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“Custom-made – Information system for managing a restaurant chain”

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Abstract—Sometimes there are some apprehensions when we talk about Information Systems (IS) in business, connected to restaurants, which have been categorized as something negative. The true problem is detected when the IS does not reveal to be the most adequate to the business in question. It is in this context that is referred the necessity of personalize a management information system (MIS) in this type of business. Preferably the users should be involved in the development process of a MIS. The main goal of this article is to model and sketch an IS in order to help the managers of the establishments of a restaurant chain in the current management and information control needed to the right function. In methodological terms, it was made a qualitative study in the form of an interview to the managers of the restaurants to define the necessary requisites to the next MIS. The purpose of this project is to develop and implement the MIS prototype during a master's study which will be improved in the future.

Keywords—information systems, restaurant, technology.

I. INTRODUCTION

In the 21st century, catering establishments have expanded greatly in Portugal to meet the needs of the population, who were looking for a pleasant and complete experience outside the home environment (Carvalho, 2005). This type of business belongs to the tourism sector and according to the data collected by the National Institute of Statistics (INE), it is considered to be the sub-sector with the highest gross value added (GVA) contribution rate. The management of the restaurant business is very complex and proactive and the type of business in question is depends on the will of the consumer, which results in additional dedication from the managers (Oliveira, 2006). Technology emerges in the catering sector to support managers in conducting the business in question, with a focus on technology and thought out for consumer satisfaction (Buhalis & O'Connor, 2005). The use of information and communication technologies (ICT), when used by restaurants, helps business efficiency and has repercussions not only on equipment or the physical environment, but also on client-employee, employee-employee and client-client communication (e.g., apps for evaluations) (Ruiz-Molina & Berenguer-Contrí, 2005; Law & Jogaratham, 2005). According to Ham, Kim and Forsythe (2008) the technology increases the speed and consistency of the service provided by the establishment's workers. Information technology (IT) is exploited to increase performance, even if its benefits are regularly blocked by the inability of users to accept and deal with the proposed systems (Park, 2006). According to a report made by Band et al.

(2006) on internal sabotage and espionage, users feel frustrated when systems do not appeal to ease of use, therefore incur internal sabotage. In addition, the same dilemma proves the importance of customizing a management system with the fundamental help of the users of the IS itself to be created and who, specifically in this project, are the managers. The fact that the option of joint creation of the system is explored, allows employees to consider the management system as user-friendly. The main advantage of involving IT in a restaurant, which is more relevant to this project, is the possibility of customizing the service provided by it, which can lead to a shorter duration of service providing more coherence and accuracy than the most qualified employees, in some cases (Berry, 2001).

The research question that arises is "How to develop an information system to manage a restaurant chain, paying particular attention to customer reservation processes".

The aim is to create an information system for the management of a restaurant chain with the prerogative of supporting the managers and employees of the space, allowing a better organization of the service, uniform monitoring, and a more controlled management of the whole business, without additional costs. Doran (2010) argues that to achieve success, restaurant chains need to promise consistency of their systems and management.

Consequently, the main objective of this work is to model and design an IS to (assist in) the day-to-day management and control of information in catering establishments. This involves analyzing the market needs of restaurant information systems at the level of what already exists and what the opinions, needs and requirements highlighted by direct users are. These will make it possible to describe the modelling and construction processes, of a personalized IS that meets expectations. This article is based on a dissertation work that is under development, aiming to create, test and analyze the prototype of an IS. We discuss the results obtained so far and leave some proposals for improvement for the future.

We start by investigating the problems, needs and requirements of the managers, through interviews with open-ended questions, conducted with the help of a (interview) script. Then, we proceed to conceptualize the system to be developed and model the future IS, through diagrams of use cases, activities and classes of objects, using UML. Once the modeling phase is over, the IS prototype will be developed using Microsoft Access.

We start by doing a brief literature review - about tourism

and the IT environment, information technologies, and IS from the user's perspective. The methodology of the exploratory study that was carried out, as well as the detailed phases of IS modelling, including the diagrams mentioned above, will be presented below. Finally, a brief conclusion is made on future improvements.

II. THEORETICAL VIEW

A. The evolution of technology in restaurants

In the 1980s, the need for innovation and IT in restaurant processes began to emerge, with the first systems requiring a plurality of hardware positioned in certain places, inside and outside the restaurant, and there was a need to write down the order on paper and only then could the system be inserted (Dorr, 1985). As the years went by, many Point of Sales (POS) systems began to exist, but these systems presented an obstacle, as they did not have a complete method to assist in the management of a specific restaurant, nor a real-time integration (Coleman, Davis & Morgan, 2000).

