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Decision Support Systems in a Tourism Destination: Literature Survey and Model Building

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Abstract

Information and communication technologies have profound implications for the tourism industry. They are being used extensively in a great variety of functions and count innumerable applications. Among these, Decision Support Systems (DSS) can play a fundamental role for their capacity to give organizations and people managing tourism destinations the possibility to base all the decisions concerning policies, infrastructure development and stakeholders progress on sound and rational bases. Aim of this paper is to present an overview of DSS usage in tourism management organizations and to portray a general framework for the design of an effective practical implementation. Initial considerations on development issues are addressed.

Keywords: tourism, destination management, information systems, decision support systems

Introduction

Tourism has become, in the second part of last century, what is considered to be probably the most important economic activity in the world. According to the World Tourism Organization (WTO) and World Travel and Tourism Council (WTTC) about 11% of World Gross Domestic Product (GDP) is generated by the tourism sector and a consistent part (more than 200 million people) of the World's workforce is employed.

More than that, it is predicted to be one of a few businesses that will continue to grow at a appreciable rate (around 5% per year) and to generate job opportunities in the future. Tourism is nowadays an important vehicle for regional and national development and, to many countries and regions, it represents the major (if not the only) contributor to the local economy.

The boundaries of the tourism and travel industry are fairly indefinite. It brings together, and strongly influences, segments from a number of different activities with a wide variety of products and services exhibiting little homogeneity and different technologies are used in the production process. There is probably no other economic sector with such a diversity in terms of activities. This has raised the question of whether tourism and travel should even be classified as an industry by itself, in the traditional sense of manufacturing or trade.

In the last decade, then, tourism has become an extremely dynamic system. Introduction of flexible structures, fast changing customer behaviour and strong impacts from the development of transportation technologies have exerted a strong pressure on the sector.

In this scenario, the only common element is information.

From the demand side (the tourist), the tourism experience is made up of several stages: pre-trip decision phases, time spent in the chosen destination, post-trip evaluation. At each stage, instinctive processes utilize different sources of information to revise existing knowledge and prepare for subsequent experiences. From the supply side (the tourism industries), the planning, the development, the organization of products and services and the management of the infrastructures needed to deliver them make almost exclusive use of a whole lot of information gathered from different sources: tourists, local environment, general economy, etc. (Cooper et al., 2004; Buhalis, 2003; Gunn, 1994).

The intangibility of a tourism product stresses its information component so that it is always described as an "information intensive" one, therefore (Poon 1993:154):

> *"In few other areas of activity are the generation, gathering, processing, application and communication of information as important for day-to-day operations as they are for the travel and tourism industry."*

Then, a direct consequence is that any technology able to manage information in an efficient and effective way is vital for the tourism sector. The relationship between the two worlds (information technology and tourism) is so strict to allow us to think to a kind of genetic tie. Travel and tourism companies have been the first to make sophisticated uses of the possibilities and the capabilities of the applications of the electronic technology to the processing and the management of data and information. The industry is especially sensitive to the ever-increasing competitive pressure and to the growing need for more effective operational and control tools. The help that can be given by information and communication technologies is therefore much sought-after and is seen as capable of providing new opportunities for business development.

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 global markets. These solutions increase the importance of information flows within organizations and among their partners. In today's world, using Information and Communication Technologies (ICT) is no more a distinctive characteristic by itself, only an effective and efficient usage can help in obtaining a competitive advantage. Therefore an effective and rational strategy is considered a key element to achieve a competitive advantage on the market.

Contemporary ICTs allow to reconfigure the entire business. They represent a possible instrument able to increase efficiency, reduce costs, and improve customer care (Buhalis, 2003). New possibilities of action and approach are continuously made available by ICTs, and one of the main effects of their widespread usage is a change in the attitudes and the behaviours of both consumers and producers.

On the other hand, tourism has become an extremely dynamic system (Farrell & Twining-Ward, 2004). In the last years, the globalisation enabled by technology development and by less expensive travel costs has greatly increased competition. The intensified marketing efforts of all tourism organisations has led to a more effective approach: the destination management approach (Ritchie & Crouch, 2003).

Tourism destinations

The spectrum of definitions describing a destination is extremely broad, and there are many difficulties in setting clear boundaries to a Tourism Destination (TD). Many definitions have been proposed; in general, every place for a holiday, every place to visit may be considered a destination.

