

Harvard Deusto

Business Research



Vol. 9, No. 1 (2020)



Contents

Letter from the Managing Editor 1

Josep Maria Altarriba. Managing Editor

Non-profit organization-business value co-creation: conceptualization and scale development 3

Yolanda Díaz-Perdomo. Postgraduate in Economics and Business. University of Oviedo. Spain.

Luis Ignacio Álvarez-González. Associate Professor in Marketing. University of Oviedo. Spain.

María José Sanzo-Pérez. Professor in Marketing. University of Oviedo. Spain.

Empirical Evaluation of the Efficiency of the Ecuadorian Banking Sector 20

Jorge Arturo Campoverde Campoverde. Coordinator of the Business Research Group. Master's degree in Business Administration. Principal Investigator and Professor of Operations Research at the Universidad de Cuenca. Ecuador.

Gustavo Giovanni Flores Sánchez. Investigator and professor of finance management at the Universidad de Cuenca. Ecuador.

Katherine Tatiana Coronel Pangol. Junior Investigator in the Business Research Group at the Universidad de Cuenca. Ecuador.

Carlos Armando Romero Galarza. Junior Investigator in the Business Research Group at the Universidad de Cuenca. Ecuador.

The perception of educational brand capital in the Spanish context: a proposal for measurement with internal stakeholders 40

Javier Casanoves-Boix. Lecturer in Marketing. Valencian International University. Spain.

Pablo Pinazo-Dallenbach. Lecturer in Marketing. Valencian International University. Spain.

José Ricardo Flores-Pérez. Dean of the College of Economic and Business Sciences. José Simeón Cañas Central American University. El Salvador.

How do servant leaders promote radical innovation? The role of organizational learning capability 53

Emilio Domínguez-Escrig. Assistant lecturer. Department of Management. College of Law and Economics. Jaume I University. Spain.

Francisco Fermín Mallén Broch. Assistant lecturer. Department of Management. College of Law and Economics. Jaume I University. Spain.

Rafael Lapiedra Alcamí. Professor. Department of Management. College of Law and Economics. Jaume I University. Spain.

Ricardo Chiva Gómez. Professor. Department of Management. College of Law and Economics. Jaume I University. Spain.

Cultural tourism: A methodological approach based on the knowledge of its demand 69

María Dolores Sánchez-Sánchez. Visiting professor in Economic History. Researcher in the OpenInnova high-performance research group and Chair of Natural Parks at King Juan Carlos University in Madrid. Spain.

Carmen De-Pablos-Heredero. Professor in the field of Business Organization. Director of the Master's program in Business Organization and the Master's program in SAP Logistic Project Management at King Juan Carlos University in Madrid. Head of the OpenInnova high-performance research group. Spain.

José Luis Montes-Botella. Professor of Advanced Statistics and Econometrics at King Juan Carlos University in Madrid. Spain.

Planning and implementation of a study of times and methods in the Packaging Logistics Center (PLC) of industrial gas - analysis and standardization of production: A case study 84

Gustavo Andrés Araque González. Full-time Assistant Professor. College of Engineering, Design and Innovation FIDI. Gracolonbian Polytechnic University Institution. Colombia.

Mauricio Gómez Vásquez. Full-time Assistant Professor (Coordinator of the Industrial Engineering Program). College of Engineering, Design and Innovation FIDI. Gracolonbian Polytechnic University Institution. Colombia.

Juan Pablo Vélez Uribe. Full-time Assistant Professor. College of Engineering, Design and Innovation FIDI. Gracolonbian Polytechnic University Institution. Colombia.

Albeiro Hernán Suárez Hernández. Full-time Assistant Professor. College of Engineering, Design and Innovation FIDI. Gracolonbian Polytechnic University Institution. Colombia.

Book Review: Outside Insight 105

Patricia Vargas Portillo. Senior Lecturer. ESIC Business & Marketing School, Spain.

Letter from the Managing Editor

Josep Maria Altarriba

Managing Editor

hdbresearch@pmp.es

We are in a complex and difficult period as a consequence of the pandemic caused by COVID-19. From Harvard Deusto Business Research we join the effort of the whole society to overcome this situation as soon as possible. In this sense, and with the existing limitations, we continue to work and develop our activity in order to add value to the scientific, business and university environment, ultimately contributing our grain of sand to society.

The articles in this issue of *Harvard Deusto Business Research* include studies and research on the co-creation of value in non-profit organizations, efficiency in Ecuadorian banking sector, the perception of educational brand equity, the effect of servant leadership on radical innovation, cultural tourism and the industrial processes for gas production, distribution and supply.

In the first article, professors Yolanda Díaz-Perdomo, Luis Ignacio Álvarez-González and María José Sanzo-Pérez focus their attention on the co-creation of value in non-profit organizations, a strategy that companies have already adopted in their relationships with stakeholders as a mechanism to improve the performance of their activities. In their article, they develop a scale for the co-creation of value, consisting of four basic dimensions: participation, reciprocity, learning and commitment.

Next, the article by Jorge Arturo Campoverde Campoverde, Gustavo Giovanni Flores Sánchez, Katherine Tatiana Coronel Pangol and Carlos Armando Romero Galarza considers the measurement of the efficiency of the Ecuadorian banking sector during the periods 1993-1999 and 2000-2018, applying the Data Envelopment Analysis method, employing the CCR and BCC approaches, using the fixed asset and operating cost accounts as input variables and accounts receivable, income, investments and total deposits as the output variables.

In the third article, professors Javier Casanoves-Boix, Pablo Pinazo-Dallenbach and José Ricardo Flores-Pérez attempt to develop and validate a scale to measure the perception of university brand equity by internal stakeholders. The results of their research show the significance of all the variables used, while laying the foundation for university managers to develop marketing strategies adapted to maximize the building of educational equity.

The study by professors Emilio Domínguez-Escrig, Francisco Fermín Mallén Broch, Rafael Lapiedra Alcamí and Ricardo Chiva Gómez provides empirical evidence of the positive effect of servant leadership on radical innovation, using organizational learning capacity as a mediating variable. In their work, they observe that servant

leadership has a positive effect on organizational learning capacity and that the effect of the latter construct on radical innovation is also positive.

The purpose of the research by María Dolores Sánchez-Sánchez, Carmen De-Pablos-Herederó and José Luis Montes-Botella is to propose and validate a conceptual model that measures the level of satisfaction by cultural tourists. This model can help us better understand this market segment and identify factors that explain the level of customer satisfaction. Given the growing importance of cultural tourism around the world, it could become an interesting tool for the management of the touristic positioning of destinations with a cultural heritage, as it helps us understand the satisfaction and loyalty of the tourism flow.

In the article that finishes off this issue, professors Gustavo Andrés Araque González, Mauricio Gómez Vásquez, Juan Pablo Vélez Uribe and Albeiro Hernán Suárez Hernández analyze the transformation of the industrial processes in the production, distribution and supply of gas to clients as the result of the increase in demand and market competitiveness. They develop a proposal for a methodological-investigative-combined development in relation to the study of times and methods focused on a company supplying gas in an effort to standardize processes. The results of the investigation permitted the company to optimize the operating times for the processes of gas inspection, rack cylinder filling and mobile gas pumping.

I want to convey our sincere thanks to the authors for their effort, to the editorial committee and to the reviewers for their invaluable collaboration and professionalism, and to the readers for their warm welcome. Likewise, I do not want to end the presentation of this new issue of Harvard Deusto Business Research without conveying encouragement and my belief that together and collaborating we will overcome this complicated situation thanks to the collaboration and social responsibility of each and every one of us. Thank you very much to everyone. 🛡

Non-profit organization-business value co-creation: conceptualization and scale development

Yolanda Díaz-Perdomo

Postgraduate in Economics and Business. University of Oviedo. Spain. ORCID: [0000-0002-7724-1844](https://orcid.org/0000-0002-7724-1844).

Luis Ignacio Álvarez-González

Associate Professor in Marketing. University of Oviedo. Spain. ORCID: [0000-0003-3901-2044](https://orcid.org/0000-0003-3901-2044).

María José Sanzo-Pérez

Professor in Marketing. University of Oviedo. Spain. ORCID: [0000-0001-5510-5924](https://orcid.org/0000-0001-5510-5924).

yolandadiazperdomo@gmail.com, alvarezg@uniovi.es, mjsanzo@uniovi.es

Received: October, 2019.

Accepted: November, 2019.

Published: June, 2020.

Abstract

The value co-creation strategy is adopted by companies in its relationships with stakeholders as a mechanism to improve the performance of their activities. Both from the perspective of Corporate Social Responsibility (CSR) practices carried out by companies, and from the approach of the mission that non-profit organizations (NPOs) must effectively fulfil, adopt the strategy of co-creation in activities, projects, programs, etc. that both entities jointly develop is essential to achieve the expected organizational and social value. However, although the value co-creation between companies and customers has been substantially investigated, there is a significant gap in both theoretical and empirical research into the adoption by the NPOs. Therefore, after reviewing the literature on co-creation, an NPO-business value co-creation scale is developed in the empirical part, consisting of four basic dimensions: participation, reciprocity, learning, and engagement. The scale shows reliability and construct validity. The main conclusions and practical implications are presented.

Key words

Value co-creation; Non-profit organizations-business relationships; Scale development; Non-profit organizations.

How to cite this article

Díaz-Perdomo, Y., Álvarez-González, L. I., & Sanzo Pérez, M. J. (2020). Non-profit organization-business value co-creation: conceptualization and scale development. *Harvard Deusto Business Research*, IX(1), 3-19. <https://doi.org/10.3926/hdbr.253>

.....

The objective of this paper is to develop a scale of non-profit organization (NPO)-business value co-creation

1. Introduction

In the current competitive environment, in which networks and social relations are essential to promote the capacity to create value and achieve competitive advantages for the company (Polese, 2009), co-creation emerges as a process through which companies integrate individuals and citizens as active co-creators in all parts of the value chain (Ramaswamy, 2009).

Therefore, the value co-creation reinforces suppliers and customers' active roles (Andreu, Sánchez & Mele, 2010), and implies the use of their own resources and capabilities, through interactions and transactions, in the business processes, to share and integrate them in accordance with its own objectives (Payne, Storbacka & Frow, 2008). However, the co-creation approach aims to serve the interests of all stakeholders (Ramaswamy & Gouillart, 2010), through an orientation towards interactions with internal and external business partners of the company (Polese, 2009).

One of the key stakeholders for the companies with which to co-create is the non-profit organizations (NPOs) (Ramaswamy, 2009). In this sense, the joint development between the NPO and the company of an integrated business model and the delivery of mutual value is significant from the point of view of the Corporate Social Responsibility (CSR) strategy of the companies (Brugmann & Prahalad, 2007). Also, NPOs can more effectively fulfill their mission objectives (Austin & Seitanidi, 2012).

Thus, given the imperative of finding innovative solutions to social problems, intersectoral alliances constitute an organizational modality to generate important social and organizational value (Austin, 2010; Austin & Seitanidi, 2011). Regarding the NPO-business co-creation, Austin and Seitanidi (2012: 744) state that "it is clear from the literature review that value creation through collaboration is recognized as a central goal, but it is equally clear that it has not been analyzed by researchers and practitioners to the extent or with the systematic rigor that its importance merits. Although many of the asserted benefits (and costs) of collaboration rest on strong hypotheses, there is a need for additional empirical research—quantitative and qualitative, case study and survey—to produce greater corroborating evidence". However, the NPO-business co-creation process has rarely been considered from the NPO perspective (Al-Tabbaa, Leach & March, 2014; Al-Tabbaa, 2017).

In particular, the specialized literature does not identify a scale that allows evaluating and measuring the extent to which NPOs adopt strategies of value co-creation in its collaborative relationships with companies. Therefore, there is a limitation of the analysis of the conditions, moderators and consequences of this management approach. Thus, the main objective of this paper is to develop a valid and reliable scale of measurement of a value co-creation strategy adopted by NPOs in its relations with private companies, which can serve as a strategic reference in the decision making of both parties involved in co-creation.

In order to achieve this objective, and after reviewing the literature on value co-creation, an NPO-business value co-creation scale of measurement is developed in the empirical part. Finally, the main conclusions and practical implications for NPO management, as well as the limitations and future lines of research, are established.

2. Theoretical framework

The value co-creation, which has been substantially investigated in recent years (Prahalad & Ramaswamy, 2004; Ramaswamy, 2009; Spohrer & Maglio, 2010; Grönroos & Ravald, 2011;

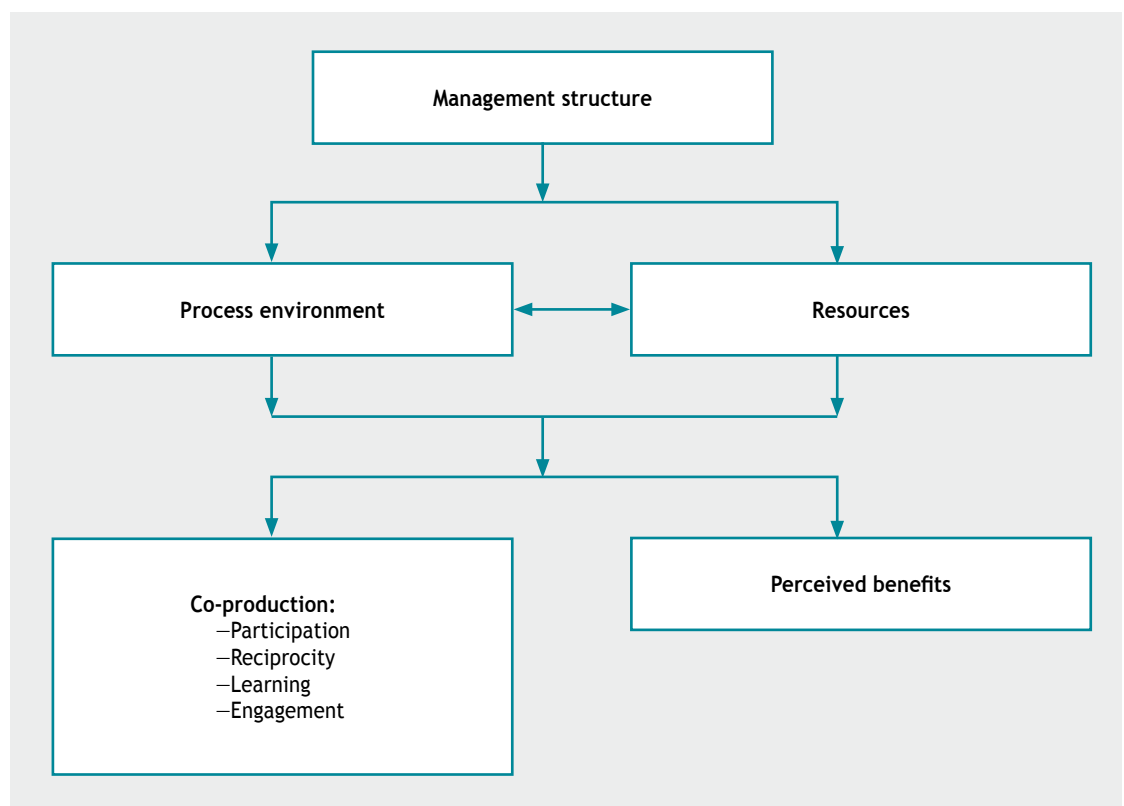
Co-creation entails a rethinking of the purpose of the organization and its collaborative role in creating value

Grönroos, 2012; Bharti, Agrawal & Sharma, 2015; Ranjan & Read, 2016), can be defined as “the joint actions by a customer (or other beneficiary) and a service provider during their direct interactions” (Grönroos, 2012: 1520).

Currently, research on the co-creation of value is determined by the theory based on the Service-Dominant Logic (SDL) (Vargo & Lusch, 2004; Vargo, Maglio & Akaka, 2008; Vargo & Lusch, 2016), which provides an understanding of how companies, customers and other market participants co-create value through their interactions. In this sense, the value co-creation implies an approach towards intangibles, such as skills, information and knowledge (Vargo & Lusch, 2004). It also involves the development of interactivity, connectivity and relations between the parties involved in the process (Vargo & Lusch, 2004), which entails a rethinking of the purpose of the organization and its collaborative role in creating value with the actors involved in the exchange (Vargo & Lusch, 2008).

After carrying out a detailed bibliographic review on the literature of value co-creation, through an analysis of thematic content, Bharti et al. (2015) identified the five critical dimensions (and its latent sub-dimensions) of the business-customer co-creation process: process environment, resources, co-production, perceived benefits, and management structure. These authors argue that these dimensions and its sub-dimensions “are the basis of almost all processes of co-creation of value” (Bharti et al., 2015: 593) (see Figure 1).

Figure 1
Interrelationships between the value co-creation dimensions



Source: Bharti et al. (2015).

In the context of value co-creation, intersectoral alliances between companies and NPOs can be included

According to Bendapudi & Leone (2003), co-production is one of the most important elements of value co-creation. In fact, the remaining elements can be understood as conditioning factors and/or as consequences. In this sense, four main sub-dimensions of co-production are distinguished:

- Customer participation: degree to which the customer shares information, provides suggestions and participates in the decision-making process shared with the company during the co-creation process (Chan, Yim & Lam, 2010; p. 4).
- Customer involvement: participatory and dynamic linking (learning) of customers with the company (Vargo & Lusch, 2004).
- Partnership and engagement: the significant involvement of the company and its employees (physically, cognitively and emotionally) with customers (Kahn 1990; p. 692) and the promotion of the long-term relationship between both parties.
- Mutuality: receptivity and pro-activity towards the other party in the relationship based on mutual interest, that is, openness towards the influence of the other party, its availability and predisposition to change depending on the state of the other party (Jordan, 1986).

Furthermore, Ranjan and Read (2016), after a review of the academic literature on value co-creation, extract two main dimensions of co-creation, co-production and value in use, as well as three key co-production elements (information exchange, equity and interaction) and three elements of value in use (experience, relationship and personalization). Regarding the elements of co-production:

- In relation to customer participation, established by Bharti et al. (2015) as a dimension of co-production, the information shared between the company and the customer generates greater competition in co-creation.
- Also, regarding reciprocity or mutuality, the company will to share control in favor of customer empowerment is the essence of equity.
- In addition, the interaction between customers and the company, which is manifested through participation, dialogue, and engagement, allows a complex exchange between both parties by considering the possibility of generating solutions (Ranjan & Read, 2016). Therefore, it highlights the importance of involvement in the customer relationship, as well as partnership and engagement.

In relation to the value in use, and its three sub-dimensions (experience, relationship and personalization), Ranjan and Read (2016) consider them a basic part of value co-creation. In this context, Bharti et al. (2015) showed that customer experience, customer learning, value, expected benefits and problem solving are some of the perceived benefits considered important by the customer. In addition, according to Ranjan and Read (2016), the joint, reciprocal and iterative processes, which are the basis of the relationship between the customer and the company, occur: (1) in an active communication environment, and (2) through commitment and mutual use of resources (Ng, Maull & Yip, 2009), meaning that process environment and resources are conditioning factors for value co-creation.

Moreover, the process of value co-creation implies that the role of the customer is refined, changing from being a passive agent to being considered a provider of important resources (knowledge, creativity ...) in the relationship with the company (Saarijärvi, 2012). However, the best form of value co-creation is attention to all stakeholders' experiences (Ramaswamy &

NPO-business value co-creation model is defined, consisting of four key dimensions: participation, reciprocity, learning, and engagement

Gouillart, 2010). Thus, co-creation with stakeholders poses a number of challenges due to their different characteristics, interests and objectives, and creates benefits for the company, such as access to unique resources and knowledge (Kazadi, Lievens & Mahr, 2015).

In the context of value co-creation, intersectoral alliances between companies and NPOs can be included (Austin & Seitanidi, 2012), in the sense that the value creation process generated by the collaborations between both entities implies organizational benefits for companies and NPOs, in addition to benefiting society (Al-Tabbaa et al., 2014).

In addition, according to Anheier et al. (2014; p. 4), “non-profits engage in advocacy activities to protect or advance the position in society and welfare of people needing help [...] Non-profit organisations are hypothesised to be an important element of social self-organisation, to “give voice” to those otherwise unheard, and to support those who would otherwise find little or no attention”. Thus, the characteristics of NPOs that identify them as social innovators are (Anheier et al., 2014; p. 37): (1) their social needs orientation; (2) their greater ability to detect social needs; (3) their ability to give voice to minority groups; (4) their high degree of social capital as a result of citizen participation, which increases the acceptance of innovations and, therefore, serves as a significant variable in the construction and maintenance of legitimacy; (5) their real engagement to change.

In fact, social innovators, such as NPO, act as agents of change in society, taking advantage of opportunities that others miss, improving systems, introducing new methods and creating solutions to regenerate society (Păunescu, 2014). Thus, NPOs, by developing socially innovative programs, projects, services or activities, such as the co-creation of services and products with companies, can generate a positive social impact (Álvarez-González, García-Rodríguez, Sanzo-Pérez & Rey-García, 2017). In this regard, through the NPO-business intersectoral alliances (PwC, 2015; pp. 55-57): (1) social agents achieve their objectives faster and on a large scale; (2) the private sector generates social and economic value for all its stakeholders.

Through the contribution of complementary capacities along each stage of the value chain, to jointly develop products or services, the company and the NPO create and deliver value in new ways and minimize costs and risks (Dahan, Doh, Oetzel, & Yaziji, 2010). Companies can have potential positive effects on business performance and profitability as they actively become involved with NPOs (Den Hond, De Bakker & Doh, 2015). NPOs can generate the necessary value to successfully complete its defining missions (Austin, 2010; Austin & Seitanidi, 2012), increase its resources, increase its exposure and networks, and acquire new skills and practices (Schiller & Almog-Bar, 2013).

Thus, taking the work of Bharti et al. (2015) as reference, an NPO-business value co-creation model is defined, consisting of four key dimensions. According to this model, co-creating firstly implies the participation of the collaborating company in the stages related to the collaboration process (participation). It also assumes that each partner gives and receives in the same proportion as the other party in the relationship (reciprocity), as well as the link between the company and the NPO through the information obtained from it (learning). Finally, it is additionally required that there be an effective involvement of the company with the NPO (engagement).

Therefore, in the absence of a specific scale of adoption by NPOs of a co-creation strategy in its collaborative relationships with companies, the empirical aim of this paper is to develop a valid and reliable scale of measurement of NPO-business co-creation, in accordance with the proposed model.

In order to strengthen the content validity of the scale, a Delphi Analysis was carried out

3. Scale of measurement of the NPO-business value co-creation strategy

The scale of measurement has been developed following the methodological process through the following sequential stages (Churchill, 1979; Netemeyer, Bearden & Sharma, 2003): (1) content validity of the scale, (2) data collection and editing, and (3) assessment of dimensionality, construct reliability, and convergent and discriminant validity. Each of these stages is described below.

3.1. Content validity of the scale

Despite the proliferation of relevant literature on value co-creation in recent years, no exhaustive scale globally accepted by the academic world is identified that validly and reliably allows to evaluate this strategy from the point of view of the relationship that NPOs have with private companies. Therefore, it was decided to generate a scale of NPO-business value co-creation from the critical dimensions and sub-dimensions of the co-creation established by Bharti et al. (2015), after an extensive literature review of thematic content.

In particular, as specified in the previous section, five main dimensions (as well as a set of critical sub-dimensions) of value co-creation was established: management structure, process environment, resources, co-production and perceived benefits. However, the first three (management structure, process environment and resources) can be considered as antecedents or conditions of co-production, while perceived benefits would be the consequences of it. As a result, co-production must be considered in itself as the central pillar of the specific NPO-business value co-creation strategy.

For its evaluation, a multi-item scale of NPO-business co-creation is proposed, developed from the four critical sub-dimensions of co-production established previously: customer participation; reciprocity; customer involvement; and partnership and engagement. These sub-dimensions have been called as follows: (1) participation, (2) reciprocity, (3) learning and (4) engagement, so that they reflect its meaning more accurately.

Afterwards, we proceeded to select the items related to each of the four dimensions previously indicated, adapted to the NPO-business relationship and its inherent characteristics. The result was a first relationship of 31 items. Specifically, the items of the participation dimension (in our case, of the collaborating company), and those of the reciprocity dimension have been obtained from its definition and fundamental characteristics described by Bharti et al. (2015). The items of the learning dimension come from the scale used by Sanzo, Santos, García and Trespalacios (2012). Finally, the items of the engagement dimension derive from the scale of Vivek, Beatty, Dalela and Morgan (2014).

In addition, in order to strengthen the validity of the content of the scale, a Delphi Analysis was carried out. The Delphi technique “is a widely used and accepted method for gathering data from respondents within their domain of expertise” (Hsu & Sandford, 2007: 1). Specifically, we had the collaboration of nine researchers and / or managers in the field of social innovation, corporate social responsibility, non-profit marketing, value co-creation or management of NPOs. All of them were selected according to the recommendations of Hsu and Sandford (2007) regarding (1) their specialization in the thematic areas to be analyzed, and (2) their high training and competence in the areas of knowledge related to the topic of the study. The Delphi was carried out in three main phases or stages, which bring together Ortega’s methodological proposals (2008: 32-33), as detailed below:

- In the first stage, experts were given a cover letter, describing the dynamics of the technique and the relationship of 31 items of the four dimensions that initially formed the

A census of Spanish NPOs which potentially co-create value in its relations with private companies was developed

NPO-business co-creation scale. Specifically, they were asked to indicate whether the wording of each item was valid to evaluate the dimension to which it was linked, by using a 1 to 7 scale, in which 1 indicated that “the item is not valid at all”, and 7 showed that “the item is perfectly valid”. In addition, a blank space was left in each dimension to make observations, clarifications or comments to the initial wording, as well as to provide new items, if deemed appropriate.

- In a second and third stage, after calculating the average and mode of scores given by experts to the writing of each item, according to the proposal of Hasson, Keeney and McKenna (2000: 1012), and assessing the observations made, we proceeded to eliminate, merge, modify or add items to each scale. The result of this process was presented to each of the nine experts participating in the Delphi analysis, as well as the initial score assigned to each item in the first stage, aiming to ratify it in its initial score or to modify it instead, after comparing both values.

The final result was a initial scale, comprising critical dimensions of the NPO-business value co-creation, with 32 items formulated in a seven point Likert-type scales, from 1 (total disagreement) to 7 (total agreement).

3.2. Data collection and editing

A census of Spanish NPOs which potentially co-create value in its relations with private companies was developed, to the extent that they collaborate or have collaborated with them in the development of projects, programs or activities that favor the achievement of its organizational mission. This NPO census was necessary in the absence of an analogous one in public records. Its preparation had its starting point in a previous work between innovative social NPOs (Álvarez-González et al., 2017), and resorted to about twenty secondary sources of information.

Figure 2 describes the census in relation to its main classification variables: year of incorporation, legal form, founders, type of beneficiaries, type of activity carried out, geographical scope of action, and size (by volume of income in euros).

Figure 2
NPO Census: Classification Variables

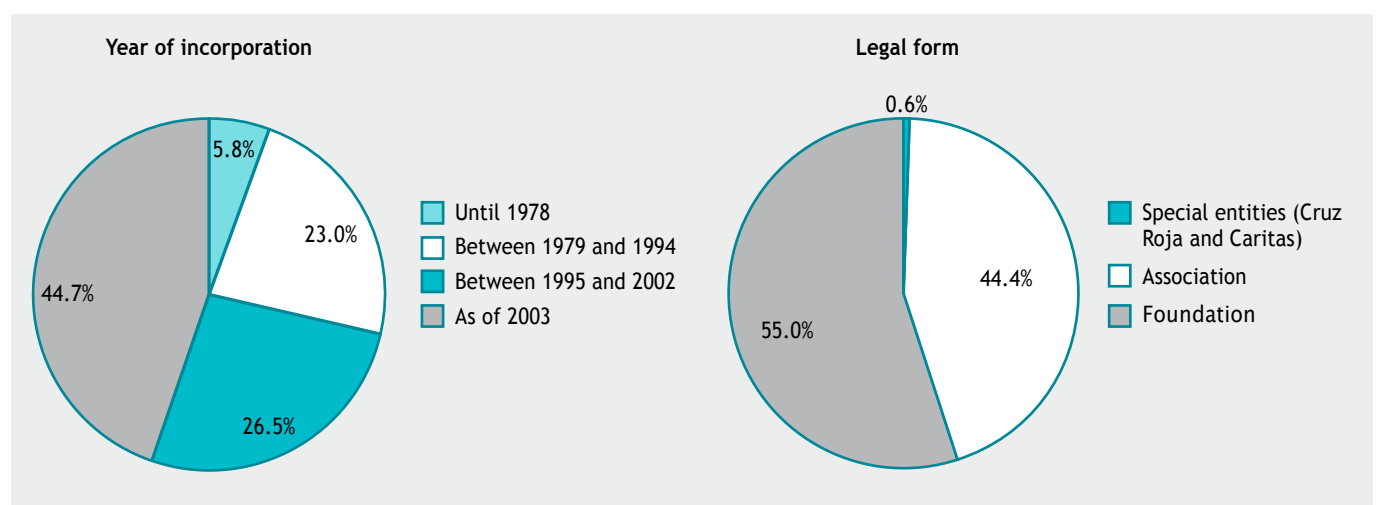
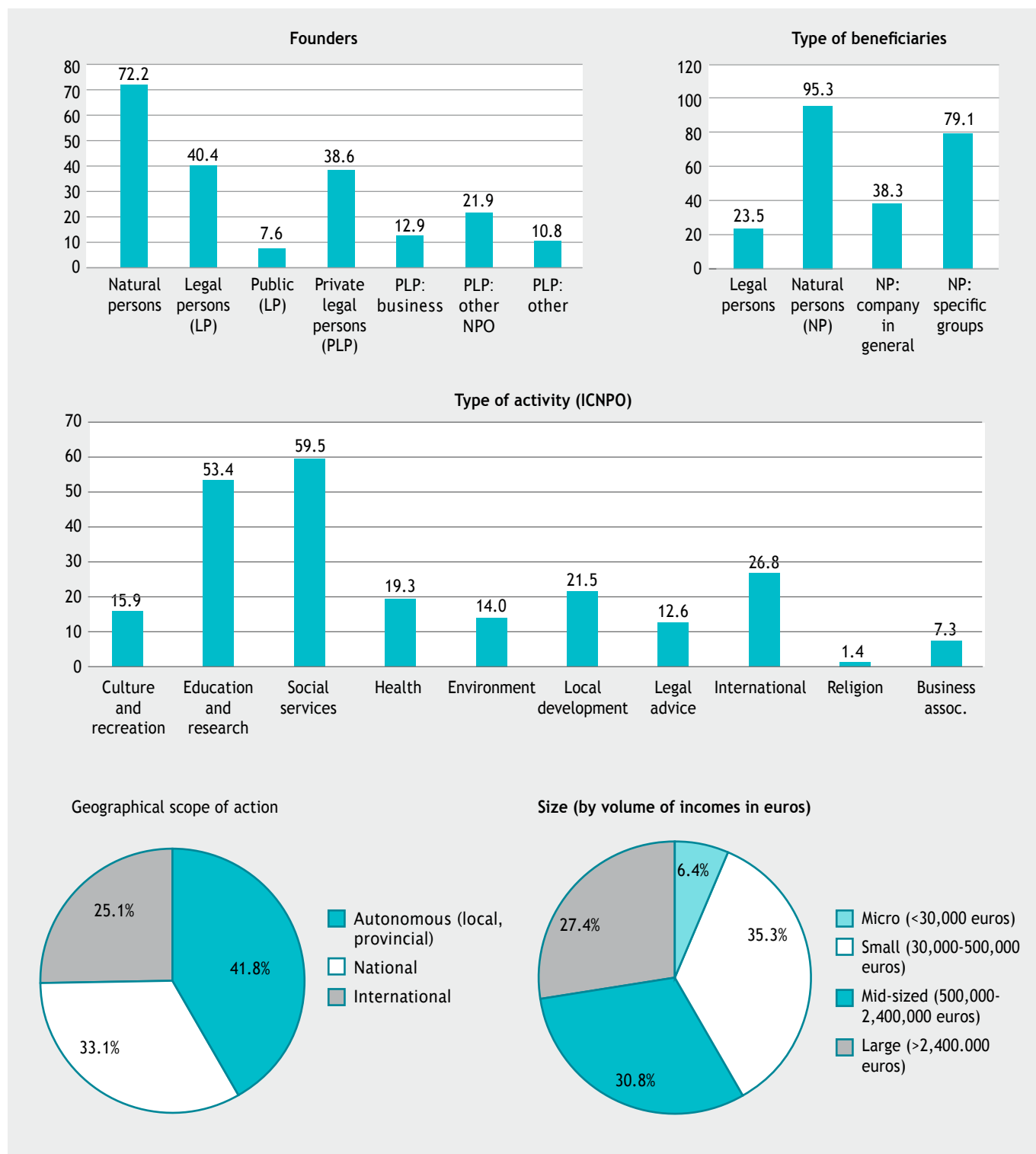


Figure 2 (continued)

NPO Census: Classification Variables

Source: own elaboration.

Results related to dimensionality, reliability and validity (convergent and discriminant) of the scale are presented

After setting up the census, collaboration in the study was requested to 358 NPOs through a self-administered structured online survey. The recipient of the questionnaire was the Director or, failing that, the President of each NPO in charge of daily management. The sample, initially set by 212 NPOs, reached 205 NPOs, after eliminating those insufficiently filled questionnaires or whose reliability raised doubts. Therefore, the response rate was 57.3% over the configured census, with a sampling error of $\pm 4.5\%$ (95% level of confidence for $z = 1.96$ and the most unfavorable case in which $p = q = 0.5$). Table 1 summarizes the data in the data sheet of the empirical study.

