# THE USE OF EXPERT SYSTEMS IN RURAL TOURISM IN MARAMUREŞ

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*The existing accommodation in the rural Maramureş region is essential for the development of tourism. Most accommodation units are within the typology of rural tourist hostels, therefore special attention should be paid to promote and diversify their touristic offers. Despite its attractive potential, the rural tourism in Maramureş has its weaknesses because there is no organizational strategy for its deployment. Tour operators must adopt new solutions to promote tourist services, one of which may be using expert systems. The main purpose of this study is to develop a model of an expert system, applying new methodological approaches to the evaluation and ranking of countryside hostels in Maramureş. This model can be easily implemented with private and public entities and could be a source of significant benefits for them.*
*Scientific literature in the field highlights the benefits of using expert systems in all business sectors and reinforces our conviction that they can be applied extensively in tourism as well.*
*The research methodology included: defining the nature and scope of the problem, identifying experts, acquiring knowledge, selecting the system building tools, as well as encoding and evaluating the system. In the knowledge acquisition phase we used interviews, thus obtaining a database with information on countryside hostels in Maramureş. We turned to tourism professionals to establish expert rules in a way that reflects as accurately and completely as possible the context. These rules led to the encoding of the system. In order to encode them, we used the Corvid system, developed by Exsys, which was verified and validated.*
*The system, once designed, provides a user-friendly interface. After being implemented in specialized sites, the system will be able to facilitate searching and finding information by users.*
*We propose that the model obtained will be a starting point for further research, given that the development environment allows the system to be constantly updated. Using the system will enrich the knowledge database by storing user requirements, and the results thus obtained can be used for statistical calculations useful in determining future development strategies.The implementation of the proposed model in websites, through the assistance it provides, can attract customers both from our country and from the top tourism consumer countries of the European Union and around the world.*

*Keywords: Expert System , Exsys, Corvid, rural holiday hostels, Maramureş*

*JEL Classification: C80, C88, L83*

## I. Introduction

The current development of tourism is characterized by a constant renewal of tourist offers, in particular by developing a new range of tourist products, superior both qualitatively and quantitatively.

Tourism offers a range of intangible services, which tourists do not come into direct contact with at the time of purchase. The main characteristic of tourist products is their enjoyment "at the source", assuming that tourists travel to it. Buying a product requires prior knowledge of it. The image created in the tourist's head is critical and this is achieved using means and methods of promotion. The tourism industry needs to rethink the concept of "tourism", so as to adapt it to highly qualified and therefore, sophisticated audiences. This stems from the fact that the tourist is a demanding customer; his demands are motivated by various reasons and change together with the transformations that human society is subjected to.

The tourist offer is part of an increasingly segmented market where competition becomes increasingly fierce, as the main players on the market are trying new ways to create marketing products and to promote themselves by adopting new strategies.

Recognizing that the Web has become the main means of communication, one solution would be to implement expert systems in web sites, so that online assistance could be offered to potential customers who will be assisted in making such decisions. Human experts are not always available, and many functions that used to depend on direct human contact are now provided via the web. In order to make the best decisions, one needs to take into account the specific needs of each user. Expert systems are the most effective way to manage these situations. The ability to have web sites with "advisors" interacting with the user greatly increases the quality and level of detail of the recommendations that can be provided. A site that provides visitors with expert advice will attract customers and keep them coming in the future to access the site.

Rural Maramureş, by the diversity and complexity of its potential, offers the possibility to practice a wide range of forms of tourism, so that it satisfies tourist needs regardless of the customer segment. But, in order to better meet the desires of tourists travelling to the Maramureş region, it is essential that it should be promoted as well as possible.

As we are convinced of the benefits of expert systems, we can but ask ourselves: ***Will using expert systems improve the promotion of tourist services in the Maramureş County?***

The objective of this paper is to design an expert system to assess rural holiday hostels in the Maramureş County, to help users search for and find information in a fast and efficient way, allowing them to compare offers and choose the best. The system will use a database with complete information about hostels in the area.

## II. Literature Review

It is considered that expert systems are those that add the element of artificial intelligence to classic decision support systems. They are the oldest and perhaps the best grounded technology in the field of artificial intelligence (Holsapple and Whinston 1996).

