Information Technologies in Restaurants in the City of Lima: Analysis of Strategic Variables

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Manuscript received May 5, 2023; revised July 2, 2023; accepted September 13, 2023; published January 17, 2024

***Abstract*—This research was carried out with the purpose of conducting a prospective study to analyze the implementation of Information Technologies in restaurants in Lima. For this purpose, a search of various academic articles and journalistic articles was carried out to collect information to help structure the project and compose the problem, theoretical framework, and contextual framework. Then, for the identification of the variables to be analyzed, the first method that was implemented was to carry out a documentary review of the articles and classification in Variables of the restaurant subsector and variables related to information technologies; to complement the extracted variables, interviews were conducted with experts in the gastronomic sector who helped to validate the variables and made a recommendation of new ones that they considered important and could be taken into consideration for analysis; so they finally proceeded to rate them according to the level of dependence and influence of one against the others by means of a confrontation matrix. Finally, the MicMac software was used, where the weighted rating of each variable was entered, and the result was those key variables that have a high level of dependence and influence on the others and characterize the implementation of IT in restaurants.**

***Keywords*—Information technologies, restaurants, Micmac, structural analysis, prospective**

I. Introduction

Nowadays, we live in an era where technology is present in people's lives and in their daily lives [1]. For Peruvian companies, this fact is extremely attractive because the use of IT makes profitable the expenses incurred in working methods with little innovation or without the use of technologies. However, not all organizations take advantage of the digital era in which we live to innovate their work tools. 26.7% of companies in Peru invested in Science and Technology in 2017, while the remaining 73.3% did not [2], which is interpreted in that companies may not have sufficient resources to invest in IT or, on the contrary, do not have incentives to do so. In addition to the above, the world is currently going through one of the most important health junctures in recent years. Due to the impact on people's health, the strong spread of the virus, and the number of deaths worldwide, Tedros Adhanom, director of the World Health Organization (WHO), declared in Geneva on March 11, 2020: "We have assessed that Covid-19 can be characterized as a pandemic [3]." Consequently, nations around the world have been forced to mitigate the impact of the virus by taking unanticipated restrictions on citizens [4]. In the case of Peru, some of the measures imposed by the state were total immobilization and the restriction of pedestrian movement at certain hours of the day. While it is true that these restrictions were able to moderately control the spread of the virus among people, they brought with them an extremely important problem that continues to have repercussions on the most important industries in the country, which is the stoppage and limitation of the functions of commercial establishments. Although the companies tried to stay afloat without receiving any monetary retribution due to the cessation of their functions, many of them declared bankruptcy because they could not continue to pay the operating costs [5]. Many of these companies were part of the percentage of those that made use of IT, so this factor came to negatively affect the number of companies that invested in Science and Technology to improve their working methods.

II. Theoretical and Contextual Framework

A. Theoretical Framework

Currently, various types of technology are being implemented in different social and commercial fields in order to increase productivity and effectiveness in services [6]. More and more people are betting on innovation since it is considered fundamental in entrepreneurship [7].

Information technologies (IT) are tools of fundamental value and of great utility for any company. Regardless of the way or purpose in which they are used, the purpose of IT is to display, collect, store, analyze and distribute information either internally (from the company itself) or externally, quickly, and easily [8].

The following points should be considered to positively implement information technology:

- The company must have the appropriate equipment and technology.
- Identify the needs within the areas of the company.
- Determine the objectives to be met by area.

The main objective of IT is to improve and support the operation and business processes to increase the competitiveness and production of companies in the treatment of any type of information [9]. Among the most used IT are Social networks, websites, mobile applications, among others.

Restaurants and hotels, among others, find in technologies an ally that allows them to distribute their products and services since, through the Internet, it is possible to direct business messages to many users or recipients in an instant [10]. Regarding the relationship between the administrative management of traditional restaurants and IT, they meet the

basic requirements for carrying out daily activities; however, innovation in these businesses should be carried out with greater intensity and adopt those IT that promote differentiation [10].

Social networks are effective tools for the promotion, advertising, and branding of restaurants and their products. Social network reviews can influence customers' intention to visit a restaurant [11].

