Decision Support Systems in a Tourism Destination: Literature Survey and Model Building, itAIS 2005 – *2nd Conference of the Italian chapter of AIS (Association for Information Systems)*, Verona, Italy, 1-2 December 2005, pp.1-15, (http://www.iby.it/turismo/papers/baggio-dss-tourism.pdf)

Băileşteanu, Gh. (2005) – *Semiotică economică*, ISBN: 973-661-528-6, Editura Mirton, Timişoara

Băileşteanu, Gh. & Târnăveanu, D. (2006) – Reprezentarea cunoaşterii. Premisă a axiomatizării deciziei, *Buletin Ştiințific al Universității de Vest Timişoara*, Facultatea de Ştiințe Economice, Seria: Teoria şi Practica Managementului, Timişoara, anul III, nr.3, p.20

Brândaş C. (2007) – *Sisteme suport de decizie pentru managementul performant. Concepere, proiectare şi implementare*, ISBN: 978-973-602-273-9, Editura Brumar, Timişoara

Cândea, M., Stăncioiu, F.A., Mazilu M., Marinescu R.C – The competitiveness of the Tourist Destination on the Future Tourism Market, *WSEAS Transactions on Business and Economics*, Issue 7, Volume 6, 2009, pp.374-384, ISSN: 1109-9526, (http://www.worldses.org/journals/economics/economics-2009.htm)

Cooper, C. (2006) – Knowledge management and tourism. *Annals of Tourism Research*, *33*(1), pp.47-64, Elsevier, (http://linkinghub.elsevier.com/retrieve/pii/S0160738305000915)

Bondecka-Krzykowska I. (2005) – Semantic tree method – historical perspective and applications, Annales UMCS Informatica AI 3, pp. 15-25 (www.cse.chalmers.se/edu/course/DAT060/tree.pdf)

Dănăiață, D., Hurbean, L., Margea, C. (2008) – Sisteme informatice pentru administrația publică, ISBN: 978-973-125-170-7, Editura Universității de Vest, Timişoara

Dănăiață, I., Bibu N.A. & Predişcan M. (2006) – *Management. Bazele teoretice*, Second Edition, ISBN: 973-661-287-2, Editura Mirton, Timişoara

Filip F., Gh (2007) – Sisteme suport pentru decizii, ISBN: 978-973-31-2308-8, Editura Tehnică, Bucureşti

Gretzel, U. & Fesenmaier, D. R. (2004) – Implementing a Knowledge-Based Tourism Marketing Information Systems: The Illinois Tourism Network, *Information Technology&Tourism*, vol. 6, 1098-3058/04, pp.245-255, USA, 2004 (http://tourism.wu-wien.ac.at/jitt/JITT_6_4_Gretzel_Fesenmaier.pdf)

Harmon P., King. D. (1992) – *Artificial Intelligence in Business Expert Systems*, ISBN: 978-0471808244, John Wiley & Sons, 1992

Laniado, E., Cappiello, A., Celline, F., Cerioli, R., Hernandez, K. & Laghi A. – A decision support system for sustainable tourism: the SFIDA project, presented in Envirosoft, 2004 (enver.eu/vol_07/6.Laniado%20&%20Cellina.pdf)

Lin, ZP., Wang, R. & Tseng ML. – Determination of a Cause and Effect Decision Making Model for Leisure Farm's Service Quality in Taiwan,), *WSEAS Transactions on Business and Economics,* Issue 2, Volume 6, 2009, pp. 73-86, ISSN: 1109-9526

Micu, A., Micu, A.-E. & Capatina, A. – OLAP Technique – An It&C Support for Marketing Managers Decision-Making Process (Case Study: Sales Multidemnsional Analysis Applied in Hotel Services Industry), *WSEAS Transactions on Business and Economics,* Issue 2, Volume 6, 2009, pp. 63-72, ISSN: 1109-9526

Muntean, M. & Târnăveanu, D. (2009a) – Information Technology & Organizational Knowledge Management, *Proceedings of the 13th WSEAS International Conference on COMPUTERS*, Rodos, 2009, ISSN:1790-5109, ISBN:978-960-474-099-4, pp.335-339, (http://www.wseas.us/elibrary/conferences/2009/rodos/COMPUTERS/COMPUTERS49.pdf)