Expert systems (ES) are computer systems that use specialized knowledge to achieve high performance decisions in a particular area (Turban, Sharda and Delen 2011, 542). The main features of expert systems are:

- in conceptual terms, ES are aimed at reconstituting human reasoning according to the expertise obtained from experts;
- ES have the knowledge and capacity to conduct human intellectual activity;
- ES are organized for the acquisition and exploitation of knowledge in a particular area called the problem range;
- ES have ways of invoking knowledge and expressing expertise, behaving as an "intelligent assistant";
- with respect to their computing organisation method, ES are based on the principle of separation between the data (the database) and the program that treats it (the inference engine);

- ES are able to store knowledge, to establish links between knowledge and to infer conclusions, solutions, advice, tips and the causes of some phenomena from the data and the processing of uncertain knowledge.

Expert systems consist of two environments: **the development environment** and **the consultation environment**. The development environment is used by those who build the system and update it constantly with new knowledge from industry experts and other sources. System users resort to the environment to obtain advice and consultation to solve specific problems (Turban, Sharda and Delen 2011, 550).

The applications of expert systems are increasingly diverse, with multiple roles and places in a variety of areas. The timeliness and speed of problem solving, the ease of use and the consultation in the steps to making the optimal decision actions contribute to their use in virtually all areas of economic and social activity.

Studies on a number of expert systems (Nedovic and Devedzic 2002) have shown that these systems improve customer satisfaction, the quality of products and services, and reduce decision-making time.

Expert systems and the Web are closely connected. One reason for the development of expert systems was their ability to provide recommendations to a large number of users. This potential has been harnessed through the use of expert systems on the web. The costs of their use are minimal, making them very attractive.

The scientific literature highlights the benefits of expert systems and strengthens our belief that the expert system model for evaluating rural accommodation services developed by us will successfully promote their tourist offer in the county of Maramureş.

Currently, the county does not offer to potential tourists the opportunity to obtain information suited to their needs, given that searching and finding information supposes looking over many specialized sites, where information is rather brief (http://www.cazaremaramures.ro/; http://www.turistinfo.ro/zona-maramures/). The model we suggest can eliminate tedious search and can be implemented with public and private entities (tourism agencies, local councils). The impact carried by the proposed model would be reflected in an increase in the number of tourists in the region and, implicitly, in a more developed rural tourism.

## III. Research Methodology

Designing expert systems is a process that includes: defining the nature and scope of the problem, identifying experts, acquiring the database, selecting the system building tool, as well as encoding and evaluating the system (Turban, Sharda and Delen 2011, 566).

### *Identifying the Nature of the Problem and Defining its Purpose*

In our case, the problem is the fact that potential tourists who would like to spend holidays in the Maramureş County cannot find enough information about rural holiday hostels in the area. Our aim would be to provide complete information about the tourism services offered by existing rural hostels.

Identifying Experts

We turned to tourism professionals who knew very well the problems and were willing to help develop the database.

### *Collection and Representation of Data*

The collection phase is aimed at obtaining all the knowledge which is necessary for building the conceptual models and the database. We used the method of interviews, which are frequently used in developing conventional software applications. Unlike them, whose object of study

generally consists of well-defined administrative procedures, human expertise is more difficult to define and extract, which adds to the inherent disadvantages of the interview a degree of uncertainty.
For this reason, we have defined various alternative techniques which consist essentially of applying a controlled method which could identify systematically the cases to be solved and the characteristics on whose grounds the expert formulates decisions and recommendations.
We have obtained the necessary data, which were entered into a spreadsheet (Figure 1).
The knowledge gathered in this stage is not directly usable, it will be structured and expressed in the appropriate form of knowledge according to the knowledge representation methods and the features of the inference engine.
Still in the knowledge acquisition stage will be set the rules underlying the system. Rules should reflect in a most correct and complete way the decision-making context. Rules must be expressed in a way to incorporate the action to be executed when triggered by an event. The most widespread format is the IF-THEN rule.