Based on a number of characteristics common to a majority of definitions, a tourism destination may be intended as a geographical area that offers the tourist the opportunity of exploiting a variety of attractions and services, or, more simply: a physical space in which a visitor spends at least one overnight (Jafari, 2000).

All the tourism destination models proposed see the presence of an entity, the destination management organization (DMO), whose main aim is to be responsible for the planning and marketing of the TD and to have the power and the resources to organize infrastructures and local stakeholders and their relationships. Destinations can thus offer a combination of tourism products and services, which are consumed under the brand name of the destination (Heath, 2003; Ritchie & Crouch, 2003; Buhalis, 2000).

Having the complete responsibility for the entire destination product, DMOs must facilitate the development and the distribution striving to meet the demand, but taking care of assuring a balanced and sustainable progress of the local resources, avoiding any possible threat to people and environment. Being typically public organizations, DMOs can count on incentives and policies.

The main challenge for a DMO is to foster the implementation of innovative successful products create local partnerships and cooperations able to deliver visitors a seamless and memorable experience. These collaborations should bring together both private and public sector organizations with the objective to ensure that the long-term competitiveness of the tourism product overcomes all decision making processes. One more difficulty is generated by the fact that, all over the world, tourism services are offered by small and medium tourism enterprises (SMTEs).

A prominent role in this scenario is played by the management of information, the essential "raw material" with which a DMO may fulfil its organizational and management duties in an efficient and effective way.

Information technology, as said, has profound implications for the tourism industry, is being used extensively in a great variety of functions, and the tourism industry is well aware of the importance and of the beneficial effects of *e-managing* a great amount of information generated. This situation has been acknowledged by the ICT industry and a series of sophisticated software applications have been deployed.

Among these, a Decision Support System (DSS) should be a fundamental tool for a DMO.

Broadly defined as a computer-based system that aids the process of decision making (Finlay, 1994), a DSS may assume numerous forms and may be built by using different architectures and components (Eom et al., 1998). In this context, its main aim is to give a DMO the possibility to base all the decisions concerning policies, infrastructure development and stakeholders progress on sound and "scientific" bases.

Main aim of this paper is to present a concise overview of the current environment and the state of the art in the area of DSS and their usage in tourism organizations. Based on that, a general framework will be presented and a possible implementation model for an effective DMO decision support system will be designed, along with some considerations on the main issues to be addressed for the realization of such a system.

Decision support systems, an overview

A DSS can be considered a class of computerized information systems that support business and organizational decision-making activities. A properly designed DSS is, typically, an interactive software-based system intended to help decision makers extract useful information from raw data, documents, personal knowledge, and/or business models to identify and solve problems and take decisions. This definition may look too broad, but the many possibilities to build an information system (IS) with the objective to support managerial activities prevent us from giving an exact characterization. This position has been well expressed by Keen (1980), who claims that it is impossible to give a precise definition including all the aspects of the DSS ("there can be no definition of decision support systems, only of decision support").

Although the term Decision Support System has many connotations, it is possible to identify the following three major characteristics (Alter, 1980):

- DSS are designed specifically to facilitate decision processes;
- DSS should support rather than automate decision making; and
- DSS should be able to respond quickly to the changing needs of decision makers.

More recently, Holsapple and Whinston (1996), in identifying general characteristics for a DSS, broaden the perspective on the concept, by stating that a DSS:

- includes a body of knowledge that describes some aspects of the decision maker's world, that specifies how to accomplish various tasks and indicates what conclusions are valid in various circumstances;
- has an ability to acquire and maintain descriptive (i.e., record keeping) and other kinds of knowledge (i.e., procedure keeping, rule keeping, etc.);
- has an ability to present knowledge on an *ad-hoc* basis in various customized ways as well as in standardized reports;
- has an ability to select any desired subset of stored knowledge for either presentation or deriving new knowledge in the course of problem recognition and/or problem solving;
- can interact directly with a decision maker or a participant in a decision in such a way that the user has flexible choice of knowledge-management activities.

DSS can be thought of as a broad category of analytical management information systems. They provide managers more control on data, access to analytical tools, and capabilities for consulting and interacting with a distributed group of staff. From an enterprise-wide point of view, a DSS is linked to a large data warehouse and serves many people in a company (Power, 1997). Also, it is defined as an interactive system in a networked environment that helps a targeted group of managers make decisions.