Table 1
Data sheet of the empirical study

Sample group	Spanish innovative social NPOs, which collaborate or have collaborated with private companies
Geographical scope	National
Information collection method	Online survey through structured questionnaire, with previous telephone contact
Sample Unit	Director or President of the NPO
Population census	358 Spanish NPOs
Sample size	205 Spanish NPOs
Sampling error	$\pm 4.5\%$
Level of confidence	95% for $z=1.96$ and $p=q=0.5$
Time period	January 2018 - May 2018

Source: own elaboration.

After the process of data collection and the corresponding process of editing or elimination of incorrect values, the data were subjected to the relevant statistical analysis processes, leading to the results which are the subject of development in the following section.

3.3. Evaluation of dimensionality, construct reliability, convergent validity and discriminant validity

Afterwards, results related to dimensionality, reliability and validity (convergent and discriminant) of the specifically proposed scale in this study are presented to measure the degree of adoption by an NPO of the value co-creation strategy in its business relationships.

3.3.1. Evaluation of the dimensionality of the scale

The analysis of the proposed NPO-business value co-creation scale has been performed using the statistical technique of Confirmatory Factor Analysis (CFA) by means of structural equations. The estimation method used has been that of maximum likelihood.

The structural equation model (SEM) is a multivariable statistical analysis method that combines multiple regression and factor analysis. It is a statistical technique that allows to measure underlying latent constructs, which have been identified by means of a factorial analysis and that makes it possible to assess the existing relationships between the constructs (Hair, Anderson, Tatham & Black, 1999). The CFA is a statistical analysis technique that allows

The objective has been achieved after the empirical analysis of the construct under analysis

to verify if the observable variables (or indicators) adequately represent the latent variable or construct with which they are associated.

In order to assess the overall adequacy of the sample data to the structure of the proposed scale, a review of the joint measures of adjustment quality has been carried out (Hair et al., 1999). However, since CFA models do not usually adjust data in a first contrast, different adjustment models have been estimated sequentially until reaching the optimal model, considering three criteria (Jöreskog & Sörbom, 1993): (1) eliminating those indicators that have a weak convergence condition with its corresponding latent variable (a student's t-distribution greater than 2.58 is required for $p = 0.01$); (2) eliminating those variables with standardized coefficients of less than 0.5, being considered as a strong convergence criterion; and (3) eliminating those indicators that have a linear R^2 ratio of less than 0.3.

In the analysis carried out, no indicator has a weak convergence with its latent variable, surpassing in all cases a student's t-distribution of 2.58. Therefore, the first criterion referring to the elimination of items was not applied. Thus, this model (**Model 1**) is equal to the original model. When the second criterion was applied, some variables with standardized coefficients of less than 0.5 were eliminated, which led to a modification of the model with respect to the original model (**Model 2**). In addition, based on the third criterion, those indicators that have a linear R^2 ratio of less than 0.3 were eliminated. In order to reach the optimal or most suitable model, the value of the modification indices, which must have a value of 3.84 or higher, was examined, which suggests that a statistically significant reduction in the chi-square statistic is obtained when estimating the coefficient (Hair et al., 1999). Furthermore, modification rates suggested moving items A_1, A_6, A_7 and A_8, from the learning dimension to the reciprocity dimension, which improves the model in correspondence with the underlying theory. This process led to the optimal "Co-creation of NPO-business value" model (**Model 3**), as can be seen in Figure 3.

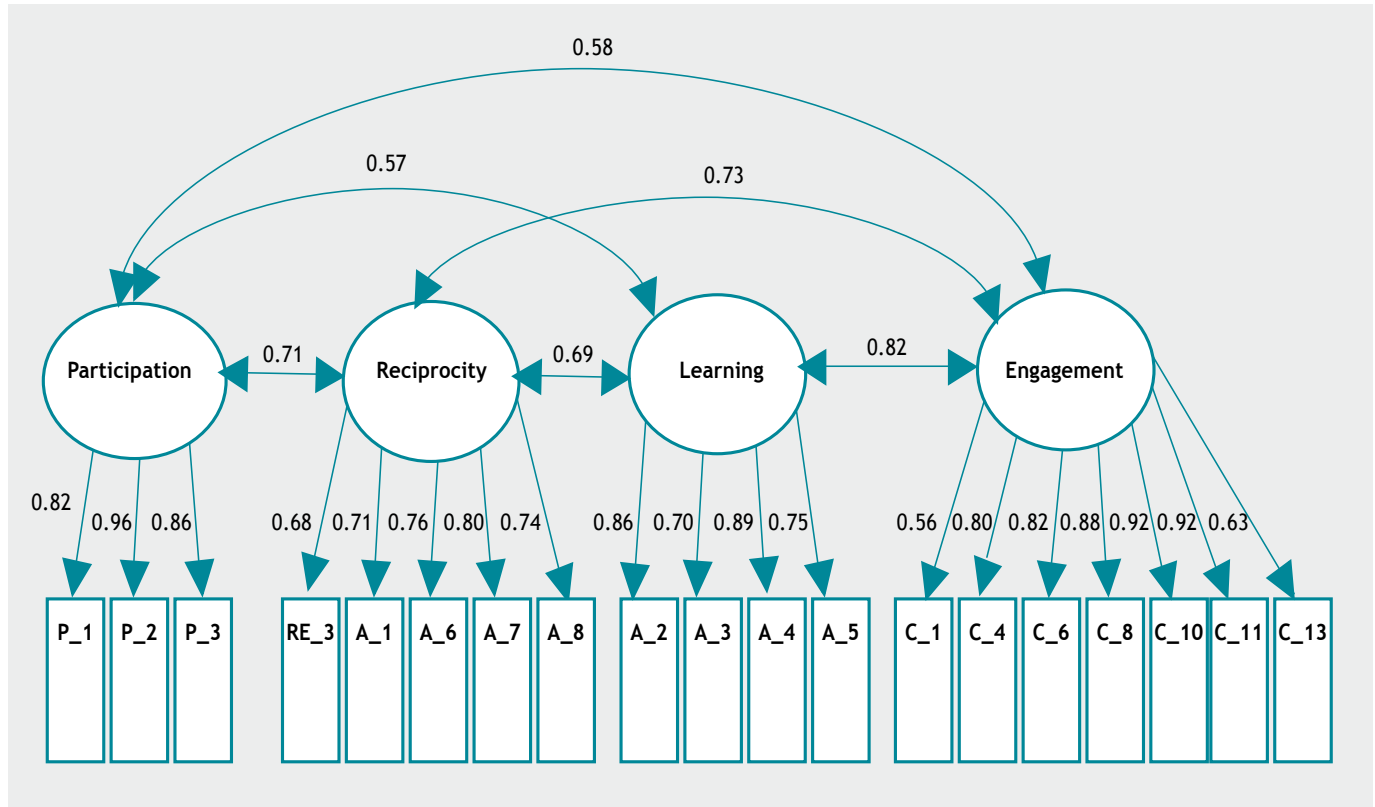
Table 2 shows the joint measures of adjustment quality of each of the three models indicated above.

Table 2
Confirmatory Factor Analysis of the value co-creation scale

Goodness-of-Fit Statistics	Model 1	Model 2	Model 3 (Optimal)
Absolute Fit Indices			
Chi-Square	1381.182 (p= 0.000)	1107.608 (p= 0.000)	284.321 (p= 0.000)
Chi-Square Reason / degrees of freedom	3.016	3.483	1.947
Comparative Fit Indices			
Comparative Fit Index (CFI)	0.766	0.791	0.938
Tucker-Lewis Index (TLI)	0.747	0.769	0.928
Others			
Root Mean Square Residual (RMSR)	0.092	0.089	0.054
Root Mean Square of Approximation (RMSEA)	0.112	0.125	0.077

Source: own elaboration.

Figure 3

Relationship diagram of the NPO-business value co-creation scale

Note: The relationship diagram shows the standardized parameters.

Source: own elaboration.

3.3.2. Construct reliability

To evaluate the reliability of the scales the composite reliability coefficient has been used. A measurement is reliable when it provides consistent or stable results in repeated measurements, that is, the measurement is made without random errors (Bagozzi, 1981). Thus, in order to evaluate the internal consistency of the measures of the model factors proposed in the study, the composite reliability coefficient is obtained, with a value of 0.8 as a reference point (Nunnally & Bernstein, 1994). This point is exceeded by the four factors analyzed, reflecting a high internal consistency (Table 3).

3.3.3. Convergent validity

Convergent validity refers to the fact that the same concept measures must be correlated. The convergent validity of the measurement model is confirmed on the proposed scale (Bagozzi & Yi, 1988), since: (1) there is statistical significance between each indicator and its factor, and (2) all standardized loads are greater than the minimum reference value of 0.5. Likewise, the average extracted variance (AVE) exceeds, in the four constructs of the model, the reference value of 0.5 (Hair et al., 1999). Therefore, the study confirms that the indicators converge on the established factors. In that sense, Table 3 also showed the values of the lambda coefficients standardized of items, and the AVE for each of the factors.

Table 3

CFA of the NPO-business value co-creation measurement model

Factor	Item	Lambda Coefficients Standardized	Reliability	AVE
Participation (P)	P_1	0.818	0.912	0.777
	P_2	0.958		
	P_3	0.862		
Reciprocity (RE)	RE_3	0.680	0.857	0.547
	A_1	0.712		
	A_6	0.759		
	A_7	0.803		
	A_8	0.737		
Learning (A)	A_2	0.864	0.879	0.647
	A_3	0.700		
	A_4	0.888		
	A_5	0.749		
Engagement (C)	C_1	0.558	0.924	0.642
	C_4	0.800		
	C_6	0.818		
	C_8	0.880		
	C_10	0.924		
	C_11	0.922		
	C_13	0.626		

Source: own elaboration.

3.3.4. Discriminant validity

To evaluate whether the measurement model meets the discriminant validity criteria, the method of Fornell and Larcker (1981) has been used. Specifically, we check how the square of the correlations between each of the constructs is less than the AVE of the factors involved, indicating that each factor is different from the other constructs of the model (see Table 4).

Table 4

Discriminant validity of the value co-creation scale

Factor	P	RE	A	C
P	0.777			
RE	0.500	0.547		
A	0.326	0.479	0.647	
C	0.331	0.534	0.130	0.642

Source: own elaboration.

NPOs must carry out a series of practices to effectively co-create with private companies

4. Conclusions and practical implications

The objective has been achieved after the empirical analysis of the construct under analysis. Therefore, a valid and reliable scale of measurement has been developed for the adoption of a value co-creation strategy by the NPO in its relations with private companies (see Appendix 1). This scale is based on the four basic sub-dimensions of co-creation: participation, reciprocity, learning, and engagement. According to these dimensions, NPOs must carry out a series of practices to effectively co-create with private companies in the execution of activities, projects, programs, etc.

Firstly, regarding the participation of the collaborating company in the design and implementation of this strategy, the NPO managers should encourage the company to provide all the important and necessary information at all times, to facilitate the suggestions it deems appropriate, and to participate in the decision making of issues related to the collaboration project. For example, by opening new communication channels between the two organizations (see the usefulness of the new online platforms for this purpose), or by allowing permanent interaction between the staff of the two parties directly involved in the relationship.

Secondly, in relation to the reciprocity that should prevail in this type of relationship, the NPO might be interested in promoting the long-term balance of costs and benefits of collaboration (if it was not equitable at a certain point in time). Also, NPO managers could encourage the actual learning of each partner with respect to the other, the joint review of past experiences to learn from the successes and mistakes, the questioning at all times by both entities of the actions carried out and the adaptation to the new circumstances, and the commitment to the same shared goal of collaboration. In order to achieve all this, it would be very interesting, for example, that managers of the non-profit entity and the company could hold regular meetings during each stage of the project, encouraging effective communication feedback.

Third, in order to deepen the learning that derives from the collaboration, NPO managers must promote in the collaborating company the acquisition of relevant information from the non-profit entity for their own activities or processes. Likewise, NPO managers must encourage the application of the information within the organizational framework of the company, its use to be more efficient and better perform its activities, and the introduction of changes in the way it operates with respect to the NPO. To this end, the NPO could provide the company with all those reports related to the projects in which the business organization is collaborating, and that could be useful to business managers for decision-making.

Lastly, with the purpose of engaging over the long term in the relationship with the company, the NPO would be interested in encouraging such commitment among company directors, as well as the interest and attention of its most direct interlocutors. Thus, the NPO should ensure compliance with the collaboration objectives by the company, the personal involvement of the aforementioned partners, their perception of enjoyment in the activities where they collaborate, the performance of teamwork that is really appreciated by them, and the creation of personal ties between partners of both parties. For example, the non-profit entity could carry out different types of events (conferences, forums ...) to promote the encounter of people directly involved in collaborative activities, or invite the company staff to participate directly in the provision of your services and personally appreciate the achievements of the alliance. In addition, NPO managers could provide relevant information to the company about the potential future projects in which the company could collaborate, thus promoting long-term links and its permanence in development.

In this paper a valid and reliable scale of measurement of NPO-business co-creation has been generated. However, the main limitation that it presents is that it has been carried out from a

Appendix 1

NPO-business value co-creation scale

Participation	
P_1	The company shares with us relevant information that can be used in the different stages of the collaboration processes.
P_2	The company provides suggestions for these collaboration processes.
P_3	The company participates in decision-making regarding one or more stages of the collaboration.
P_4	<i>The company has made monetary contributions to our entity.</i>
P_5	<i>It has made contributions in kind (products and / or services) to our entity.</i>
P_6	<i>The company has provided us with infrastructure and / or equipment.</i>
P_7	<i>The company has allowed its employees to dedicate hours to our entity in the form of corporate volunteering.</i>
Reciprocity	
RE_1	<i>In our collaborative relationship there is a balance between what each of the 2 parties contributes and receives.</i>
RE_2	<i>Our entity helps the company, just as the company helps us.</i>
RE_3	Even if the relationship cost and benefits are not equivalent at a certain moment of time, they are balanced in the long term.
RE_4	<i>In the relationship there are no undesirable behaviors (abuse of power, dominant positions, etc.) in the process management.</i>
A_1	We believe that the relationship is characterized by the fact that each partner learns from the other.
A_6	Both organizations (your entity and the company) jointly review past experiences to learn from successes and mistakes.
A_7	We both like to ask ourselves frequently how to do things, and we are willing to change in order to adapt to new circumstances.
A_8	Both organizations share the same goal with collaboration, to which we are committed.
Learning	
A_2	The company gets information from us that can be helpful in your own activities or processes.
A_3	We believe that such information is spread, shared and / or applied within your organization.
A_4	We believe that this information allows the company to be more efficient and / or to better perform its activities.
A_5	We believe that the company introduces changes in its management or in the way it operates, as a result of collaborating with us.
Engagement	
C_1	Business executives prove to be very committed to collaboration.
C_2	<i>We believe that company executives would like to continue collaborating with us.</i>
C_3	<i>The company (and its management bodies) seems willing to continue investing in the long term in collaboration.</i>
C_4	Business partners who collaborate with us show a lot of interest and attention for the project, program, etc., particularly where we collaborate.
C_5	<i>These partners like to know everything related to the purpose of the collaboration.</i>
C_6	Business partners who collaborate with us take the necessary time to fulfill the collaboration objectives.
C_7	<i>These partners are always looking for new opportunities to actively participate in our activities.</i>
C_8	Such interlocutors prove to be personally involved in the collaboration.
C_9	<i>The company's partners speak enthusiastically about the collaboration.</i>
C_10	Business partners seem to enjoy the collaboration a lot.
C_11	Business partners who collaborate with us enjoy teamwork.
C_12	<i>These interlocutors like the opportunity to interact with other people.</i>
C_13	The relationship that is developed between our staff and the business partners extends beyond the professional relationship, creating personal ties.

Note: in italics, the items that have been removed after the process of reliability and validation appear.

single perspective: the socially innovative Spanish NPOs. Therefore, as in any other intersectoral alliances, research should be replicated in the other part of the relationship, private companies, and identify possible dissonances.

Likewise, once the scale has been developed, the lines of research that could be developed are the following: (1) identifying institutional factors, and those defining the type of relationship established between both partners, as well as those organizational factors which can stimulate co-creation; (2) consider possible moderators of the consequences of co-creation; and (2) analyzing the consequences, at different levels of analysis (micro, meso and macro), that can be derived from it.

5. Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

6. Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

7. References

- Al-Tabbaa, O. (2017). On the Role of Proactiveness: Factors to Determine NGOs Effectiveness in Cross-Sector Collaboration. *SSRN Electronic Journal* [online] Available online: <https://ssrn.com/abstract=2943063>.
<https://doi.org/10.2139/ssrn.2943063>
- Al-Tabbaa, O., Leach, D., & March, J. (2014). Collaboration between nonprofit and business sectors: A framework to guide strategy development for nonprofit organizations. *Voluntas: International Journal of Voluntary and Nonprofit Organizations*, 25(3), 657-678.
<https://doi.org/10.1007/s11266-013-9357-6>
- Álvarez-González, L. I., García-Rodríguez, N., Sanzo-Pérez, M. J., & Rey-García, M. (2017). Análisis multidimensional del concepto de innovación social en las organizaciones no lucrativas españolas. Evidencias prácticas. *Revista Española del Tercer Sector*, 36, 23-48.
- Andreu, L., Sánchez, I., & Mele, C. (2010). Value co-creation among retailers and consumers: New insights into the furniture market. *Journal of Retailing and Consumer Services*, 17(4), 241-250.
<https://doi.org/10.1016/j.jretconser.2010.02.001>
- Anheier, H. K., Krlev, G., Preuss, S., Mildenerberger, G., Bekkers, R., Mensink, W., Bauer, A., Knapp, M., Wistow, G., Hernandez, A., & Adelaja, B. (2014). *Social Innovation as Impact of the Third Sector. ITSSOIN Project, European Commission – 7th Framework Programme*. Brussels: European Commission, DG Research. Available online: http://itssoin.eu/site/wp-content/uploads/2015/09/ITSSOIN_D1_1_Social-Innovation-as-Impact.pdf
- Austin, J. E. (2010). From organization to organization: On creating value. *Journal of Business Ethics*, 94, 13-15.
<https://doi.org/10.1007/s10551-011-0787-z>
- Austin, J. E., & Seitanidi, M. M. (2011). Value Creation in Business-nonprofit Collaborations. *Harvard Business School Working Paper*, 12-019, 1-95.
- Austin, J. E., & Seitanidi, M. M. (2012). Collaborative value creation: A review of partnering between nonprofits and businesses: Part I. Value creation spectrum and collaboration stages. *Nonprofit and Voluntary Sector Quarterly*, 41(5), 726-758.
<https://doi.org/10.1177/0899764012450777>
- Bagozzi, R. P. (1981). Attitudes, intentions, and behavior: A test of some key hypotheses. *Journal of Personality and Social Psychology*, 41(4), 607-627.
<https://doi.org/10.1037/0022-3514.41.4.607>
- Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, 16(1), 74-94.
<https://doi.org/10.1007/BF02723327>

- Bendapudi, N., & Leone, R. P. (2003). Psychological implications of customer participation in co-production. *Journal of marketing*, 67(1), 14-28.
<https://doi.org/10.1509/jmkg.67.1.14.18592>
- Bharti, K., Agrawal, R., & Sharma, V. (2015). Literature review and proposed conceptual framework. *International Journal of Market Research*, 57(4), 571-603.
<https://doi.org/10.2501/IJMR-2015-012>
- Brugmann, J., & Prahalad, C. K. (2007). Cocreating business's new social compact. *Harvard Business Review*, 85(2), 80-90.
- Chan, K. W., Yim, C. K. & Lam, S. S. (2010). Is customer participation in value creation a double-edged sword? Evidence from professional financial services across cultures. *Journal of Marketing*, 74(3), 48-64.
<https://doi.org/10.1509/jmkg.74.3.048>
- Churchill Jr, G. A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, 16, 64-73.
<https://doi.org/10.1177/002224377901600110>
- Dahan, N. M., Doh, J. P., Oetzel, J., & Yaziji, M. (2010). Corporate-NGO collaboration: Co-creating new business models for developing markets. *Long Range Planning*, 43(2), 326-342.
<https://doi.org/10.1016/j.lrp.2009.11.003>
- Den Hond, F., De Bakker, F. G., & Doh, J. (2015). What prompts companies to collaboration with NGOs? Recent evidence from the Netherlands. *Business and Society*, 54(2), 187-228.
<https://doi.org/10.1177/0007650312439549>
- Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of Marketing Research*, 18(3), 328-388.
<https://doi.org/10.1177/002224378101800313>
- Grönroos, C. (2012). Conceptualising value co-creation: A journey to the 1970s and back to the future. *Journal of Marketing Management*, 28(13-14), 1520-1534.
<https://doi.org/10.1080/0267257X.2012.737357>
- Grönroos, C., & Ravald, A. (2011). Service as business logic: implications for value creation and marketing. *Journal of Service Management*, 22(1), 5-22.
<https://doi.org/10.1108/09564231111106893>
- Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1999). *Análisis multivariante*. Madrid: Prentice Hall.
- Hasson, F., Keeney, S., & McKenna, H. (2000). Research guidelines for the Delphi survey technique. *Journal of Advanced Nursing*, 32(4), 1008-1015.
<https://doi.org/10.1046/j.1365-2648.2000.t01-1-01567.x>
- Hsu, C. C., & Sandford, B. A. (2007). The Delphi technique: making sense of consensus. *Practical Assessment, Research and Evaluation*, 12(10), 1-8. Available online: <http://pareonline.net/getvn.asp?v=12&n=10>
- Jordan, J. V. (1986). *The Meaning of Mutuality*. Wellesley, MA: Stone Center for Developmental Services and Studies, Wellesley College.
- Jöreskog, K. G., & Sörbom, D. (1993). *New features in LISREL 8*. Chicago, Illinois: Scientific Software International.
- Kahn, W. A. (1990). Psychological conditions of personal engagement and disengagement at work. *Academy of Management Journal*, 33(4), 692-724.
<https://doi.org/10.5465/256287>
- Kazadi, K., Lievens, A., & Mahr, D. (2015). Stakeholder co-creation during the innovation process: Identifying capabilities for knowledge creation among multiple stakeholders. *Journal of Business Research*, 69(2), 525-540.
<https://doi.org/10.1016/j.jbusres.2015.05.009>
- Netemeyer, R. G., Bearden, W. O., & Sharma, S. (2003). *Scaling procedures: Issues and applications*. Thousand Oaks, CA: Sage Publications.
<https://doi.org/10.4135/9781412985772>
- Ng, I. C., Maull, R., & Yip, N. (2009). Outcome-based contracts as a driver for systems thinking and service-dominant logic in service science: Evidence from the defence industry. *European Management Journal*, 27(6), 377-387. Available online: <http://hdl.handle.net/10036/86962>
<https://doi.org/10.1016/j.emj.2009.05.002>
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory*. New York: McGraw-Hill.

- Ortega, F. (2008). El método Delphi, prospectiva en Ciencias Sociales a través del análisis de un caso práctico. *Revista Escuela de Administración de Negocios*, (64), 31-54. Available online: <http://www.redalyc.org/articulo.oa?id=20612981004>
<https://doi.org/10.21158/01208160.n64.2008.452>
- Păunescu, C. (2014). Current trends in social innovation research: social capital, corporate social responsibility, impact measurement. *Management and Marketing*, 9(2), 105-118.
- Payne, A. F., Storbacka, K., & Frow, P. (2008). Managing the co-creation of value. *Journal of the Academy of Marketing Science*, 36(1), 83-96.
<https://doi.org/10.1007/s11747-007-0070-0>
- Polese, F. (2009). The influence of networking culture and social relationships on value creation. *Sinergie*, (16), 193-215.
- Prahalad, C. K., & Ramaswamy, V. (2004). Co-creating unique value with customers. *Strategy and Leadership*, 32(3), 4-9.
<https://doi.org/10.1108/10878570410699249>
- PwC (2015). *Más valor social en 2033. Nuevas oportunidades para las empresas*. Available online: <https://www.pwc.es/es/publicaciones/espana-2033/mas-valor-social-2033.html>
- Ramaswamy, V. (2009). Co-creation of value - towards an expanded paradigm of value creation. *Marketing Review St. Gallen*, 26(6), 11-17.
<https://doi.org/10.1007/s11621-009-0085-7>
- Ramaswamy, V., & Gouillart, F. (2010). Building the co-creative enterprise. *Harvard Business Review*, 88(10), 100-109.
- Ranjan, K. R., & Read, S. (2016). Value co-creation: concept and measurement. *Journal of the Academy of Marketing Science*, 44(3), 290-315.
<https://doi.org/10.1007/s11747-014-0397-2>
- Saarijärvi, H. (2012). The mechanisms of value co-creation. *Journal of Strategic Marketing*, 20(5), 381-391.
<https://doi.org/10.1080/0965254X.2012.671339>
- Sanzo, M. J., Santos, M. L., García, N., & Trespalacios, J. A. (2012). Trust as a moderator of the relationship between organizational learning and marketing capabilities: Evidence from Spanish SMEs. *International Small Business Journal*, 30(6), 700-726.
<https://doi.org/10.1177/0266242611418907>
- Schiller, R. S., & Almog-Bar, M. (2013). Revisiting collaborations between nonprofits and businesses: An NPO-centric view and typology. *Nonprofit and Voluntary Sector Quarterly*, 42(5), 942-962.
<https://doi.org/10.1177/0899764012471753>
- Spohrer, J. & Maglio, P. P. (2010). The emergence of service science: toward systematic service innovations to accelerate co-creation of value. *Production and Operations Management*, 17(3), 238-246.
<https://doi.org/10.3401/poms.1080.0027>
- Vargo, S. L., & Lusch, R. F. (2004). Evolving to a new dominant logic for marketing. *Journal of Marketing*, 68, 1-17.
<https://doi.org/10.1509/jmkg.68.1.1.24036>
- Vargo, S. L., & Lusch, R. F. (2008). From goods to service (s): Divergences and convergences of logics. *Industrial Marketing Management*, 37(3), 254-259.
<https://doi.org/10.1016/j.indmarman.2007.07.004>
- Vargo, S. L., & Lusch, R. F. (2016). Institutions and axioms: an extension and update of service-dominant logic. *Journal of the Academy of Marketing Science*, 44(1), 5-23.
<https://doi.org/10.1007/s11747-015-0456-3>
- Vargo, S. L., Maglio, P. P., & Akaka, M. A. (2008). On value and value co-creation: A service systems and service logic perspective. *European Management Journal*, 26(3), 145-152.
<https://doi.org/10.1016/j.emj.2008.04.003>
- Vivek, S. D., Beatty, S. E., Dalela, V., & Morgan, R. M. (2014). A generalized multidimensional scale for measuring customer engagement. *Journal of Marketing Theory and Practice*, 22(4), 401-420.
<https://doi.org/10.2753/MTP1069-6679220404>

Empirical Evaluation of the Efficiency of the Ecuadorian Banking Sector

Jorge Arturo Campoverde Campoverde

Coordinator of the Business Research Group. Master's degree in Business Administration. Principal Investigator and Professor of Operations Research at the Universidad de Cuenca. Ecuador.

ORCID: [0000-0002-1633-5644](https://orcid.org/0000-0002-1633-5644).

Gustavo Giovanni Flores Sánchez

Investigator and professor of finance management at the Universidad de Cuenca. Ecuador.

ORCID: [0000-0003-4123-2644](https://orcid.org/0000-0003-4123-2644).

Katherine Tatiana Coronel Pangol

Junior Investigator in the Business Research Group at the Universidad de Cuenca. Ecuador.

ORCID: [0000-0003-4370-756X](https://orcid.org/0000-0003-4370-756X).

Carlos Armando Romero Galarza

Junior Investigator in the Business Research Group at the Universidad de Cuenca. Ecuador.

ORCID: [0000-0003-1149-4299](https://orcid.org/0000-0003-1149-4299).

jorge.campoverde@ucuenca.edu.ec, gustavo.flores@ucuenca.edu.ec, katherine.coronelp95@ucuenca.edu.ec, armando.romerog@ucuenca.edu.ec

Received: November 2019.

Accepted: December 2019.

Published: June 2020.

Abstract

This research constitutes the measurement of the efficiency of the Ecuadorian banking sector during the periods 1993-1999 and 2000-2018, applying the Data Envelope Analysis methodology, using the CCR and BCC approaches. The fixed asset and operating expense accounts were used as input variables for this purpose. The output variables were accounts receivable, income, investments and total deposits. Data were taken from monthly bulletins submitted by the different decision-making units to the *Superintendencia de Bancos del Ecuador*. The main findings indicate that the levels of efficiency during the 2000-2018 period were higher than in the 1993-1999 period. On average, during the first period, the banks had an efficiency ratio of 74.31%, according to the CCR approach, and 82.17%, according to the BCC approach. However, the efficiency levels during the second period reached 95.43% and 97.01%, respectively. In addition, the results show that large banks have a higher level of efficiency than smaller banks. However, medium-sized banks have the lowest level of efficiency. It should be noted that the data varies when analyzed according to the CCR approach. Furthermore, efficiency levels are generally associated with factors related to the country's situation. This research is presented as one of the first studies on the analysis of efficiency in the Ecuadorian banking sector using this method.

Key words

Efficiency, Banking System, Data Envelopment Analysis, Decision-Making Units, DEA.

How to cite this article

Campoverde Campoverde, J. A., Flores Sánchez, G. G., Coronel Pangol, K. T., & Romero Galarza, C. A. (2020). Empirical Evaluation of the Efficiency of Ecuadorian Banking Sector. *Harvard Deusto Business Research*, IX(1), 20-39. <https://doi.org/10.3926/hdbr.256>



We analyze efficiency of the banking sector to investigate the behavior and efficiency achieved by the banking institutions that operated in the country, before and after the currency substitution

1. Introduction

The efficiency analysis in different types of organizations (financial, educational, health care, governmental, etc.) constitutes a very relevant topic, since the results obtained facilitate decision-making by the directors of each institution, in which proper resource assignment and an increase in investments promote economic growth (Andrieş & Cocriş, 2010). This is particularly true in financial institutions, where this type of study, like profitability and risk analyses, is highly applicable to different countries around the world. Berger and Mester (1997) state that efficiency analyses in the banking sector constitute an important contribution from a micro- and macroeconomic perspective. In the field of microeconomics, this is due to their impact at the organizational level of each bank, helping them to increase their competitiveness (Koutsomanoli-Filippaki, Margaritis & Staikouras, 2009); and on the macroeconomic level, the efficiency of the banking system has an influence on the cost of intermediation and on the overall financial stability of the banking sector (Rossi, Schwaiger & Winkler, 2005).

In this context, we deemed the efficiency analysis of this sector to be a necessary and important contribution to Ecuadorian literature, given the need to know the performance and efficiency achieved by the banking institutions that operated in the country before and after the currency substitution (replacing the sucre with the United States dollar) that occurred in the country in 2000, as the result of the 1999 bank holiday. It is also important to study the effects that the international financial crisis of 2008 could have had on the national banking system.

The aim of this study is to measure the efficiency of the Ecuadorian banking sector, examining certain parameters and/or variables of each institution, such as: costs, resource allocation, performance, etc., by measuring the technical efficiency (TE) and pure technical efficiency (PTE) during the periods 1993-1999 and 2000-2018, applying the Data Envelopment Analysis (DEA) methodology, thus obtaining ratios that would make it possible to determine the efficient and inefficient Decision-Making Units (DMU). The efficiency of each bank is calculated by comparing its inputs and outputs to the rest of the banks (Arieu, 2004).

Another aim is to study the evolution and behavior individually and on a group basis for the financial institutions based on their size: large, medium and small, classified based on their total assets. In this context, the research questions are: (i) Has the efficiency of the banking sector increased over time? (ii) In which period are the banks more efficient (in the era of the sucre or with the dollar)? (iii) Are large banks more efficient? (iv) Can these findings provide relevant information for decision-making by owners and administrators of banking institutions?

The article is structured as follows: the first part succinctly reports the most important events occurring in the Ecuadorian banking sector before and after the currency substitution and the reasons why we conducted this investigation. The second section shows several cases analyzed based on the application of the DEA model to the banking sector in different countries, which will serve as the reference literature in order to conduct the research. The third section

This study constitutes one of the first approaches to an updated and retrospective efficiency analysis of the financial sector, using non-parametric methods

indicates the methodology and the description of the analysis models used. The fourth section presents the results obtained, while the final part addresses the conclusions derived from the investigation. The previous literature has made it possible to identify a work related to the topic of analysis (Buenaño, 2004), which analyzed the efficiency of 18 institutions in the Ecuadorian banking sector during the period 2000-2003, from the perspective of DFA (Distribution Free Approach); however, no similar works have been found in recent years, and thus the present study constitutes one of the first approaches to the analysis of the efficiency of the financial sector that is both up-to-date and retrospective, through the use of non-parametric methods for this purpose. It constitutes an interesting starting point for the later study of efficiency in different sectors and its evolution within the same sector.

1.1. Previous literature

Efficiency is directly related to the productive capacity and/or the capacity to carry out a job with a certain amount of resources. It is measured according to variables that evaluate the relationship between results and the resources invested. To do this, different methods with focuses on parametric and non-parametric data have allowed us to measure the efficiency of several types of institutions, including financial, educational, health care, service provision, commercial and other institutions, in both the public and private sector (Navarro & Torres, 2006). The measurement of efficiency constitutes a topic of great importance in the different institutions in which the use of DEA methodology is considered a useful factor for decision-making (Valencia & Chediak, 2008; Restrepo & Villegas, 2011). The studies conducted on this topic have been generated subsequent to the work done by Farrell (1957).