Restaurants began to innovate their processes, thanks to technologies such as the central counter method and the innovation of pagers that were designed to be used for the benefit of the user (Livingston, Blink & Lovegreen, 2004). In addition to these innovations, restaurant owners began to encounter an increasing amount of data to store and consequently, after the organization and interpretation of the data, they wanted to transform this data into information that could be used to assist their management (Bazzotti & Garcia, 2006). Thus, the owners of the establishments decided to innovate their services through IT, considering not only the costs and benefits of these technologies, but also the opinions and reactions of customers (Dixon & Verma, 2009). This sub-sector has successfully integrated the technologies into its organization with the aim of overseeing the management components of the facility (Oronsky & Chathoth, 2007). These technologies are considered the "main strategic tool of the company" and are an extremely important investment for a company (Kearns and Lederer, 2003). Currently, to support the owners of the catering business there are several apps, such as Tripadvisor and Zomato, which have a very similar goal. The apps allow potential customers to know the restaurants with updated information at the moment, with the option of leaving evaluations and comments and more recently they can make reservations in restaurants and orders, with Tripadvisor focusing on tourism in general, while Zomato focuses on restaurants and bars. On the other hand, for a value agreed with the business managers, they can advertise them. Another type of apps that stand out are Uber Eats and Glovo, which deliver orders, offer discount coupons and cancellation options with refund. They are distinguished by the fact that Glovo carries out deliveries of any type of order, such as products from a pharmacy or grocery store, and the prices and restaurants available are not common in both apps. These companies have partnerships with restaurants that are available in the app and are willing to enter the take-away meal segment. Depending on the value offered to the owners

of a business, this can become profitable.

For the restaurant sub-sector, it is essential to treat and store information and choose the right IS that helps manage the company and ensures data security and privacy (Pearlson, Saunders & Galetta, 2019). The owner of a restaurant needs to define the important information for the course of the business, which allows a strategic positioning and assistance in decision making. So a system that has the right capacity for the amount of data that the business needs is essential (Fonseca, 2018). According to Wang (2008), the systems must be pleasant, easy to use and useful, with benefits for the employee and the company, just like the system designed in this article.

B. Customer insight

After a visit to the restaurant, the general memories and perceptions of past experience that the customer records (Ozdemir & Caliskan, 2014), and when he wants to choose which establishment to visit, he first resorts to those experiences, and if they are not enough, seeks external information. Choi and Ok (2011) name the term "electronic word-of-mouth", as clients consult online reviews to avoid potential risks or indecision about the quality of service. Clients depend on "word of mouth" to make decisions, and restaurant service is a product where they invest much of their time looking for justifications to support their decision making (Lu, Ba, Huang & Feng, 2013). Consumers attach more importance to the information exchanged between them than to that provided by marketing professionals or the companies themselves (Huang & Chen, 2006). Nevertheless, the same consumers associate the technology used in a restaurant with its quality (Oliveira, 2006). It is possible to bridge the gap between the indispensable use of IS and their tools, and the consequences that the country is currently facing, due to the coronavirus pandemic, where all interpersonal contact needs to be minimal.

A study by Susskind and Curry (2016) focuses on examining how a new technology influences customer perception and behaviour. The results indicate that, on average, 70% of customers who use the technology during service in the restaurant report that their experience has improved and that they would return to the restaurant. This data is supported by the National Restaurant Association (2014), which additionally states that customers believe the technology accelerates service and improves order accuracy. On the other hand, the other consumers do not defend the use of the technology during the service because they believe it interferes with the employee's interaction with them (Susskind and Curry, 2016).

III. METHODOLOGY

As a methodological approach, and in order to meet the proposed objectives, we began by mapping out needs, requirements and problems that the future IS should address. For this purpose, and based on the literature review, an interview script was prepared with several questions, among which we highlight:

- What would you like to improve on the procedures you currently perform?
- What problems would you like to see solved in the restaurant management?
- What are you looking for in a management system?
- In a first version, what are the priorities of a management tool that you are designing?

All questions were open-ended, and participants were very collaborative, and interested in the development of the study (and success of the future IS). The sample consisted of three restaurant managers (N = 3) through individual interviews. A qualitative research measure, in the form of an interview, allows interviewees to feel free to respond without restrictions, and freely; it also allows contextual effects to be examined in order to capture perception and sensitivity to the context in question, taking into account the perspectives of the interviewees (Yardley, 2017). This sensitivity is essential, since we are dealing with professionals who are, respectively: the owner of a 50-year-old restaurant chain, a manager of a younger age group, 36 years old, and another who has only been in the position for seven months, at the age of 53. After the interviews, they were transcribed and categorized. The data were processed by hand and for categorization, after reading the answers obtained in the interviews, small phrases and words were highlighted that were important to answer the questions related to the subject. The respective sentences or words constituted the categories that allowed a more precise analysis. The data analysis carried out led to the conclusion that the main requirements for the future system are focused on:

- Creating customer, reservation and take-away registers;
- Managing booking, customer and employee reports;
- Controlling supplier purchases;
- Monitoring invoices;
- Sending customer messages and newsletters;
- Ensure fast system response time and data protection of customers and system users.