However, for some restaurants implementing social networks is not enough, so some incorporate and/or develop applications to improve both technical (service level) and financial (staff costs) indicators. These are innovative, offering personalized, fast, and intelligent assistance; facilitating the work for both the restaurant staff and the customer, i.e., the presence of a waiter will no longer be necessary when taking the order, but through the application, users are able to place their own orders [12].

Regarding the service level of restaurants, some of them use different technological resources such as tablets, touch screens, QR codes, among others, to streamline the ordering process. In the case of tablets, these help to improve the service experience, more specifically, the ordering experience for the customer. Tablet content can provide more detailed information on menu items for the customer. It is considered that in a restaurant environment that is dedicated to serving take-out orders, this model will be more efficient [13].

B. Contextual Framework

Due to the pandemic caused by the Covid-19 virus, the Peruvian government was forced to impose a series of restrictive measures related to the mobilization and concentration of citizens in closed spaces to reduce the number of contagions by the virus.

Before the pandemic, there were more than 200,000 restaurants operating, employing more than 1 million people nationwide, but of this total, 50% of small businesses have had to close [14]. In addition, the restaurant subsector decreased 33.01% in November 2020, when compared to the same month of 2019, explained by the downward report in all food and beverage vending items [15].

The gastronomy sector had an investment in Science and Technology of 26.6% [2]. This percentage is below the average of the other sectors, suggesting that, within the gastronomic sector, investment in Information Technology is not a priority to meet its organizational objectives.

Currently, because of the pandemic, the activity of restaurants decreased by 93.78%, due to the declaration of the National State of Emergency in March, due to the presence of the Covid-19 virus [16]. However, the pandemic also brought a positive contribution after these restrictions were lifted. It is a fact that the pandemic has accelerated the process of digital transformation, a decisive change for all companies, regardless of their size, in order to achieve continuity of operations and competitiveness in their markets at this juncture [17]. In addition, another trend that has been asserting itself in recent years is that different websites and mobile applications have been born within the gastronomic sector with a common purpose: to provide technological solutions to improve the experience of diners in the establishments [18].

III. Methodology

A. Focus

To develop the proposed topic and propose a solution to the described problem, a foresight is considered as a type of research, through the method of structural analysis, with a mixed approach oriented to the gastronomic sector, in this case to restaurants in Peru, and to the growth of IT implementation in them. Foresight is presented as a scientific discipline and not as a simple way of guessing the future [19].

Foresight has traditionally had and still has today objects of study linked to military, territorial, economic, and even scientific and technological scenarios [19]. Structural analysis is a method whose objective is to identify the main influential and dependent variables and thus the variables essential to the evolution of the system [20]. The development of the structural analysis is suggested to be carried out in three phases, which are: List of variables, description of relationships between variables, and identification of key variables [20]. The development of each phase is outlined below.

B. Scope

The scope of this study will be descriptive, given that it identifies certain characteristics that are present in the proposed problem. The descriptive scope seeks to specify the properties, characteristics, and profiles of people, groups, communities, processes, objects, or any other phenomenon under analysis [21].

C. Phases

- Phase 1: List of variables

This first phase consists of listing the variables that influence the subject of study, in this case, the gastronomic sector. During this phase, it is advisable to be as exhaustive as possible and not to exclude a priori any avenue of research [20]. The environment of the sector understudy must be known to understand it.

In order to define the objective, it is necessary to establish what the research aims to achieve ... some investigations seek, above all, to contribute to solving a particular problem; in this case, it should be mentioned what it is and how it is thought that the study will help to solve it; others have as their main objective to test a theory or provide empirical evidence in favor of it [21]. The objective of this phase is to select which variables characterize the implementation of IT in restaurants.

To meet the stated objective, certain information must be collected, which will be recorded in a checklist. This information will be obtained through two techniques, which are documentary analysis and interviews.

In the documentary analysis, there will be a review of the articles that have been extracted to take into consideration the variables identified by the different authors, a review of the problem, the theoretical framework, and the contextual framework.

The interviews will be semi-structured, i.e., there will be a fixed set of questions, and some may arise at some point during the interview for certain interviewees. Godet and Durance advise feeding the list of variables by means of free conversations with people who are representatives of actors in

investment (12), and level of IT innovation (14).