The DEA method, known as Data Envelopment Analysis, is based on an approach that uses numerical input and output data, which makes it possible to estimate the efficiency ratios for each of the units of analysis or DMUs. This technique was developed by Charnes, Cooper and Rhodes (1978) and is defined as a model applied under the assumption of constant returns to scale (CRS), also known as CCR, after the names of its authors; it was later improved by Banker, Charnes and Cooper (1984), who included the assumption of variable returns to scale (VRS), thus modifying the original linear programming model, also known as BCC, after the names of its authors.

The adaptation of the VRS model permitted the authors to define the technical efficiency (TE) according to two concepts known as pure technical efficiency (PTE) and scale efficiency (SE), for which the CRS and VRS models should be applied, respectively. TE coincides with the CRS or CCR measurement and PTE with the VRS or BCC measurement (Navarro & Torres, 2006).

Initially, the model was used to measure the efficiency of production of a single unit of analysis, and was later expanded to the analysis of several units in different types of organizations (Cooper, Seiford & Tone, 2007). This methodology has also been commonly used in finance analysis to evaluate efficiency (Board, Sutcliffe & Ziemba, 2003; Fethi & Pasiouras, 2010); as an example of how the model has been applied, it has been generally used in different countries to measure the efficiency values of institutions in the financial sector, including banks and cooperatives (Andrieş & Cocriş, 2010; Favero & Papi, 1995; Joseph & Pastory, 2013; Asawaruangpipop & Suwunnamek, 2014; Xueping, Jie & Hongxin, 2011; Nitoi, 2009; Radojka, Marija & Predrag, 2013; Belmonte & Plaza, 2008; Pirateque, Piñeros & Mondragón, 2013; Vilela, Nagano & Merlo, 2007; Borenstein, Luiz Becker & José do Prado, 2004). In addition to the works by these authors, we can add that by Lozano, Pastor and Pastor (2002), which reveals that most of the studies are focused on the efficiency analysis of banks. DEA has also been used in almost every banking system in the world. Tanna (2009) has used this methodology to analyze a group of world banking institutions. Many studies were

The DEA method represents an extremely useful tool when studying the relative efficiency of different economic entities, when both output and input variables are used

conducted in countries belonging to the European Union (Casu & Molyneux, 2003), and some were also carried out in developing countries. In this sense, we can cite several examples of the use of this methodology: Idries (2007) uses DEA in a study investigating the levels of profitability in the banking sectors of several Arab countries, including Jordan, Egypt, Saudi Arabia and Bahrain, during the period 1992-2000. The main purpose of this research is focused on conducting a comparative analysis of the performance of the banking operations with their counterparts in the most highly developed nations. The study highlights the characteristics associated with the roles of economic and financial development, considering a sample of 82 banks representing 78%, 88%, 63% and 55% of the financial system in these countries, respectively. As a result, they determined that the profitability of the banks being studied was on average 50%, when the estimate was made according to constant returns to scale models and ascended to 70% according to the variable returns to scale model.

Other evidence that can be cited is the analysis of the banking sector in India, where Karimzadeh (2012) estimates the technical efficiency and total efficiency of the economy of commercial banks in the period 2000-2010. He uses the CCR and BCC models applied to India's 8 largest commercial banks. As a result of determining the efficiency ratios, it is generally indicated that in the year 2000, the efficiency was 100%, and that this fluctuated to lower percentages in later years, until reaching the level of 100% once again in 2010. It was also generally determined that the profitability of the banks studied was on average 93% when estimated according to constant returns to scale (CRS) models, and reached 99% with variable returns to scale (VRS) models. Similar analyses have been made in the state of Missouri, where the DEA model was used to evaluate the management of 64 commercial banks during the period 1984-1990 (Yue, 1992). The research consisted of measuring the TE by applying the CCR model. This made it possible to obtain details of the efficiency ratios of the banks, which were used to make comparisons between the different variables that affect the levels of efficiency.

Finally, one example considered for research is the analysis of the banking sector in Bangladesh, where Hoque and Rayhan (2012) analyzed the technical efficiency, pure technical efficiency and scale efficiency of a total of 24 banks during 2010. In Latin America, one related study is that conducted by Carreño, Loyola and Portilla (2010), which characterized the evolution of the efficiency of the Chilean banking industry between 1987 and 2007, based on a performance frontier report; in this sense, one of the main results indicates that this sector has achieved only 15% of its maximum earnings, which is presented as the cause of technical shortcomings in the sector, which affect small, national banks to a larger extent. The DEA method was used for this analysis. Furthermore, Vergara (2006) proposes an analysis to estimate the stochastic frontiers of the Chilean banking sector, in which the technical efficiency is estimated through three functional forms: the Fourier flexible, Translog and Cobb Douglas forms, determining that the latter tends to underestimate efficiency. It is also indicated that the non-parametric models can be effective to determine efficiency and stochastic frontiers.

In short, the DEA method represents an extremely useful tool for studying the relative efficiency of different economic institutions, in which outputs and inputs are used as variables, applying this methodology in different sectors, such as health care, education, transportation, industry, banking, etc. Emrouznejad (2015) has provided information related to the DEA methodology, which can be found at: <http://www.deazone.com/>.

2. Methodology

Throughout history, many different techniques have been used to determine efficiency. Some have been based on the analysis of indicators, while others compare the efficiency of

DEA methodology allows for different approaches to be taken, either input or output, depending on the optimization objective, and also determines an efficient production frontier

organizations, considering the application of various inputs that will generate various outputs. These efficiency techniques have been divided into two categories, the first of which corresponds to linear programming models (DEA), while the second category refers to regression techniques called stochastic frontier analysis (SFA).

The use of DEA methodology makes it possible to have different focuses, either input or output, depending on the optimization aim, also specifying an envelopment surface or efficient production frontier. DEA methodology has been validated in the analysis sector by several studies (Andrieş & Cocriş, 2010; Benavides & García, 2014; Radojka et al., 2013; Vilela et al., 2007). In addition, it is applicable to case studies, as it analyzes homogeneous units and considers information and variables defined as inputs and outputs.

Cooper et al. (2007) propose the following methodological description of the CCR and BCC models.

2.1. CCR (CRS) model

This is considered the basic model of the DEA methodology, which starting with the information, relates corresponding data to their input and output variables, determining the optimal weight of each DMU through the use of linear programming to maximize the ratios obtained.

The weights are determined according to the following formula:

$$\frac{\text{virtual output (U)}}{\text{virtual input (V)}}$$

The weights obtained can vary from one DMU to another, and thus the model derives the efficiency ratio obtained on an individual basis; each DMU is compared simultaneously with a set of weights obtained for the other DMUs.

With the data from each DMU, the efficiency is determined by calculating (n) optimizations, one for each DMU_j being evaluated, permitting each DMU_j to be designated as DMU_o, where o = 1, 2, 3 up to n. The optimization problem is resolved with the approach that considers the input variables as (V_i) (i = 1, ... m) and the output variables as (U_r) (r = 1, ... s).

Objective function:

$$\max_{u,v} \theta = \frac{u_1 y_{10} + u_2 y_{20} + \dots + u_s y_{s0}}{v_1 x_{10} + v_2 x_{20} + \dots + v_m x_{m0}} \quad (1)$$

Subject to:

$$\frac{u_1 y_{1j} + \dots + u_s y_{sj}}{v_1 x_{1j} + \dots + v_m x_{mj}} \leq 1 \quad (j = 1, \dots, n) \quad (2)$$

To measure efficiency, the objective function is transformed into a linear programming problem in which the numerator is maximized

$$v_1, v_2, \dots, v_m \geq 0 \quad (3)$$

$$u_1, u_2, \dots, u_s \geq 0 \quad (4)$$

To measure the efficiency, the objective function is transformed into a linear programming problem, where the numerator is maximized and the denominator is kept constant.

Objective function:

$$\max_{u,v} \theta = u_1 y_{10} + u_2 y_{20} + \dots + u_s y_{s0} \quad (5)$$

Subject to:

$$v_1 x_{10} + v_2 x_{20} + \dots + v_m x_{m0} = 1 \quad (6)$$

$$u_1 y_{1j} + \dots + u_s y_{sj} \leq v_1 x_{1j} + v_2 x_{2j} + \dots + v_m x_{mj} \quad (j = 1, \dots, n) \quad (7)$$

$$v_1, v_2, \dots, v_m \geq 0 \quad (8)$$

$$u_1, u_2, \dots, u_s \geq 0 \quad (9)$$

2.2. BCC (VRS) model

This model is based on a modification of the basic CCR model, where Banker et al. (1984) add the concept of variable scale performances to the concepts of PTE and SE. The BCC linear programming model calculates the PTE, evaluating the efficiency of each DMU_o ($o = 1, \dots, n$), solving the following mathematical model.

Objective function:

$$\min_{\theta_B, \lambda} \theta_B \quad (10)$$

Subject to:

$$\theta_B x_o - \lambda \leq 0 \quad (11)$$

We use a variation of the production approach, where outputs are related to the bank's activity, while the inputs are the resources needed

$$X\lambda \leq x_0 \quad (12)$$

$$e\lambda = 1 \quad (13)$$

$$\lambda \geq 0 \quad (14)$$

Where θ_B is a scale measurement.

2.3. Description of the variables

There is currently discussion in the banking literature regarding the correct definition of data inputs and outputs. Berger and Humphrey (1997) identify two main approaches for the selection of inputs and outputs; they are the “production approach” and the “intermediation approach”. The first assumes that banks make loans and deposits, and in doing so, they use inputs such as work and capital, and the number and type of transactions or documents are processed as output variables. The second approach considers banks as intermediaries between the savers and the investors. These same authors allege that neither of these approaches is perfect, because they do not fully capture the essence of the function of financial institutions as providers of transactions. In fact, different studies have indicated that the focus on intermediation may be better for evaluating the efficiency of bank branches and the focus on production might be more appropriate for evaluating the financial institutions as a whole. Support for both approaches can be found in the literature; however, we used a variation on the production approach, where the outputs are related to the banking activity, while the inputs are the resources necessary to carry out said activities.

Based on the observations made by Berger and Humphrey (1997), previous studies (Isik & Hassan, 2002; Casu & Molyneux, 2003; Tsionas, Lolos & Christopoulos, 2003; Havrylchyk, 2006; Sealey & Lindley, 1977; Tortosa-Ausina, 2002) and the structure of the database used (Bank Superintendency of Ecuador), the following variables were considered in the models that were developed:

- *Inputs*: Fixed Assets (FA), Operating Expenses (OE)
- *Outputs*: Accounts Receivable (AR), Income (INC), Investments (INV), Total Deposits (TD)

A sensitivity analysis has also been carried out, taking into account the intermediation approach, i.e., the TD variable is considered as an input, while the accounts receivable and investment variables continue to be outputs. The results will be presented further on.

2.4. Description of the data

The information corresponding to each of the variables was taken from the annual financial information bulletins published on the website of the Bank Superintendency, the supervisory body that publishes information corresponding to the accounting periods of each of the financial institutions on a monthly basis.

All banks have been considered for the analysis, of which those were filtered that remained during all periods of analysis (1993-1999 and 2000-2018). An efficiency analysis will subsequently be conducted only on those banks that survived the banking crisis of 1999 and 2000.

This analysis considers all banks, from which those that remain operative throughout all the analysis periods have been filtered

The data on the DMUs were taken from the reports corresponding to December of each year during the period of analysis. Table 1 indicates the list of banking institutions considered in the study during the 1993-1999 period, organized into the given categories according to the size of each institution. This categorization is established according to the percentile method applied to total assets. Table 2 presents the list of banking institutions studied during the 2000-2018 period, categorized according to the same criteria (Bank Superintendency, 2017). It should be mentioned that fewer banks are analyzed in the second period as the result of the strong impact of the financial crisis the country suffered during 1999 and 2000.

Table 1

List of financial institutions considered in the analysis period 1993-1999

Name of the financial institution	Abbreviation	Assets (Dec. 1999) in millions of sucres
Large banks		
FILANBANCO	DMU1	16,047,672.53
PICHINCHA	DMU2	11,898,689.60
DE GUAYAQUIL	DMU3	8,557,816.40
PACIFICO	DMU4	7,728,270.47
PROGRESO	DMU5	7,103,514.18
POPULAR	DMU6	6,680,903.19
PRODUBANCO	DMU7	5,645,355.89
PREVISORA	DMU8	4,721,717.85
CONTINENTAL	DMU9	3,651,780.61
CITIBANK	DMU10	3,513,307.69
BOLIVARIANO	DMU11	2,917,554.52
PRESTAMOS	DMU12	2,381,382.84
Medium-sized banks		
INTERNACIONAL	DMU13	1,976,568.93
AUSTRO	DMU14	1,431,094.05
LLOYDS	DMU15	1,339,753.42
TUNGURAHUA	DMU16	1,204,680.64
GRAL. RUMIÑAHUI	DMU17	933,108.45
AMAZONAS	DMU18	901,507.53
MACHALA	DMU19	870,109.98
CREDITO	DMU20	801,524.77
Small banks		
AZUAY	DMU21	742,354.55
LOJA	DMU22	291,758.73
LITORAL	DMU23	201,580.46
TERRITORIAL	DMU24	174,337.66

Source: Bank Superintendency, 2019.
Compiled by the Authors.

There is a reduced number of banks analyzed in the second period, due to the strong impact of the financial crisis

Table 2

List of financial institutions considered in the analysis period 2000-2018

Name of the financial institution	Abbreviation	Assets (Dec. 2018) in thousands of USD
Large banks		
BP PICHINCHA	DMU2	10,615,390.88
BP PACIFICO	DMU4	5,451,933.88
BP PRODUBANCO	DMU7	4,271,783.49
BP GUAYAQUIL	DMU3	4,023,542.09
Medium-sized banks		
BP INTERNACIONAL	DMU13	3,558,412.08
BP BOLIVARIANO	DMU11	3,114,918.93
BP AUSTRIO	DMU14	1,692,870.79
BP GENERAL RUMIÑAHUI	DMU17	829,859.26
BP SOLIDARIO	DMU25	720,162.20
BP MACHALA	DMU19	698,383.71
BP CITIBANK	DMU10	642,798.01
BP LOJA	DMU22	446,942.85
Small banks		
BP AMAZONAS	DMU18	165,431.22
BP COMERCIAL DE MANABI	DMU26	57,167.05
BP LITORAL	DMU23	37,496.83

Source: Bank Superintendency, 2019.
Compiled by the Authors.

3. Results

Tables 3, 4, 5 and 6 present the efficiency ratios obtained in the CCR and BCC analysis models focused on inputs during the two periods of analysis.

Tables 3 and 5 show the efficiency ratios obtained by applying the CCR model for banks during the periods 1992-1999 and 2000-2018, respectively, while Tables 4 and 6 show the ratios with the application of the BCC model for the same periods.

Table 3 indicates that according to the CCR approach in the large bank category, there is only 1 DMU that is completely efficient during the period of analysis, while in medium-sized and small banks, no DMU reached full efficiency in all periods. However, on average, medium-sized banks demonstrate a greater level of efficiency, followed by small banks; meanwhile, large banks present the lowest level of efficiency. Using this same approach, in Table 5 it can be seen that during the period 2000-2018, exclusively in the medium-sized bank category, there was one single DMU that was shown to be completely efficient during the period of analysis, while in the large and small bank categories there were no institutions that reached efficiency in all periods. However, unlike the previous period of analysis, in this period the average for superior efficiency is reached in large banks at rate of 98.72%, followed by medium-sized and small banks, with rates of 97.24% and 90.32%, respectively.

During the period 2000-2018, exclusively in the medium-sized bank category, one single DMU is completely efficient

Table 3

Efficiency ratios from the CCR-I model during the 1993-1999 period

DMU	1993	1994	1995	1996	1997	1998	1999
Large banks							
DMU1	0.45	0.76	0.71	0.97	1	1	1
DMU2	0.49	0.65	0.61	0.84	1	0.77	0.67
DMU3	0.80	1	1	1	0.60	1	0.96
DMU4	0.41	0.45	0.64	0.98	0.33	0.70	0.37
DMU5	1	1	1	1	1	1	1
DMU6	0.41	0.72	0.69	0.94	0.71	0.60	0.17
DMU7	0.69	0.63	0.51	0.70	0.51	0.64	0.85
DMU8	0.38	0.36	0.41	0.78	0.54	0.70	1
DMU9	0.34	0.57	1	0.29	0.28	0.52	0.76
DMU10	0.58	1	1	1	1	1	1
DMU11	0.21	0.41	0.47	0.44	0.41	0.71	0.79
DMU12	0.27	0.52	0.89	1	1	1	1
Mean	0.50	0.67	0.74	0.83	0.70	0.80	0.80
Medium-sized banks							
DMU13	0.42	0.50	0.36	0.75	0.56	0.74	0.70
DMU11	0.63	0.71	0.99	1	1	1	1
DMU14	1	1	1	0.68	1	1	1
DMU17	1	1	1	0.64	0.63	0.44	0.75
DMU25	1	0.84	1	1	1	0.84	1
DMU19	0.38	0.52	0.92	0.90	0.54	0.62	0.49
DMU10	0.27	0.33	0.39	0.57	0.55	0.75	0.69
DMU22	1	0.67	0.93	0.54	0.86	1	1
Mean	0.71	0.70	0.83	0.76	0.77	0.80	0.83
Small banks							
DMU21	0.40	0.51	0.64	0.67	0.76	0.96	0.04
DMU22	1	0.85	0.89	1	0.57	0.44	0.36
DMU23	1	1	1	0.87	0.78	0.74	1
DMU24	0.28	0.97	0.46	0.95	1	0.93	0.60
Mean	0.67	0.83	0.75	0.87	0.78	0.77	0.50

Table 4, according to the BCC approach, indicates that during the period 1993-1999, there were three large banks that attained efficiency in every period, but only one is the same as in the CCR model (DMU5). In turn, according to this approach in the small bank category, there is also one institution that is completely efficient in every period, a situation that does not occur with the previous approach. Similarly, the average efficiencies are higher with the BCC approach as opposed to the CCR approach, even though they do not maintain the same trend. With the BCC approach, small banks are on average more efficient (84.75%), followed by large banks (82.57%) and finally medium-sized banks (79.18%). On the other hand, Table 6 shows

According to the BCC approach, in the period 1993-1999, there were three large banks that achieved efficiency in all periods

that in both the large and small bank categories, there are 2 institutions that are efficient in all periods. The levels of efficiency are higher on average as compared to the CCR approach, with large banks reaching the highest level of efficiency (98.78%), followed by small banks (98.46%) and finally, medium-sized banks (93.79%). It can also be seen that between the years 2002 and 2014, large banks present perfect efficiencies, while banks in the small category have perfect efficiencies for the periods 2001, 2002, 2006-2011, 2013 and 2016.

Table 4
Efficiency ratios from the BCC-I model during the 1993-1999 period

DMU	1993	1994	1995	1996	1997	1998	1999
Large banks							
DMU1	1	1	1	1	1	1	1
DMU2	1	1	1	1	1	1	0.90
DMU3	1	1	1	1	0.61	1	1
DMU4	1	1	1	1	0.33	0.7	0.41
DMU5	1	1	1	1	1	1	1
DMU6	0.65	1	1	1	1	0.81	0.86
DMU7	0.85	0.66	0.51	0.76	0.57	0.64	1
DMU8	0.40	0.38	0.41	0.78	0.54	0.71	1
DMU9	0.90	0.78	1	0.30	0.28	0.53	0.78
DMU10	1	1	1	1	1	1	1
DMU11	0.21	0.42	0.48	0.44	0.41	0.72	0.91
DMU12	0.27	0.53	0.89	1	1	1	1
Mean	0.77	0.81	0.86	0.86	0.73	0.84	0.91
Medium-sized banks							
DMU13	0.42	0.56	0.37	0.78	0.56	0.77	0.76
DMU11	0.64	0.72	1	1	1	1	1
DMU14	1	1	1	0.79	1	1	1
DMU17	1	1	1	0.67	0.66	0.45	0.88
DMU25	1	0.91	1	1	1	0.88	1
DMU19	0.45	0.55	0.94	0.92	0.56	0.66	0.51
DMU10	0.27	0.41	0.41	0.58	0.56	0.77	0.71
DMU22	1	0.67	1	0.55	1	1	1
Mean	0.72	0.73	0.84	0.79	0.79	0.82	0.86
Small banks							
DMU21	0.41	0.59	0.68	0.72	0.86	1	0.06
DMU22	1	1	1	1	0.66	0.51	0.54
DMU23	1	1	1	1	1	1	1
DMU24	0.70	1	1	1	1	1	1
Mean	0.78	0.90	0.92	0.93	0.88	0.88	0.65

Table 5

Efficiency ratios from the CCR-I model during the 2000-2018 period

DMU	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Large banks																			
DMU2	1	1	0.73	0.82	0.99	0.87	0.9	0.87	0.93	0.94	0.94	0.98	1	0.84	0.96	0.78	1	0.94	0.84
DMU4	0.49	0.68	0.85	1	1	1	1	1	1	1	1	1	1	1	1	0.96	1	1	1
DMU7	0.99	0.85	0.79	0.92	1	0.93	1	1	1	1	1	0.93	0.95	0.91	0.95	1	0.89	0.84	0.88
DMU3	0.83	1	1	1	0.94	1	1	0.97	1	1	1	1	0.89	0.93	1	0.8	0.82	0.85	0.92
Mean	0.83	0.88	0.84	0.94	0.98	0.95	0.97	0.96	0.98	0.98	0.98	0.98	0.96	0.92	0.98	0.89	0.93	0.91	0.91
Medium-sized banks																			
DMU13	1	0.88	1	0.92	0.91	0.96	0.93	0.83	0.94	0.95	0.99	1	1	1	1	1	1	1	1
DMU11	0.82	0.98	0.95	0.86	0.94	1	1	1	1	0.95	1	1	0.99	0.95	1	1	0.89	0.97	0.91
DMU14	1	1	0.82	0.88	0.91	0.83	0.72	0.88	0.95	0.9	1	1	0.93	1	1	0.92	0.91	1	1
DMU17	1	1	1	1	1	1	1	1	1	1	1	1	1	0.94	1	1	0.97	0.92	1
DMU25	0.5	0.84	0.73	0.9	1	1	1	0.63	0.94	1	1	1	1	1	0.91	0.92	1	1	1
DMU19	0.51	0.59	0.71	0.78	0.73	0.7	0.64	0.5	0.59	0.62	0.65	0.64	0.67	0.67	0.66	0.62	0.64	0.66	0.73
DMU10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
DMU22	0.76	1	1	1	1	1	1	0.94	1	1	1	1	1	0.99	0.93	0.93	0.94	0.91	0.9
Mean	0.82	0.91	0.9	0.92	0.94	0.94	0.91	0.85	0.93	0.93	0.96	0.96	0.95	0.94	0.94	0.92	0.92	0.93	0.94
Small banks																			
DMU18	0.74	1	1	0.8	0.98	0.92	1	1	0.98	1	1	0.98	0.77	1	0.76	0.79	1	0.77	1
DMU26	1	0.83	0.66	0.8	0.96	0.97	0.86	0.84	0.7	0.65	0.57	0.58	0.8	1	0.68	0.7	0.79	0.91	0.64
DMU23	1	1	1	1	1	1	0.98	1	0.77	1	1	0.99	0.64	0.57	0.63	0.77	0.67	0.63	0.72
Mean	0.91	0.94	0.89	0.86	0.98	0.96	0.94	0.95	0.82	0.88	0.86	0.85	0.74	0.86	0.69	0.75	0.82	0.77	0.79

Table 6

Efficiency ratios from the BCC-I model during the 2000-2018 period

DMU	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Large banks																			
DMU2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
DMU4	1	0.68	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
DMU7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
DMU3	0.84	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.85	0.87	0.9	0.94
Mean	0.96	0.92	1	1	1	1	1	1	1	1	1	1	1	1	1	0.96	0.97	0.98	0.98
Medium-sized banks																			
DMU13	1	1	1	0.97	0.99	1	0.94	0.84	0.97	1	1	1	1	1	1	1	1	1	1
DMU11	0.87	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.97	0.97	0.93
DMU14	1	1	0.92	0.9	0.94	0.85	0.75	0.88	0.95	0.95	1	1	0.94	1	1	0.92	0.92	1	1
DMU17	1	1	1	1	1	1	1	1	1	1	1	1	1	0.99	1	1	0.98	1	1
DMU25	0.56	0.85	0.97	1	1	1	1	0.64	0.95	1	1	1	1	1	0.95	0.96	1	1	1
DMU19	0.52	0.60	0.71	0.82	0.76	0.73	0.65	0.52	0.59	0.62	0.65	0.65	0.7	0.68	0.68	0.64	0.67	0.69	0.78
DMU10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
DMU22	0.78	1	1	1	1	1	1	1	1	1	1	1	1	1	0.98	0.98	0.99	0.97	0.94
Mean	0.84	0.93	0.95	0.96	0.96	0.95	0.92	0.86	0.93	0.95	0.96	0.96	0.96	0.96	0.95	0.94	0.94	0.95	0.96
Small banks																			
DMU18	0.8	1	1	0.83	0.99	0.95	1	1	1	1	1	1	0.87	1	0.89	0.9	1	0.9	1
DMU26	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
DMU23	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mean	0.93	1	1	0.94	1	0.98	1	1	1	1	1	1	0.96	1	0.96	0.97	1	0.97	1

In 1999, one bank reached the lowest efficiency level of the entire analysis period, of approximately 4.31%

Tables 7 and 8 show the results obtained from the analysis of the descriptive statistics for each model. Table 7 shows that both the CCR and the BCC measurements show minimum efficiency averages in the year 1993, with 60.07% and 75.68%, respectively. However, in 1999 there is one bank that reaches its lowest efficiency for the entire period of analysis, equal to approximately 4.31% (this bank would later cease activity in the following years). Table 8 demonstrates that the year with the lowest efficiencies is 2000, both in terms of the average and minimum values; this is also the year with the highest standard deviations, which provides significant evidence of the disparity in terms of the variation in efficiency among the different banks.

Table 7

Descriptive statistics for the efficiency ratios during the period 1993-1999

CCR 93-99	1993	1994	1995	1996	1997	1998	1999
Average	0.60	0.71	0.77	0.81	0.73	0.80	0.76
Max	1	1	1	1	1	1	1
Min	0.21	0.33	0.36	0.29	0.28	0.44	0.04
St Dev	0.29	0.23	0.24	0.21	0.25	0.19	0.29
BCC 93-99	1993	1994	1995	1996	1997	1998	1999
Average	0.76	0.80	0.86	0.85	0.78	0.84	0.85
Max	1	1	1	1	1	1	1
Min	0.21	0.38	0.37	0.30	0.28	0.45	0.06
St Dev	0.29	0.23	0.23	0.21	0.25	0.19	0.24

Table 8

Descriptive statistics for the efficiency ratios during the period 2000-2018

CCR-I (00-18)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Average	0.84	0.91	0.88	0.91	0.96	0.95	0.93	0.90	0.92	0.93	0.94	0.94	0.91	0.92	0.90	0.88	0.90	0.89	0.90
Max	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Min	0.49	0.59	0.66	0.78	0.73	0.70	0.64	0.50	0.59	0.62	0.57	0.58	0.64	0.57	0.63	0.62	0.64	0.63	0.64
St Dev	0.20	0.13	0.13	0.09	0.07	0.09	0.11	0.15	0.13	0.13	0.14	0.14	0.13	0.13	0.14	0.13	0.12	0.12	0.12
BCC-I (00-18)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Average	0.89	0.94	0.97	0.97	0.98	0.97	0.96	0.93	0.96	0.97	0.98	0.98	0.97	0.98	0.97	0.95	0.96	0.96	0.97
Max	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Min	0.52	0.60	0.71	0.82	0.76	0.73	0.65	0.52	0.59	0.62	0.65	0.65	0.70	0.68	0.68	0.64	0.67	0.69	0.78
St Dev	0.16	0.13	0.07	0.06	0.06	0.08	0.11	0.15	0.11	0.10	0.09	0.09	0.08	0.08	0.08	0.10	0.09	0.08	0.06

4. Sensitivity Analysis

Table 9 shows the results of a sensitivity analysis in which the intermediation approach is applied. The main difference between the model proposed in the present work and this new focus lies in the TD (Total Deposit) variable, which was considered to be an output, but is now considered to be an input variable.

The intermediation approach evidences a notable reduction in the level of efficiency as compared to the production approach

Table 9

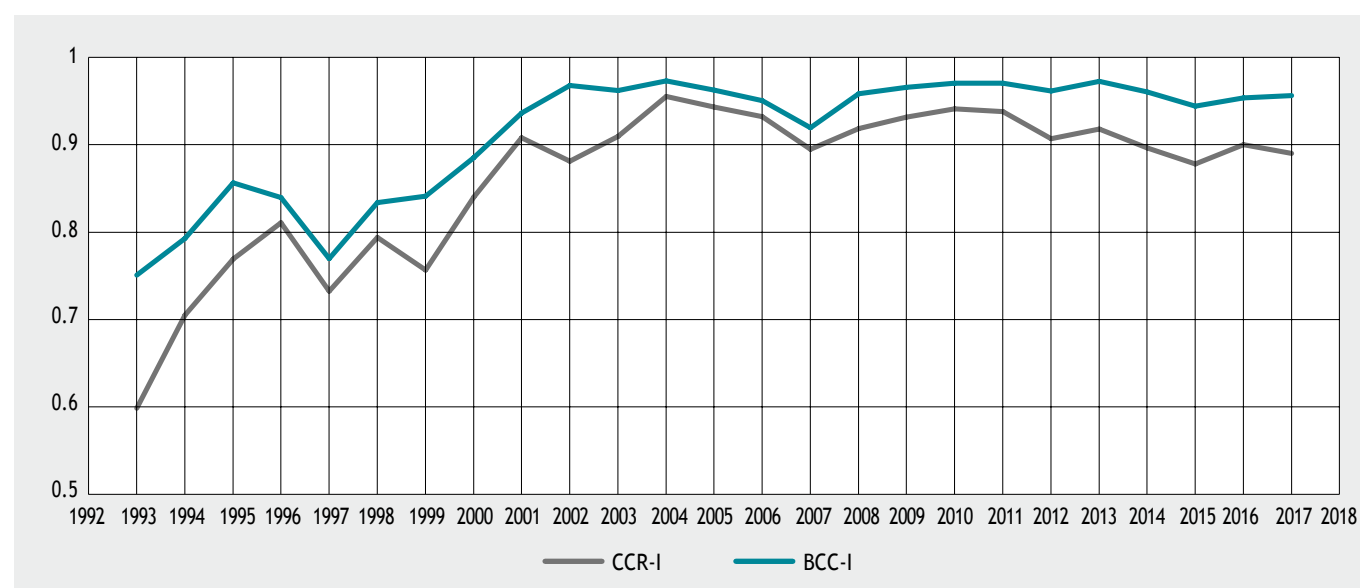
Efficiency ratios from the intermediation approach during the 1993-2018 period

Year	CCR-I	BCC-I	Year	CCR-I	BCC-I	Year	CCR-I	BCC-I
1993	47.84%	79.01%	2003	92.77%	95.67%	2013	95.48%	97.74%
1994	84.95%	90.85%	2004	95.93%	96.69%	2014	96.40%	98.00%
1995	82.70%	89.91%	2005	92.00%	95.26%	2015	96.27%	97.80%
1996	80.84%	86.00%	2006	94.55%	95.76%	2016	92.73%	96.48%
1997	73.16%	79.57%	2007	95.36%	96.26%	2017	96.17%	96.21%
1998	71.84%	80.46%	2008	92.79%	96.22%	2018	93.61%	97.85%
1999	74.38%	82.86%	2009	93.44%	97.11%			
2000	74.10%	86.75%	2010	93.41%	97.17%			
2001	93.62%	96.47%	2011	94.42%	97.38%			
2002	84.41%	96.15%	2012	95.51%	96.80%			

As in the previous tables, the trend toward the BCC approach presenting a higher efficiency than the CCR approach is maintained. However, there is evidence of a noticeable reduction in the level of efficiency as compared to the production approach presented in the methodology. These results can lead us to understand that the banking activity is not as efficient when analyzing the acquisition and placement of resources in the market. It is also necessary to mention that the lowest efficiency appears in 1993 (47.84%), while the highest occurs in 2014 (96.40%), both results according to the CCR approach. According to the BCC approach, the lowest and highest efficiencies are found in the aforementioned years, but the percentages increase to 79.01% and 98%, respectively.

Figure 1

Fluctuation in the average levels of efficiency during the period 1992-2018



The year of analysis with the lowest level of efficiency is 1993, however, there are decreases in efficiency levels in 1997, 1999, 2007 and 2015

Figure 1 shows the evolution of the average efficiency ratios in the banking sector, where it can be seen that in a general sense, the performance of the decision-making units is higher in the BCC model. It can also be seen that the year of analysis with the lowest level of efficiency is 1993; however, in 1997, 1999, 2007 and 2015 decreases in efficiency levels also occurred, a trend that is revealed by both models. The highest moments of efficiency occurred during the periods 2004 and 2013, and on the other hand, according to the BCC approach, during the period 2008-2014, apparent stability is observed in the efficiency levels, while the CCR model shows no such stability.

In a complementary manner, national and international banking regulations and the studies conducted allow us to define situations or factors that can explain the levels of efficiency found in the analyzed periods (Coca Valle, 2015; Lucas Pérez & Salcedo López, 2004).

In addition, the efficiency of the banking sector has been evaluated analyzing only those banks that remained in operation throughout the entire period of analysis (1993-2018), in other words, those that survived the banking crisis that affected the country in the years 1999 and 2000. The results can be seen in Table 10, which shows the BCC and CCR approaches. As mentioned throughout the document, the BCC approach shows higher levels of efficiency than the CCR approach.

