

# A model of DSS based on knowledge to optimize the performance. Application in the hospitality business

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## Abstract

In this work we present a model of DSS based on the knowledge and supported in Datawarehouse and Datamining technologies, with the objective of help to the hospitality business of Gran Canaria to obtain information of value to management the performance applying Yiel Management techniques. The system that we propose will provides support to generate knowledge and management it.

## Introduction

The globalization of the economy at world level is configuring a new environment which is conditions the operation of the tourist business. This situation obliges us to look for new working methods and innovative techniques, that help improve decision making and conveniently exploit the available information in the information systems as well as that which needs to be captured from the environment. In this way, we try to add value to the information in a way that provides useful information to the business. In this frame the Canarian Hospitality Business is in need of technological tools that not only facilitate the management of its processes, but also help make relevant decisions relate to the market. Innovation is an important source of competitive advantage in markets where customer preferences are changing rapidly, where competition is intense, where product lifecycles are shortening and maturing and/or where differentiation is limited. Although there is substantial body of research linking innovation and performance in the goods area, this has only been addressed in the services sector comparatively (see [1] and [2]). Given the need to communicate intangible benefits, and the relative importance of good customer relationships, it could be expected that these characteristics could also be of particular value to service firms, especially those in the hospitality industry (see [3]).

On the basis of the conclusions reflected in the White Book of the Canarian Tourism (see [4]) the competitive strategic analysis of the canarian touristic system shows as weak points as low user level of New Information Technology (NIT), pointing out the necessity to insist on the potential of communicating the concepts and techniques of the management performance and combine them with the use of more appropriate technology.

The Canarian Tourist Sector possesses quite an important accumulated know-how as a consequence of the experience acquired in the development of its own tourist business. However, the problem arises because such knowledge is not formalised. The governmental organizations and the implicated agents within the sector possess strategic information to be able to cope with the conditions of the global market in which the tourist industry develops itself.

## Objectives

Based on the aforementioned we suggest as a final objective proposing a model of IS that helps systemize the information and serves as support in the decision making, principal

related with the environment of the business. Furthermore, such a system should provide help in selling the correct room at the correct price to the correct client.

### **Technologies and tools for the management the knowledge**

In the frame of the proposed objective, focusing on adding value of the information that support knowledge to the business, the Canarian Hospitality Business is in need of technological tools that, not only facilitate the management of the process but also help them make relevant decisions. In this way the actual business is beginning to operate on an economy based on knowledge, understanding this term in the field of an organization like that key information which adds value to its activity (see [5]). From this perspective the knowledge is being recognised as the most important possession of a business needs to be generated, codified, and transferred the right way. For this reason, the last instance is going to depend on how it is used and who it is used by, which implicates the consideration of the capacities of the people and the technology as well as the system in which it is supported. The use of such technology will permit the capture, modelling, validating, verifying and maintaining of it with the objective of development applications which are based on the knowledge.

Thre creation of the system that support the management of the knowledge is focused on identifying the key information that the business needs to capture just as organising and mainaining the organization of the data through time to finally, help the users obtain the information and the knowledge that they need (see [6]). For this, the business should forms the neccessary means to produce the accumulation of the knowledge from the right management of the knowledge as the base to improve the competitive position.

From this point of view the management of the knowledge needs the support itself on the use of technological tools, specifically in the new technology like Groupware, Workflow, Datawarehouse, Datamining, Intranet and Internet, due to the potential that they offer to the business to configurate advanced information systems and help to generate and accumulate knowledge.

In funtion of the objective that we have proposed in this paper we need to make a special mention of Datawarehouse technology and Datamining tools as support of a strategy of integration of the information for the business´ of Hospitality in Gran Canaria, aspect that we consider necessary to develop the model of DSS that we propose.

### **Datawarehouse and Datamining**

The Datawarehouse (DW) technology is a set of data integrate in a corporative data base that they are clustering by subject, they are not changeable and change with the time, permitting us to realize not only one analysis in two dimensions as in classical database technologies, but a multidimensional analysis in this way helping the organisation of the information to be analysed at a later date (see [7]).

Another more important characteristic that presents Datawarehouse is because it allows us to register permanent data and concentrate the information from the internal operative systems of the business and the external data. In this way the information contained in the Datawarehouse will be distributed using queries and reports that will be the base of the decision making.

It is important that the information technology that support it is independent of the technology that supports the systems at operative level. In this respect, in the case of the hospitality business in Gran Canaria, this premise doesn't work (see [8], [9] and [10],

where the data used has been collected in 3, 4 and 5 star hotels, and the conclusions established in the diagnostics collected in the White Book of Canarian Tourism, see [5]), given that the main problem is with the integration of the contained information in the IS of these business'; this is consequence of the way in the have been incorporating IT/IS to its processes. The implantation of IT/IS has not adjusted most of the time a formal plan and due to this the growth of the applications of the system has not been reachable the objectives such defined before. From this we derive that the system configured are limiting the potential use of these technologies with the consequential lose of the opportunity of business for a great number of business'. In the same way we have been able to observe inefficiencies in the management of the data, fundamentally the lack of integration of the applications that are in their IS (problem with linking data from different applications, redundancy in the data, major costs of gaining information and the non availability of useful information for decision making).