Muntean, M. & Târnăveanu, D. (2009b) – Some Considerations About Collaborative Systems Supporting Knowledge Management in Organizations, *WSEAS Transactions on Computers*, Issue 8, Volume 8, August 2009, pp.1378-1387, ISSN: 1109-2750, (http://www.wseas.us/e-library/transactions/computers/2009/29-621.pdf)

Paudel, B. & Hossain, M.A. – Fuzzy based Decision Support System for E-tourism Investment Risk Analysis (eastwest.inf.brad.ac.uk/document/publication/Paudel-SKIMA.pdf)

Radu, I., Ursăcescu, M., Vlădean, D., Cioc, M. & Burlacu, S. (2005) – *Informatică şi management – O cale spre performanță*, ISBN: 973-7787-59-5, Editura Universitară, Bucureşti

Shahua, L., Salvolainen, V. (1994) – Knowledge-Based Technology in Executive Information Systems, *Studies in Informatics and Control*, vol.3, no.4, Dec. 1994, pp.330-345

Tacu, P., Alexandru, Vancea, R., Holan, Ş. & Burciu, A. (1998) – *Inteligența artificială. Teorie şi aplicații în economie*, ISBN: 973-590-083-1, Editura Economică, Bucureşti

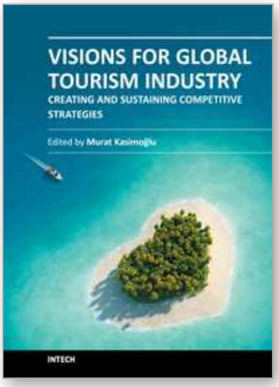
Târnăveanu, D. A. (2010a) – Axiomatization – a Fundament for Decision Support Sytem in Tourism, *Proceedings of the 3rd WSEAS International Conference on Cultural Heritage and Tourism*, Corfu, 2010, ISSN: 1792-4308, ISBN: 978-960-474-205-9, pp.78-82 (http://www.wseas.us/e-library/conferences/2010/Corfu/CUHT/CUHT-10.pdf)

Târnăveanu, D. A. (2010b) – A Model of Decission Support System in Economy, *WSEAS Transactions on Business and Economics*, Issue 4, Volume 7, October 2010, pp. 444-453, ISSN: 1109-9526, (http://www.wseas.us/e-library/transactions/economics/2010/88-404.pdf)

Zaharia, M., Cârstea, C. & Sălăgean, L. (2003) – *Inteligența artificială şi sistemele expert în asistarea deciziilor economice*, ISBN: 973-590-870-0, Editura Economică, Bucureşti

Wöber, K. – Information Supply in Tourism Management by Marketing Decision Support Systems, *Tourism Management*, Elsevier, Volume 24, Number 3, June 2003 , pp. 241-255

http://media.unwto.org/en/press-release/2011-05-11/international-tourism-first-results-2011-confirm-consolidation-growth
http://media.unwto.org/en/press-release/2011-06-22/unwto-executive-council-endorses-efforts-better-position-tourism-global-age
http://www.unwto.org/tourism&mdgsezine/



Visions for Global Tourism Industry - Creating and Sustaining Competitive Strategies

Edited by Dr. Murat Kasimoglu

ISBN 978-953-51-0520-6
Hard cover, 478 pages
Publisher InTech
Published online 18, April, 2012
Published in print edition April, 2012

We have been witnessing huge competition among the organisations in the business world. Companies, NGO's and governments are looking for innovative ways to compete in the global tourism market. In the classical literature of business the main purpose is to make a profit. However, if purpose only focus on the profit it will not to be easy for them to achieve. Nowadays, it is more important for organisations to discover how to create a strong strategy in order to be more competitive in the marketplace. Increasingly, organisations have been using innovative approaches to strengthen their position. Innovative working enables organisations to make their position much more competitive and being much more value-orientated in the global tourism industry. In this book, we are pleased to present many papers from all over the world that discuss the impact of tourism business strategies from innovative perspectives. This book also will help practitioners and academician to extend their vision in the light of scientific approaches.

InTech Europe
University Campus STeP Ri
Slavka Krautzeka 83/A
51000 Rijeka, Croatia
Phone: +385 (51) 770 447
Fax: +385 (51) 686 166
www.intechopen.com

InTech China
Unit 405, Office Block, Hotel Equatorial Shanghai
No.65, Yan An Road (West), Shanghai, 200040, China
中国上海市延安西路65号上海国际贵都大饭店办公楼405单元
Phone: +86-21-62489820
Fax: +86-21-62489821