Table 10

Efficiency ratios for 1993-2018, considering banks that survived the financial crisis

Year	BCC	CCR	Year	BCC	CCR
1993	91.04%	65.83%	2006	95.61%	95.04%
1994	95.26%	92.97%	2007	96.57%	95.22%
1995	88.43%	82.67%	2008	96.51%	95.77%
1996	84.60%	81.69%	2009	96.66%	96.50%
1997	82.50%	76.05%	2010	97.17%	96.79%
1998	90.48%	80.18%	2011	97.11%	96.62%
1999	90.86%	80.18%	2012	97.70%	96.28%
2000	87.64%	77.26%	2013	97.74%	96.07%
2001	96.11%	94.11%	2014	98.12%	97.55%
2002	95.57%	83.31%	2015	97.84%	97.16%
2003	96.55%	94.54%	2016	97.09%	93.96%
2004	96.29%	95.39%	2017	97.48%	95.48%
2005	96.67%	92.95%	2018	97.57%	95.39%

In order to compare the results obtained by analyzing all the banks that operated in each period and those that maintained operations during the years 1993 and 2018, a summary table has been created, showing the most significant variations. In most years, a higher level of efficiency can be seen when analyzing only the banks that survived the crisis period, while in other years there are no noticeable differences.

It should be noted that in the 1993-1999 period, when the banks that were dissolved between 1999 and 2000 are not considered, efficiency increases by as much as 22%

Table 11 shows these differences. It should be stressed that during the period 1993-1999, if the banks that disappeared between 1999 and 2000 are not considered, the efficiency increases to 22%, depending on the approach used (CCR); in other words, the banks that did not manage to overcome the impasse of the bank holiday reduced the efficiency of the sector during this period, by 15% and 22%, depending on the year.

However, during the early years of the 2000-2018 period, efficiency improved by as much as 5%, thanks to the emergence of new banks that were founded after the banking crisis.

However, in the latest periods analyzed, it can be seen once again that the banks that survived the crisis are the ones that increase in efficiency, even though they do so with low percentages.

Table 11

Difference in efficiency ratios for 1993-2018, considering banks that survived the financial crisis

Year	BCC	CCR	Year	BCC	CCR
1993	15%	6%	2006	0%	1%
1994	15%	22%	2007	4%	5%
1995	2%	6%	2008	1%	4%
1996	0%	1%	2009	0%	3%
1997	4%	3%	2010	-1%	3%
1998	6%	0%	2011	-1%	3%
1999	6%	4%	2012	1%	5%
2000	-1%	-7%	2013	0%	4%
2001	2%	3%	2014	1%	8%
2002	-1%	-5%	2015	3%	9%
2003	0%	4%	2016	1%	4%
2004	-2%	-1%	2017	1%	6%
2005	0%	-2%	2018	1%	5%

5. Conclusions and discussion

Using the DEA method of non-parametric data analysis, we were able to measure the efficiency of banking institutions in Ecuador, considering two periods of analysis: 1993-1999 and 2000-2018. The cut-off date was set in 1999 to analyze the behavior of Ecuadorian banking before and after the bank holiday (currency substitution), considering it to be one of the most important financial events in the Ecuadorian economy, which caused several negative effects, one of the most important of which was the closure of several financial institutions. This event even led to the change in currency, adopting a “borrowed” currency (the U.S. dollar) in 2000, which would limit and even prevent the state from taking action in establishing monetary policies.

This analysis provides relevant information about the performance of the analysis units. It is important to stress that there are differences between the analyses according to the CCR and BCC approaches.

This event even led to the substitution of the national currency, with the adoption of a “borrowed” currency (USD) in 2000, which limits the state’s action in establishing monetary policies

During the period 1993-1999, a total of 24 financial institutions were analyzed and classified according to the amount of their assets as large, medium-sized or small banks. On the other hand, during the period 2000-2018, only 15 units were analyzed. The difference in units analyzed is explained by the closure of institutions following the 1999 crisis.

After 2000, a relative stability occurred in efficiency levels, with the exception of the year 2007, when a decrease in the ratios is observed, but one that never reaches the levels of the 1993-1999 period. This answers the first and second research questions, confirming that the efficiency of Ecuadorian banks has been higher following the adoption of the dollar as the national currency.

There is one financial institution that has been fully efficient in both periods of analysis according to the BCC approach: DMU 10, which corresponds to City Bank, a foreign private bank.

During the period 2000-2018, large banks obtained on average a higher level of efficiency. There were even years in which the efficiency in this segment reached values of nearly 100%, which answers the third research question. The ratios differ slightly, depending on the approach used. The evidence shows that with the BCC model, they are higher, due to the mathematical considerations involved, which cause the difference between the ratio obtained for each DMU and the efficiency frontier to be less than that resulting from the CCR approach.

With regard to the fourth research question, those DMUs that are not fully efficient are recommended to make an effort to adjust the variables analyzed to improve their levels of efficiency. However, the limitations to resources often prevent adjusting all the variables at the same time, so we recommend placing greater emphasis on the input variables, i.e., fixed assets and operating expenses.

Finally, the levels of efficiency obtained in each period can be explained as follows: in the period 1993-1999, the low ratios could be related to the publication of the General Financial System Institution Act passed on May 12, 1994, which failed to explain in sufficient detail the meaning of “financial groups,” thus permitting shareholders in private financial institutions to own companies to which they could grant credit funds known as “related loans.” Furthermore, in 1997, more than half (55%) of the “signature loans” provided by the financial system had no guarantee to ensure their recovery; however, the ratio between loans and fund acquisition reached approximately 99%, which did not permit customer deposits to be recovered if necessary.

In addition, another factor that could have had an influence are the aggressive natural phenomena that occurred in the late 1990s, the “El Niño Phenomenon,” which brought about great losses in the production sector and a decrease in the GDP. In 1999, in light of the lack of assistance from the Ecuadorian financial system, the little money that was found in the banks was withdrawn by those who decided to start small businesses, taking advantage of economic reactivation programs, which left the banks severely under-financed.

With regard to the period 2000-2018, the higher levels of efficiency may be the result of the implementation of consolidation programs in the financial sector, developed within the regulatory framework of the Basel Rules, which were intended to increase the internal control over financial institutions, ensuring adequate risk management by establishing Banking Board resolutions and the control and monitoring by the Bank Superintendency.

With regard to the 2000-2018 period, higher efficiency levels may be a consequence of the implementation of programs to strengthen the financial sector

Another crucial factor for increasing efficiency is the development and incorporation of technologies in the banking system. According to Angulo (2019) y El Comercio (2019), the Ecuador Banking Association has focused its efforts on increasing the number of technological advances, such as ATMs and digital means, including applications for mobile telephones, telephone banking, virtual banking, etc., offering new services such as mobile payment and cash withdrawals from any ATM, among others, making it possible to improve activities through the optimization of resources, constituting more effective, efficient institutions.

DEA methodology has been successfully applied to institutions in the banking sector, and we have obtained a general overview of the past and present situation of these institutions in Ecuador. This will serve as a basis and theoretical framework for possible studies and research in the future, enabling better decisions to be made in both the public and private sector.

6. Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

7. Funding

This article had the academic endorsement and was supported by the Faculty of Economic and Administrative Sciences of Universidad de Cuenca.

8. References

- Andrieș, A. M., & Cocriș, V. (2010). A comparative analysis of the efficiency of Romanian banks. *Romanian Journal of Economic Forecasting*, 13(4), 54-75.
- Angulo, S. (2019). La innovación está en la agenda de la banca ecuatoriana. *Revista Líderes*. Retrieved from <https://www.revistalideres.ec/lideres/innovacion-agenda-banca-ecuatoriana.html>
- Arieu, A. (2004). Eficiencia técnica comparada en elevadores de granos de Argentina, bajo una aplicación de análisis de envoltorio de datos. La situación del puerto de Bahía Blanca. *Consortio de Gestión Del Puerto de Bahía Blanca*.
- Asawaruangpipop, P., & Suwunnamek, O. (2014). Analysis on Savings and Credit Cooperatives Efficiency in Thailand: A Data Envelopment Analysis (DEA) Approach. *Research Journal of Business Management*, 8(3), 242-253. <https://doi.org/10.3923/rjbm.2014.242.253>
- Banker, R., Charnes, A., & Cooper, W. (1984). Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis. *Management Science*, 30(9), 1078-1092. <https://doi.org/10.1287/mnsc.30.9.1078>
- Belmonte, L., & Plaza, J. (2008). Análisis de la eficiencia en las cooperativas de crédito en España. Una propuesta metodológica basada en el análisis envoltorio de datos (DEA). *CIRIEC-España, Revista de Economía Pública, Social y Cooperativa*, 63, 113-133. Retrieved from http://www.ciriec-revistaeconomia.es/banco/6305_Belmonte_y_Plaza.pdf
- Benavides, R., & García, C. (2014). *Eficiencia en la Banca Múltiple peruana, mediante la aplicación del Análisis Envoltorio de Datos DEA, en el período 2003-2012*. Universidad Nacional Agraria La Molina. <http://repositorio.lamolina.edu.pe/handle/UNALM/2275>
- Berger, A., & Humphrey, D. (1997). Efficiency of financial institutions: International survey and directions for future research. *European Journal of Operational Research*, 98(2), 175-212. [https://doi.org/10.1016/S0377-2217\(96\)00342-6](https://doi.org/10.1016/S0377-2217(96)00342-6)
- Berger, A., & Mester, L. (1997). Inside the Black Box: What Explains Differences in the Efficiencies of Financial Institutions? *Journal of Banking and Finance*, 21(7), 895-947. [https://doi.org/10.1016/S0378-4266\(97\)00010-1](https://doi.org/10.1016/S0378-4266(97)00010-1)

- Board, J., Sutcliffe, C., & Ziemba, W. (2003). Applying operations research techniques to financial markets. *Interfaces*, 33(2), 12-24.
<https://doi.org/10.1287/inte.33.2.12.14465>
- Borenstein, D., Luiz Becker, J., & José do Prado, V. (2004). Measuring the efficiency of Brazilian post office stores using data envelopment analysis. *International Journal of Operations & Production Management*, 24(10), 1055-1078.
<https://doi.org/10.1108/01443570410558076>
- Buenaño, E. (2004). Eficiencia-X en la banca ecuatoriana durante el período 2000-2003. *Cuestiones Económicas, BCE*, 20(2), 5-53.
- Carreño, J. L., Loyola, G., & Portilla, Y. (2010). Eficiencia bancaria en Chile: un enfoque de frontera de beneficios. *Economía Chilena*, 13(3), 33-65.
- Casu, B., & Molyneux, P. (2003). A comparative study of efficiency in European banking. *Applied Economics*, 35(17), 1865-1876.
<https://doi.org/10.1080/0003684032000158109>
- Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research*, 2(6), 429-444.
[https://doi.org/10.1016/0377-2217\(78\)90138-8](https://doi.org/10.1016/0377-2217(78)90138-8)
- Coca Valle, J. A. (2015). Impacto de Basilea en la confianza de los ecuatorianos para un nuevo sistema financiero. *Observatorio Economía Latinoamericana*.
- Cooper, W. W., Seiford, L. M., & Tone, K. (2007). *Data Envelopment Analysis* (2nd Edition). New York: Springer.
- El Comercio. (2019). *Entidades financieras apuestas por la digitalización de servicios*. Retrieved from <https://www.pressreader.com/>
- Emrouznejad, A. (2015). Data Envelopment Analysis: Ali Emrouznejad's DEA Homepage, The most comprehensive source of Data Envelopment Analysis!! Retrieved March 2, 2018, from <http://www.deazone.com/>
- Farrell, M. J. (1957). The Measurement of Productive Efficiency. *Journal of the Royal Statistical Society. Series A (General)*, 120(3), 253-290.
<https://doi.org/10.2307/2343100>
- Favero, C. A., & Papi, L. (1995). Technical efficiency and scale efficiency in the Italian banking sector: a non-parametric approach. *Applied Economics*, 27(4), 385-395.
<https://doi.org/10.1080/00036849500000123>
- Fethi, M., & Pasiouras, F. (2010). Assessing bank efficiency and performance with operational research and artificial intelligence techniques: A survey. *Research, European Journal of Operational*, 2(204), 189-198.
<https://doi.org/10.1016/j.ejor.2009.08.003>
- Havrylychuk, O. (2006). Efficiency of the Polish banking industry: Foreign versus domestic banks. *Journal of Banking and Finance*, 30(7), 1975-1996.
<https://doi.org/10.1016/j.jbankfin.2005.07.009>
- Hoque, R., & Rayhan, I. (2012). Data Envelopment Analysis of banking sector in Bangladesh. *Russian Journal of Agricultural and Socio-Economic Sciences*, 5(5), 17-22.
<https://doi.org/10.18551/rjoas.2012-05.02>
- Idries, A.-J. (2007). The use of DEA in measuring efficiency in Arabian banking. *Banks and Banks System*, 2(4), 21-27.
- Isik, I., & Hassan, M. K. (2002). Technical, scale and allocative efficiencies of Turkish banking industry. *Journal of Banking and Finance*, 26(4), 719-766.
[https://doi.org/10.1016/S0378-4266\(01\)00167-4](https://doi.org/10.1016/S0378-4266(01)00167-4)
- Joseph, J., & Pastory, D. (2013). Technical Efficiency of the Rural Savings and Credits Cooperative Societies in Tanzania: A DEA Approach. *International Journal of Management Sciences and Business Research*, 12(2), 49-61.
- Karimzadeh, M. (2012). Efficiency Analysis by using Data Envelopment Analysis Model: Evidence from Indian Banks. *International Journal of Latest Trends in Finance & Economic Sciences*, 3(3), 228-236.
- Koutsomanoli-Filippaki, A., Margaritis, D., & Staikouras, C. (2009). Efficiency and productivity growth in the banking industry of Central and Eastern Europe. *Journal of Banking and Finance*, 33(3), 557-567.
- Lozano, A., Pastor, J. T., & Pastor, J. M. (2002). An efficiency comparison of European banking systems operating under different environmental conditions. *Journal of Productivity Analysis*, 18(1), 59-77.
<https://doi.org/10.1023/A:1015704510270>

- Lucas Pérez, A. S., & Salcedo López, A. (2004). *La normativa de Basilea y su papel dentro de las reformas introducidas en el sistema financiero ecuatoriano*.
- Navarro, J., & Torres, Z. (2006). Análisis de eficiencia técnica global mediante la metodología DEA: evidencia empírica de la industria eléctrica mexicana en su fase de distribución, 1990-2003. *Revista Nicolaita de Estudios Económicos*, 1(1), 9-28.
- Nitoi, M. (2009). Efficiency in the Romanian Banking System: An Application of Data Envelopment Analysis. *Romanian Journal of Economics*, 29(2), 162-176.
- Piranteque, J., Piñeros, J. H., & Mondragón, L. (2013). Eficiencia de los establecimientos Bancarios (EB): una aproximación mediante modelos DEA. *Borradores de Economía* (798). Retrieved from <https://www.banrep.gov.co/es/borrador-798>
<https://doi.org/10.32468/be.798>
- Radojka, M., Marija, K., & Predrag, M. (2013). Application of DEA methodology in measuring efficiency in the banking sector. *Економика Пољопривреде / Economics of Agriculture*, 60(4), 843-855.
- Restrepo, M. I., & Villegas, J. G. (2011). Análisis envolvente de datos: introducción y herramienta pública para su utilización. *Palabras Clave*, 27.
- Rossi, S., Schwaiger, M., & Winkler, G. (2005). Managerial behavior and cost/profit efficiency in the banking sectors of Central and Eastern European countries. *Working Paper 96, Oesterreichische Nationalbank*.
<https://doi.org/10.2139/ssrn.676365>
- Sealey, C., & Lindley, J. (1977). Inputs, outputs, and a theory of production and cost at depository financial institutions. *Journal of Finance*, 4(32), 1251-1266.
<https://doi.org/10.1111/j.1540-6261.1977.tb03324.x>
- Superintendencia de Bancos (2017). Superintendencia de Bancos.
- Superintendencia de Bancos (2019). Superintendencia de Bancos.
- Tanna, S. (2009). The impact of foreign direct investment on total factor productivity growth: International evidence from the banking industry. *Managerial Finance*, 35(3), 297-311.
<https://doi.org/10.1108/03074350910931799>
- Tortosa-Ausina, E. (2002). *Bank cost efficiency and output specification*. *Journal of Productivity Analysis*, 3(18), 199-222.
<https://doi.org/10.1023/A:1020685526732>
- Tsionas, E. G., Lolos, S. E. G., & Christopoulos, D. K. (2003). The performance of the Greek banking system in view of the EMU: Results from a non-parametric approach. *Economic Modelling*, 20(3), 571-592.
[https://doi.org/10.1016/S0264-9993\(01\)00101-8](https://doi.org/10.1016/S0264-9993(01)00101-8)
- Valencia, L. S., & Chediak, F. (2008). Metodología para medir la eficiencia mediante la técnica del Análisis Envolvente de Datos DEA. *Vector*, 3, 70-81.
- Vergara, M. (2006). Nota técnica para estimar fronteras estocásticas: una aplicación a la banca chilena. *Estudios de Administración*, 13(2), 47-66. Retrieved from <http://estudiosdeadministracion.unegocios.cl/index.php/2006-vol-13-nd-2.html>
- Vilela, D. L., Nagano, M. S., & Merlo, E. M. (2007). Aplicação da análise envoltória de dados em cooperativas de crédito rural. *Revista de Administração Contemporânea*, 8(2), 99-120.
<https://doi.org/10.1590/S1415-65552007000600006>
- Xueping, X., Jie, T., & Hongxin, R. (2011). A DEA-model evaluation of the efficiency of peasant household credit investigation system in rural credit cooperatives: A positive research in Hubei Province, China. *China Agricultural Economic Review*, 3(1), 54-66.
<https://doi.org/http://dx.doi.org/10.1108/17561371111103543>
- Yue, P. (1992). Data Envelopment Analysis and Comercial Bank Performance: A Primer With Applications to Missouri Banks. *Federal Reserve Bank of St. Louis Review*, 74(1), 31-45.
<https://doi.org/10.20955/r.74.31-45> 

The perception of educational brand capital in the Spanish context: a proposal for measurement with internal stakeholders¹

Javier Casanoves-Boix

Lecturer in Marketing. Valencian International University. Spain. ORCID: [0000-0001-6993-8708](https://orcid.org/0000-0001-6993-8708).

Pablo Pinazo-Dallenbach

Lecturer in Marketing. Valencian International University. Spain. ORCID: [0000-0002-5538-9979](https://orcid.org/0000-0002-5538-9979).

José Ricardo Flores-Pérez

Dean of the College of Economic and Business Sciences. José Simeón Cañas Central American University. El Salvador. ORCID: [0000-0001-5098-6929](https://orcid.org/0000-0001-5098-6929).

javier.casanoves@campusviu.es, pablo.pinazo@campusviu.es, rflores@uca.edu.sv

Received: February, 2020.

Accepted: March 2020.

Published: June 2020.

Abstract

This research was carried out to develop and validate a measurement scale to determine internal stakeholders' perceptions of university brand capital by internal stakeholders. To this end, the main contributions in the literature related to the study of brand capital and its application in the educational sector were analysed, identifying which variables determine brand capital in this sector. Once a suitable model was established, an empirical study was realised using a sample of 303 valid responses from lecturers at two Spanish universities (one public and one private). In order to validate the proposed construct, the partial least squares method (PLS) has been applied. The results obtained show the significance of all the variables, while laying the foundation for university managers to develop marketing strategies adapted to maximize the building of educational brand capital.

Key words

Marketing, universities, internal stakeholders, measurement scale, Spain.

How to cite this article

Casanoves-Boix, J., Pinazo-Dallenbach, P., & Flores-Pérez, J. R. (2020). The perception of educational brand capital in the Spanish context: a proposal for measurement with internal stakeholders. *Harvard Deusto Business Research*, IX(1), 40-52. <https://doi.org/10.3926/hdbr.265>

.....

¹ The present article is based on the presentation given at the 13th Ibero-American Management Accounting Conference (CIBEC19) in Puerto Vallarta, Mexico.

The main contribution made by this article is the development of a valid, reliable scale to measure the brand capital of universities in Spain

1. Introduction

In recent years, a set of problems have arisen that threaten the educational sector. Among these are: (1) the increase in the educational offering, (2) the decrease and delay in registration, (3) the “cascade” effect in terms of average expenditure per family allocated to education, (4) defaults in the payments of fees and “self-scholarships” and (5) the increase in structural costs. However, the opportunities that arise must be seen in a positive light, in particular (1) institutional reorganization and redimensioning, (2) the administration of change processes and (3) the application of educational marketing strategies with both an internal and external nature (Manes, 2014).

In Spain, according to the 2019 report issued by the Ministry of Science, Innovation and Universities, there are currently around 50 public and 40 private universities. For this reason, universities must design marketing strategies in order to meet the demands of increasingly more demanding customers and to compete alongside one another in increasingly more heterogeneous markets (Durán & Parra, 2014). Moreover, Retamosa (2018) highlights the need to build educational brand capital in order to differentiate ourselves from aggressive competition, capture a larger market share of students and attract talent. Within said marketing strategy, we must opt for maximizing brand capital, a concept coined by Farquhar (1989) to explain the experiential sensations of each consumer with the brand, not just on an individual level, but also through universal behavior. In other words, the idea is to generate a feeling of love for the brand by consumers and use it to improve sales figures (Esteban, Ballester & Muñoz, 2014). For this reason, brand evaluation as applied to higher education has received a significant amount of academic attention in recent years (Mourad, Meshreki & Sarofim, 2020).

Furthermore, the internal stakeholders play a significant role, since the entire organization offering a service (whether educational or in any other sector) must take into account the work of its employees, which is important to build strong brand capital (Lovelock, Staines & Dorfsman, 1997). Therefore, the universities must adapt to new management methods, where customer relations take precedence, as does the good performance of its human capital, seeking to adapt to the best strategy for them all (Deem & Brehony, 2005). The present research thus focuses its attention on the university faculty, which is directly involved on an internal level and which plays an important role in maximizing educational brand capital (Maura, 2002; Zabalza, 2009; Mas, 2011; Küster, 2012).

The contributions of (1) Farquhar (1989); (2) Aaker (1992); (3) Keller (1993); (4) Faircloth, Capella & Alford (2001); (5) Yoo & Donthu (2001); (6) Delgado & Munuera (2002); and (7) Buil, Martínez & De Chernatony (2010) were analyzed as they pertain to brand capital, which is considered to have a great repercussion on later research. As a result, having exhaustively reviewed the proposals of each of them, there are considered to be four basic variables, which are: (1) brand awareness, (2) brand image, (3) perceived quality and (4) brand loyalty.

Thus, applying said concept to the higher education sector, a set of research is conceived to exist that analyzes some of the brand capital variables, although separately (Casanoves & Küster, 2017). For this reason, the objectives of this work are based on (1) designing a measurement scale that considers all four variables of brand capital, but adapted to the university sector and (2) analyzing at an empirical level whether these four variables are determining factors for the internal stakeholders of Spanish universities. This work is thus considered to contribute to advances in the field of scientific marketing, given that there is no previous work that considers all the brand capital variables as applied to the Spanish university system. Likewise, the intent is to

The main contributions to brand capital were analyzed as they apply to the educational sector, using the literature as a starting point

provide a clear vision to university managers, so they can see the benefits of applying the developed scale in their marketing departments and in the institution in general.

2. Conceptual framework

Following the contribution by Casanoves & Küster (2017), it was deemed appropriate to review the literature on the four variables that make up educational brand capital. These are detailed below.

2.1. Brand awareness

In the specific field of higher education, Brewer & Zhao (2010) indicated that the brand awareness of several universities in Sydney improved when there was extensive brand recognition, reputation, favorable opinions about the brand and the quality of teaching. Furey, Springer & Parsons (2014), in turn, explain that the brand of universities in the United Kingdom is greater when the educational brand is clearly positioned, shows experience, aspiration for study and a partnership with the environment. Foroudi, Dinnie, Kitchen, Melewar & Foroudi (2017) argue that the renown of a university brand will increase as brand elements such as identity, service attributes, public relations and the made-in effect are maximized.

As established in the preceding paragraphs, it is possible to propose the first research hypothesis: *H1*. The perception of brand awareness affects the perception of educational brand capital.

2.2. Brand image

In the specific field of higher education, Gómez & Medina (2010) explain that Spanish universities must generate effective marketing policies and communication strategies to improve the brand image of the institution. Rauschnabel, Krey, Babine & Ivens (2016), in turn, show that when faced with an aggressive argument from the competition, universities must opt for generating a solid brand position, based in particular on its personality and image. In addition Yuan, Liu, Luo & Yen (2016) reveal that the link between identity and image is influenced by the congruence perceived by consumers and the legitimacy of the expansion of the brand in the university market.

All this leads to the second research hypothesis: *H2*. The perception of brand image affects the perception of educational brand capital.

2.3. Perceived quality

In the specific field of higher education, Jillapalli & Jillapalli (2014) argue that the faculty must develop their own brand value in the minds of the students, with the fundamental characteristics being quality of teaching, competence and reputation. This goes to show that these characteristics influence the sentiments of devotion on the part of the students towards the instructor and the quality of the relationships with the instructor's brand. Pinar, Trapp, Girard & Boyt (2014), in turn, show that perceived quality is the most important variable to consider when building powerful university brands, followed by brand reputation and the emotional environment. Within this, the library service is the biggest determining factor, followed by student residences, professional development and the facilities. Ali, Zhou, Hussain, Nair & Ragavan (2016) present five dimensions related to the perceived quality of the educational service, which have an influence on the institutional image and, at the same time, maximize student loyalty towards universities in Malaysia.

Based on the preceding paragraphs, it is possible to propose the third research hypothesis: *H3*. The perception of perceived quality affects the perception of educational brand capital.

All the authors studied considered four variables: brand awareness, brand image, perceived quality and brand loyalty

2.4. Brand loyalty

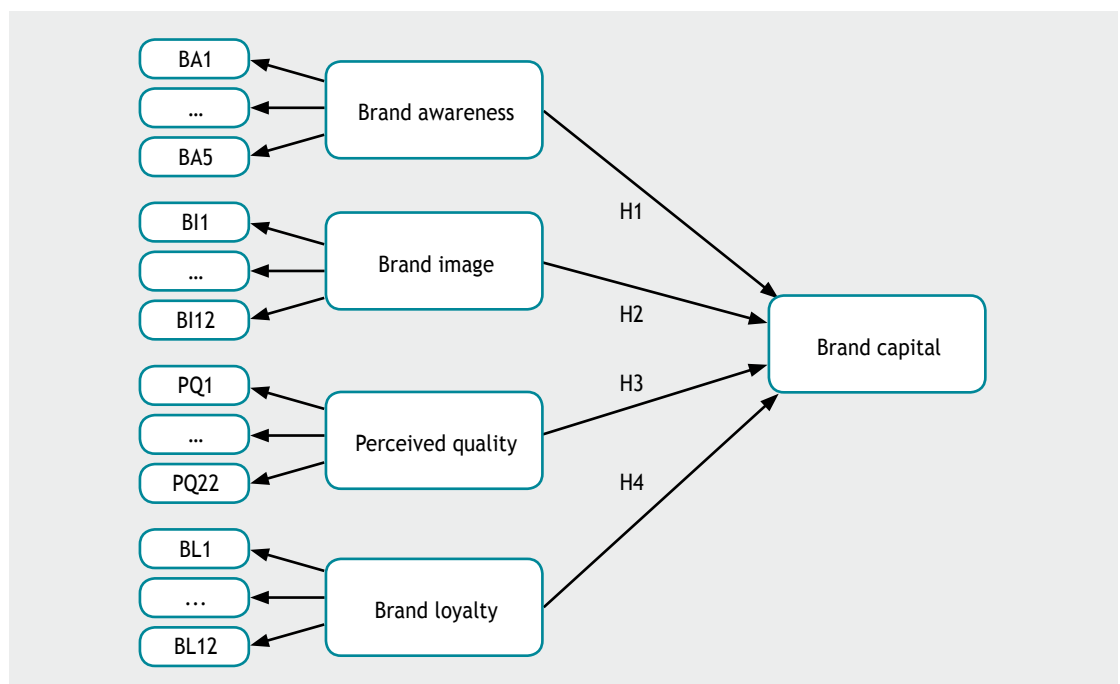
In the specific field of higher education, Nguyen & LeBlanc (2001) sustain that the degree of loyalty of university clients increases as the brand image of the institute of higher education improves. Bok (2009) studies those universities that have included a marketing strategy for the services they offer in their annual instructional plan, with brand loyalty being the most important variable when it comes to generating cross-selling among educational products. Brown & Mazzarol (2009) explain that Australian students are more loyal to their university when their needs are met. This thus becomes an important variable to be considered, particularly by less prestigious universities that seek to compete in an increasingly more deregulated market, based on a business market environment.

All this leads to the fourth research hypothesis: *H4*. The perception of brand loyalty affects the perception of educational brand capital.

As described in the previous paragraphs, Figure 1 shows our particular proposal of a theoretical model designed to defend the present research.

Figure 1

Theoretical model proposed for the present research



3. Methodology

In order to contrast the hypotheses and fulfill the proposed objectives, a quantitative study was carried out in Valencia (Spain). This city was chosen since it is perceived by the student market as a great educational center, due to the establishment of eight centers of higher education (both universities and affiliated centers) in recent years, which have projected the image and renown of the city across the nation.

Applying this concept to the higher education sector, studies are believed to exist that analyze some of the variables, albeit separately

In order to quantify the target population, a non-probabilistic convenience sampling method was used, employing official data from the departments in the field of Economics at two of the eight institutions of higher education referred to above, one of which is public (University of Valencia) and the other private (ESIC Business & Marketing School). It was thus possible to confirm that a total of 3,932 university lecturers were accounted for, all employed by one of the two universities studied in the current investigation.

The complete design of the research was planned in two phases, namely: (1) a review of the literature, along with the drafting of the questionnaire and (2) the application of the final measurement instrument. Below is a description of each.

3.1. Drafting the questionnaire

The questionnaire designed to collect the information was based on an extensive review of the literature. A 5-point Likert scale was used (1=Strongly disagree and 5=Strongly agree) to measure the concepts of (1) brand awareness, (2) brand image, (3) perceived quality and (4) brand loyalty. All of these are based on the measurement scales proposed by Aaker (1992) and Keller (1993), which were selected for having a similar attitudinal focus to that of this work, and for having been validated and used in multiple studies throughout the literature (Casanoves, 2016). Following this line, the corresponding items were adapted to our field of study, higher education (see Table 1).

Table 1
Proposed items for the measurement instrument

Variable	Author	Items proposed in the literature	Items proposed for the present research
Brand Awareness	Aaker (1992)	Have you heard about this brand?	BA1 - In general, I have heard positive comments about my university.
		Do you have any opinion about the brand?	BA2 - In general, I have a good opinion about my university.
		Have you heard about these brands?	BC3 - In general, I have high knowledge of my university.
	Keller (1993)	Which brands would you most likely use in the following situations...?	BA4 - If I decided to do some undergraduate studies, I would definitely consider my university.
			BA5 - If I decided to do some postgraduate studies, I would definitely consider my university.
Brand Image	Aaker (1992)	Does the brand provide good value for the money that is paid?	BI1 - In my opinion, my university provides good value for the money that is paid.
		There is a reason to buy this brand instead of others.	BI2 - I have many reasons to work at my university instead of others.
	Keller (1993)	How reliable is this brand?	BI3 - My university: transmits confidence to me.
		To what degree does this brand offer special benefits?	BI4 - It offers me special benefits.
	Aaker (1992)	Does the brand have a rich history?	BI5 - It has a rich history.
	Keller (1993)	How effective is this brand's service? Does it completely meet your needs?	BI6 - The service completely satisfies my needs.
		How efficient is the service of this brand in terms of speed, response capacity, etc.?	BI7 - The service of my university is effective and efficient (in terms of speed, responsiveness, etc.).
		Compared to other brands, in the category in which it competes, are prices generally higher, lower or almost the same?	BI8 - Compared to other universities, fees are generally lower.
		Is it easy to receive maintenance and service?	BI9 - It is easy to receive maintenance and service at my university.
		To what degree do the people you admire and respect use this brand?	BI10 - The people that I admire and respect would want to work at my university.
		To what extent do you feel that you feel that you have grown with the brand?	BI11 - I feel that I have grown professionally thanks to my university.
		How much do you like the people who use this brand?	BI12 - My opinion about the workers at my university is good.