In order to know where the data needed to conduct the research will be collected, the focus is on "what or who," i.e., on the participants, objects, events, or communities of study (the units of analysis), which depends on the research approach and the scope of the study. [21]. For this phase, the unit of analysis is four experts in the gastronomic sector.

- Phase 2: Description of relationships between variables

Once the first phase is completed, we will begin to relate all the variables found; in this phase, the data obtained will be placed in a confrontation matrix to review which variables have greater influence over others.

After collecting the information, it will be uploaded to the Micmac program (Matrix of Cross Impacts Multiplication Applied to a Classification), which helps to position the variables in a Cartesian plane that has as axes the dependence and influence and will be classified in groups those that have a greater hierarchy.

The objective will be to search for relationships between the variables that characterize the implementation of IT in restaurants. An interview with the four experts of the gastronomic sector who were involved in the first phase will be used as a data collection technique.

In this case, the interview will be used to complete the confrontation matrix according to the participants' criteria. The filling is qualitative, and for each pair of variables, the following questions are asked: is there a relationship of direct influence between variable I and variable j? if not, we score 0; otherwise, we ask ourselves if this relationship of direct influence is weak (1), medium (2), strong (3), or potential (4) [20].

- Fase 3: Identification of key variables

The last phase will be the identification of the most important variables, where, according to what was obtained in phase 2, we will validate with the sector experts which variables are well positioned in the Micmac by means of new interviews.

This process allows confirming the importance of certain variables but also allows revealing certain variables that, due to their indirect actions, play a major role (and that the direct classification did not reveal) [20]. The objective is to identify those variables that are considered the most important for implementing IT in restaurants.

As mentioned, in this last phase, the interviews will be implemented again; these will be conducted in-depth in order to validate the key variables. If any of the experts do not agree with the position of a variable in the Cartesian plane of the Micmac, it will be adjusted until all the experts interviewed are satisfied with the proposed model.

IV. Results

During the research, several variables were obtained that were grouped into two sets; the first refers to variables related to the restaurant subsector (Table 1), and the second set, to variables related to the implementation of information technologies (Table 2).

Table 1. Restaurant subsector variables

N°	Variable	Abbreviation
1	Restaurant concept	CONREST
2	Restaurant objectives	OBJEREST
3	Competition within the sector	COMPSECT
4	Technological development	DESATECN
5	Age of the restaurant	EDADREST
6	Restaurant location	UBICREST
7	Consolidated brand	MARCCONS
8	Service policy	POLATE

Table 2. Variables involved in the implementation of TI

N°	Variable	Abbreviation
9	Interest in technology	INTETECN
10	Types of IT	TIPTECINF
11	Level of IT management	NIVMANTI
12	Level of IT investment	NIVINVTI
13	IT performance	RESUSOTI
14	Level of innovation	NIVLINNOV
15	Technology manager	GESTTECNOL
16	Age of staff	EDADPERS

These 16 variables were analyzed in a matrix by four sector experts in a personal interview with each of them.

Then we proceeded to use the MicMac tool to identify which variables are the most relevant and will be key to analyzing our object of study, according to their relationships of influence and dependence.

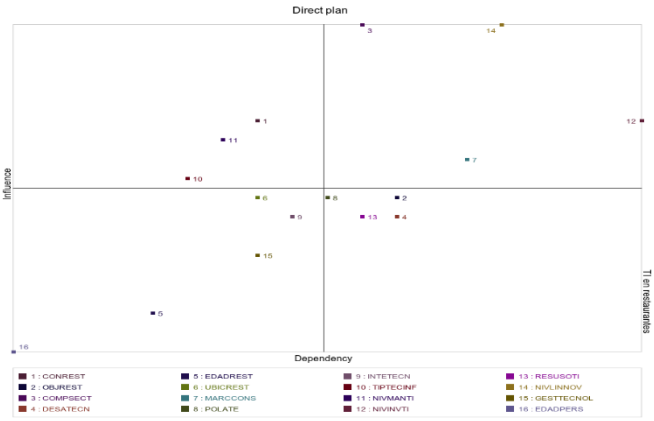

Fig. 1. Final projection of the variables (direct impacts matrix).