In many activities – for example understanding of the status of operations, awareness of customer preferences, care of business results – managers need to have data and information in a timely and current way. Also, information has to be accurate, relevant and complete. Moreover, managers want information presented in a format that effectively assists them in making decisions. In general, management information should be presented in a summarized format and any support system should have an option for managers to get to the level of details needed.

Decision Support Systems respond to these requirements. They aim at providing current, timely, accurate, relevant and complete information. The information presented by a DSS may result from analysis of internal transaction data or of data gathered from external sources. It may be also the result of a decision model. Therefore, the information presented by these systems depend by the type of DSS implemented or used.

DSS are both off-the-shelf and custom designed systems. They may support a small group of managers using a single personal computer or a large group of people in a networked client-server environment. These latter systems are often called Enterprise-Wide DSS (Power, 1997).

DSS characteristics and taxonomy

A general taxonomy of DSS had been proposed by Alter (1980) by distinguishing a number of categories: file drawer systems, data analysis systems, analysis information systems, accounting and financial models, representational models, optimization models, suggestion models.

More recently, Power (2002) differentiates these five types of DSS:

- *Data-Driven DSS*: they emphasize access to and manipulation of large databases of structured data (especially a time-series of internal company data and some times external data). Simple file systems accessed by query and retrieval tools provide the most elementary level of functionality. Data-Driven DSS with Online Analytical Processing (OLAP) provide the highest level of functionality and decision support (Dhar and Stein, 1997). Executive Information Systems (EIS), Geographic Information Systems (GIS) and Business Intelligence Systems are also examples of Data-Driven DSS.
- *Model-Driven DSS*: they include systems that use accounting and financial models, representational models, and optimization models. Model-Driven DSS emphasize access to and manipulation of a model. Simple statistical and analytical tools provide the most elementary level of functionality. Model-Driven DSS use data and parameters provided by decision-makers to aid them in analyzing a situation, but they are not usually data intensive.
- *Document-Driven DSS*: they integrate a variety of storage and processing technologies to provide complete document retrieval and analysis. Examples of documents that would be accessed by a Document-Based DSS are policies and procedures, product specifications, catalogues, and corporate historical documents, including minutes of meetings, corporate records, and important correspondence.
- *Communications-Driven and Group DSS*: they include communication, collaboration and decision support technologies which allow groups of decision makers to work together in a coordinate way. They are sometimes identified as Group DSS (GDSS). A GDSS is a hybrid DSS that emphasizes both the use of communications and decision models. A Group Decision Support System is an interactive computer-based system intended to facilitate the solution of problems by decision-makers working together as a group.
- *Knowledge-Driven DSS*: they are person-computer systems with specialized problem-solving expertise. The “expertise” consists of knowledge about a particular domain, understanding of problems within that domain, and “skill” to solve some of these problems. A related concept is Data Mining. Data Mining tools can be used to create hybrid Data-Driven and Knowledge-Driven DSS.

Actually, the Document-Driven class may well be considered a sub-category of the Knowledge-Driven one.

DSS can also be categorized by user groups – intra-organizational and inter-organizational. An inter-organizational DSS provides stakeholders with access to a company’s intranet and authority or privileges to use specific DSS capabilities. The prefix “intra” means that the DSS is used within a specific organization and “inter” means that the DSS is used across a set of different companies.

From a different perspective, Decision Support Systems can be categorized by their purpose. Many have a narrow, focused, specific purpose (such as single queries or specific forecasts) rather than a general purpose (such as collaborative decisions or strategy formation).

Finally, DSS can be categorized by the basic enabling technology.

Some are hybrid systems driven by more than one major component, such as Web-based DSS, implemented using Web technologies. A Web-Based DSS is a computerized system that delivers decision support information or decision support tools to a manager or business analyst using a "thin-client" Web browser.

Today, both the diffusion of such systems and the technological advancements may suggest a multidimensional framework in which DSS can be classified according to their main typology. Each one of them has as attributes the user groups, the main purpose and the enabling technology.

Table 1 summarizes the DSS framework described above, identifying relationship among DSS type, user groups, purpose, and enabling technology.