Table 1 (continued)

Proposed items for the measurement instrument

Variable	Author	Items proposed in the literature	Items proposed for the present research
Perceived Quality	Keller (1993)	What is your assessment of the quality of the products of this brand?	PQ1 - In relation to quality-price, my assessment of my university is good.
		To what extent does this brand completely satisfy your product needs?	PQ2 - In relation to hours of work-salary, my assessment of my university is good.
		What is your general opinion about this brand?	PQ3- In general, my university completely satisfies my needs.
		How innovative are the suppliers?	PQ4 - My general opinion of my university is good.
		To what extent are the suppliers interested in your opinions?	PQ5 - The lecturers of my university are innovators.
		How much do you admire the brand? How much do you respect it?	PQ6 - The lecturers are interested in the opinions of the students.
		How innovative are the suppliers?	PQ7 - The lecturers are interested in the opinions of their colleagues.
		To what extent are the suppliers interested in your opinions?	PQ8 - The lecturers admire and respect my university.
		How much do you admire the brand? How much do you respect it?	PQ9 - The service staff of my university are innovative.
		How likely is it that you recommend this brand to others?	PQ10 - The service staff are interested in the opinions of the students.
		How much personal relevance does the brand have for you?	PQ11 - The service staff are interested in the opinions of their colleagues.
		To what degree are you offered advantages that other brands do not provide?	PQ12 - The service staff admire and respect my university.
		Does it produce emotion?	PQ13 - I would recommend my university to other people.
		Does it give you a sense of fun?	PQ14 - My university as a brand has a lot of relevance for me.
		Does this brand give you a feeling of warmth?	PQ15 - Working in my university: offers me some advantages that another university would not offer me.
		Does it provide you with a sense of security?	PQ16 - It is exciting.
		Does it offer you a sense of self-respect?	PQ17 - It gives me a sense of fun.
		Does it give you a sense of social approval?	PQ18 - It gives me a feeling of warmth.
			PQ19 - It gives me a feeling of job security.
			PQ20 - It gives me a feeling of job stability.
			PQ21 - It gives me a feeling of self-respect.
			PQ22 - It gives me a sense of social approval.
Brand Loyalty	Keller (1993)	Do you consider yourself totally loyal to this brand?	BL1 - I consider myself as a completely loyal worker to my university.
		Is this the brand you prefer to buy/use?	BL2 - My university is the type of university in which I want to work.
		Is this brand more than a product to you?	BL3 - I like what the brand my university transmits over any other university.
		Is this brand special to you?	BL4 - My university is special to me.
		Do you really love this brand?	BL5 - I completely identify with the values of my university.
		Do you really identify with people who use this brand?	BL6 - I completely identify with the values of my work colleagues.
		Do you feel like you almost belong to a club with the other users of this brand?	BL7 - I have a great sense of belonging to my university.
		Do you feel a deep connection with the other people who use it?	BL8 - I feel a deep connection with my study colleagues.
		Do you really like to talk about this brand with others?	BL9 - I like to talk to other people about my university.
		Are you always interested in learning more about the brand?	BL10 - I am interested in learning more about my university.
		Do you closely follow news about this brand, compared to other people?	BL11 - I often follow the news of my university (at face-to-face and/or digital level).
		Are you proud of the fact that others know you use it?	BL12 - I am proud that others know that I study at my university.

In order to contrast the hypotheses and meet the proposed objectives, a quantitative study was carried out in Valencia (Spain)

3.2. Application of the measurement instrument

In this stage the measurement instrument was applied, taking advantage of on-site classes taught at both universities. Therefore, the questionnaire was sent by email and in paper format to 394 lecturers, obtaining a total of 303 valid responses.

Regarding the sampling profile, it can be seen that 55.4% were men, 29.4% were women and another 15.2% did not answer the question. Furthermore, nearly 60% of the lecturers who responded to the questionnaire came from the private university, while the other 40% came from the public university, with an average age of 47 and most holding the position of associate or full professor. In addition, most of the respondents have Spanish nationality (83.5%), and the rest come from countries such as Australia, The USA, England and Ireland. Along with this, it should be pointed out that nearly 53% of them had been working in their educational institution for more than ten years and 35% of the sample had a doctorate or an accredited doctorate. All of this indicates that most of the responses received are reliable, since they come from employees with vast experience and good knowledge of the operation of their educational institution.

Finally, the techniques that were employed to analyze the data are based on descriptive statistics and multivariate analysis, using SPSS v.19 for Windows for the data descriptive techniques and SmartPLS 2.0 for the multivariate techniques as working tools. The statistical processing of the data used in this study represents the application of different methods of analysis, according to the information that we wish to obtain, distinguishing between: (1) validation of the measurement instrument, and (2) analysis of the structural model.

4. Results

First the psychometric characteristics of the measurement instrument were analyzed. To perform this task, the information was divided into (1) an analysis of the quality of the items and (2) the validation of the scales, which is shown in Table 2.

Table 2
Reliability and convergent validity

Factor	Indicator	Load	Student's <i>t</i>	CR	CA	AVE
Brand awareness	BA1	0.86	47.00	0.89	0.85	0.62
	BA2	0.50	6.96			
	BA3	0.75	14.03			
	BA4	0.87	48.23			
	BA5	0.89	46.05			
Brand image	BI1	0.89	39.70	0.98	0.98	0.79
	BI2	0.89	33.67			
	BI3	0.94	93.34			
	BI4	0.89	53.75			
	BI5	0.86	26.37			
	BI6	0.93	62.26			
	BI7	0.91	56.84			
	BI8	0.72	14.05			
	BI9	0.90	51.11			
	BI10	0.88	43.00			
	BI11	0.91	46.99			
	BI12	0.92	67.70			

Table 2 (continued)

Reliability and convergent validity

Factor	Indicator	Load	Student's <i>t</i>	CR	CA	AVE
Perceived quality	PQ1	0.93	72.59	0.99	0.99	0.84
	PQ2	0.87	45.15			
	PQ3	0.93	72.12			
	PQ4	0.96	104.09			
	PQ5	0.92	77.81			
	PQ6	0.93	86.65			
	PQ7	0.93	86.69			
	PQ8	0.95	121.11			
	PQ9	0.90	59.92			
	PQ10	0.91	64.60			
	PQ11	0.91	63.28			
	PQ12	0.93	69.03			
	PQ13	0.93	63.91			
	PQ14	0.94	87.50			
	PQ15	0.90	53.59			
	PQ16	0.91	74.43			
	PQ17	0.89	59.42			
	PQ18	0.93	103.39			
	PQ19	0.90	49.03			
	PQ20	0.81	25.79			
	PQ21	0.93	68.55			
	PQ22	0.91	50.65			
Brand loyalty	BL1	0.93	64.59	0.99	0.99	0.91
	BL2	0.97	88.59			
	BL3	0.96	68.06			
	BL4	0.97	97.00			
	BL5	0.96	59.55			
	BL6	0.95	52.91			
	BL7	0.96	88.88			
	BL8	0.92	52.84			
	BL9	0.97	102.10			
	BL10	0.94	76.78			
	BL11	0.93	60.31			
	BL12	0.97	99.98			

Student's *t*: level of significance; CA: Cronbach's alpha; CR: composite reliability; AVE: average variance extracted

Firstly, it should be highlighted that the sampling error was calculated for a total of 3,932 lecturers, all of whom were employed in one of the two universities analyzed in Valencia at the time of the survey, obtaining an error of 10% for a confidence level of 90% (estimating the maximum error committed in estimating the proportions as $p=q=10\%$).

As can be seen, both the composite reliability indexes and Cronbach's α (CA) have a high level of internal consistency for the four dimensions analyzed, since all the reliability measurements exceed the recommended levels (Cronbach, 1951). The composite reliability index values, in turn, exceeded even the strictest threshold of 0.8, with values higher than 0.88 in all cases.

A 5-point
Likert scale
was used
(1=Strongly
disagree and
5=Strongly
agree)

These results confirm that the dimensions used to measure the educational brand capital were reliable, thus verifying the internal consistency of these dimensions.

Moreover, it should be pointed out that no proposed item was eliminated, in spite of the fact that BA2 did not individually meet the convergence validity criteria in terms of being higher than 0.6 (Falk & Miller, 1992). It is true that the set of items related to brand awareness have a high degree of consistency with regard to the composite reliability index and Cronbach's α (CA). In terms of the average variance extracted (AVE), it must be noted that the values obtained in the present work were greater than 0.5 (Fornell & Larcker, 1981; Chin, 1998), thus making it possible to state, according to both analysis methods, that all four variables analyzed exhibit convergent validity.

Furthermore, in terms of the discriminant validity, it can be stated that the four educational dimensions show greater correlations with their measurement indicators than with the indicators of other dimensions, which indicates the existence of discriminant validity (Gefen & Straub, 2005). In light of all this, and analyzing the results obtained in Table 3, it is demonstrated that the values of the main diagonal are higher than those that lie outside it, which further supports the existence of discriminant validity.

Table 3
Discriminant validity

	Perceived quality	Brand image	Brand loyalty	Brand awareness	Brand capital
Perceived quality	0.916				
Brand image	0.748	0.889			
Brand loyalty	0.905	0.697	0.952		
Brand awareness	0.411	0.489	0.397	0.788	
Brand capital	0.255	0.237	0.187	0.391	1.000

Diagonal: square root of the AVE; bottom triangle: correlation among the factors

Secondly, the structural model analysis was carried out by means of PLS, as shown in Table 4, indicating the path coefficients, which demonstrate the relationships between the constructs and the significance of the relationships. A bootstrapping technique was used for the stability and significance analysis of the estimated parameters, which made it possible to generate the Student's *t* statistics and the standard errors (Aldás, 2012), confirming the existence of stable relationships in all the proposed structural relationships, as the value of the Student's *t* statistic is significant in every case.

Based on the coefficients obtained and the significance of each one, it is possible to test the hypotheses. The *t* values are thus given for the (outer) model, demonstrating that the set of all the loads are significant, which reinforces our conclusion that the measurement model is reliable and shows convergent validity (Aldás, 2012). The results thus show that the four variables proposed have a positive significant effect on the brand capital in higher education institutions.

Finally, a Stone-Geisser *Q*-square (*Q*²) of predictive relevance was performed for each endogenous variable, in order to assess the fit of the model in the PLS analysis, according to the proposals of Geisser (1974) and Stone (1974), in which they state that *Q*² generally provides more information than *R*² and AVE, because the latter have biases, since they are evaluated with the same data that are used to estimate their parameters. In this manner, positive

The working tools used for the analysis were SPSS v.19 for Windows and SmartPLS 2.0

values indicate that the model has predictive relevance, while negative values suggest that the model lacks predictive value (Wold, 1985; Fornell & Cha, 1994; Aldás, 2012). In our case, it is observed that all values are positive, thus showing that the model has predictive power in terms of their estimation.

Table 4
Hypothesis testing

	Standardized β	t value
H1: Perception of brand awareness $\rightarrow$ Perception of brand capital	0.391**	6.06
H2: Perception of brand image $\rightarrow$ Perception of brand capital	0.237**	5.47
H3: Perception of perceived quality $\rightarrow$ Perception of brand capital	0.255**	4.01
H4: Perception of brand loyalty $\rightarrow$ Perception of brand capital	0.187**	8.40
R ² (F1:BA) = 0.153; R ² (F2:BI) = 0.056; R ² (F3:PQ) = 0.065; R ² (F4:BL) = 0.035		** p < 0.01
Q ² (F1:BA) = 0.074; Q ² (F2:BI) = 0.036; Q ² (F3:PQ) = 0.046; Q ² (F4:BL) = 0.028		* p < 0.05

5. Conclusions

The work conducted validates an instrument to measure university brand capital based on the perception of internal stakeholders. The proposed scale offers a measurement that is broken down into four dimensions (brand awareness, brand image, perceived quality of the brand and brand loyalty), each consisting of several indicators, which allows researchers, specialists and directors to evaluate the main aspects related to brand capital.

There are relatively recent empirical works carried out with samples of agents involved in higher education that used one or more of the four indicators mentioned above (brand awareness, brand image, perceived quality and brand loyalty) to measure educational brand capital (Brown & Mazzarol, 2009; Rojas, Vasquez, Kara & Cerdá, 2009; Mourad, Ennew & Kortam, 2011; Williams, Williams & Omar, 2013; Pinar, Trapp, Girard & Boyt, 2014; Retamosa, 2018), perhaps as the result of the lack of valid and reliable scales appropriated for this purpose. On a national level, there are also several current works that use a sample of agents involved in Spanish universities to develop and validate measurement scales based on two of the aforementioned variables, namely brand image and brand loyalty (Cubillo, Sánchez & Cerviño, 2006; Cervera, Schlesinger, Mesta & Sánchez, 2012). This goes to show that research is making progress in this sense, due to the need to develop scales adapted to institutions of higher education in Spain to measure their brand capital.

Therefore, the main contribution made by this article is the development of a valid, reliable scale to measure the brand capital of universities in Spain, for which there is no reference index. In addition, as no subjective weights of the factors are used, the proposed scale can be applied to any activity sector, since if necessary, specific weights could be established for each of the four dimensions, or even for one of the items, thus making this a versatile tool that is easy to apply.

Having analyzed these results and conclusions derived from the empirical study, they should be qualified by a series of limitations that we believe to be associated with this research. On the one hand, the model was tested based on the opinions of the lecturers involved over a specific period of time and in two particular universities in Valencia (Spain). For this reason, expanding this study to other universities and comparing the results is recommended, thus validating the

It would be interesting to include other cooperating groups within the higher educational setting on both an internal and external level

instrument in other institutions on both a national and international level. Likewise, it would also be appropriate to carry out longitudinal studies that contemplate possible variations over time, including other activity sectors, in order to verify its adaptability.

Finally, it should be indicated that the conclusions and limitations of this research, along with the nature of the very phenomenon being studied, allow further work to be carried out through the proposal of new lines of research. It would thus be interesting to include other groups participating in the higher educational setting on an internal level (administrative and service staff) and external level (students), since these groups are believed to be very important in order to increase the quality of the brand capital measurement of an educational institution, regardless of whether it is public or private.

6. Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

7. Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

8. References

- Aaker, D. A. (1992). The value of brand equity. *Journal of business strategy*, 13(4), 27-32.
<https://doi.org/10.1108/eb039503>
- Aldás, J. (2012). Partial Least Squares Path Modelling in Marketing and Management Research: An Annotated Application. In L. Moutinho, L. & K. H. Huarng (Eds.), *Quantitative Modelling in Marketing and Management* (pp. 43-78). London: World Scientific.
https://doi.org/10.1142/9789814407724_0003
- Ali, F., Zhou, Y., Hussain, K., Nair, P. K., & Ragavan, N. A. (2016). Does higher education service quality effect student satisfaction, image and loyalty? A study of international students in Malaysian public universities. *Quality Assurance in Education*, 24(1), 70-94.
<https://doi.org/10.1108/QAE-02-2014-0008>
- Bok, D. (2003). *Universities in the Marketplace: The Commercialization of Higher Education*. Princeton and Oxford: Princeton University Press.
- Brewer, A., & Zhao, J. (2010). The impact of a pathway college on reputation and brand awareness for its affiliated university in Sydney. *International Journal of Educational Management*. 24(1), 34-47.
<https://doi.org/10.1108/09513541011013033>
- Brown, R. M., & Mazzarol, T. W. (2009). The importance of institutional image to student satisfaction and loyalty within higher education. *Higher Education*, 58(1), 81-95.
<https://doi.org/10.1007/s10734-008-9183-8>
- Buil, I., Martínez, E., & De Chernatony, L. (2010). Medición del valor de marca desde un enfoque formativo. *Cuadernos de Gestión*, 10, 167-196.
<https://doi.org/10.5295/cdg.100204ib>
- Casanoves, J. (2016). *El capital de marca en la educación superior: Los agentes implicados, público versus privado* (Doctoral dissertation). Universidad de Valencia.
- Casanoves, J., & Küster, I. (2017). Evolution of marketing in higher education: Educational brand capital. *Esic Market Economics and Business Journal*, 48(1), 69-93.
<https://doi.org/10.7200/esicm.156.0481.2>
- Cervera, A., Schlesinger, W., Mesta, M. A., & Sánchez, R. (2012). Medición de la imagen de la universidad y sus efectos sobre la identificación y lealtad del egresado: una aproximación desde el modelo de Beerli y Díaz (2003). *Revista Española de Investigación en Marketing ESIC*, 16(2), 7-29.
[https://doi.org/10.1016/S1138-1442\(14\)60012-7](https://doi.org/10.1016/S1138-1442(14)60012-7)

- Chin, W. W. (1998). The partial least squares approach to structural equation modeling. In G. A. Marcoulides (Ed.), *Modern Methods for Business Research* (pp. 295-336). Mahwah, NJ: Lawrence Erlbaum.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297-334.
<https://doi.org/10.1007/BF02310555>
- Cubillo, J. M., Sánchez, J., & Cerviño, J. (2006). International students' decision-making process. *International Journal of Educational Management*, 20(2), 101-115.
<https://doi.org/10.1007/BF02310555>
- Deem, R., & Brehony, K. J. (2005). Management as ideology: The case of 'new managerialism' in higher education. *Oxford review of education*, 31(2), 217-235.
<https://doi.org/10.1080/03054980500117827>
- Delgado, E., & Munuera, J. L. (2002). Medición del capital de marca con indicadores formativos. *Investigación y Marketing*, 75, 16-20.
- Duran, S., & Parra, M. (2014). Diversidad Cultural para promover el desarrollo de habilidades sociales en educación superior. *Cultura educación y sociedad*, 5(1), 55-67.
- Esteban, A. A., Ballester, M. E. D., & Muñoz, J. P. (2014). ¿Quién ama a las marcas? Determinantes personales y de consumo. *Revista española de Investigación de Marketing ESIC*, 18(1), 2-16.
[https://doi.org/10.1016/S1138-1442\(14\)60002-4](https://doi.org/10.1016/S1138-1442(14)60002-4)
- Faircloth, J. B., Capella, L. M., & Alford, B. L. (2001). The effect of brand attitude and brand image on brand equity. *Journal of Marketing Theory and Practice*, 9(3), 61-75.
<https://doi.org/10.1080/10696679.2001.11501897>
- Falk, R. F., & Miller, N. B. (1992). *A primer for soft modeling*. University of Akron Press.
- Farquhar, P. H. (1989). Managing brand equity. *Marketing research*, 1(3), 24-33.
- Fornell C., & Cha, J. (1994). Partial Least Squares. In R. P. Bagozzi (Ed.). *Advanced Methods of Marketing Research* (pp. 52-78). Cambridge, Massachusetts: Blackwell Business.
- Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of Marketing Research*, 18(3), 382-388.
<https://doi.org/10.1177/002224378101800313>
- Foroudi, P., Dinnie, K., Kitchen, P. J., Melewar, T. C., & Foroudi, M. M. (2017). IMC antecedents and the consequences of planned brand identity in higher education. *European Journal of Marketing*, 51(3), 528-550.
<https://doi.org/10.1108/EJM-08-2015-0527>
- Furey, S., Springer, P., & Parsons, C. (2014). Positioning university as a brand: distinctions between the brand promise of Russell Group, 1994 Group, University Alliance, and Million+ universities. *Journal of Marketing for Higher Education*, 24(1), 99-121.
<https://doi.org/10.1080/08841241.2014.919980>
- Geisser, S. (1974). A predictive approach to the random effect model. *Biometrika*, 61(1), 101-107.
<https://doi.org/10.1093/biomet/61.1.101>
- Gefen, D., & Straub, D. (2005). A practical guide to factorial validity using PLS-Graph: Tutorial and annotated example. *Communications of the Association for Information systems*, 16(1), 91-109.
<https://doi.org/10.17705/1CAIS.01605>
- Gómez, D. F. H., & Medina, R. Z. (2010). Diagnóstico de la imagen de marca de las instituciones universitarias en España. In *Actas II Congreso Internacional Latina de Comunicación Social: La Comunicación Social, en estado crítico: entre el mercado y la comunicación para la libertad* (p. 20). Sociedad Latina de Comunicación Social.
- Jillapalli, R. K., & Jillapalli, R. (2014). Do professors have customer-based brand equity? *Journal of Marketing for Higher Education*, 24(1), 22-40.
<https://doi.org/10.1080/08841241.2014.909556>
- Keller, K. L. (1993). Conceptualizing, measuring, and managing customer-based Brand equity. *Journal of Marketing*, 57(1), 1-22.
<https://doi.org/10.1177/002224299305700101>
- Küster, I. (2012). *El Docente Universitario desde una perspectiva de mercado: Influencia en el rendimiento del estudiante*. Alicante: 3 ciencias.
- Lovelock, C. H., Staines, G. M., & Dorfsman, I., 1997. *Mercadotecnia de servicios*. Prentice-Hall Hispanoamericana.
- Manes, J. M. (2014). *Gestión estratégica para instituciones educativas*. Ediciones Granica S.A.
- Mas, O. (2011). El profesor universitario. *Profesorado: Revista de curriculum y formación del profesorado*, 15(3), 195-211.

- Maura, V. G. (2002). El profesor universitario: ¿un facilitador o un orientador en la educación de valores? *Pedagogía Universitaria*, 7(4), 44-51.
- Mourad, M., Ennew, C., & Kortam, W. (2011). Brand equity in higher education. *Marketing Intelligence & Planning*, 29(4), 403-420.
<https://doi.org/10.1108/02634501111138563>
- Mourad, M., Meshreki, H., & Sarofim, S. (2020). Brand equity in higher education: comparative analysis. *Studies in Higher Education*, 45(1), 209-231.
<https://doi.org/10.1080/03075079.2019.1582012>
- Nguyen, N., & LeBlanc, G. (2001). Image and reputation of higher education institutions in students' retention decisions. *International Journal of Educational Management*, 15(6), 303-311.
<https://doi.org/10.1108/EUM0000000005909>
- Pinar, M., Trapp, P., Girard, T., & E. Boyt, T. (2014). University brand equity: an empirical investigation of its dimensions. *International Journal of Educational Management*, 28(6), 616-634.
<https://doi.org/10.1108/IJEM-04-2013-0051>
- Rauschnabel, P. A., Krey, N., Babin, B. J., & Ivens, B. S. (2016). Brand management in higher education: the university brand personality scale. *Journal of Business Research*, 69(8), 3077-3086.
<https://doi.org/10.1016/j.jbusres.2016.01.023>
- Retamosa, M. (2018). *University Branding: capital de marca universitario desde la perspectiva de sus grupos de interés (Doctoral dissertation)*. Universidad de Castilla-La Mancha.
- Rojas, J. I., Vasquez, A. Z., Kara, A. L. I., & Cerda, A. (2009). Determinants of student loyalty in higher education: A tested relationship approach in Latin America. *Latin American Business Review*, 10(1), 21-39.
<https://doi.org/10.1080/10978520903022089>
- Stone, M. (1974). Cross-validatory choice and assessment of statistical predictions. *Journal of the Royal Statistical Society, Series B (Methodological)*, 36(2), 111-147.
<https://doi.org/10.1111/j.2517-6161.1974.tb00994.x>
- Williams, R. L., Williams, H. A., & Omar, M. (2013). *The Marketing Impact of the Principles of Renaming Within a Higher Education Service Organization*. American Marketing Association.
- Wold, H. (1985). Partial least squares. In: S. Kotz & N. L. Johnson (Eds.), *Encyclopedia of Statistical Sciences* (pp. 581-591). New York: Wiley.
- Yoo, B., & Donthu, N. (2001). Developing and validating a multidimensional consumer-based brand equity scale. *Journal of Business Research*, 52(1), 1-14.
[https://doi.org/10.1016/S0148-2963\(99\)00098-3](https://doi.org/10.1016/S0148-2963(99)00098-3)
- Yuan, R., Liu, M. J., Luo, J., & Yen, D. A. (2016). Reciprocal transfer of brand identity and image associations arising from higher education brand extensions. *Journal of Business Research*, 69(8), 3069-3076.
<https://doi.org/10.1016/j.jbusres.2016.01.022>
- Zabalza, M. A. (2009). Ser profesor universitario hoy. *La cuestión universitaria*, 5, 69-81. 

How do servant leaders promote radical innovation? The role of organizational learning capability

Emilio Domínguez-Escrig

Assistant lecturer. Department of Management. College of Law and Economics. Jaume I University. Spain.
ORCID: [0000-0002-5380-2774](https://orcid.org/0000-0002-5380-2774).

Francisco Fermín Mallén Broch

Assistant lecturer. Department of Management. College of Law and Economics. Jaume I University. Spain.
ORCID: [0000-0002-0394-3077](https://orcid.org/0000-0002-0394-3077).

Rafael Lapiedra Alcamí

Professor. Department of Management. College of Law and Economics. Jaume I University. Spain.
ORCID: [0000-0001-5739-247X](https://orcid.org/0000-0001-5739-247X).

Ricardo Chiva Gómez

Professor. Department of Management. College of Law and Economics. Jaume I University. Spain.
ORCID: [0000-0001-9525-8220](https://orcid.org/0000-0001-9525-8220).

edomingu@uji.es, fmallen@uji.es, lapiedra@uji.es, rchiva@uji.es

Received: January, 2020.

Accepted: March, 2020.

Published: June, 2020.

Abstract

Through structural equations, this study provides empirical evidence of the positive effect of servant leadership on radical innovation, using organizational learning capability as a mediator variable. The study is based on a sampling frame of 402 Spanish companies, which are characterized by the excellent management of their human resources. 142 different firms participated in the study, and 2 questionnaires were obtained per company. Data were collected between 2010 and 2015. Human resource and innovation managers participated by answering the questionnaires during telephone interviews. All the hypotheses were validated. Servant leadership has a positive effect on organizational learning capability, while the effect of the latter construct on radical innovation is also positive. This study has implications for the literature on leadership, innovation and organizational learning. In addition, it has practical applications, suggesting how to foster innovative organizational performance by improving workplace conditions.

Key words

Servant leadership; leadership; organizational learning; radical innovation; innovation.

How to cite this article

Domínguez-Escrig, E., Mallén Broch, F. F., Lapiedra Alcamí, R., & Chiva Gómez, R. (2020). How do servant leaders promote radical innovation? The role of organizational learning capability. *Harvard Deusto Business Research*, IX(1), 53-68. <https://doi.org/10.3926/hdbr.264>

Innovation is essential to guarantee the long-term survival and success of firms

1. Introduction

In a turbulent and complicated competitive context, innovation is essential to guaranteeing the long-term survival and success of firms (Rese & Baier, 2011). For this reason, it is important to disentangle the factors that promote innovation within companies, or that make some companies more innovative than others. The academic literature has differentiated among different innovation typologies which, in turn, have different antecedents and consequences. Hence, it is necessary to study the promoters and results of the different innovation typologies separately. One of the best-known classifications distinguishes between radical and incremental innovation (Marvel & Lumpkin, 2007). Although the main features of these typologies of innovation will be explained in the literature review section, it is worth mentioning that the present research focuses on radical innovation, due to the important benefits of radicalness for organizations and national economies (Büschgens, Bausch & Balkin, 2013).

Leadership is one of the central factors that facilitate innovation. Leaders promote climates in which followers feel protected to take risks and experiment, which may trigger innovation (Aragón-Correa, García-Morales & Cordon-Pozo, 2007; Nutt, 2002). However, there are different types of leadership, and their effects within organizations are not always positive (e.g. Kiliç & Günsel, 2019). This is one of the reasons why there is a demand for new leadership styles. In this sense, unethical behaviors (Sendjaya, Sarros & Santora, 2008) and the prevalence of leaders focused on self-interest have shifted attention towards leadership styles that are people-oriented (Panaccio, Henderson, Liden, Wayne & Cao, 2015). This shift in the study of leadership has been reflected by an increased interest in servant leadership. These leaders highlight the followers' needs (Barbuto & Wheeler, 2006; Peterson, Galvin & Lange, 2012) and manage organizations ethically (Rodríguez-Carvajal, de Rivas, Herrero, Moreno-Jiménez & Van Dierendonck, 2014).

Williams, Brandon, Hayek, Haden and Atinc (2017) stated that servant leadership might promote creativity and innovation, because it serves the needs of the followers in an authentic and empowering manner. Servant leaders encourage innovation by promoting employee participation in decision making, through which they may share new ideas and renew their knowledge, giving a voice to the employees. This type of behavior emphasizes expressing new ideas to improve the current situation (Ruiz-Palomino, Hernández-Perlines, Jiménez-Estévez & Gutiérrez-Broncano, 2019). Hughes, Lee, Tian, Newman and Legood (2018) have recently called for more research on the relationship between leadership and innovation, highlighting that servant leadership, which promotes creativity and innovation, has received less attention than other classic leadership styles, such as transformational leadership. Although there are some studies that demonstrate the importance of servant leadership in promoting innovation in the organizational context (e.g. Ruiz-Palomino et al., 2019; Yoshida, Sendjaya, Hirst & Cooper, 2014), the consequences of this leadership style on radical innovation have yet to be considered. Taking into account the important outcomes that may be derived from radical innovations and the growing importance of servant leadership in the business field, the relationship between these two concepts is worthy of study.

On the other hand, when studying leadership, it is important to consider the organizational context in which it takes place; because it does not occur in a vacuum, its effects should not be studied in an isolated manner. For instance, Moser, Dawson and West (2019) suggest that additional factors must be considered when analyzing the influence of leadership on innovation. Many studies follow the same approach and explain the consequences of leadership through mediating variables. In this vein, organizational learning is one of those mediating variables that previous studies have highlighted as essential in the relationship

Leadership is one of the main factors that facilitate innovation

between leadership and innovation (e.g. Domínguez-Escrig, Mallén, Chiva & Lapiedra, 2016). Despite the importance of organizational learning in deciphering the relationship between leadership and innovation, little is known about how servant leaders promote it, with just a few examples in the academic literature (e.g. Choudhary, Akhtar & Zaheer, 2013). To the best of our knowledge, this is the first study to analyze the effects of servant leaders on organizational learning capability, as conceptualized by Chiva, Alegre and Lapiedra (2007).

Accordingly, the present study hypothesizes that organizational learning capability mediates the positive relationship between servant leadership and radical innovation (Figure 1). All told, the gaps addressed in this study are twofold: 1) it tests the effects of servant leadership on organizational learning capability for the first time, and 2) it is the first research to focus on the effects of servant leaders in facilitating radical innovation, highlighting the mediating role of organizational learning capability. The following sections present a review of the literature on servant leadership, organizational learning capability and radical innovation. Taking into account previous research, relationships among these constructs have been established. Details of the methodology and results are also provided. The study finishes with some conclusions, suggestions for future research and an evaluation of the limitations.

2. Literature review

2.1. Servant leadership

Servant leadership is an ethical type of leadership that focuses on people and emphasizes the needs of the followers (Van Dierendonck & Nuijten, 2011). Barbutto and Wheeler (2006) have identified five factors that characterize servant leadership: altruistic calling, emotional healing, persuasive mapping, wisdom and organizational stewardship. They describe altruistic calling as the desire to make a positive difference in other people's lives, putting others' interests ahead of one's own. Emotional healing helps followers to recover from hardship or trauma. Persuasive mapping describes how leaders can encourage followers, offering compelling reasons to act. Wisdom is related to the ability to observe and anticipate the consequences of one's actions. Organizational stewardship is focused on how leaders positively contribute to society, accepting responsibility for the well-being of the community and being mindful of the impact of one's decisions on future generations.

2.2. Organizational learning capability

Organizational learning capability involves "the managerial practices that facilitate organizational learning or the conditions and enablers that can help an organization to become a learning organization" (Goh & Richards, 1997:577). Chiva et al. (2007) established five dimensions to measure organizational learning capability: experimentation, risk taking, interaction with the external environment, dialogue and participative decision-making. They defined experimentation as the degree to which new ideas and suggestions are attended to and dealt with sympathetically. Risk taking is the tolerance of ambiguity, uncertainty, and errors. Interaction with the external environment considers the relations with factors that are beyond the direct control of the organization, such as other competitors, and the economic, social, monetary and political/legal systems. Dialogue is defined as a sustained collective inquiry into the processes, assumptions and certainties that make up everyday experience. Participative decision-making is related to the level of influence employees have on the decision-making process.

2.3. Radical innovation

One of the most widely recognized and studied classifications in the academic field is the differentiation made between incremental and radical innovation (e.g. Marvel & Lumpkin,

There is an increasing demand for organizations to be people-oriented and managed ethically

2007). Radical innovations advance the price/performance frontier by much more than the existing rate of progress; they also render obsolete and negate existing competencies, skills and know-how. Incremental innovations are those that improve the price/performance advance at a rate consistent with the existing technical trajectory, and they reinforce existing competencies, skills and know-how (Gatignon, Tushman, Smith & Anderson, 2002: 1107). Although the development of radical innovations is risky, uncertain and complicated, it can also provide many benefits, such as long-term success, or better financial and non-financial performance (e.g. Domínguez-Escrig, Mallén, Lapiedra & Chiva, 2019; Gatignon et al., 2002).

3. Hypotheses

3.1. Servant leadership and organizational learning capability

Leadership is one of the factors that facilitates organizational learning (Vera & Crossan, 2004), and in recent decades different studies have analyzed the impact of different leadership styles, such as transformational or transactional leadership, and leader behaviors, such as altruistic behaviors, on it (e.g. Kim & Park, 2019; Mallén, Chiva, Alegre & Guinot, 2016). However, little is known about the impact of servant leadership on organizational learning, and to the best of our knowledge, no research has analyzed its effect on organizational learning capability. For instance, Choudhary et al. (2013) analyzed organizations in the profit-oriented service sector of Pakistan and showed that servant leadership promotes organizational learning, suggesting that by taking care of the needs of the followers, organizational knowledge may be increased. However, these authors concluded that its effect on learning was less than that of transformational leadership. The results of this study are limited to a specific sector and cultural context, and the same authors demanded more research on these relationships to elucidate whether this difference remains under other circumstances.

On the other hand, the different dimensions that make up servant leadership (altruistic calling, emotional healing, persuasive mapping, wisdom and organizational stewardship), according to the conceptualization proposed by Barbuto and Wheeler (2006), offer some insights into the potential relationship between servant leadership and organizational learning capability. To shed light on this relationship, it would be interesting to analyze the impact of the different dimensions separately. For instance, Mallén et al. (2016) positively related altruistic leader behaviors to the organizational learning capability because these leaders provide a safe and supportive environment in which employees can take risks, make mistakes and dialogue. In addition, negative experiences within the organizational context may lead to negative emotions, such as anxiety or disappointment. Understanding and addressing the emotions of followers creates a positive workplace climate (Jit, Sharma & Kawatra, 2017) that may facilitate learning. In this vein, Antonacopoulou and Gabriel (2001) state that emotions are essential for organizational processes, such as communication or decision making. Besides, according to stewardship theory, leaders promote open communication, collectivistic behaviors, participative organizations, low-power distance, an involvement orientation, trustworthy relationships and reinforce external ties, among other aspects (Davis, Schoorman & Donaldson, 1997; Dumay, La Torre & Farnetti, 2019; Nihof, Schaveling & Zalesky, 2019), which are factors that facilitate organizational learning (e.g. Chiva et al., 2007; Guinot, Chiva & Mallén, 2013). Finally, Nonaka and Takeuchi (2011) suggest that wise leaders facilitate interactions within organizations, promote information sharing, boost communication, bring together people with conflicting goals and involve employees and followers, distributing leadership as much as possible throughout the organization. In this way, they may renew knowledge and enhance learning.