In relation with the IT we observe that it is being used in all establishments, but in no case exists different technology which support the systems at the operative level. Obviously, this causes an obstacle that limits the possible development of the advanced tools like Datawarehouse and IS which need support in this type of technology.

The studies carried out by different authors (see [11], [12], [13] and [14]) reflect the necessity that the touristic business has in general, and the hotelier in particular, to use the information resource and the IT/IS as strategic factors that can aid the gaining of competitive advantages for the business that know how to exploit them.

These resources that the Canarian business is using but not from a strategic perspective, for this reason, this inadequate exploitation is also limiting obtaining the competitive advantages as opposed to other destinies that are making adequate use of such resources.

Some of the aforementioned authors (see [14]), also go deeper into this focus considering that to one of the most important actions that the tourist business must do is to help the acumulation of information and the knowledge by way of the diffusion of mature applications of IT/IS as essential bases. This reinforces the need that exists to count on technologies of the kind mentioned previously which in the case of the Canarian hospitality business is only being used at a low level and in a restricted way, that is to say, not in all of them.

To extract the maximum benefit from DW it is necessary for the business to use Datamining (DM) tools combined with the before mentioned technology helps the business to consolidate and homogenize the information that it is going to use, allowing: it, not only to analyse the information but also at the same time, from the data, discover facts, correlations, patrons, tendencies, groups, models, etc., that generally stay hidden in the great volumes of data warehoused in a database like DW (see [15]).

The use of DM implicates adopting a new focus for the treatment of the information from the large databases that serve as support the analysis and discovery of information like the acumulation of active knowledge. At the same time, the DM tools permit to look at the value conclusions for the business, by exploration of the data of the own business.

## **Yield Management**

For a long time the managers of the small and medium firms hospitality industry (SMFHI) in Gran Canaria have focused their effort in making profit on a short term basis with the objective to of following the rising trend of the sector in the islands to stay in the market. We point out that in Canary the seasonality does not exist, it is characterised as being tourist destination with preference in winter for the European market, this means less

competition with other tourist destinations. Moreover, this situation is not the same in other periods of the year where, normally, there is an intensification in the competition for remote or close destinations. To cope with this situation the hospitality business in Gran Canaria are starting to consider the need to adopt new methods and techniques of management that permit them: 1) to adapt to the dynamic of the tourist market to world level; 2) to stimulate the service and adapt to the necessities of each client; 3) to reduce the strong dependence that the touroperators have at the moment; 4) strengthen the diversification of the product.

With the final objective of coping with aforementioned situation some establishments have begun to implant new management systems orientated towards the client and adapted to the new situation of the market. One of these systems is yield management (YM) which has as an objective to help the business in the sector to manage their progress in an optimum way in working with the use they make of their resources.

Many experts have participated in the study of the situation of the Canarian touristic sector whose conclusions have been noted in the White Book of Canarian Tourism (see [5]) they have put to manifest the need that these business have to use techniques of this type that provide them with the most important knowledge of their business and the possibilities that they can make use of them. In this way, in such conclusions points to the necessity to insist on the need to communicate the concepts and techniques of the progress of management, like those technologies more appropriate for them. The necessity to apply such concepts in the Canarian SMFHI and encourage stronger links between these needs to be stressed so that the development of these systems is economically attractive. With respect to the SMFHI this group of techniques that are yield management could help them to maximise the revenue by the using of the available rooms at the correct price, to the correct client. In this way, YM interprets how a group of forecast techniques of the used demand to determine if the prices should be lower or higher and if a booking required should be accepted or not to maximize the progress (see [16]).

The techniques of those which work a system of yield management to achieve its objectives of optimization specifically concentrate on: management of overbooking, discounts and margins of tariffs, control of the duration of the stay, optimization of the group bookings and supplementary controls. The applications of these in a business need to be thought about before its adoptions, the next stages: 1) define the problems related to YM and 2) identify the models of YM that can be adapted in a better way in each business (see [17]).

Until now, the experience of the establishments of Gran Canaria with this type of systems has been linked with chain establishments and with the big independent establishments who in principal have more resources (finances, technologists, humans, better relations with the agents in the market) have been the only ones who have been able to propose the use of the YM techniques. With respect to canarian SMFHI the situation they are in is completely different, in most cases they have been limited because of non availability of resources and due to the major dependency on touroperators who oblige them to fix lower prices to full the establishment. These aspects are the main reason that has impeded the use of some of the techniques mentioned to manage the progress. However, the advantage that these system offer to the SMFHI are that they help to segment the demand, to determine the class of clients, to establish criterions of flexibility in the prices in function of the availability of their resources, and integrate the variable time to optimize the capacity of use of the resources of an establishment. These aspects help support a strategy of differentiation of customer service and diversification of the prices in accordance with the demand in the new economic field in which the sector is developing.