The projected variables will be classified as follows according to their position in the Cartesian plane (Fig. 1).

A. Input Variables

These variables are located in the upper left corner of the plane and are characterized by having a strong influence and little dependence; they are considered explanatory of the studied system [22]. In this case, the two variables that fall under this classification are the restaurant concept (1) and the level of IT maintenance (11).

B. Linking Variables

Any action on them will simultaneously have repercussions on the other variables and an effect on them, thus considerably modifying the overall dynamics of the system [22]. To this group belong the variables sector competition (3), consolidated brand (7), level of IT

of IT innovation (14).

C. Resulting Variables

The resulting variables are not very influential and are highly dependent. Their evolution is explained by the impact of other variables, mainly input and linkage variables [22]. This group includes the variables restaurant objectives (2) and technological development (4).

D. Excluded Variables

They have little impact on the system under study, either because they constitute heavy trends whose inertia does not modify the dynamics of the system or because they have little relationship with the latter and undergo a relatively autonomous development [22]. The variables restaurant age (5), technology manager (15), and staff age (16) belong to this classification.

E. Platoon Variables

They are not sufficiently characterized by influence or dependence to make it possible to draw a conclusion as to their role in the system [22]. Within the platoon variables, we have restaurant location (6), care policy (8), technological interest (9), type of information technology (10), and IT outcomes (13).

V. Discussion

According to the results obtained, the variables of the level of innovation, level of investment in IT, and competition in the sector are considered as key variables in the research.

The innovation level variable must nowadays be considered by all restaurants if they seek to have important growth within the sector. As a result of the pandemic, innovation has been consolidated as an essential factor and will no longer be something optional for restaurants since some of them will be forced to take a step forward towards technological transformation so that their respective competitors do not have an advantage over them and run the risk of disappearing.

In the case of the IT investment level variable, restaurants that invest more in information technologies are those that seek to automate processes or make a workflow more efficient. It is important to know how much to invest and what to invest in since the tools to be used must be closely related to the restaurant's objectives. It was also verified that, for restaurants without significant capital, there are other options in information technology that can be taken advantage of, such as social networks, but if there is an opportunity to invest in technologies that will have a greater impact on the business and customers, this should be taken into consideration according to the objectives set. Finally, they mention that it is extremely important the amount of capital be invested in making a consolidated brand different from the others to stand out from the competition and meet the projected goals.

Finally, for the experts involved in this study, competition is a factor that is marked in the different industries of the world and should always be taken into consideration; in this case, it is indicated that, in the restaurant subsector, being at the level of the competition involves making use of different strategies that make a difference over the other restaurants and these strategies should be linked to the implementation of information technologies. Currently, for consumers, it is not enough to have a good service inside the restaurant, but it must also have a consolidated brand with which the customer can feel identified, in order to achieve this consolidation; information technologies should be used either to extend the type of service offered, advertise the brand, improve customer service, attract new customers, among others.

VI. Conclusions

According to the results obtained in this research, the following conclusions were drawn.

- The variables of Sector Competence, Level of Innovation, and Level of IT Investment are essential for the implementation of information technologies in the restaurant subsector, given that they present a greater relationship and degree of dependence among the others, and should be considered in future similar studies.
- The variables Age of the personnel and Age of the restaurant are not essential for the implementation of information technologies in the restaurant subsector, given that they do not present any contribution in terms of influence and dependence with the others.
- The variables that were not part of the groups of linking variables and excluded variables have a degree neither so high nor so low of importance, but it is also fundamental to be able to validate them with the experts of the sector to have a more accurate projection of the IT implementation.
- Consequently, in the current health situation, there has been a rapid growth in the implementation of IT in restaurants, and this will continue in the future since it is essential to have the technology to continue with the care despite the restrictions imposed by the state.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

The following is a detail of the work of each author in this article:

Adrian Figueroa and Boris Lecca conducted the research, through article search, interviews and systems management. They analyzed the information and obtained the results of this research.

Martin Collao and Carlos Chirinos gave guidance to the research clarifying the management of the methodology and the considerations to be taken for this process. They also validated the information and results presented.

Jose Quiroz and Alberto Flores reviewed the information and results presented.

All authors had approved the final version.

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