Consequently, the first hypothesis of the study is:

H1: Servant leadership is positively related to the organizational learning capability.

3.2. Organizational learning capability and radical innovation

Previous research has demonstrated the importance of organizational learning in order to innovate (Alegre & Chiva, 2008), and some empirical studies have shown its positive impact on radical innovation. For instance, Domínguez-Escrig, Mallén, Lapiedra and Chiva (2018) conclude that the organizational learning capability is positively related to radical innovation and mediates the relationship between high-quality innovation systems and this type of innovation. Moreover, the different factors that make up this construct (experimentation, risk taking, interaction with the external environment, dialogue and participative decision-making) appear to have a positive relationship with innovation in general, and radicalness in particular. For example, Chang, Chang, Chi, Chen and Deng (2012) consider that experimentation is essential in order to foster radical innovation, because it involves moving into unknown territories. López-Cabralles, Medina, Lavado and Cabrera (2008) positively relate risk taking to radical innovation, because people are more creative if they are encouraged to engage in these behaviors. Sheng and Chien (2016) state that knowledge from external sources fuels the development of radical innovation, as it renews current ideas. Slater, Mohr and Sengupta (2014) argue that communication facilitates radicalness, because members of the organization share ideas and different points of view. Finally, Hurley and Hult (1998) conclude that participative groups are more innovative, as members are encouraged to learn and develop new ideas.

Therefore, the second hypothesis of the study is:

H2: The organizational learning capability has a positive effect on radical innovation.

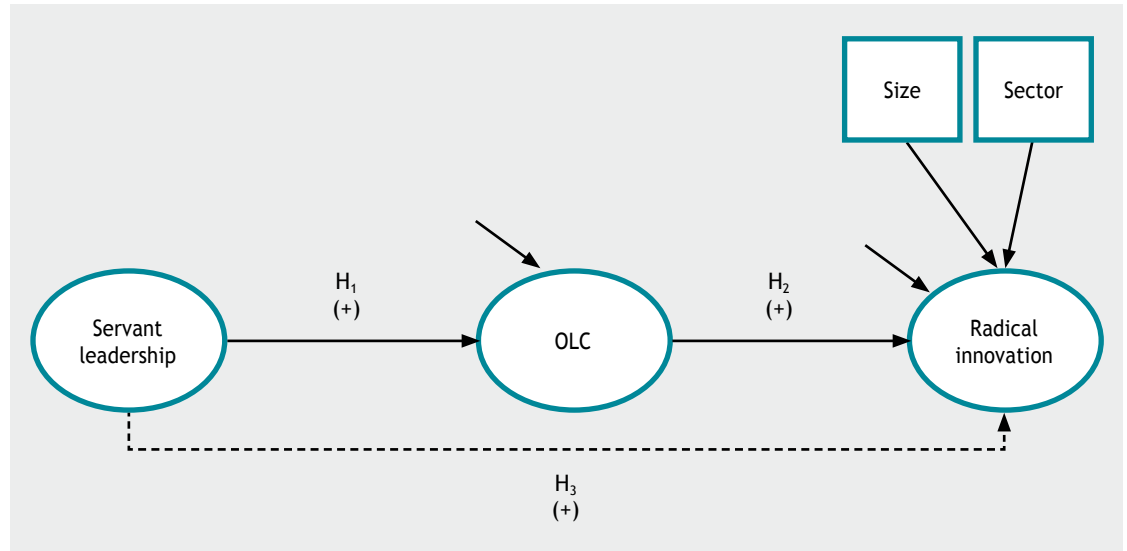
3.3. Servant leadership and radical innovation: the mediating role of organizational learning capability

Leadership is crucial to promote innovation within organizations. Previous studies have positively related different leadership styles with innovation. However, in the light of the heterogeneous results achieved (Rosing, Frese & Bausch, 2011), the effects of leaders on innovation should be studied in conjunction with complementary processes. Organizational learning is one of the factors that has been highlighted as being essential to mediate the effect of leadership styles or leader behaviors on innovation (e.g. Domínguez-Escrig et al., 2016). O'Malley, O'Dwyer, McNally and Murphy (2014) state that radical innovations demand an organizational context that facilitates communication, risk-taking or cooperation, which are features of the organizational learning capability. Considering that servant leaders, as suggested in Hypothesis 1, may boost the conditions that enhance participation in decision-making, dialogue, experimentation, interaction with the external environment and risk taking, it is reasonable to believe that servant leaders may promote the conditions under which radical innovation flourishes.

Therefore, the final hypothesis is:

H3: The positive effect of servant leadership on radical innovation is mediated by the organizational learning capability.

Figure 1
Conceptual model and hypotheses



4. Research methodology

4.1. Data collection

The basis of the study was a sampling frame of 402 Spanish companies with excellent management of human resources. The sampling frame was composed of companies from different databases and lists: Great Place to Work, the CRF Institute's 'Top Companies to Work For' and 'Top Employers', and the Merco Personas list of best companies to work for, from the journal *Actualidad Económica*. 142 different companies participated in the study. In terms of the number of companies, this represents a response rate of 35.3%.

In each company, the questionnaire was addressed to human resources and innovation managers, with at least two years of experience in the company. Each type of manager was asked to answer a different questionnaire: human resources managers responded to 142 questionnaires related to servant leadership and organizational learning capability, and innovation managers responded to another 142 questionnaires, with questions related to radical innovation. Human resources managers are a reliable source to evaluate leadership styles and learning within organizations (e.g. Domínguez-Escrig et al., 2016). On the other hand, 'innovation managers' is a broad term that includes product managers and R&D managers, depending on the people who are in charge of the innovation activities in each organization. These professional profiles have been used in previous research studies on radical innovation (e.g. Domínguez-Escrig et al., 2018). The anonymity of the participants was guaranteed in order to promote honest responses and facilitate the reliability of the results and conclusions.

The questionnaire administered to human resources managers consisted of 37 items measured according to a five-point Likert scale, while innovation managers answered 6 items measured according to a seven-point Likert scale. These items were expressed in a positive sense. Respondents showed whether they agreed or disagreed with the ideas

Servant leadership is an ethical type of leadership focused on people and emphasizing the needs of the followers

expressed in the items. The survey was administered via telephone interviews, as this technique facilitates contact with managers.

To avoid common method bias, various recommendations were followed, such as using different endpoint scales, ensuring the anonymity of the interviewees and obtaining the information from different respondents at different times (e.g. Chang, Van Witteloostuijn & Eden, 2010). The fieldwork was carried out between 2010 and 2015. In 2010, responses pertaining to servant leadership and organizational learning capability were obtained. Five years later, information about radical innovation was collected.

Finally, given that the study was conducted in Spain, all the items were worded in Spanish. Although the organizational learning capability scale was originally developed in Spanish, servant leadership and radical innovation scales were developed in English. To guarantee the accuracy of the translation, a double-back translation procedure was used (Brislin, 1970). This technique involves translating the original English version of measurement scales into Spanish and then retranslating it into English, comparing it to the original version.

4.2. Measurement instruments

Measurement scales had already been used and validated in the previous research. The reliability of the scales was assessed using Cronbach's alpha. The Radical Innovation Scale was based on the works developed by Gatignon et al. (2002), and Marvel and Lumpkin (2007). This construct had a Cronbach's alpha of 0.88. The scale developed by Chiva et al. (2007) was used to measure the organizational learning capability. All dimensions that comprise the organizational learning capability obtained Cronbach's alpha values greater than 0.70. Finally, servant leadership was measured using the scale developed by Barbuto and Wheeler (2006). Each dimension of servant leadership obtained Cronbach's alpha values greater than 0.70.

4.3. Control variables

Company size and sector were used as control variables, due to their potential influence on innovation (e.g. Acs & Audretsch, 1988; Fitjar & Rodríguez-Pose, 2015). According to the number of employees, companies were classified as follows (frequencies for each category in our sample appear in parentheses): fewer than 50 employees (13.4%), between 50 and 100 employees (22.5%), between 101 and 250 employees (24.6%), between 251 and 500 employees (26.8%), between 501 and 1,000 employees (9.2%), and firms with more than 1,000 employees (3.5%). A distinction between manufacturing and service firms was also made: 29.6% of the organizations belonged to manufacturing sectors, while 70.4% were from service sectors.

4.4. Analyses

Structural equations and the statistical software AMOS-26 were used to empirically validate the proposed model, opting for the maximum likelihood estimation method. The proposed model tries to elucidate the mediating role of organizational learning capability in the relationship between servant leadership and radical innovation. Additionally, a bootstrapped confidence interval was used to validate the proposed indirect effect.

5. Results

5.1. Descriptive statistics and psychometric properties of the measurement scales

Table 1 shows the information related to the descriptive statistics. The mean of the items, standard deviations and correlations among the constructs was calculated. The psychometric

Table 1
Factor correlations, means and standard deviations

	Mean	s.d.	RI	Ser	OLC	Exp	Risk	Env	Dia	Dec	Alt	Emo	Per	Wis	Stw
RI	5.45	1.00	1												
Ser	3.80	.35	.325**	1											
OLC	3.76	.40	.260**	.534**	1										
Exp	4.03	.55	.179*	.411**	.565**	1									
Risk	3.39	.79	.113	.236**	.615**	.209*	1								
Env	3.71	.64	.109	.185*	.584**	.074	.194*	1							
Dia	4.12	.53	.211*	.450**	.709**	.334**	.184*	.340**	1						
Dec	3.54	.66	.226**	.450**	.683**	.294**	.154	.226**	.514**	1					
Alt	3.46	.64	.268**	.800**	.443**	.355**	.184*	.165*	.359**	.362**	1				
Emo	3.61	.57	.268**	.790**	.354**	.230**	.041	.233**	.361**	.315**	.646**	1			
Per	3.95	.36	.049	.628**	.389**	.289**	.301**	.089	.283**	.265**	.311**	.322**	1		
Wis	3.92	.40	.187*	.659**	.372**	.315**	.154	.062	.346**	.343**	.357**	.358**	.449**	1	
Stw	4.07	.46	.314**	.658**	.365**	.292**	.225**	.066	.253**	.325**	.355**	.327**	.392**	.359**	1

Notes: For the standard deviations and factor correlations, we used the mean of the items constituting each dimension.

** Significant correlation at $p < 0.01$.

Note: RI = Radical innovation; SER = Servant leadership; OLC = Organizational learning capability; EXP = Experimentation; RISK = Acceptance of risk; ENV = Interaction with the external environment; DIA = Dialogue; DEC = Participative decision-making; ALT = Altruistic calling; EMO = Emotional healing; PER = Persuasive mapping; WIS = Wisdom; STW = Stewardship

properties of the measurement scales were evaluated to determine the validity of the constructs (Anderson & Gerbing, 1988). Consequently, their dimensionality and reliability, as well as their convergent, discriminant and content validity were analyzed (Tippins & Sohi, 2003).

Moreover, in the case of servant leadership and organizational learning capability, the fit of the second-order factor models was tested to support the proposed multidimensionality of these concepts. In the case of servant leadership, the results were as follows: Chi-square (d.f.)=340.04 (225); p -value=0.00; Chi-square/d.f.=1.51; NFI=0.82; NNFI=0.92; CFI=0.93; RMSEA=0.06; while in the case of organizational learning capability the results were: Chi-square (d.f.)=85.07 (72); p -value=0.14; Chi-square/d.f.=1.18; NFI=0.91; NNFI=0.98; CFI=0.99; RMSEA=0.04.

Regarding the structure of the constructs, in addition to confirmatory factor analyses, a full measurement model that includes all the variables was assessed (Anderson & Gerbing, 1988). Testing a full measurement model establishes the structure of the variables in the context of other variables measured in the study, and ensures that the measures used in the study are different from one another. The overall fit of this general model was: Chi-square (d.f.)=1122.110 (847); p =0.00; CFI=0.91; RMSEA=0.05. The Chi-square statistic was non-significant, while all the standardized estimates were significant and in the expected direction. Therefore, it is confirmed that the constructs were different from one another.

Radical innovations render existing competencies, skills, and know-how obsolete, negating them

The results of the reliability analysis were also satisfactory (Table 2). Cronbach's alpha values, as well as those of composite reliability, exceeded the minimum accepted value of 0.7 (Nunnally, 1978).

Content validity was supported by the procedure used to select the measurement scales, all of which have been used and validated in the previous research. The variables used to measure radical innovation were based on the scales developed by Marvel and Lumpkin (2007) and Gatignon et al. (2002). Servant leadership is based on the scale by Barbuto and Wheeler (2006). Finally, organizational learning capability was measured using the items of the scale developed by Chiva et al. (2007).

Table 2
Reliability of the measurement scales

Construct	Composite reliability	Cronbach's alpha
Radical innovation	0.91	0.88
Servant leadership	0.96	0.90
Organizational learning capability	0.96	0.83
Experimentation	0.80	0.78
Acceptance of risk	0.81	0.79
Interaction with the external environment	0.80	0.79
Dialogue	0.86	0.85
Participative decision-making	0.89	0.88
Altruistic calling	0.90	0.89
Emotional healing	0.88	0.87
Persuasive mapping	0.81	0.75
Wisdom	0.78	0.79
Stewardship	0.86	0.85

To evaluate convergent validity, the NFI coefficient (Figure 2) and the magnitude of the factor loadings were taken as a reference. However, the NFI results did not reach the minimum threshold of 0.9 (Bentler & Bonnet, 1980). Nonetheless, as this indicator is sensible to sample size, it is necessary to consider other indicators that are not affected by this issue, such as NNFI and CFI (Kline, 2005; Tucker & Lewis, 1973). These indicators are greater than 0.9 (Figure 2), showing an acceptable level of fit (Marsh, Hau & Wen, 2004). Finally, the magnitudes of factorial loadings reach or exceed the minimum level of 0.4 (Hair, Anderson, Tatham & Black, 1999) in all the constructs (Table 3). Thus, it may be concluded that the convergent validity of all the constructs is supported.

We also conducted a test of discriminant validity, which determines whether the correlations between factors are significantly different from +1 or -1 (Bagozzi, Yi & Phillips, 1991). The resulting 95% confident intervals were computed as a parameter estimate $\pm 1.96 * (SE)$ and unity was not present in any of the intervals (showing discriminant validity).

Table 3
Factor loadings and significance (Student's t)

Construct	Items	Factor loading	t
Radical innovation	RI1	0.814 (1)	
	RI2	0.658	8.359
	RI3	0.648	8.196
	RI4	0.689	8.848
	RI5	0.818	11.124
	RI6	0.909	12.763
Experimentation	EXP1	0.921 (1)	
	EXP2	0.695	4.949
Acceptance of risk	RISK1	0.692 (1)	
	RISK2	0.945	3.007
Interaction with the external environment	ENV1	0.729 (1)	
	ENV2	0.673	7.058
	ENV3	0.853	7.449
Dialogue	DIA1	0.715 (1)	
	DIA2	0.740	8.108
	DIA3	0.828	8.946
	DIA4	0.810	8.794
Participative decision-making	DEC1	0.866 (1)	
	DEC2	0.728	10.25
	DEC3	0.949	14.223
Altruistic calling	ALT1	0.951 (1)	
	ALT2	0.861	15.745
	ALT3	0.719	10.955
	ALT4	0.784	12.865
Emotional healing	EMO1	0.891 (1)	
	EMO2	0.922	15.291
	EMO3	0.716	10.169
	EMO4	0.643	8.682
Persuasive mapping	PER1	0.829 (1)	
	PER2	0.764	9.246
	PER3	0.679	8.118
	PER4	0.424	4.823
	PER5	0.693	8.312
Wisdom	WIS1	0.681 (1)	
	WIS2	0.676	6.51
	WIS3	0.695	6.642
	WIS4	0.532	5.345
	WIS5	0.573	5.693
Stewardship	STW1	0.813 (1)	
	STW2	0.851	11.032
	STW3	0.787	10.085
	STW4	0.548	6.543
	STW5	0.714	8.944

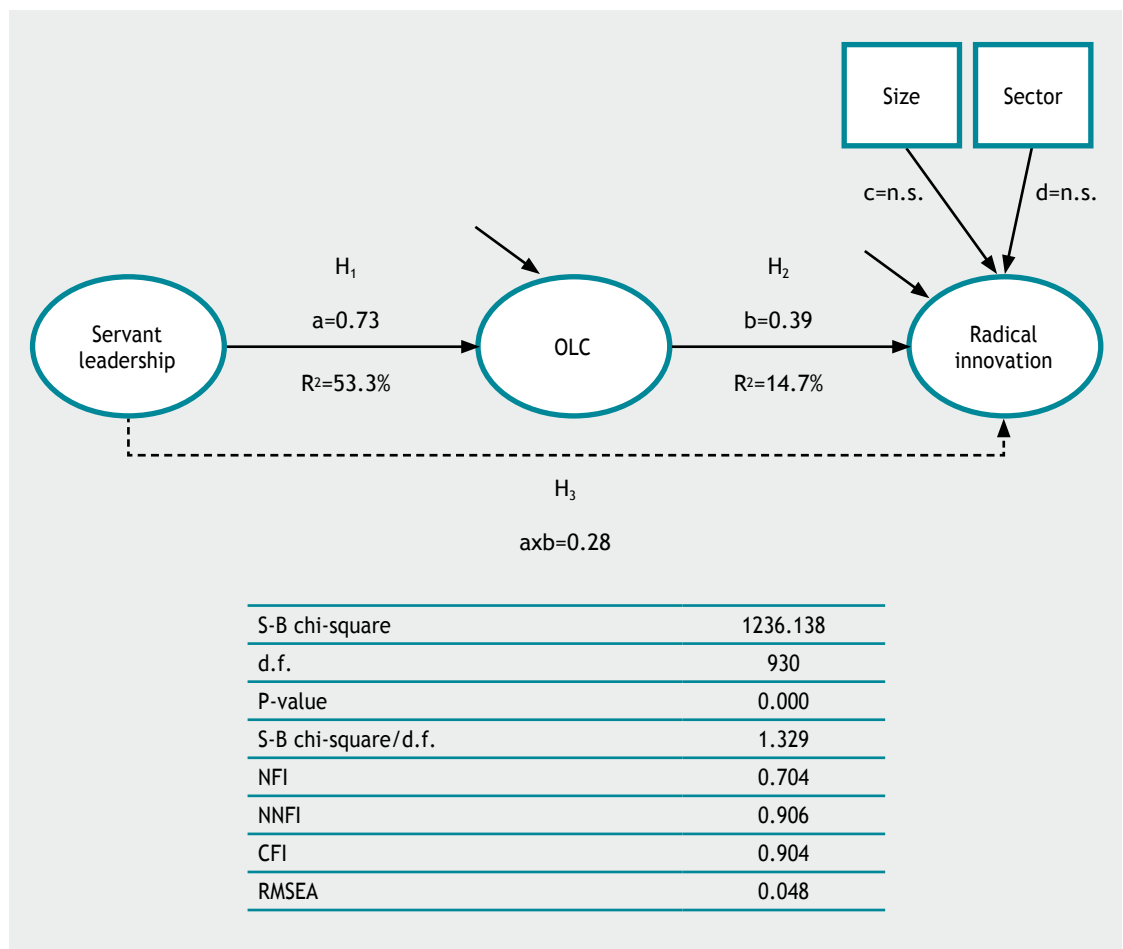
Companies must seek leaders that prioritize the interests of the followers ahead of their own

5.2. Testing the research hypotheses

Modern approaches to mediation analysis do not require evidence of a total effect prior to the estimation of direct and indirect effects (Hayes, 2012). According to Zhao, Lynch and Chen (2010), the only requirement to demonstrate mediation is a significant indirect effect $a \times b$, which can be demonstrated through a bootstrap test.

The results (Figure 2) showed a significant relationship between servant leadership and organizational learning capability ($a=0.73$, $t=4.50$, $p < 0.001$), and the path between organizational learning capability and radical innovation was also significant ($b=0.39$, $t=3.26$, $p < 0.001$). The effects of firm size ($c=0.05$, $t=0.61$) and sector ($d=-0.07$; $t=-0.77$) on radical innovation were also tested, and the results were non-significant. Furthermore, the 95% bias-corrected confidence interval for the indirect effect based on 5,000 bootstrap samples was tested using AMOS-26, and it was found to be above zero in all cases (0.14-0.45). Therefore, the indirect effect of servant leadership on radical innovation is significantly different from zero and the null hypothesis of no mediation effect can be rejected. Additionally, the direct relationship between servant leadership and radical innovation was tested and also proved to be statistically significant.

Figure 2
Causal model



Note: axb = indirect effect

This study contributes to improving the innovativeness of companies by ameliorating the working conditions within them

6. Discussion

The hypotheses proposed in the study were confirmed. These results contribute to expanding the knowledge related to the factors that facilitate radical innovation, and have implications for the literature on servant leadership and organizational learning capability.

To the best of our knowledge, this is the first empirical study that analyzes the effect of servant leadership on organizational learning capability. On the other hand, the positive effect of organizational learning capability on radical innovation is consistent with findings in previous studies that have positively related both concepts (e.g. Domínguez-Escrig et al., 2018). The indirect effect that is supported in the study expands the knowledge of the effect of servant leadership on radical innovation. Recent calls demanded more research to study the effect of this type of leadership on innovation (Hughes et al., 2018). Although there are some studies that analyzed the importance of servant leaders to promote innovation and creativity (e.g. Yoshida et al., 2014), confirming its positive influence, little is known of the effects of servant leadership on radical innovation.

The conclusions of the present study have some practical implications. To promote radical innovations, it is necessary to create organizational contexts in which communication, participation in decision-making, experimentation, interaction with the external environment and risk-taking are facilitated. In order to make this happen, companies have to seek professionals who may become servant leaders. Human resources policies, such as recruitment or training, have to be focused on stressing and promoting the values and behaviors that characterize servant leadership. Companies must seek leaders that prioritize the interests of the followers ahead of their own, help employees to recover from personal traumas, are good at anticipating the consequences of their decisions, are persuasive in convincing followers to engage in ambitious projects, believe that their organizations play a moral role in the society and are concerned with the long-term consequences of their decisions. In addition, by elucidating the positive outcomes of servant leadership, this study contributes to improving the innovativeness or success of companies by ameliorating the working conditions within them. This is something that has recently been in demand from the academic field, due to the increasing number of cases of unethical and selfish behaviors of managers and leaders in different areas (Mallén & Domínguez-Escrig, 2017).

This study has some limitations. For instance, this research only analyzed Spanish firms, so the conclusions are limited to the companies of this country. Furthermore, the sampling frame of companies was heterogeneous in terms of size and sector. Future studies should be conducted in other countries, in order to compare the innovative performance among companies of different nations. In addition, studies that differentiate between start-ups and incumbent companies, focusing on concrete sectors or distinguishing between large, small, and medium companies, may expand the conclusions reached in this study.

In addition, it would be important to continue to analyze the factors that promote radical innovation, with particular emphasis on leadership styles that prioritize the wellness of the followers, promote ethical behaviors and show a genuine concern for the future consequences of their actions on society and the environment. In this sense, it would be possible to contribute to boosting the innovativeness of companies by enhancing workplace conditions. Moreover, new studies on the consequences of servant leadership should be conducted. Effects on other types of innovation, such as incremental innovation or innovation stages would be of interest. Other mediating variables should be considered in future research. For instance, differentiating between generative and adaptive learning might further add to the conclusions of this study.

7. Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

8. Funding

The authors would like to thank University Jaume I (UJI-A2017-05, E-2017-47 & E-2017-48) and the Spanish Ministry of Economy and Competitiveness (ref. ECO2011-26780) for their financial support for this research.

9. References

- Acs, Z. J., & Audretsch, D. B. (1987). Innovation, market structure, and firm size. *The review of Economics and Statistics*, 69(4), 567-574.
<https://doi.org/10.2307/1935950>
- Alegre, J., & Chiva, R. (2008). Assessing the impact of organizational learning capability on product innovation performance: An empirical test. *Technovation*, 28(6), 315-326.
<https://doi.org/10.1016/j.technovation.2007.09.003>
- Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological bulletin*, 103(3), 411-423.
<https://doi.org/10.1037/0033-2909.103.3.411>
- Antonacopoulou, E. P., & Gabriel, Y. (2001). Emotion, learning and organizational change. *Journal of Organizational Change Management*, 14(5), 435-451.
<https://doi.org/10.1108/EUM0000000005874>
- Aragón-Correa, J. A., García-Morales, V. J., & Cordon-Pozo, E. (2007). Leadership and organizational learning's role on innovation and performance: Lessons from Spain. *Industrial marketing management*, 36(3), 349-359.
<https://doi.org/10.1016/j.indmarman.2005.09.006>
- Bagozzi, R. P., Yi, Y., & Phillips, L. W. (1991). Assessing construct validity in organizational research. *Administrative science quarterly*, 36(3), 421-458.
<https://doi.org/10.2307/2393203>
- Barbuto Jr, J. E., & Wheeler, D. W. (2006). Scale development and construct clarification of servant leadership. *Group & Organization Management*, 31(3), 300-326.
<https://doi.org/10.1177/1059601106287091>
- Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological bulletin*, 88(3), 588.
<https://doi.org/10.1037/0033-2909.88.3.588>
- Büschgens, T., Bausch, A., & Balkin, D. B. (2013). Organizing for radical innovation—A multi-level behavioral approach. *The Journal of High Technology Management Research*, 24(2), 138-152.
<https://doi.org/10.1016/j.hitech.2013.09.004>
- Brislin, R. W. (1970). Back-translation for cross-cultural research. *Journal of cross-cultural psychology*, 1(3), 185-216.
<https://doi.org/10.1177/135910457000100301>
- Chang, Y. C., Chang, H. T., Chi, H. R., Chen, M. H., & Deng, L. L. (2012). How do established firms improve radical innovation performance? The organizational capabilities view. *Technovation*, 32(7-8), 441-451.
<https://doi.org/10.1016/j.technovation.2012.03.001>
- Chang, S. J., Van Witteloostuijn, A., & Eden, L. (2010). From the editors: Common method variance in international business research. *Journal of International Business Studies*, 41(2), 178-184.
<https://doi.org/10.1057/jibs.2009.88>
- Chiva, R., Alegre, J., & Lapiedra, R. (2007). Measuring organisational learning capability among the workforce. *International Journal of Manpower*, 28(3/4), 224-242.
<https://doi.org/10.1108/01437720710755227>
- Choudhary, A. I., Akhtar, S. A., & Zaheer, A. (2013). Impact of transformational and servant leadership on organizational performance: A comparative analysis. *Journal of business ethics*, 116(2), 433-440.
<https://doi.org/10.1007/s10551-012-1470-8>

- Davis, J. H., Schoorman, F. D., & Donaldson, L. (1997). Toward a stewardship theory of management. *Academy of Management review*, 22(1), 20-47.
<https://doi.org/10.5465/amr.1997.9707180258>
- Domínguez-Escrig, E., Mallén, F. F., Chiva, R., & Lapiedra, R. (2016). How does altruistic leader behavior foster radical innovation? The mediating effect of organizational learning capability. *Leadership & Organization Development Journal*, 37(8), 1056-1082.
<https://doi.org/10.1108/LODJ-03-2015-0050>
- Domínguez-Escrig, E., Mallén, F. F., Lapiedra, R., & Chiva, R. (2018). Promoting radical innovation through end-user computing satisfaction. *Industrial Management & Data Systems*, 118(8), 1629-1646.
<https://doi.org/10.1108/IMDS-06-2017-0256>
- Domínguez-Escrig, E., Mallén, F. F., Lapiedra, R., & Chiva, R. (2019). The influence of leaders' stewardship behavior on innovation success: the mediating effect of radical innovation. *Journal of Business Ethics*, 159(3) 849-862.
<https://doi.org/10.1007/s10551-018-3833-2>
- Dumay, J., La Torre, M., & Farneti, F. (2019). Developing trust through stewardship. *Journal of Intellectual Capital*, 20(1), 11-39.
<https://doi.org/10.1108/JIC-06-2018-0097>
- Fitjar, R. D., & Rodríguez-Pose, A. (2015). Interaction and innovation across different sectors: findings from Norwegian city-regions. *Regional Studies*, 49(5), 818-833.
<https://doi.org/10.1080/00343404.2015.1016415>
- Gatignon, H., Tushman, M. L., Smith, W., & Anderson, P. (2002). A structural approach to assessing innovation: Construct development of innovation locus, type, and characteristics. *Management science*, 48(9), 1103-1122.
<https://doi.org/10.1287/mnsc.48.9.1103.174>
- Goh, S., & Richards, G. (1997). Benchmarking the learning capability of organizations. *European Management Journal*, 15(5), 575-583.
[https://doi.org/10.1016/S0263-2373\(97\)00036-4](https://doi.org/10.1016/S0263-2373(97)00036-4)
- Guinot, J., Chiva, R., & Mallén, F. (2013). Organizational trust and performance: Is organizational learning capability a missing link?. *Journal of Management & Organization*, 19(5), 559-582.
<https://doi.org/10.1017/jmo.2014.3>
- Hair, H. F., Anderson, R. E., Tatham, R. L., & Black, W.C. (1999). Multivariate dataanalysis. 5th Edition. London: Prentice Hall.
- Hayes, A. F. (2012). PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling [White paper]. Retrieved from <http://www.afhayes.com/public/process2012.pdf>
- Hughes, D. J., Lee, A., Tian, A. W., Newman, A., & Legood, A. (2018). Leadership, creativity, and innovation: A critical review and practical recommendations. *The Leadership Quarterly*, 29(5), 549-569.
<https://doi.org/10.1016/j.leaqua.2018.03.001>
- Hurley, R. F., & Hult, G. T. M. (1998). Innovation, market orientation, and organizational learning: an integration and empirical examination. *Journal of marketing*, 62(3), 42-54.
<https://doi.org/10.1177/002224299806200303>
- Jit, R., Sharma, C. S., & Kawatra, M. (2017). Healing a broken spirit: Role of servant leadership. *Vikalpa*, 42(2), 80-94.
<https://doi.org/10.1177/0256090917703754>
- Kim, E. J., & Park, S. (2019). The role of transformational leadership in citizenship behavior: Organizational learning and interpersonal trust as mediators. *International Journal of Manpower*, 40(7), 1347-1360.
<https://doi.org/10.1108/IJM-12-2018-0413>
- Kılıç, M., & Günsel, A. (2019). The Dark Side of the Leadership: The Effects of Toxic Leaders on Employees. *European Journal of Social Sciences*, 2(2), 51-56.
<https://doi.org/10.26417/ejss-2019.v2i2-64>
- Kline, R. B. (2005). Principles and practice of structural equation modeling 2nd ed. New York: Guilford.
- López-Cabralés, A., Medina, C. C., Lavado, A. C., & Cabrera, R. V. (2008). Managing functional diversity, risk taking and incentives for teams to achieve radical innovations. *R&D Management*, 38(1), 35-50.
<https://doi.org/10.1111/j.1467-9310.2007.00501.x>
- Mallén, F. F., Chiva, R., Alegre, J., & Guinot, J. (2016). Are altruistic leaders worthy? The role of organizational learning capability. *International Journal of manpower*, 36(3), 271-295.
<https://doi.org/10.1108/IJM-09-2013-0212>

- Mallén, F. F., & Domínguez-Escrig, E. (2017). Del yo al nosotros: nuevas formas de liderar. *Oikonomics: revista de economía, empresa y sociedad*, (8), 24-34.
<https://doi.org/10.7238/o.n8.1710>
- Marsh, H. W., Hau, K. T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and Bentler's (1999) findings. *Structural equation modeling*, 11(3), 320-341
https://doi.org/10.1207/s15328007sem1103_2
- Marvel, M. R., & Lumpkin, G. T. (2007). Technology entrepreneurs' human capital and its effects on innovation radicalness. *Entrepreneurship Theory and Practice*, 31(6), 807-828.
<https://doi.org/10.1111/j.1540-6520.2007.00209.x>
- Moser, K. S., Dawson, J. F., & West, M. A. (2019). Antecedents of team innovation in health care teams. *Creativity and Innovation Management*, 28(1), 72-81.
<https://doi.org/10.1111/caim.12285>
- Nijhof, A., Schaveling, J., & Zalesky, N. (2019). Business, society, and the need for stewardship orientation. *Journal of Organizational Change Management*, 32(1), 145-163.
<https://doi.org/10.1108/JOCM-09-2017-0348>
- Nonaka, I., & Takeuchi, H. (2011). The wise leader. *Harvard business review*, 89(5), 58-67.
- Nunnally, J. C. (1978). *Psychometric Theory*. New York: McGraw-Hill.
- Nutt, P. (2002). *Why decisions fail: Avoiding the blunders and traps that lead to debacles*. Berrett-Koehler Publishers.
- O'Malley, L., O'Dwyer, M., McNally, R. C., & Murphy, S. (2014). Identity, collaboration and radical innovation: The role of dual organisation identification. *Industrial Marketing Management*, 43(8), 1335-1342.
<https://doi.org/10.1016/j.indmarman.2014.08.007>
- Panaccio, A., Henderson, D. J., Liden, R. C., Wayne, S. J., & Cao, X. (2015). Toward an understanding of when and why servant leadership accounts for employee extra-role behaviors. *Journal of Business and Psychology*, 30(4), 657-675.
<https://doi.org/10.1007/s10869-014-9388-z>
- Peterson, S. J., Galvin, B. M., & Lange, D. (2012). CEO servant leadership: Exploring executive characteristics and firm performance. *Personnel Psychology*, 65(3), 565-596.
<https://doi.org/10.1111/j.1744-6570.2012.01253.x>
- Rese, A., & Baier, D. (2011). Success factors for innovation management in networks of small and medium enterprises. *R&D Management*, 41(2), 138-155.
<https://doi.org/10.1111/j.1467-9310.2010.00620.x>
- Rodríguez-Carvajal, R., de Rivas, S., Herrero, M., Moreno-Jiménez, B., & Van Dierendonck, D. (2014). Leading people positively: Cross-cultural validation of the Servant Leadership Survey (SLS). *The Spanish journal of psychology*, 17(2), 1-13.
<https://doi.org/10.1017/sjp.2014.73>
- Rosing, K., Frese, M., & Bausch, A. (2011). Explaining the heterogeneity of the leadership-innovation relationship: Ambidextrous leadership. *The leadership quarterly*, 22(5), 956-974.
<https://doi.org/10.1016/j.leaqua.2011.07.014>
- Ruiz-Palomino, P., Hernández-Perlines, F., Jiménez-Estévez, P., & Gutiérrez-Broncano, S. (2019). CEO servant leadership and firm innovativeness in hotels: A multiple mediation model of encouragement of participation and employees' voice. *International Journal of Contemporary Hospitality Management*, 31(4), 1647-1665.
<https://doi.org/10.1108/IJCHM-01-2018-0023>
- Sendjaya, S., Sarros, J. C., & Santora, J. C. (2008). Defining and measuring servant leadership behaviour in organizations. *Journal of Management studies*, 45(2), 402-424.
<https://doi.org/10.1111/j.1467-6486.2007.00761.x>
- Sheng, M. L., & Chien, I. (2016). Rethinking organizational learning orientation on radical and incremental innovation in high-tech firms. *Journal of Business Research*, 69(6), 2302-2308.
<https://doi.org/10.1016/j.jbusres.2015.12.046>
- Slater, S. F., Mohr, J. J., & Sengupta, S. (2014). Radical product innovation capability: Literature review, synthesis, and illustrative research propositions. *Journal of Product Innovation Management*, 31(3), 552-566.
<https://doi.org/10.1111/jpim.12113>
- Tippins, M. J., & Sohi, R. S. (2003). IT competency and firm performance: is organizational learning a missing link? *Strategic Management Journal*, 24(8), 745-761.
<https://doi.org/10.1002/smj.337>

- Tucker, L. R., & Lewis, C. (1973). A reliability coefficient for maximum likelihood factor analysis. *Psychometrika*, 38(1), 1-10.
<https://doi.org/10.1007/BF02291170>
- Van Dierendonck, D., & Nuijten, I. (2011). The servant leadership survey: Development and validation of a multidimensional measure. *Journal of business and psychology*, 26(3), 249-267.
<https://doi.org/10.1007/s10869-010-9194-1>
- Vera, D., & Crossan, M. (2004). Strategic leadership and organizational learning. *Academy of management review*, 29(2), 222-240.
<https://doi.org/10.5465/amr.2004.12736080>
- Williams Jr, W. A., Brandon, R. S., Hayek, M., Haden, S. P., & Atinc, G. (2017). Servant leadership and followership creativity: The influence of workplace spirituality and political skill. *Leadership & Organization Development Journal*, 38(2), 178-193.
<https://doi.org/10.1108/LODJ-02-2015-0019>
- Yoshida, D. T., Sendjaya, S., Hirst, G., & Cooper, B. (2014). Does servant leadership foster creativity and innovation? A multi-level mediation study of identification and prototypicality. *Journal of Business Research*, 67(7), 1395-1404.
<https://doi.org/10.1016/j.jbusres.2013.08.013>
- Zhao, X., Lynch Jr, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, 37(2), 197-206.
<https://doi.org/10.1016/j.jbusres.2013.08.013> 

Cultural tourism: A methodological approach based on the knowledge of its demand

María Dolores Sánchez-Sánchez

Visiting professor in Economic History. Researcher in the OpenInnova high-performance research group and Chair of Natural Parks at Rey Juan Carlos University in Madrid. Spain. ORCID: [0000-0002-7564-675X](https://orcid.org/0000-0002-7564-675X).