Once the requirements were defined and understood, it was possible to move on to modeling the system, taking into account the need to respond to the demand for technology, with the purpose of promoting acceptance and effective use of the new system designed (Park, 2006).

IV. SYSTEM MODELING

The system to be developed has the general objective of conceptualizing and developing the prototype of an information system that will help in the management of a restaurant chain, mainly in aspects related to customer reservations and other schedules. The results obtained from the interviews with the managers, and the established requirements mentioned above, have made it possible to outline specific objectives, which the system should meet, based on the requirements stipulated by the managers in the interviews.

It is possible to represent the system in terms of the events (and effects) it involves (with use case diagrams), the underlying functionality and activities (activity diagrams), and the data, i.e. the object classes (class diagrams) that are

fundamental to establish the necessary relationships (and links), to research and be able to respond to the requirements associated with the system.

A. Use cases diagram

A use cases diagram serves to visually display the relationships between actors and use cases in a system. In this system four actors are identified, "Owner", "Manager" and "Collaborator" who practice direct actions with the system, such as records and queries, and the actor "Client", considered an external actor. This diagram presents as a particularity a generalization, which represents any action exercised in the system by an employee and which can also be performed by the manager, however any action performed by one of the two is also practiced by the manager, the opposite is not allowed, as for example, the owner of the business can access exclusively the data of the three restaurants, a manager can consult records of employees who belong to the restaurant for which they are responsible, but the employees do not have this permission. The diagram in the project shows that in order to register a reservation, take-away or home order, it is necessary to create a record of the customer if he has no previous/previous record.

B. Classes diagram

In this diagram we represent the classes with their respective attributes and associated behaviors (or methods), as well as the relationships among them, and how the exchange of information in the system occurs. This diagram consists of eleven classes. In these, we highlight the "reserve" class, a superclass highlighted in this diagram (and in fact that we intend to implement), which is linked to two important subclasses, namely "take_away" and "home_order", which in turn inherit their attributes from the superclass, and the "pay_form" class which is called associative class.

In the diagram it is possible to see that there is only one "agenda" if an employee is registered and if the employee is fired, and deleted from the system, the corresponding agenda will be deleted automatically; a customer may be associated with several bookings but the opposite is not the case and the purchase records to the suppliers only the managers have access.

The classes for the diagram were stipulated as a consequence of the management needs of the restaurants studied in the project.

After carrying out the modeling of the system, we proceed to the development of the prototype of the same that will be carried out with the help of the Microsoft Access tool, and SQL (MySQL) can also be used. The reason for choosing this tool is due to some of its advantages, such as the relational database created can be customized according to needs, it is simple and intuitive, it is possible to share the databases easily and quickly through various means, and does not represent additional costs for the owner of the restaurant chain, since it is already included in the Microsoft Office package that you have, and complements it in a basic way with other tools already widely used, such as Microsoft Excel.

V.CONCLUSION

There are several IS solutions in the IT market dedicated to catering activities and, in particular, to restaurant management, but we have not found one that adequately responds to the management of (a chain of) restaurants with particular attention to the management of customer reservations - a situation with which we are relatively familiar, not only professionally, but also with a certain familiar proximity. The main question of where we start from has, of course, emerged: How can we develop an information system to manage a restaurant chain, paying particular attention to customer reservation processes?

Initially, something like a market study and a synthetic study of the history of information systems in the restaurant sector was carried out to analyse what already existed and what reactions and relations they have with users and customers in the area. This literature review allowed us to assimilate the necessary information to move on to the exploratory phase of this work, and thus understand the essential requirements for the project to be carried out.

In the exploratory phase, interviews were conducted with managers and through the results obtained, it was possible to identify that in relation to user preferences, management systems need to be user friendly and able to respond to their needs by acting intuitively and without failure. In addition, we observed that consumers are satisfied with the insertion of IT in the catering business as long as they do not lose interpersonal contact with employees.

Currently, in our Master's dissertation (in Information Systems Management) which is in the final stage of development, we are finalizing the first version of the prototype of the system, seeking to meet the requirements stipulated (by the managers following the interviews that were conducted), so that it will be possible to test and evaluate the system implemented; then, we will collect new data from the opinions and suggestions of the participants, and make the improvements that we consider important or necessary in the final prototype that we intend to present.

The described requirements should always be considered in the future advances of this project, since they mirror the needs of restaurant management. However, to expand this project to different chains of this type of business, a new exploratory study should be done, since each organization has its specificities, and each solution needs to be customized. The personalization aspect is the added value of this project and what could lead to its success.

In this way, we are able to answer the question and objectives proposed, as well as to present a GIS prototype that meets the needs of the organization under analysis. With the notion that this system is versatile and can be adapted to other similar organizations, including or reviewing some specifications (at the level of requirements and more specific aspects of modeling), without great difficulty of implementation.

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