| | A | B | C | D | E | F | G | H | I | J | K | L | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Location | Name_of_acomm_unit | Acomm_cost | Places | Ranking | Address | External_aspect | Internal_aspect | Children's_playground | TV | Internet_opportunity | Parking_place | Website_address |
| 2 | Barsana | Cerbul_Carpatin | 55 | 14 | 2_daisies | main_street | undefined | rustic | no | yes | no | no | http://izamaramures.ro/ |
| 3 | Barsana | Pop | 55 | 6 | 2_daisies | main_street | modern | rustic | no | yes | yes | no | http://www.informatii-cazare.r |
| 4 | Barsana | Vila_Barsana | 70 | 54 | 3_stars | main_street | rustic | rustic | no | yes | da | yes | http://vilabarsana.ro/index.htm |
| 5 | Barsana | Cabana_Iza | 70 | 17 | 3_stars | main_street | rustic | rustic | no | yes | no | no | http://www.barsanamaramures |
| 6 | Barsana | Fratii_Pasca | 70 | 40 | 3_daisies | main_street | rustic | rustic | yes | yes | no | yes | http://www.fratiipasca.ro/ |
| 7 | Botiza | Costinar_Aurica | 70 | 20 | 3_daisies | sec_street | traditional | rustic | yes | yes | yes | yes | http://www.agrotur.ro/aurica/r |
| 8 | Budesti | Perla_Cosaului | 55 | 16 | 2_daisies | main_street | undefined | modern | no | yes | nu | yes | http://pensiuneaperlacosaului. |
| 9 | Budesti | Poienita | 55 | 28 | 2_daisies | main_street | modern | modern | no | yes | yes | no | http://www.pensiuneapoienita |
| 10 | Chechis | Milena | 70 | 12 | 3_daisies | main_street | modern | modern | no | yes | no | no | http://www.pensiuneamilena.r |
| 11 | Coltau | Florilor | 70 | 18 | 3_daisies | main_street | modern | rustic | no | yes | no | no | http://www.cazaretransilvania. |
| 12 | Copalnic | Casa_de_peste_rau | 70 | 12 | 3_daisies | sec_street | modern | undefined | no | yes | no | no | http://www.skytrip.ro/pensiun |
| 13 | Desesti | Irina | 70 | 8 | 3_daisies | main_street | modern | modern | no | yes | yes | no | http://www.pensiuneairina.ro/ |
| 14 | Glod | In_Poiana | 70 | 51 | 3_daisies | sec_street | modern | modern | yes | yes | yes | yes | http://www.pensiunea-inpoian |
| 15 | Ieud | Chindris | 55 | 6 | 2_daisies | sec_street | modern | modern | no | yes | yes | no | http://m.cazarevacanta.ro/caza |
| 16 | Ieud | Casa_Dancus | 55 | 13 | 2_daisies | main_street | rustic | rustic | no | yes | yes | no | http://www.casadancus.ro/ |

***Figure 1. The database with the characteristics of rural hostels in Maramureş***
***Source: Screenshot of the Excel spreadsheet***

### *Identifying the Building Tool*

We chose the ***Corvid*** system developed by ***Exsys***. This system is an object oriented development platform that involves going through three types of operations: defining variables, building logical blocks and building command blocks.

### *System Encoding*

After the choice of the building tool, our attention is turned to encoding the database, following the syntactic requirements of the chosen system (Corvid). In order to find out the stages that need to be followed in the process of building the system, we have resorted to the site of the development tool Exsys Corvid (Exsys Inc 2011). Our major concern at this stage is to avoid the errors that might occur.
We have followed the following three stages of the Corvid system:
- We have defined the variables as in the figure below (Figure 2). Variables are the major factors that intervene in the problem solving process.