Table 1. A DSS framework (after Power, 2002)

DSS Type	User groups		Purpose	Enabling technology
	internal	external		
Data driven	Managers & staff	Customers & Suppliers	Query data warehouse	Mainframe, client/server
Model driven	Managers & staff	Customers & Suppliers	Scheduling, Decision analysis	Standalone workstations
Communications driven	Internal teams	Partners	Collaborative decisions	Client/server, Web
Knowledge driven	Internal users, specialist groups	Partners	Strategic and tactical decision making	Client/server, Web

The most used types of DSS are model-driven and data-driven. Generally, Data-driven DSS are intended to be interactive, real-time systems responsive to unstructured as well as structured information requests and reporting needs. Model-driven DSS are usually focused on modelling a specific decision or a set of related decisions (Power, 1997).

According to Power (2002), academics and practitioners have discussed building Decision Support Systems in terms of:

- the user interface;
- the database;
- the models and analytical tools;
- the architecture and enabling technologies.

This traditional list of components remains useful as it identifies similarities and differences among categories or types of DSS and can help managers and analysts build new systems.

Regarding the architecture of a DSS, Marakas (1999) proposes a generalized architecture made of five distinct parts: the data management system, the model management system, the knowledge engine, the user interface, and the user(s).

Decision support systems in tourism

In spite of the general belief, the real adoption of advanced software technologies by the components of the tourism sector is rather low.

More than one-third of the European tourism enterprises say that electronic supporting technologies have some effects on their way of conducting business (Figure 1; e-Business Watch, 2003).

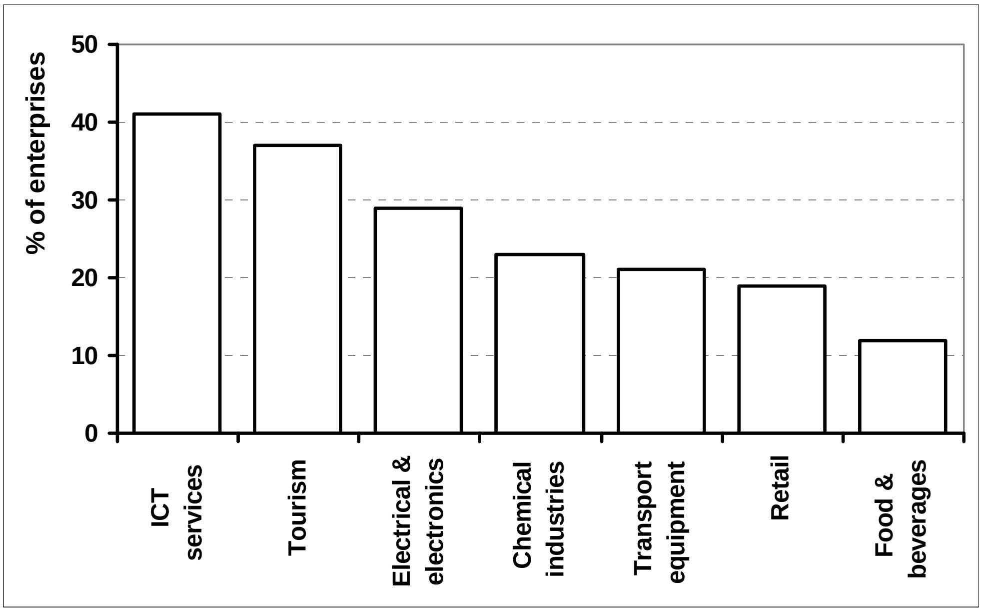

Figure 1. Perceived impact of e-business on customer relationship by industries belonging to different sectors in five EU countries: France, Germany, Italy, Spain and United Kingdom. The picture show the % of companies maintaining that interactive technologies have at least some effects on the relationships with customers (e-Business Watch, 2003)

For example, the percentage of tourism organizations adopting and using applications in different areas (customer relationship management: CRM, supply chain management: SCM, enterprise resource planning: ERP, knowledge management: KM) is sensibly lower than in other economic and industrial sectors (Figure 2; e-Business Watch, 2003).

A confirmation can be found in a recent research on the usage of Information and Communication Technologies in the Italian hotel industry. A Delphi study has been conducted in order to identify the main activities that need a technological support and to set up ideal coverage and implementation priorities (Baggio, 2004). This model has been checked (Sant'Ignazio, 2004) by surveying a sample of 100 Italian medium size hotels to evaluate their behaviour and their attitude towards ICTs. The survey shows that, in general, hotels are using ICTs at a much lower level than it is suggested by the ideal model.