Carmen De-Pablos-Heredero

Professor in the field of Business Organization. Director of the Master's program in Business Organization and the Master's program in SAP Logistic Project Management at Rey Juan Carlos University in Madrid. Head of the OpenInnova high-performance research group. Spain. ORCID: [0000-0003-0457-3730](https://orcid.org/0000-0003-0457-3730).

José Luis Montes-Botella

Professor of Advanced Statistics and Econometrics at Rey Juan Carlos University in Madrid. Spain. ORCID: [0000-0001-9024-6167](https://orcid.org/0000-0001-9024-6167).

mariadolores.sanchez@urjc.es, carmen.depablos@urjc.es, jose Luis.montes@urjc.es

Received: March 2020.

Accepted: April, 2020.

Published: June 2020.

Abstract

The aim of this research is to propose and validate a conceptual model that measures the degree of satisfaction of cultural tourists. The model could help us to better understand this segment of the market and identify factors that explain the degree of customer satisfaction. In terms of methodology, a hypothetical-deductive method has been applied. After reviewing the literature, five hypotheses have been proposed, integrated into an exploratory model. The model has been validated by a structural equations model (SEM) and estimated with data from the Survey on Resident Tourism/FAMILITUR, conducted by the Spanish National Statistics Institute (INE). The results assess the significance of sociocultural variables and tourist experience, and the null influence of satisfaction as a predictor of repeat visits. The model permits confirming a set of appropriate variables to analyze the satisfaction of Spanish internal demand with a cultural motivation, on local trips. Given the growing importance of cultural tourism worldwide, the proposed model can become an interesting tool for the management of the touristic positioning of destinations with a cultural heritage, as it helps us to understand the satisfaction and loyalty of the tourist flow.

Key words

Cultural tourism; satisfaction; tourism demand; structural equation modeling (SEM); FAMILITUR; tourism management.

How to cite this article

Sánchez-Sánchez, M. D., De-Pablos-Heredero, C., & Montes-Botella, J. L. (2020). Cultural tourism: A methodological approach based on the knowledge of its demand. *Harvard Deusto Business Research*, IX(1), 69-83. <https://doi.org/10.3926/hdbr.272>

A conceptual model of satisfaction is proposed for Spanish tourists with cultural motivations

1. Introduction

Spain has an important cultural heritage that has allowed it to diversify its tourism offering, which since the 1960s has been based on the sun-and-beach model, focusing now on new types of tourism, such as cultural tourism. This type of tourism is on the increase as the result of the economic and social transformations that have occurred in post-modern societies (Valiente, Forga & Romero, 2016).

During 2017, trips with a cultural motivation taken by residents in Spain accounted for around 12.5 million tourists, who spent a total of €6.7477 billion (INE, 2018). The data show the economic importance of cultural tourism in our country, for which our cultural resources have been key. One example of this is that UNESCO has recognized 15 Spanish historic city centers as World Heritage Sites. In 2018, this group of cities, positioned within the national and international commercial circuit for cultural tourism, received 5.4 million visitors, exerting a tourist pressure of 3.7 visitors per inhabitant. Managing this massification is precisely one of its objectives (GCPHE Tourism Observatory, 2019).

However, many other cultural resources have not been integrated into the national tourism market, such as in the case of medium-sized and small Spanish cities with a rich cultural heritage (Barrera & Hernández, 2016). Various studies on cultural tourism have revealed the spatial concentration of visitors in certain destinations and cultural resources (De la Calle Vaquero, 2003; Troitiño & Troitiño, 2009).

As a result, nowadays there is a great deal of competition among the different tourist destinations in order to attract visitors (Mariani & Baggio, 2012). This necessitates the implementation of marketing strategies focused on different segments of the demand, aimed at developing specific promotional and marketing policies (Molina, Martín-Consuegra, Esteban & Díaz, 2007).

In this sense, taking into account the current context of Spanish tourism, an analysis has been carried out on the need to implement, by destination, strategies of specialization in certain segments of the demand, offering a greater opportunity for commercial positioning (Gómez Patiño, Medina & Puyuelo Arilla, 2015). In brief, the goal is to achieve a greater competitive advantage on behalf of the cultural touristic destinations within the immense tourism offering. Finding competitive advantages that would permit both attracting the flow of tourism, in the case of emerging destinations, and maintaining it, in the case of mature destinations, is crucial in order to position a tourism destination over the rest. In this manner, the attempt to obtain the satisfaction of travelers for the various tourism destinations, and their loyalty to the destination, comes through understanding the influence of tourist behavior in both cases. As indicated by Butnaru, Miller, Nita and Stefanica (2018:1420): "The basis of the evaluation of service quality lies in the individual experience of each client." These same authors argue that the affluence of tourism in destinations is the result of their behavior.

Therefore, this study responds to the need to contribute more data that would allow us to better understand the behavior of the demand for Spanish cultural tourism. To do this, this study focuses on generating a metric, a model that would make it possible to measure the congruence between the value perceived by tourists and the heritage of the Spanish cultural destinations.

We start with the identification of those factors that can explain the cultural tourism consumption experience and its influence on the satisfaction of this type of tourist,

**Of interest
is the negative
causal
relationship
between repeat
visits and
satisfaction**

analyzing the value related to the use or consumer experience (Pine & Gilmore, 1998; Schmitt, 1999; Brida, Nogare & Scuderi, 2017; Lončarić, Perišić Prodan, & Dlačić, 2019), in this case, tourism, and the satisfaction with the object of consumption, i.e., the destination.

Following the review of the academic literature on the variables that would make up the customer experience (Homburg, Jozić & Kuehn, 2017; Garduño & Cisneros, 2018), as the theoretical foundation of the variables studied, an empirical analysis is carried out based on data concerning tourism demand for cultural reasons provided by the *Encuesta de Turismo de Residentes/FAMILITUR* (Survey on Resident Tourism/FAMILITUR) conducted periodically by the National Institute of Statistics (INE), which provides detailed information on the number of trips and visitor profiles, as well as their motivations for resident households in Spain.

To establish the factors that have an influence on the satisfaction of a visitor to a cultural destination, some of the main precedents and consequences of satisfaction considered in the academic literature and found on the FAMILITUR questionnaire are analyzed. The activities that are performed at the destination are studied, the expenditure, the socioeconomic profile of the tourist, the level of organization of the trip and the relationship between these factors and the satisfaction of Spanish cultural tourists, as well as the influence this has on destination loyalty. This thus allows us to propose a model explaining the satisfaction of cultural tourists with the destination, which is later validated by means of structural equation models (SEM).

Furthermore, among other scientific reasons for this work, which is focused on creating a model to analyze the satisfaction of cultural tourists and which will allow us to better understand the tourism demand of clients who consume cultural heritage, we can highlight that it could also provide more data on this segment of the demand, consisting of different typologies and behaviors, in order to implement relational marketing strategies that allow competitive advantages to be obtained based on differentiation. "With the currently increasing global level of competence, offering new emerging destinations, and with tourists who are more aware of their choice and the desire to have a variety of options, relational marketing offers a considerable potential to achieve competitive advantages" (Fyall, Callod & Edwards, 2003:645).

There is also a reason relating to offering information to the agents involved in tourism management, which helps them develop, design and implement tourism management policies that generate social and economic profitability at the destination (Bote & Álvarez, 1998; Molina et al., 2007). The satisfaction of the informational demand required to maintain a sustainable competitive advantage as a destination and to become a desired tourist destination necessitates having information that can be used to integrate tourism strategies over both the short and long term (Balagué & Navines, 2012).

2. Conceptual framework

2.1. Review of the literature: satisfaction

Defining satisfaction is not easy. In service marketing, customer satisfaction and perceived service quality are two closely related concepts that may even appear to be the same thing (Liljander, 1994). However, they are two entirely different concepts, perceived service quality being the component with the biggest impact on customer satisfaction (Cronin & Taylor, 1992; Bloemer & De Ruyter, 1995).

The data evidence the economic importance of cultural tourism in our country

In the area of leisure and tourism, the studies conducted conceptualize service quality as the quality of the result, understood as the perceptions by the visitor of the attributes of the service being offered, or expressed differently, the quality of the experience, determined by the psychological components that the visitor forms after consuming a service or destination.

Therefore, satisfaction would be a broader concept that is not only affected by benefits-rewards, but also by consumer-related factors (cultural, personal or experiential elements) and situational factors that are beyond the control of the service provider (Zeithaml & Bitner, 2002; Devesa Fernández, Laguna García & Palacios Picos, 2008).

In the case of tourists, their satisfaction is determined by a group of activities-experiences that have proven positive not only during their stay at the destination, but also during the preparation for the trip. In this way, the final satisfaction would be a set of several gratifying actions that occur at different times during the trip, including during the organization before it even takes place. As a result, satisfaction will depend on both the expectations of the consumers-visitors and the evaluation they make of the experiences with the product-destination once it has been “consumed” (Kotler, Cámara, Grande & Cruz, 2000; Mkono, 2016).

To the above, we must add the fact that in the tourism sector, we find the need to include both tangible and intangible elements that have an effect on satisfaction. Among the first group are the tourism resources at the destination, the tourism infrastructures, accessibility, etc. The intangible elements include the emotions that tourists experience, the perceived quality of services and the level of compliance with expectations (Gómez Patiño, 2012). These are factors that are difficult to quantify, but that can have a much greater influence on the satisfaction of tourists than the tangible elements (Bourdeau, 1985; Picos & Fernández, 2005).

In short, there are different variables that have an influence on the ultimate satisfaction of tourists, such as those related to the socioeconomic profile of the visitor (Valls, 2003), their main motivation for travel (Yoon & Uysal, 2005) or those intrinsic to the destination itself (Chen & Chen, 2010).

2.2. Variables that influence the satisfaction of the cultural tourist

Below is a review of the conceptual basis for the different factors that have an influence on the satisfaction of tourists, focusing only on those variables of the FAMILITUR study of the demand that have served as a basis for the proposed conceptual model of satisfaction.

2.2.1. Sociodemographic variables

Within the sociodemographic variables of tourists, age is important. The studies that have been conducted indicate that the age segment corresponding to cultural tourists is between 25 and 55 years of age, with the most frequent travelers being those members of the 30-44 year old age range, due primarily to their economic stability and family-related independence (Valls, 2003; Lara de Vicente & López-Guzmán, 2004; Royo & Serarols, 2005; Pulido-Fernández & Sánchez, 2010).

With regard to cultural motivation by age, the latest research conducted in the city of Madrid indicates that there are different degrees of motivation. Accordingly, tourists older

This research focuses on generating a metric or a model

than 45 years of age present lower levels of motivation than the 18-44 age group (Bautista, Duque, Fernández & Da Silva, 2015).

Among the personal characteristics of tourists most commonly identified in the literature as affecting the perception of the destination is gender. Several studies indicate that gender is a discriminating factor in client perception and motivations. Women tend to have a more positive perception of the tourist experience. "Women have greater expectations than men when they choose hotels or judge their quality, particularly in relation to the service being offered and the staff's attitude and behavior" (Callan & Bowman, 2000:108).

This factor would also have a certain significant influence on the motivations to travel. When it comes to visiting the destination, the motivations of women are more closely linked to knowledge than are those of men (Gil, Beerli & De León, 2012).

However, other authors have failed to find significant differences by gender in terms of cultural motivation, nor have they found any differences in terms of satisfaction with resources or infrastructures at the destination (Bautista et al., 2015).

In terms of the educational level of cultural tourists, those with university studies or secondary school are the most numerous (Lara de Vicente & López-Guzmán, 2004; Royo & Serarols, 2005), which is also shown by field studies conducted in different Spanish cities that have been declared World Heritage Sites (Troitiño, Brandis, Del Río, De la Calle, Gutiérrez & Martín, 2000).

The high level of studies would positively affect satisfaction, by permitting better comprehension and interpretation of the cultural resources visited at the destination. This would also influence how demanding each tourist is, which is reflected in his/her level of satisfaction (Valls, 2003).

Derived from the high level of training, some studies indicate that cultural tourists have a medium-high level of purchasing power (De la Calle Vaquero, 2003); this implies greater expenditures at the destination.

In accordance with the previous arguments outlining the variables of the sociocultural profiles of tourists, it is possible to offer the following hypothesis:

H1. The different sociodemographic and cultural variables of a cultural tourist (age, gender, level of education and purchasing power) influence their level of satisfaction.

2.2.2. Variables related to the experience of the tourist

In relation to the influence of the variables associated with the experience of the tourist (within this concept are indicators related to the activities performed, the organization of the trip and the expenditure made) and his/her level of satisfaction, several studies have analyzed the positive relationships that arise at a cultural destination between the quality of the tourism experience and satisfaction and loyalty to the destination.

Chen and Chen (2010) substitute the variables related to service quality with the quality of the experiences in order to explain the level of satisfaction and loyalty, as they consider that this variable better explains the relationships that exist in the consumption of tourism.

Creation of a model to analyze the satisfaction of cultural tourists

Experiences had at the destination, through activities performed, are one of the aspects that tourists will value the most, once the trip is over, comparing it to their expectations beforehand, which results in their level of satisfaction (Kotler, et al., 2000). Clients – and even more so, tourists, due to the very nature of tourism – seek experiences that complete their identity, which is why the experiences must be authentic, not artificial, in order to generate satisfaction. The creation of value will be determined by the quality of the experiences, which translated into the biographical imagination of the tourist, increase destination loyalty or expenditure (Alcoba, Mostajo, Paras & Ebron, 2017).

Other works (Bigné, Sánchez & Sánchez, 2001; Chen & Chen, 2010) emphasize that the capacity of a destination to provide the visitor with an experience in line with his/her expectations and needs will generate a varying level of loyalty on behalf of the tourist to the destination, manifested in both the intention to recommend the destination and to repeat the visit.

The tendency to repeat the visit has been demonstrated when the tourist feels satisfied with the attributes of the destination during the first visit (Kozak, 2000, 2001). Boo, Busser and Baloglu (2009) correlate those attributes of a product associated in marketing with perceived value, translating them to the attributes of a destination and its perceived value as fundamental criteria in terms of destination loyalty.

Yoon and Uysal (2005) also positively confirmed, by means of a structural equations model, the relationship between the level of satisfaction as a mediating variable and the tourist's motivations and his/her destination loyalty.

With regard to the positive influence of the organization of the trip on tourist satisfaction, several different studies have been carried out (Kozak, 2001; Hui, Wan & Ho, 2007). In relation to the expenditure, the work carried out on different urban cultural destinations shows a correlation between tourist satisfaction and tourist expenditure at the destination (Cárdenas, Pulido & Pulido, 2016).

As a result of this, the following hypotheses are proposed:

H2. The organization of the trip has a positive impact on overall satisfaction.

H3. The activities performed at the destination have a positive impact on overall satisfaction.

H4. The expenditure incurred before and during the trip positively influences overall satisfaction.

H5. Satisfaction has an influence on repeat visits to the destination.

**Empirically
verified with
the data
provided by
the Survey
on Resident
Tourism/
FAMILITUR**

The interrelation of these hypotheses will provide positive or negative confirmation of the level of satisfaction and loyalty to the tourist destination.

Figure 1 below shows a summarized version of the five proposed hypotheses.

Table 1
Research hypotheses

HYPOTHESIS	RELATIONSHIP	EFFECT
H1	Sociodemographic profile → Satisfaction	+
H2	Organization of the trip → Satisfaction	+
H3	Activities performed → Satisfaction	+
H4	Expenditure before and during the trip → Satisfaction	+
H5	Satisfaction → Loyalty	+

3. Proposed model

Taking into account everything that has been discussed with regard to the concept of satisfaction, this study proposes a conceptual model of satisfaction for Spanish tourists whose main motivation is of a cultural nature. It has been empirically verified against the data provided by the Survey on Resident Tourism/FAMILITUR, conducted by the INE to study the touristic movements of Spanish residents in the domestic market and abroad, since this statistic constitutes a basic reference to establish the general framework of the tourism demand in Spain, providing detailed information on the number of trips taken, the profile of the traveler and his/her motivation (Prado-Masculano, 2013). Table 2 shows a summary of its main characteristics.

Table 2
Characteristics of the sample (*Instituto Nacional de Estadística, 2018*)

Type of survey	Ongoing, every quarter.
Scope of the population	Population over age 15 who lives in the main household.
Scope	All of Spain.
Reference period	Monthly.
Sample size	Around 16,400 interviews administered each month.
Data collection	Telephone interviews, and in some cases, personal interviews.

The main objective is to discover the main variables that can contribute to satisfaction with cultural tourism.

Based on theoretical foundations presented in the scientific literature, we have structured the proposed conceptual model, identifying the most significant elements and proposing the system of interdependencies that relate them to one another.

In doing so, we have primarily identified those variables of the Survey on Resident Tourism/FAMILITUR that are considered to influence the satisfaction of cultural tourists, based on the review of the scientific literature on the topic. Next, several hypotheses were proposed

that are intended to be verified by means of the relationships established in the causal model.

As a result, a total of 23 variables are included in the exploratory model: 4 are related to the sociocultural profile, 6 to the organization of the trip, 4 to activities performed at the destination, 8 to the expenditure incurred and 1 variable refers to loyalty.

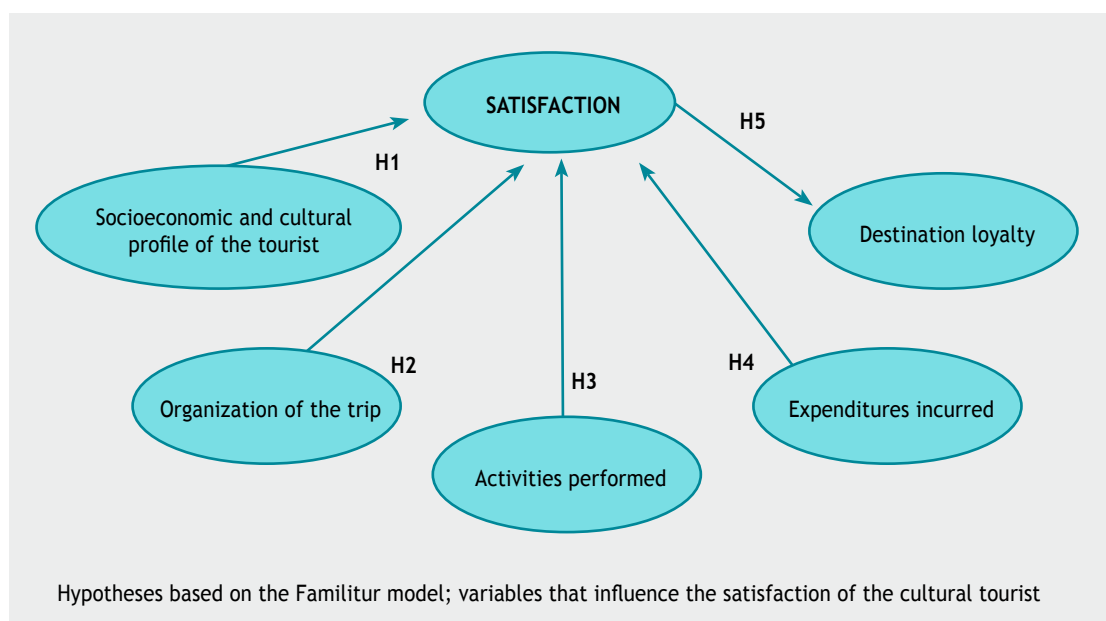
Next, the factors are presented that would determine the model of behavior whose structure we intend to verify by means of the relationships established within the proposed causal model.

The proposed model identifies the following factors that would determine the level of satisfaction.

- Factor 1. Referred to as the *Socioeconomic and cultural profile of the tourist*, it is made up of four indicators: age, gender, level of education and household income.
- Factor 2. Referred to as *Organization of the trip*, it consists of six variable indicators grouped according to the type of organized trip (or if the trip is not organized and the services used at the destination).
- Factor 3. Referred to as *Activities performed at the destination*, it is made up of four variable indicators: cultural visits, cultural performance attendance, city visits and culinary activities.
- Factor 4. Referred to as *Expenditures incurred*, it includes eight indicators grouped into expenditures made before and during the stay and their amount.
- Factor 5. Referred to as *Destination loyalty*, it is measured in terms of repeat visits.

The model in Figure 1 shows a chart of the hypotheses listed above. The interrelation of these hypotheses will provide positive or negative confirmation of the level of satisfaction and loyalty to the tourist destination.

Figure 1
Proposed causal model



A total of 23 variables are included in the exploratory model

4. Study method

The data used for the study were obtained from the data from the Survey on Resident Tourism/FAMILITUR administered by the Spanish National Institute of Statistics (INE), to study the tourism trips and excursions taken by residents in the main households in Spain, during the period between February 2015 and September 2016. The sample size was $n=18024$. Data were analyzed for those whose main purpose for taking the trip was of a cultural nature.

The research framework used intends to demonstrate the causal relationships between the following five factors or latent variables related to the *socioeconomic and cultural profile of the tourist, the organization of the trip, the activities performed at the destination, the expenditures incurred and loyalty to the destination or type of destination*, related to the variable satisfaction, estimated by means of structural equations modeling (SEM).

Given the exploratory nature of this study, it was decided that the use of structural equations was the most appropriate methodology, as it is especially useful in situations in which researchers intend to analyze relationships between latent variables in studies focused on prediction. Structural equations are a technique that is very commonly used to contrast causal models, since it makes it possible to create exploratory models consisting of latent variables (theoretical concepts) and indicators (empirical concepts) that are related to one another through hypotheses (Henlein & Kaplan, 2004).

The parameters of the model were estimated using SmartPLS 3 statistical software (Ringle, Wende & Becker, 2015). The model presented is made up of two submodels: a reflexive measurement model and a structural model. The confidence intervals for their parameters were evaluated using the bootstrap method, correcting for bias and extracting 5,000 samples (Chin, 1998; Hair, Hult, Ringle & Sarstedt, 2017). The sample size was 12,129.

The model was estimated by means of the Partial Least Squares (PLS) algorithm (Wold, 1975), which attempts to identify the relationships among latent variables. Their selection was made according to the following criteria: the modeling of the problem being investigated is in an emerging state; minimum PLS requirements in terms of sample size; precision of the prediction and comparatively low requirements as compared to other techniques, and in terms of the multinormality of data (Joreskog & Wold, 1982; Henseler, Ringle, & Sinkovics, 2009).

5. Results

Next, and based on the aforementioned theory, the values and signs are interpreted that result from the estimated coefficients of the structural equations with the causal relationships of the different latent variables present in the model. This analysis served to verify the previously proposed hypotheses.

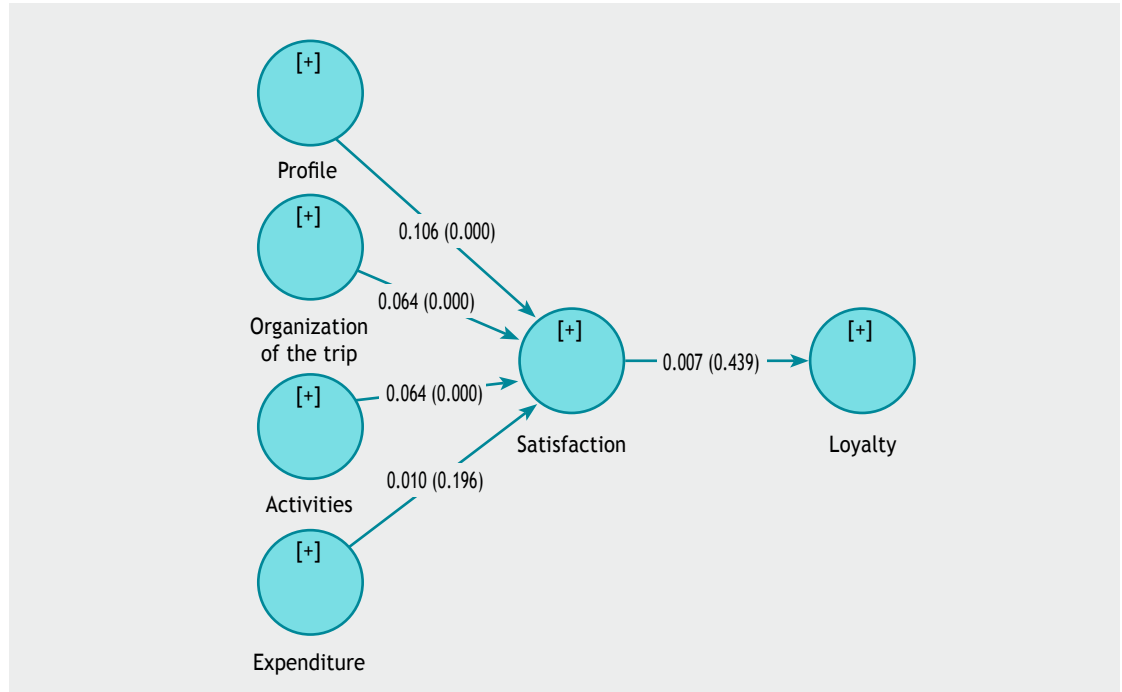
The diagram of the estimated causal model shown in Figure 2 reflects the graphic expression by means of a path diagram of the relationships between the latent variables (constructs) that constitute the proposed hypotheses.

Table 3 shows the values of the parameters and their p-values. The relationship between satisfaction and destination loyalty is clearly non-significant ($p=0.437$), while the relationship between expenditure and satisfaction is significant at a level of 80.9% ($p=0.191$), which is

These hypotheses will provide a positive or negative confirmation of the satisfaction with and loyalty to the destination

Figure 2

Estimated causal model (SmartPLS 3 Statistical Software, 2019)



lower than the generally accepted level of 95%. The rest of the relationships are significant, with p-values clearly below 0.05. Colinearity presented a value of less than 3, the value generally accepted as demonstrating low colinearity (Mason & Perreault, 1991; Becker, Ringle, Sarstedt & Völckner, 2015).

Table 3

Structural model. Values of the parameters and their p-values

Relationship	Parameter value	p-value
Activities → Satisfaction	0.064	p=0.000
Expenditure → Satisfaction	0.010	p=0.191
Organization of the trip → Satisfaction	0.064	p=0.000
Profile → Satisfaction	0.106	p=0.000
Satisfaction → Loyalty	0.007	p=0.437

Therefore, the estimates of the proposed model confirm the causal relationships that were proposed between the sociocultural profile of the tourist and satisfaction, the organization of the trip and satisfaction, the activities performed and satisfaction and the expenditures incurred and satisfaction.

Specifically, the results of the estimated model make it possible to state that the variables within the *Socioeconomic and cultural profile of the tourist* factor have an influence on the level of satisfaction of the cultural tourist ($p < 0.000$), (H1).

Women had a more positive perception of the tourism experience

The variables analyzed within the *Organization of the trip* factor have a direct influence on overall satisfaction ($p < 0.000$), (H2). This underscores the fact that the organization of the trip, alone or accompanied by other people, the level of organization of the trip, seen as the advanced purchase of packages and tourism services used at the destination, condition the ultimate satisfaction of the cultural tourist.

The *activities performed* at the destination exert a direct influence on overall satisfaction ($p < 0.000$), (H3). The tourism offering thus becomes important, in this case understood as the cultural offerings that are available at the destination.

The *expenditures incurred* during the trip also have a direct influence on overall satisfaction (H4). We can therefore establish relationships between the well-being of the tourist and the expenditures incurred at the destination.

The remaining hypothesis made about the influence of satisfaction on the loyalty of the tourist to the destination (H5) was not confirmed by the data. A significant relationship is not observed, therefore, between the satisfaction of cultural tourists and repeat visits ($p = 0.043$) (H5). Even though the scientific literature establishes the positive influence that overall satisfaction has on the loyalty of tourists (Hui et al.; Kozak, 2001), its relationship would not be as relevant as expected. It is therefore necessary to consider other studies that indicate that satisfaction may not have a linear effect on loyalty and repeat buying (Fullerton & Taylor, 2002; Moll de Alba Cabot, Prats & Coromina, 2017).

6. Conclusions

The results analyzed in the previous section reveal the importance that the type of trip organization manifested by cultural tourists, their socioeconomic characteristics, the activities performed and the expenditures incurred have on the overall satisfaction of the cultural tourist, as well as the null relationship between satisfaction and loyalty.

The relationship between the organization of the trip and satisfaction (H2) is a confirmed hypothesis. Therefore, those responsible for marketing tourist destinations of a cultural nature must take into account the way in which cultural tourists organize their trips. The Survey on Resident Tourism/FAMILITUR shows little use of vacation packages and the prevalence of trips that tourists organize themselves. It therefore becomes necessary to promote services and tourism resources that can offer greater attractions, in response to the needs derived from this way of organizing travel, which can increase their satisfaction.

The relationships between the sociodemographic profile (H1) and the activities performed (H3) and satisfaction are also confirmed hypotheses. In the case of activities performed, its confirmation suggests the importance of the diversity of tourist attractions and complementary offers at the destination in terms of the level of overall satisfaction of cultural tourists.

Attention should be called to the results obtained in terms of the negative causal relationship between repeat visits and satisfaction (H5). We must thus keep in mind regarding the marketing strategies of the destination, the fact that the visitor's satisfaction cannot be expressed in terms of repeat visits over the short term, but rather with regard to their recommendation to others.