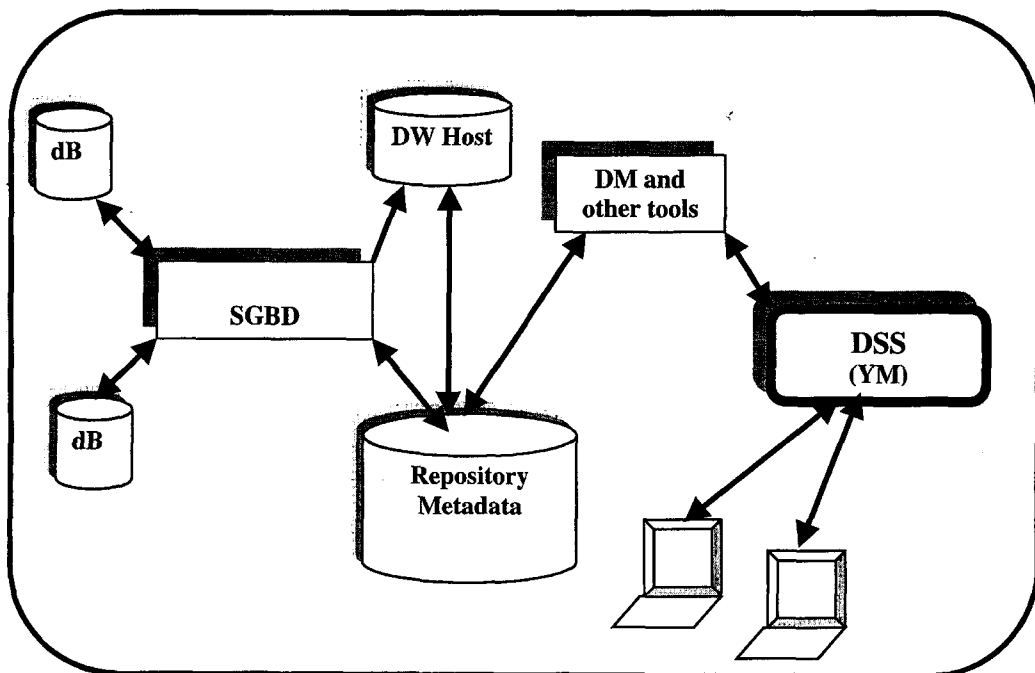
## Proposal of model of DSS

Once the situation have been described, we plan the model of IS based on the work with new technologies that are the base to generate the knowledge to the business´ and support the YM. We mean a DSS to help to make strategic decisions in different areas for the optimization of the use of the resources and to get better performances in the hotels, applying techniques of YM, to develop services that combine the segmentation and the diversification of prices supported by statistical and mathematical treatment of their historic information.

We think that this system could help the SMFHI to expan their market share and to improve the profits per unit of capacity. The system that we propose uses DW as a tool that could supply ata and information and integrate DM with it, with the objective of investigating the information and answering the queries of the manager who need to evaluate progress and the same time gives value to the data and knowledge to the business. With the new system we try to support the integration of information strategic and for this is necessary to link with the DW and with the Management Information System (MIS) of hotel lodgin.

The DSS that we propose is characterised by to be a system oriented to models, with this it permit us to predict the consequences derived from the different decisions, that it analyses and that are basic in the YM. Moreover, the quantity major of information that the system needs must be in the DW and those that are not at the internal level the business, could find in the external by the link between DW with the Internet Web.

In the next figure we present the physical structure of our model and we show the linkages that will exist between the model and the technological infrastructure.



### *Physical structure of model.*

Technological infrastructure required

1. Corporative database as DW
2. Operative databases of MIS or PMS
3. Data Base Management System
4. Tools of acces and seeking of data
5. Conection with an Web host
6. In same case could be the hardware that exist in the hotel

### *Characteristiques of Systems*

1. Linking of DW with operatives database
2. Linking of DW with the data repository
3. Integration of the acces tools with DW
4. Integration of DW with Web host

### *Processing tools*

1. Genetic Algorithms
2. Clustering
3. On-Line Analytical Processing
4. Structured Query Language

### *Information processes*

1. Client segmentation
2. Pattern of demand
3. Forecast
4. Price list
5. Clustering of rooms
6. Overbooking management
7. Discaunt to apply

### *Model of data*

1. Lodgin capacity
2. Numbers of available rooms
3. Caracteristiques of the rooms
4. Different prices
5. Information about clients
6. Historic information about clients
7. Booking of the clients
8. Buiness statistics
9. General supply information
10. Market information

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