The same situation applies to the public destination management organizations (DMO).

This is particularly true for those systems that can be classified as DSS (Wöber & Gretzel, 2000).

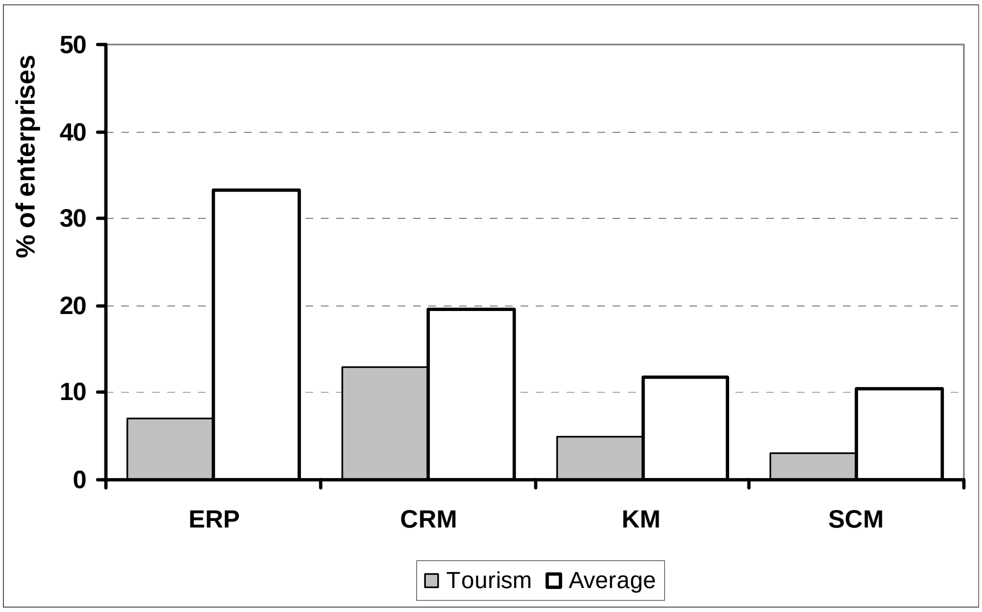

Figure 2. Diffusion of advanced software solutions in European tourism industry compared to the average diffusion in seven industry sectors (e-Business Watch, 2003)

A literature survey on this area shows a relatively limited number of works. Most of them use the idea of a decision system as related to the problem of deciding destination and modality of a travel by a tourist and only few of them take into account the decision making process by a tourism enterprise or a DMO. This even though the problem is credited to be a challenging and a complex one (Wöber, 2003: 241):

> "*Operators in tourism management, compared to other management sectors, are confronted with a vast field of complex aims, requiring different plans of action. The special working requirements of the services sector are a result of its business peculiarities. Problems in strategic, and frequently operational planning, are characterized by their complexity, often being intermingled, non-transparent, individualistically dynamic and requiring the achievement of multiple goals. The vast amount of information or complex weighting of the different sectors can present an insurmountable problem for human resources. As a result there are high expectations of decision-makers' trouble-shooting abilities.*"

The attitude towards a system able to give enough rational inputs to support the complex decisions needed in the tourism arena is generally good, as for the other information systems available to a tourism enterprise and to a DMO. The perceived usefulness, ease of use and a positive attitude towards information technology are the factors that most strongly influence the acceptance of a DSS among the managers of this sector (Wöber & Gretzel, 2000).

However, only few practical implementations can be counted and still many are just projects and not fully operational systems. From these, some general architectural elements have been acknowledged, whose importance has far more generality than the single case in which they have been identified. The main functions are (Ritchie & Ritchie, 2002):

- *tracking current situation*: gathering and communicating current information on visitors and their use of travel and tourism products during their stay at destination;

- *measuring travel motivators*: identifying and measuring main determinants that influence travel decisions;
- *gathering competitive intelligence*: monitoring and assessing marketing activities, initiatives, success of the key competitors;
- *recognizing new opportunities*: searching and profiling growing areas of potential and market trends for tourism to a destination;
- *evaluating marketing activities*: measuring the effects of the marketing activities, initiatives and campaigns;
- *monitoring industry satisfaction*: monitoring satisfaction of tourism operators with tourism activities performance;
- *measuring return on investment*: assessing the return on investment of the programs, the policies and the decisions taken.