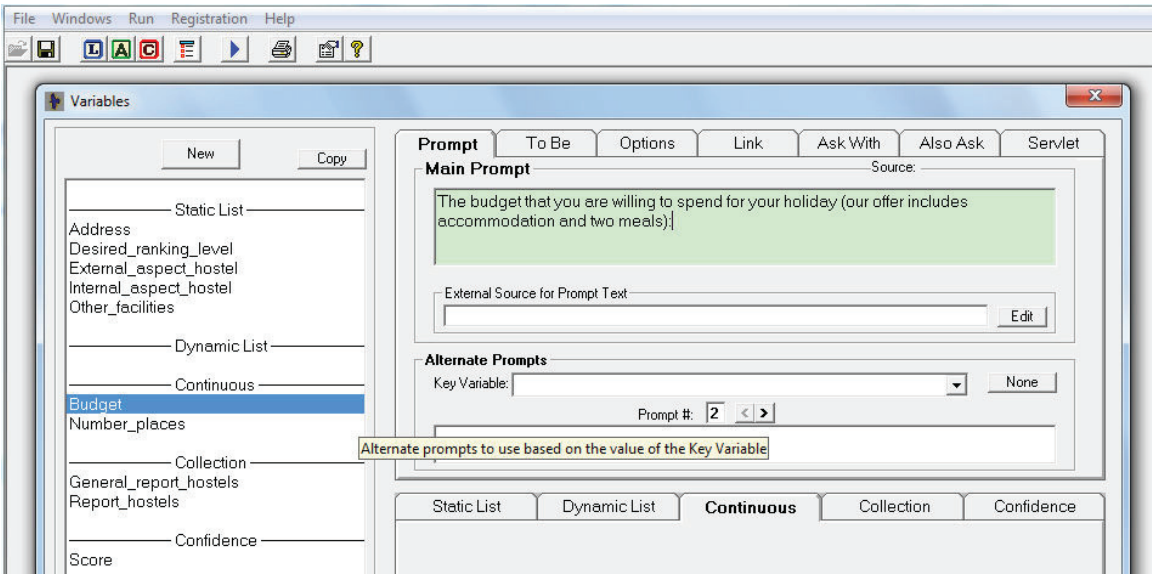


***Figure 2. System variables.***
***Source: Screenshot from the application (Exsys Inc 2011)***

We then constructed the logical block (Figure 3) using the decision rules that had been established in collecting and representing knowledge. We chose the MetaBlock option for the logical block. Metablock is a unique feature of Exsys Corvid to build systems that select the best product for an end user, from a group of products based on user preferences and requirements. The Corvid Metablock feature provides a way to write rules in the Corvid system that can be applied to product characteristics which will be stored in a spreadsheet. System variables will be compared with the data in the spreadsheet using IF-THEN rules.

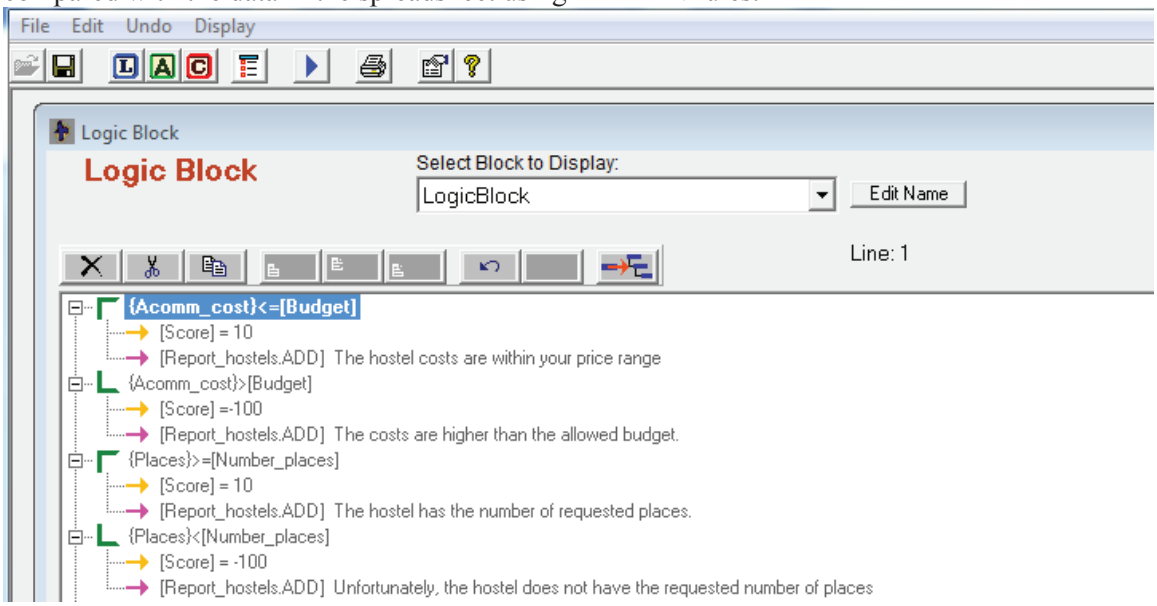


***Figure 3. The logical system block.***
***Source: Screenshot from the application (Exsys Inc 2011)***

The last stage in building the system was to define the command block. Command blocks determine how the system will interact with the user, including the order of execution and the user interface (Figure 4).