To these we should add the monitoring of the basic resources of the destination: physical environment, cultural resources, infrastructures (both physical and technological) and the local social and economic conditions. Obviously enough, all the previously mentioned activities must be conducted on an ongoing basis, with a frequency useful for the main objectives of the DMO.

From a technological point of view, apart from the “usual” database architectures, it has been recently suggested that the use of a geographic information system (GIS) could be of great benefit.

By adopting a wide definition, a GIS can be seen as an information system for a sequence of operation ranging from the collection to the survey, storage, analysis and output of spatial information for supporting decision making. A tourism destination is essentially a (more or less) confined geographical area and a GIS has been recognized as a very efficient tool of using spatial data (Laniado et al., 2004).

On the other hand, the management of knowledge is becoming an issue of primary importance for any tourism organization. KM is proving a beneficial strategy to underpin the competitiveness of a destination, supporting innovation and new products development and both short and long term goals of a DMO (Cooper, 2005).

The Internet can play a fundamental role in the present era. The capabilities of Internet protocols and technologies to be (relatively) standard, platform independent, inexpensive and easily usable even by low skilled people, have been the major determinant of their wide diffusion. In a TD, with a vast diversity (in size, type, skills, equipments etc.) of stakeholders, these technologies seem to be the only viable possibility to form an effective infrastructure. Moreover, they can be easily deployed to the “external” world and used to offer actual or potential tourists a wide range of useful information and documentation elements. Elements that have been widely recognized as the most effective determinants of their choice (see, for example, Frew, 2005, 2004; Frew et al., 2003).

A framework for a destination management DSS

A tourism destination is a complex system composed by many diverse elements whose interactions are highly dynamic and open to external influences. The task of any organization whose responsibility is to manage (partially or fully) such a system is a very difficult one. A DMO needs to be able to gather an accurate knowledge of the destination resources, of the different public and private organizations present, of the social and economical situation both at the destination level and at a wider national or international level. Combined with this, a good intelligence of diverse methodologies and techniques for analysing, forecasting and planning is crucial for the achievement of the objectives set (see for example Cooper et al., 2004 or Ritchie & Crouch, 2003).

As an example, Figure 3 (adapted from Loy Puddu, 2005) shows, in a schematic way, a typical planning process in a DMO. Basically it is a large feedback cycle in which each phase is connected to another via activities that consist, mainly, in the processing of a high number of diverse elements. The whole sequence is complicated by the influence of several external inputs.

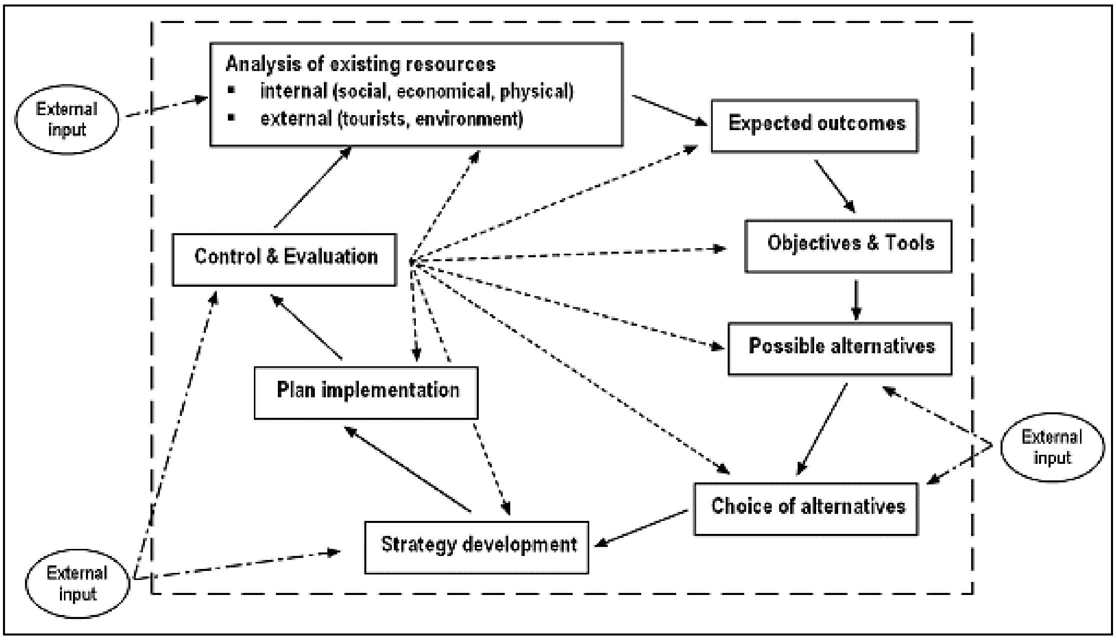

Figure 3. Schematic representation of a DMO planning process (after Loy Puddu, 2005)

In a situation like the one depicted above, the *decision system* needs to rely on a great variety of tools and methods, and it may be quite impossible to identify, in a single one of the DSS types listed above (see Table 1), the “ideal” system. The solution can only consist in a combination of them.

A possible proposal for an architecture of a DSS suitable for a tourism destination management organization is shown in Figure 4.

Through an application interface the user can access, via a communication layer, a combination of “bases” containing the data, the models and the documents needed for his actual specific task.

In particular, the user interface (UI) – typically a graphic interface – is the part of the system through which the end user interacts with the system. The UI has also the responsibility to manage the authorization system, allowing different user typologies to perform different tasks .

The communication layer (CL), based on Internet technologies and their standard protocols, establishes and provides the connectivity functionalities. This layer, in practice, allows the user to reach the components needed. The use of the Web entails availability and easy access to data-base and knowledge-base systems even if distributed across a variety of different physical locations.

Communication channels will not be discussed, but the Internet protocol layers relieve the user from the problem of managing, and even knowing, which kind of physical medium is used (i.e. wired or wireless).

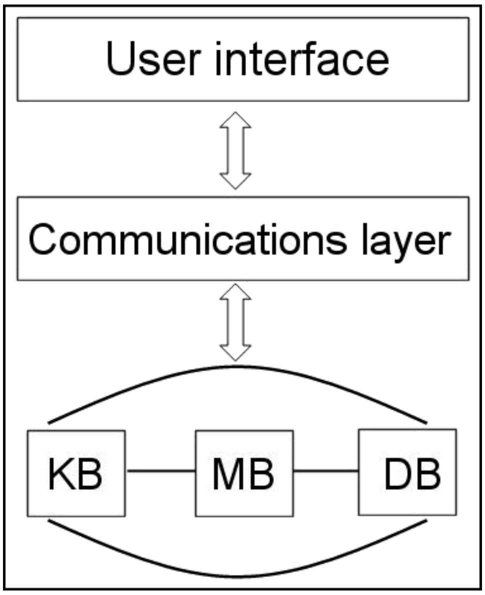

Figure 4. General architecture for a tourism DMO decision support system

The core components are: a Knowledge Base (KB), a Data Base (DB) and a Model Base (MB). Their main characteristics are:

- for the *knowledge base*: a container of "human knowledge" that is modeled or represented in a way that a computer can process (Laudon & Laudon, 2004). The KB is also defined as a centralized repository for information, like a public library, a database of related information about a particular subject. From the information technology point of view, a KB is a computer resource, generally online accessible, for the collection and dissemination of information. A KB is used to optimize information collection, organization, and retrieval for a specific request or for public and open searches. A KB is not a static collection of information, but a dynamic resource;
- for the *data base*: a collection of data organized to service many applications at the same time by storing and managing the different items so that they appear to be in a single location (Laudon & Laudon, 2004). Data can be collected from various sources (primary data coming from surveys, secondary data from national or regional statistical boards etc.) and part of them can be organized, for example, by using the techniques and the tools of a geographical information system (GIS);
- for the *model base*: a collection of models and algorithms used by the decision support systems to provide useful information required by decision makers. Some examples are: decision trees, probability density functions, maximum likelihood estimation, neural networks, inference in Bayesian networks, k-means and hierarchical clustering, zero-sum game theory. The MB also contains tools able to perform simulations of dynamical complex systems.

Both DB and KB are based on a distributed infrastructure. The several possible strategies for creating a distributed infrastructure include:

- *client/server*; this approach provides workers with access to information and applications whenever they log in to the network, which is, typically, a local or company-based network;
- *web-based applications* (and thin client); this strategy allows users to log in through

whatever Internet connection they have available; it validates the single person, usually by a password, rather than the machine.