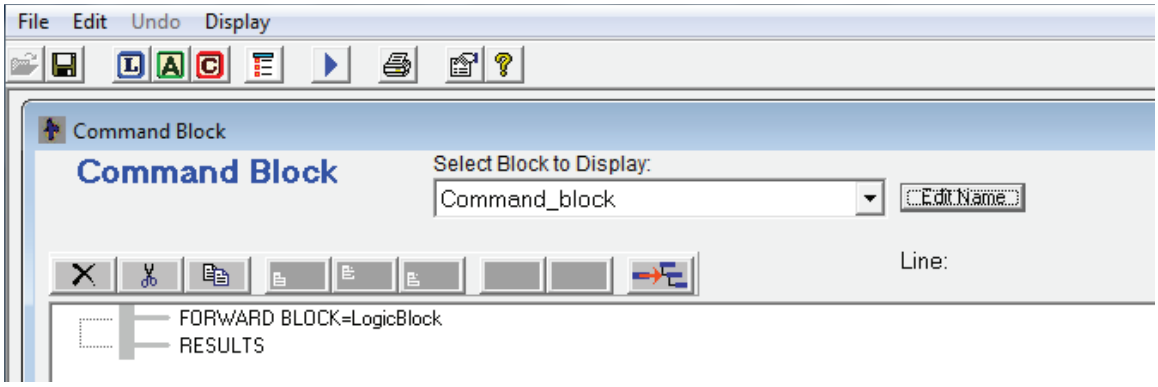


*Figure 4. The system command block.*
*Source: Screenshot from the application (Exsys Inc 2011)*

***Evaluating the System***

After the expert system is built, it must be assessed. Assessment includes verifying and validating the system. The verifying phase ensures that the database knowledge base contains data acquired from the expert and that there are no errors in the encoding phase. Validation confirms that the system can solve the problem correctly.

## IV. Research Results

The designed system provides the end-user with a friendly, easy-to-use interface. The system, once implemented in specialized sites, will be able to facilitate searching and finding information by internet users. The expert system will extract from the database, depending on the user choices, the top five hostels, ordered by score (the score is given by proceeding sequentially through the rules of the logical block), supplemented with additional details as text. The result will contain the contact details of recommended hostels, including the webpage, which makes is a link to more detailed information about the hostel.


*Figure 5. System recommendations.*
*Source: Screenshot while running the application (Exsys Inc 2011)*

## V. Conclusions

Expert systems can play an important role in the evaluation of tourism destinations. By applying IF-THEN scenarios, one can evaluate the benefits of tourist destinations from several points of view and obtain information useful for decision making. Otherwise, a decision is often difficult to make and time consuming for those who intend to choose from the multitude of possible variants, as all conventional methods use a large amount of data and require a long series of calculations.

Our suggested model has proved effective in the testing phase, given that the final result contained useful recommendations, and users can be assured that the result is correct. In this respect, we can say that the expert system has reached the purpose for which it was created.

We suggest that this model should be a starting point for further research. The system development environment can be constantly updated by the system manager to provide comprehensive information system to users (for instance, the knowledge database can be complemented with maps that can provide information on location and access routes to the selected destinations). The knowledge database system grows by storing user requirements. The data obtained in this way can be used to generate statistics on customer behavior and choices, which may contribute to the establishment of rural tourism development strategies.

The solution that we have put forward is a solution for the successful promotion of tourism offers. Owing to the online assistance it offers, its implementation in websites can attract customers from both our country and top tourism consumer countries of the European Union, as well as from anywhere in the world.

## VI. Bibliography

1.*Exsys Inc.* 2011. http://www.exsys.com/ (accessed martie 24, 2011).

2.Holsapple, Clyde and Whinston, Andrew. *Decision Support System: A Knowledge Based Approach.* St. Paul: West Publishing, 1996.

3.Nedovic, Ljubica and Devedzic, Vladan. "Expert System in Finance: A Cross-Section of the Field." *Expert System with Application, vol.23, No.1*, 2002.

4.Turban, Efraim, Sharda, Ramesh and Delen, Dursun. *Decision Support and Business Intelligence Systems, 9th Edition*. New Jersey: Prentice Hall, 2011.