- *distributed applications*; this strategy includes any application that does not need to run on a single computer or environment. Distributed applications can be made available to users logging in through a variety of means.

The first two strategies (client/server and web-based) require the user to have a live network or Internet connection to be fully functional. The most part of computing resources – i.e. enterprise applications and data – remains centralized, only small portions of the work utilize the remote machine.

The third one (distributed applications) may be implemented by using recurring synchronization tasks, so that the user does not need to be permanently connected and information contents stay current and in line with centralized databases.

Distributing computing across platforms, languages, and devices is becoming more feasible and used by many organizations.

Some advantages of distributed applications are:

- *increased productivity*. Distributed application environments allow employees to work from any location, even if they are not permanently connected to the Internet or other networks;
- *cost savings*. Distributed computing does not obviate organizations' investments in existing infrastructure, but savings may be realized by better exploiting existing hardware;
- *improved business decisions*. Distributed application environments allow users to work with full data sets even when they are not connected, so they can improve their decision capacity.
- *flexibility and scalability*. These attributes refer, in one hand, to the capacity of the system to be adaptable, or variable, and, on the other hand, to the ability to increase or decrease size or capability in cost-effective increments with minimal impact on the unit cost of business and the procurement of additional services.

The MB uses web services architecture. It is composed by some software components deliverable over the Internet, enabling one application to communicate with another without requiring any translation (i.e. regardless of operating system, programming language). Web-services can provide significant cost efficiency and effectiveness improvements compared to traditional in-house systems (Laudon & Laudon, 2004). Moreover, they may give access to complex and sophisticated applications even to organizations not able otherwise to approach them.

Rather obviously, all the different parts of the DSS framework described (Figure 4) have the capability, via suitable interfaces, of connecting each other for exchanging or accessing possible common elements.

The complete implementation of such a system cannot follow a monolithic approach. Changing environmental conditions, diverse priorities or evolving needs of the users strongly suggest the adoption of evolutionary methodologies. The overall project needs to be partitioned in smaller self-contained blocks, so that functional capabilities can be provided to the users on a regular basis (Hugh, 1993).

Besides that, the build-up of the DSS has to take into account a number of different issues that can be grouped in three main areas (Bhargava & Power, 2001):

- *technological challenges*: mainly in choosing and adopting a consistent and stable set of technologies with the aim of being usable and useful for the purpose of a similar project;
- *economic challenges*: the development costs of DSS such as the one described above may

be very high, and they should be carefully analyzed (Kohli & Sherer, 2002). They may be contained by using effectively the possibilities of distributing the resources and working on the setting of exchange standards able to group the vast mass of existing data, more than developing whole databases from scratch;

- *social and behavioral challenges*: basic condition for the success of a DSS project is the full collaboration of all the actors involved. In a TD this can be a difficult goal to achieve. The number and the great diversity, in type, size and culture, of the stakeholders involved and the often conflicting short range objectives they have must be addressed thoroughly (Buhalis, 2000).

Conclusive remarks

In a highly dynamic, globalized and competitive World, computerized decision systems are an essential tool to support managers for their capability to provide timely and accurate information.

The tourism sector has long lasting relationships with the information technologies. Since the 1960's, with the introduction of the first computerized reservation systems, tourism operators make extensive use of ICTs. This use, however, is almost entirely an operative use. More recent sophisticated systems (SCM, KM, ERP etc.) are relative much less diffused through tourism enterprises than in all the other industrial sectors. These systems are, quite universally in the field, recognized to be important and could give useful help in managing the business.

Among these systems, DSS have an important role for the support they are able to give decision-makers in achieving their goals.

A DMO faces the challenging task of managing a complex mixture of diverse social and economical entities. Its main objective being the one of enhance the long-term prosperity of local people while maximizing visitors satisfaction and local enterprises profitability.

DMO managers strive to reach these goals and the support of a computerized system is recognized as having a fundamental role in providing the elements needed to base their decisions.

A proposal has been made for the architecture of a DSS to be used in this sector.

The framework considered consists of a combination of distributed knowledge, data and model bases. The user can access these systems, or the needed parts, via a layer of communication protocols.

After having sketched the framework, an initial discussion of possible implementation issues has been made. Future work will need to address at a deeper level these elements and possibly, with empirical test, validate, at least from a hypothetical point of view, the consideration presented here to support this model.

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