To increase the number of repeat visits, the possibilities offered by the destination to engage in different activities and its available cultural tourism offerings are important. If the possibilities to engage in new activities are exhausted at the destination, it may be that even though the

The results are therefore relevant for the planning and management of cultural tourism destinations

tourism experience has been positive, the visit will not be repeated. However, if tourists believe that they might be able to engage in others, in other words, have new experiences during the next visit or they find the performance of the same activities to be attractive, they might return to the destination.

With regard to satisfaction and its positive causal relationship to expenditure (H4), the lesser influence of the expenditure on satisfaction could be explained by the possibility that the cultural tourist will pay a price for which the exchange value does not correspond to the satisfaction of that need. This highlights the importance, within the marketing actions, of the design of certain products or tourism services with high added value, which respond to a segment of the demand that, because of its sociodemographic characteristics, has a high level of purchasing and educative power.

6.1. Contribution of the study

A city can position itself as a tourist destination according to the level of satisfaction of its visitors. In doing so, it is crucial to know about the behavior of the tourists that visit it. The study of the variables found in any direct survey on the tourism demand after the conclusion of the visit is fundamental to obtain data that would allow us to expand our knowledge about their behavior and how it influences their level of satisfaction.

Generally speaking, the results of this initial exploratory study have confirmed a model that would make it possible to establish actions to increase the satisfaction of visitors whose main motivation is of a cultural nature.

The results obtained in this research based on the Survey on Resident Tourism/FAMILITUR enable us to identify a set of indicators that influence the satisfaction of the cultural tourist. These results are therefore relevant for planning and managing cultural tourism destinations.

In this sense, being able to identify different profiles of cultural tourists based on their level of satisfaction would enable us to implement specific policies to promote and market cultural destinations. It would also allow us to identify the cultural resources and tourism services at the destination, which could help increase their level of satisfaction or loyalty.

6.2. Limitations of the study

The limitations that have been identified in this study are primarily related to the variables present in the Survey on Resident Tourism/FAMILITUR, framed within the more general approaches given by the World Tourism Organization for the study of demand, certain variables of which were not given a more operational adaptation.

This is the case of the loyalty construct, which only includes one item, as it is considered from a behavioral perspective, such as repeat visits, and not an attitudinal one, i.e., satisfaction, which is not analyzed by attributes, but rather in a more global manner. It is for this reason that the use of these statistics establishes a general framework and not a specific one, such as that which would be required for a more segmented study of the demand, such as the flow of cultural or rural tourism.

This implies that, for a more in-depth analysis of the demand for cultural tourism, it would be necessary to integrate more operative concepts or variables that are adapted to the needs of the area being studied, in this case cultural tourism. This would provide specific data on the different segments of the demand, making it possible to determine differentiated marketing strategies, among other actions.

Visitor satisfaction can be expressed in their recommendations of the destination to others

6.3. Future lines of research

In order to complete a broader study of the behavior of cultural tourists in Spain, in the future it would be recommended to develop the lines of research considered, expanding the analysis of the relationship that exists between the satisfaction of the cultural tourist and future intentions to make repeat visits and their influence on the recommendation of the destination to others. The model applied to cultural tourists could also be applied to another type of tourists and destinations, such as health, nature or sun and beach tourism.

7. Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

8. Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

9. References

- Alcoba, J., Mostajo, S., Paras, R., & Ebron, R. A. (2017). Beyond Quality of Service: Exploring What Tourists Really Value. In S. Za, M. Drăgoicea, M. Cavallari (Eds.), *Exploring Services Science. IESS 2017. Lecture Notes in Business Information Processing*, vol. 279. Springer, Cham, 261-271.
https://doi.org/10.1007/978-3-319-56925-3_21
- Bautista, V., Martín, C., Fernández, J., & Da Silva, R. (2015). Relaciones entre factores sociodemográficos-genero-edad, nacionalidad, motivación y satisfacción turística: análisis exploratorio en una muestra turística de la ciudad de Madrid. *Revista de Análisis Turístico*, 20, 39-45.
- Balagué, J., & Navines, F. (2012). Sistema de indicadores como herramienta de gestión sostenible de un destino turístico: aplicación a la Costa Brava centro. *Harvard Deusto Business Research*, 1(2), 132-146.
<https://doi.org/10.3926/hdbbr.27>
- Barrera, D., & Hernández, M. (2016). El impacto de la política urbanística en la gestión de la ciudad histórico-turística: un estudio comparativo. *PASOS, Revista de Turismo y Patrimonio Cultural*, 14(3), 705-724.
- Bigné, J. E., Sánchez, M. I., & Sánchez, J. (2001). Tourism image, evaluation variables and after purchase behaviour: Inter-relationship. *Tourism Management*, 22(6), 607-616.
[https://doi.org/10.1016/S0261-5177\(01\)00035-8](https://doi.org/10.1016/S0261-5177(01)00035-8)
- Becker, J.-M., Ringle, C. M., Sarstedt, M., & Völckner, F. (2015). How collinearity affects mixture regression results. *Marketing Letters*, 26(4), 643-659.
<https://doi.org/10.1007/s11002-014-9299-9>
- Bloemer, J., & De Ruyter, K. (1995). Integrating service quality and satisfaction: pain in the neck of marketing opportunity? *Journal of Consumer Satisfaction, Dissatisfaction and Complaining Behaviour*, 8, 44-52.
- Boo, S., Busser, J., & Baloglu, S. (2009). A model of customer-based brand equity and its application to multiple destinations. *Tourism Management*, 30(2), 219-231.
<https://doi.org/10.1016/j.tourman.2008.06.003>
- Bourdeau, P. (1985). Espacio social y génesis de las clases. *Espacios de crítica y producción*, 2, 24-35.
- Bote, V., & Álvarez, R. (1998). *Promoción y comercialización del turismo cultural de la ciudad de Sevilla: diagnóstico y orientaciones estratégicas. Documentos de trabajo. Serie A*. Alcalá de Henares: Ed. Universidad de Alcalá de Henares.
- Brida, J. G., Nogare, C. D. & Scuderi, R. (2017). Learning at the museum: Factors influencing visit length. *Tourism Economics*, 23(2), 281-294.
<https://doi.org/10.1177/1354816616656249>
- Butnaru, G. I., Miller, A., Nita, V., & Stefanica, M. (2018). A new approach on the quality evaluation of tourist services. *Economic research-Ekonomska istraživanja*, 31(1), 1418-1436.
<https://doi.org/10.1080/1331677X.2018.1477611>

- Callan, R. J., & Bowman, L. (2000). Selecting a hotel and determining salient quality attributes: a preliminary study of mature British travellers. *International Journal of Tourism Research*, 2, 97-118.
[https://doi.org/10.1002/\(SICI\)1522-1970\(200003/04\)2:2<97::AID-JTR190>3.0.CO;2-1](https://doi.org/10.1002/(SICI)1522-1970(200003/04)2:2<97::AID-JTR190>3.0.CO;2-1)
- Cárdenas, P. J., Pulido, J. I., & Pulido, M. (2016). The influence of tourist satisfaction on tourism expenditure in emerging urban cultural destinations. *Journal of Travel & Tourism Marketing*, 33(4), 497-512.
<https://doi.org/10.1080/10548408.2015.1064061>
- Chin, W. W. (1998). The partial least squares approach for structural equation modeling. In G. A. Marcoulides (Ed.), *Modern methods for business research* (pp. 295-336). Mahwah, NJ: Lawrence Erlbaum Associates Publishers.
- Chen, C., & Chen, F. (2010). Experience quality, perceived value, satisfaction and behavioral intentions for heritage tourist. *Tourism Management*, 31(1), 29-35.
<https://doi.org/10.1016/j.tourman.2009.02.008>
- Cronin, J., & Taylor, S. (1992). Measuring service quality: a reexamination and extension. *Journal of Marketing*, 56(3), 55-68.
<https://doi.org/10.1177/002224299205600304>
- De la Calle Vaquero, M. (2003). *La ciudad histórica como destino turístico*. Barcelona: Ariel.
- Devesa Fernández, M., Laguna García, M., & Palacios Picos, A. (2008). Un modelo estructural sobre la influencia de las motivaciones de ocio en la satisfacción de la visita turística. *Revista de Psicología del Trabajo y de las Organizaciones*, 24(2), 253-268.
<https://doi.org/10.4321/s1576-59622008000200007>
- Fyall, A., Callod, C., & Edwards, B. (2003). Relationship marketing: The challenge for destinations. *Annals of Tourism Research*, 30(3), 644-659.
[https://doi.org/10.1016/S0160-7383\(03\)00046-X](https://doi.org/10.1016/S0160-7383(03)00046-X)
- Fullerton, G., & Taylor, S. (2002). Mediating, Interactive and Non-Linear Effects in Service Quality and Satisfaction with Services Research. *Canadian Journal of Administrative Sciences*, 19(2), 124-136.
<https://doi.org/10.1111/j.1936-4490.2002.tb00675.x>
- Garduño, M. G., & Cisneros, H. F. (2018). Una aproximación a la experiencia turística desde la Antropología del Turismo: una mirada mutua al encuentro entre turistas y locales. *PASOS. Revista de Turismo y Patrimonio Cultural*, 16(1), 197-211.
<https://doi.org/10.25145/j.pasos.2018.16.013>
- Gil, M., Beerli, S., & De León, J. (2012). Entender la imagen de un destino turístico: factores que la integran y la influencia de las motivaciones. *Criterio Libre*, 10(16), 115-142.
- Gómez Patiño, M. (2012). *Escapistas de la realidad. Los intangibles del turismo*. Barcelona: Editorial Laertes.
- Gómez Patiño, M., Medina, F. X., & Puyuelo Arilla, J. M. (2015). Efectos de la crisis y propuestas para su recuperación en el sector turístico español. *Harvard Deusto Business Research*, 4(2), 62-72.
<https://doi.org/10.3926/hdbr.72>
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Thousand Oaks, CA: Sage.
<https://doi.org/10.15358/9783800653614>
- Henlein, M., & Kaplan, A. (2004). A beginner's guide to partial least squares analysis. *Understanding Statistics*, 3(4), 283-297.
https://doi.org/10.1207/s15328031us0304_4
- Henseler, J., Ringle, C., & Sinkovics, R. (2009). The Use of Partial Least Squares Path Modelling in International Marketing. *Advances in International Marketing*, 20, 277-320.
[https://doi.org/10.1108/S1474-7979\(2009\)0000020014](https://doi.org/10.1108/S1474-7979(2009)0000020014)
- Homburg, C., Jozić, D., & Kuehn, C. (2017). Customer experience management: toward implementing an evolving marketing concept. *Journal of the Academy of Marketing Science*, 45(3), 377-401.
[https://doi.org/10.1108/S1474-7979\(2009\)0000020014](https://doi.org/10.1108/S1474-7979(2009)0000020014)
- Hui, T. K., Wan, D., & Ho, A. (2007). Tourists' satisfaction, recommendation and Revisiting Singapore. *Tourism Management*, 28(4), 965-975.
<https://doi.org/10.1016/j.tourman.2006.08.008>
- Instituto Nacional de Estadística (2018). *Encuesta de Turismo de Residentes/FAMILITUR*. Madrid: INE.
- Jöreskog, K. G., & Wold, H. O. (1982). *Systems under indirect observation: Causality, structure, prediction*. North Holland.
- Kotler, P., Cámara, D., Grande, I., & Cruz, I. (2000). *Dirección de Marketing Turístico*. Madrid: Prentice Hall.
- Kozak, M. (2000). Comparative assessment of tourist satisfaction with destinations across two nationalities. *Tourism Management*, 22(4), 391-401.
[https://doi.org/10.1016/S0261-5177\(00\)00064-9](https://doi.org/10.1016/S0261-5177(00)00064-9)

- Kozak, M. (2001). Repeaters' behavior at two distinct destinations. *Annals of Tourism Research*, 28(3), 784-807. [https://doi.org/10.1016/S0160-7383\(00\)00078-5](https://doi.org/10.1016/S0160-7383(00)00078-5)
- Lara de Vicente, F., & López-Guzmán, T. J. (2004). El turismo como motor de desarrollo económico en ciudades patrimonio de la humanidad. *Pasos*, 2(2), 243-256. <https://doi.org/10.25145/j.pasos.2004.02.019>
- Liljander, V. (1994). Modeling perceived service quality using different comparison standards. *Journal of Consumer Satisfaction, Dissatisfaction and Complaining Behaviour*, 7, 126-142.
- Lončarić, D., Perišić Prodan, M., & Dlačić, J. (2019). The role of market mavens in co-creating tourist experiences and increasing loyalty to service providers. *Economic research-Ekonomska istraživanja*, 32(1), 2252-2268. <https://doi.org/10.1080/1331677X.2019.1645713>
- Mariani, M., & Baggio, R. (2012). Managing tourism in a changing world: Issues and cases. *Anatolia*, 23(1), 1-3. <https://doi.org/10.1080/13032917.2011.653636>
- Mason, C. H., & Perreault, W. D. (1991). Collinearity, power, and interpretation of multiple regression analysis. *Journal of Marketing Research*, 28(3), 268-280. <https://doi.org/10.1177/002224379102800302>
- Mkono, M. (2016). The reflexive tourist. *Annals of Tourism Research*, 57, 206-219. <https://doi.org/10.1016/j.annals.2016.01.004>
- Molina, A., Martín-Consuegra, D., Esteban, A., & Díaz, E. (2007). Segmentación de la demanda turística: un análisis aplicado a un destino de turismo cultural. *Revista de Análisis Turístico*, 4, 36-48.
- Moll de Alba Cabot, J., Prats, L., & Coromina, L. (2017). Análisis del comportamiento del turista de negocios en Barcelona. *PASOS. Revista de Turismo y Patrimonio Cultural*, 15(2), 419-435. <https://doi.org/10.25145/j.pasos.2017.15.027>
- Observatorio turístico del Grupo Ciudades Patrimonio de la Humanidad (2019). www.ciudadespatrimonio.org.
- Picos, A. P., & Fernández, M. D. (2005). Predicciones en el nivel de satisfacción percibida por los turistas a partir de las variables motivacionales y de la valoración de la vista. *Información Comercial Española, ICE: Revista de economía*, 821, 241-256.
- Pine, B. J. II, & Gilmore, J. H. (1998). *The Experience Economy: work is theatre and every business a stage*. Boston: Harvard Business School Press.
- Prado-Masculano, J. (2013). La lógica de las estadísticas de turismo en España y el papel del Instituto de Estudios Turísticos. *Revista de Estadística y Sociedad*, 56, 24-26.
- Pulido-Fernández, J. I., & Sánchez, M. (2010). Attitudes of the cultural tourist: a latent segmentation approach. *Journal of Cultural Economics*, 34(2), 111-129. <https://doi.org/10.1007/s10824-010-9115-1>
- Ringle, C., Wende, S., & Becker, J. (2015). *SmartPLS 3*. Boenningstedt: SmartPLS GmbH.
- Royo, M., & Serarols, C. (2005). El turismo rural-cultural: un modelo de gestión del marketing turístico a nivel local basado en la medida de la imagen del destino. *Cuadernos de Turismo*, 16, 197-222.
- Schmitt, B. H. (1999). *Experiential marketing*. New York: Free Press.
- Troitiño, M. A., Brandis, D., Del Río, I., De la Calle, M., Gutiérrez, J., & Martín, F. (2000). *El turismo cultural en las Ciudades Españolas con patrimonio de la Humanidad, en Turismo cultural: el patrimonio histórico como fuente de riqueza*. Valladolid: Fundación del Patrimonio Histórico de Castilla y León.
- Troitiño, M. Á., & Troitiño, L. (2009). Turismo y patrimonio en Castilla y León: las ciudades patrimonio de la humanidad (Ávila, Salamanca y Segovia) como destinos turísticos de referencia. *Polígonos*, 19, 145-178.
- Valiente, G. C., Forga, J. M. P., & Romero, A. B. (2016). Turismo en España, más allá del sol y la playa. Evolución reciente y cambios en los destinos de litoral hacia un turismo cultural. *Boletín de la Asociación de Geógrafos Españoles*, 71, 431-454.
- Valls, J. F. (2003). *Las claves del mercado turístico. Cómo competir en el nuevo entorno*. Zalla: Ed. Deusto.
- Wold, H. (1975). Path models with latent variables: The NIPALS approach. In *Quantitative sociology* (pp. 307-357). Academic Press. <https://doi.org/10.1016/B978-0-12-103950-9.50017-4>
- Yoon, Y., & Uysal, M. (2005). An Examination of the Effects of Motivation and Satisfaction on Destination Loyalty: A Structural Model. *Tourism Management*, 26(1), 45-56. <https://doi.org/10.1016/j.tourman.2003.08.016>
- Zeithaml, V., & Bitner, M. (2002). *Marketing de servicios: un enfoque de integración del cliente a la empresa*. México: McGraw-Hill / Interamericana de México. ☐

Planning and implementation of a study of times and methods in the Packaging Logistics Center (PLC) of industrial gas - analysis and standardization of production: A case study

Gustavo Andrés Araque González

Master's degree (M.S.) in Production Engineering, with a line of research in transport and logistics from Pontifical Catholic University of Rio de Janeiro (PUC-Rio). Professional in Industrial Engineering. Full-time Assistant Professor. College of Engineering, Design and Innovation FIDI. Grancolombian Polytechnic University Institution. Colombia. ORCID: [0000-0001-8627-8924](https://orcid.org/0000-0001-8627-8924).

Mauricio Gómez Vásquez

Master's degree (M.S.) in Science; Innovation in Education, with a line of research in education and quality assurance in ITM (Medellin). Professional in Instrumentation and Control Engineering. Full-time Assistant Professor (Coordinator of the Industrial Engineering Program). College of Engineering, Design and Innovation FIDI. Grancolombian Polytechnic University Institution. Colombia. ORCID: [0000-0001-5631-1252](https://orcid.org/0000-0001-5631-1252).

Juan Pablo Vélez Uribe

Master's degree (M.S.) in Engineering from the National University of Colombia. Professional in Mechanical Engineering. Full-time Assistant Professor. College of Engineering, Design and Innovation FIDI. Grancolombian Polytechnic University Institution. Colombia. ORCID: [0000-0002-0592-5622](https://orcid.org/0000-0002-0592-5622).

Albeiro Hernán Suárez Hernández

Master's degree (M.S.) in Science, with a specialization in Quality and Productivity from the TEC of Monterrey. Professional in Industrial Engineering. Full-time Assistant Professor. College of Engineering, Design and Innovation FIDI. Grancolombian Polytechnic University Institution. Colombia. ORCID: [0000-0001-8385-9037](https://orcid.org/0000-0001-8385-9037).

garaque@poligran.edu.co, mgomezva@poligran.edu.co, jpvelezu@poligran.edu.co, asuarez@poligran.edu.co

Received: February, 2020.

Accepted: April, 2020.

Published: June 2020.

Abstract

The industrial gasification operations sector has transformed the logistics of industrial processes in the production, distribution and supply of gas to customers, as a result of increased demand and market competitiveness. In the health sector, this type of behavior occurs on a daily basis, in order to meet the demand for medical gas (O₂) supply in hospitals. The present investigation offers a proposal for methodological-investigative-mixed development, in relation to the study of times and methods focused on a gas supply company, in an effort to standardize processes. This is presented in five main phases: 1) Initial production diagnosis, with the analysis of the current productive behavior; 2) characterization and planning of the production proposal of the company being investigated; 3) purification and statistical

treatment of information, analysis and sample intervention; 4) matrix construction and generation of production standards; 5) analysis of the results and presentation of the value proposition, through the application of engineering strategies and the cost-benefit ratio. The results obtained from the present investigation made it possible to optimize the operational times of the gas inspection process, filling of rack cylinders and mobile gas pumping by 14.72%, 6.46% and 8.02%, respectively.

Key words

Study of times and methods, standard time, medicinal gas (O₂), work design, production, industrial cost-benefit analysis.

How to cite this article

Araque González, G. A., Gómez Vásquez, M., Vélez Uribe, J. P., & Suárez Hernández, A. H. (2020). Planning and implementation of a study of times and methods in the Packaging Logistics Center (PLC) of industrial gas - analysis and standardization of production: A case study. *Harvard Deusto Business Research*, IX(1), 84-104. <https://doi.org/10.3926/hdbr.270>

This research examines the operating system at the Packaging Logistics Center (PLC) in the supply activities for bottled gas cylinders

1. Introduction

Industrial processes within organizations have a particular characteristic, namely, the constant demand for the energy required for the correct fulfillment of the processes involved in the transformation of raw materials into finished products. This type of fuel, in general, is characterized by being non-renewable, which makes it an interesting product to be considered in order to guarantee its use by future generations (Oliver & Mason, 2018). Based on this characteristic, investigations around the world are developing studies and strategies to improve the factors of effectiveness and efficiency for this type of industrial supply.

One of the consumable goods used in this type of industry, which constitutes the subject of our present research, is what is known as Medicinal Gas (O₂), a product in high demand by hospitals around the country. The integration of the finished product into the supply chain and the correct transport and distribution logistics strategy play an essential role in the correct functioning of the gasification operating system. The present research considers and analyzes the operating system used by the *Packaging Logistics Center* (PLC) in the supply activities for gas cylinders (bottling), and a study is conducted on the work performed during the operating processes and their correct execution, based on the times and methods study methodology.

The current problem presented by the *Packaging Logistics Center* (PLC) is the lack of a system for controlling, monitoring and standardizing the processing times for each of the activities that form part of the current logistics system. The opportunities for improvement and identification of non-productive times are studied and identified within the study and a proposal for an improvement plan is made, based on a brainstorming strategy, along with a proposal for the improvement of the associated techniques. The current productivity indicators quantify the information on finished products for each of the study areas. However, the lack of identification of the related activities as elements for the correct

The integration of the finished product into the supply chain and the transport and distribution logistics strategy play an essential role in the functioning of the gasification operating system

measurement of each of them necessitates the generation of more specific lines of measurement in order to identify the causes of non-productive times for the associated operations.

The present research is carried out in 5 main phases, the first of which is the *initial production diagnosis*, with the characterization of the production times registered by the organization and the measurement of the company's performance indicators for each of the study activities; in the second phase, the *characterization and planning of the production proposal* is performed, in which the main elements that make up the times study, needs identification and measurement elements are described; the third element refers to the *debugging and statistical processing of the data*, in which the normal behavior of the data is analyzed, the control limits are identified and the ideal sample sizes are determined in order to statistically guarantee the reliability of the study sample; the fourth element is known as the *elaboration of the matrix for the times and methods study and the generation of production standards*; this is based on the generation of the basic and standard observed time, considering the supplements of each of the activities being studied, as well as the characterization and the work rituals of the operators. Finally, the analysis of the results obtained and presentation of the value proposal is carried out, with the generation of the production indicators according to the times and methods study, comparative analysis with the organization's current indicators and generation of the value proposal, with the new production values according to the productivity of each of the departments in the study. The results of the present research allowed the identification of improvements to the work study, the characterization and determination of the activities that generate value within the organization's logistic process, the generation of a technological matrix to measure the performance of the activities, the generation of production standards, the study of causes of non-productive times and the implementation of proposals for improvement.

2. Methodology and research development

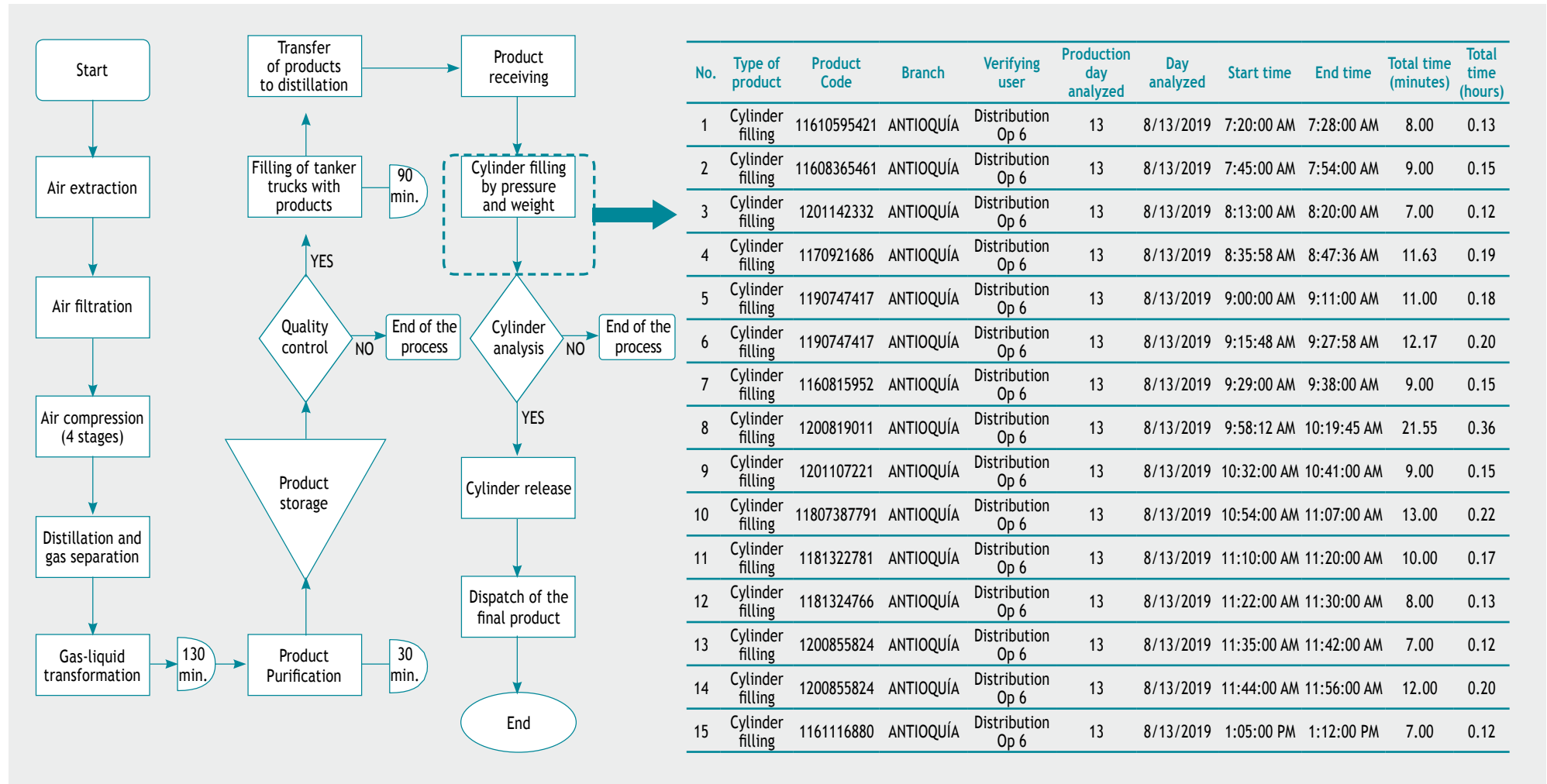
In this project, the methodology that has been developed consists of five phases, which were implemented over the course of 4 months. This information is presented below.

2.1. Phase I: Initial production diagnosis

During the first phase of the research process, the current production indicators were studied and the method of generating the data obtained was analyzed. A stopwatch was used to measure the times in order to analyze the Packaging Logistics Center (PLC); this procedure was carried out for each day, monthly, over the course of 6 months as the first step in the research and standardization of times. As a complement to the time recording, a direct observation was made to identify the main "non-productive" factors within each of the workstations: work ergonomics, product design, tolerances and specifications, the production process, tools and equipment, material handling and plant distribution. The description and characteristics of the data obtained are presented in Figure 1.

In the present research process, time information was collected for the rack cylinder filling, pipe quality inspection (cylinder analysis) and mobile gas pumping (filling of tanker trucks with products) activities. For each of the processes, the "qualified employees" were identified, characterized as being operators with average levels of production, a consistent level of work, knowledge of the activities carried out and a normal rate of work within the analyzed operating area (Niesel, Freivalds, Del, Ibarra & Ana, 2009).

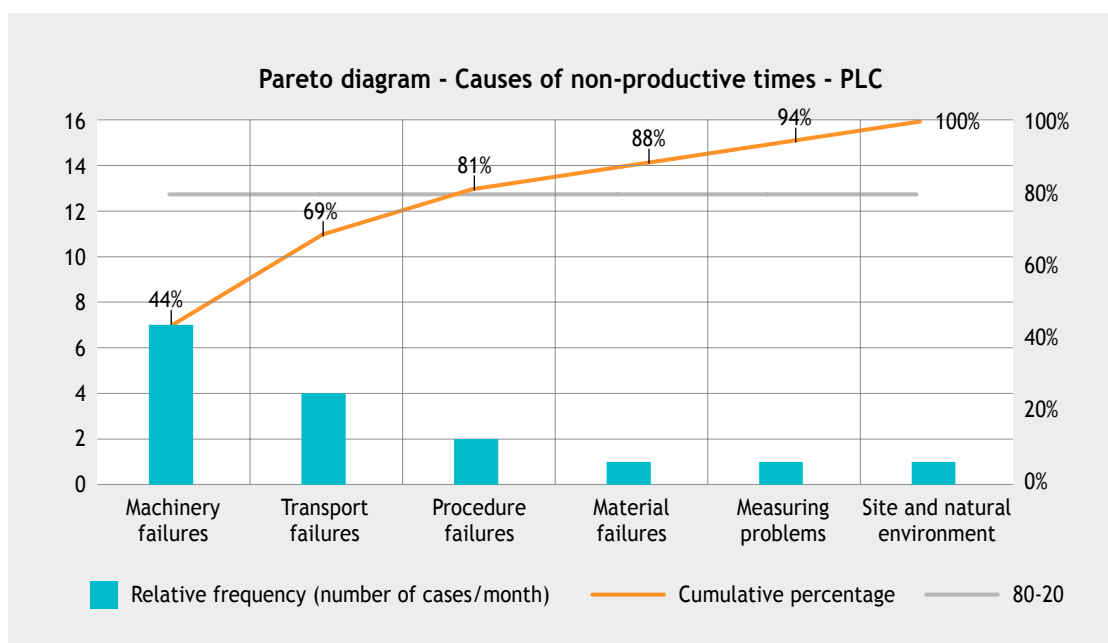
Figure 1
Description of the elements analyzed and example of data collection - Operator 6



In the present study, the main causes of non-productive time in the Packaging logistics process were analyzed and identified, as illustrated in Figure 2. The following 3 main shortcomings were identified within the process: First, *Machinery failures* (44% of non-productive causes), specifically in the rack cylinder filling activity, where the purge valves present deterioration, specifically due to the service life of this equipment. The above is presented based on the service life of the equipment and the lack of preventive maintenance, directly affecting the operating system and industrial process. This causes the workers to have to move to obtain a spare valve, affecting the filling process and its continuity.

Figure 2

Diagram of the causes of non-productive times - Packaging Logistics Center (PLC)



A second element identified within the processes is *transport failures* (25% of non-production causes); this situation occurs during the mobile gas pumping activity, as the result of the constant movement of the required cylinders from the production area to the distribution area, due to the lack of a ground pipeline transport system for this type of supply (O₂). The third element of non-productive times is due to *failures in operating procedures* (12% of non-productive causes), specifically for rack cylinder filling, pipe quality inspection and mobile gas pumping activities.

Based on the above information, the organization's administrative department has determined, together with the engineers from the operational area, the "rigid" time standards according to which the employee must perform the task on a daily basis and establishing the production and periodic monitoring indicators, as shown in Table 1. The processing times for each of the activities (total time in minutes) can be seen in the record for each area operator. For the present calculation, the maximum possible working time for each operator (minutes/day) is taken into account, according to their working hours (8 hours/day).

Table 1
Production Indicator - Rack cylinder filling activity - 2018

Type of product	Product Code	Branch	Verifying user	Production day analyzed	Start time	End time	TOTAL TIME (minutes)	Minutes/day	Average break (lunch time; break time)	Net time	Unit production/day	Production indicator
Cylinder filling	1201037114	ANTIOQUÍA	Distribution Op	1	2:14:00 PM	2:25:00 PM	11.00	480	85	395	36	40
Cylinder filling	1201022214	ANTIOQUÍA	Distribution Op	5	2:32:00 PM	2:41:00 PM	9.00	480	85	395	44	
Cylinder filling	1161144444	ANTIOQUÍA	Distribution Op	7	2:45:00 PM	3:00:00 PM	15.00	480	85	395	26	
Cylinder filling	1161144444	ANTIOQUÍA	Distribution Op	9	3:03:00 PM	3:12:00 PM	9.00	480	85	395	44	
Cylinder filling	1191104847	ANTIOQUÍA	Distribution Op	11	3:13:00 PM	3:21:00 PM	8.00	480	85	395	49	
Cylinder filling	1191104847	ANTIOQUÍA	Distribution Op	15	3:25:00 PM	3:34:00 PM	9.00	480	85	395	44	
Cylinder filling	1191104847	ANTIOQUÍA	Distribution Op	18	3:36:00 PM	3:48:00 PM	12.00	480	85	395	33	
Cylinder filling	1191104847	ANTIOQUÍA	Distribution Op	21	3:50:00 PM	4:00:00 PM	10.00	480	85	395	40	
Cylinder filling	1201149661	ANTIOQUÍA	Distribution Op	24	4:01:00 PM	4:10:00 PM	9.00	480	85	395	44	
Cylinder filling	1201149661	ANTIOQUÍA	Distribution Op	27	4:12:00 PM	4:21:00 PM	9.00	480	85	395	44	
Cylinder filling	1181320461	ANTIOQUÍA	Distribution Op	30	4:24:00 PM	4:34:00 PM	10.00	480	85	395	39	

2.2. Phase II: Characterization and production planning

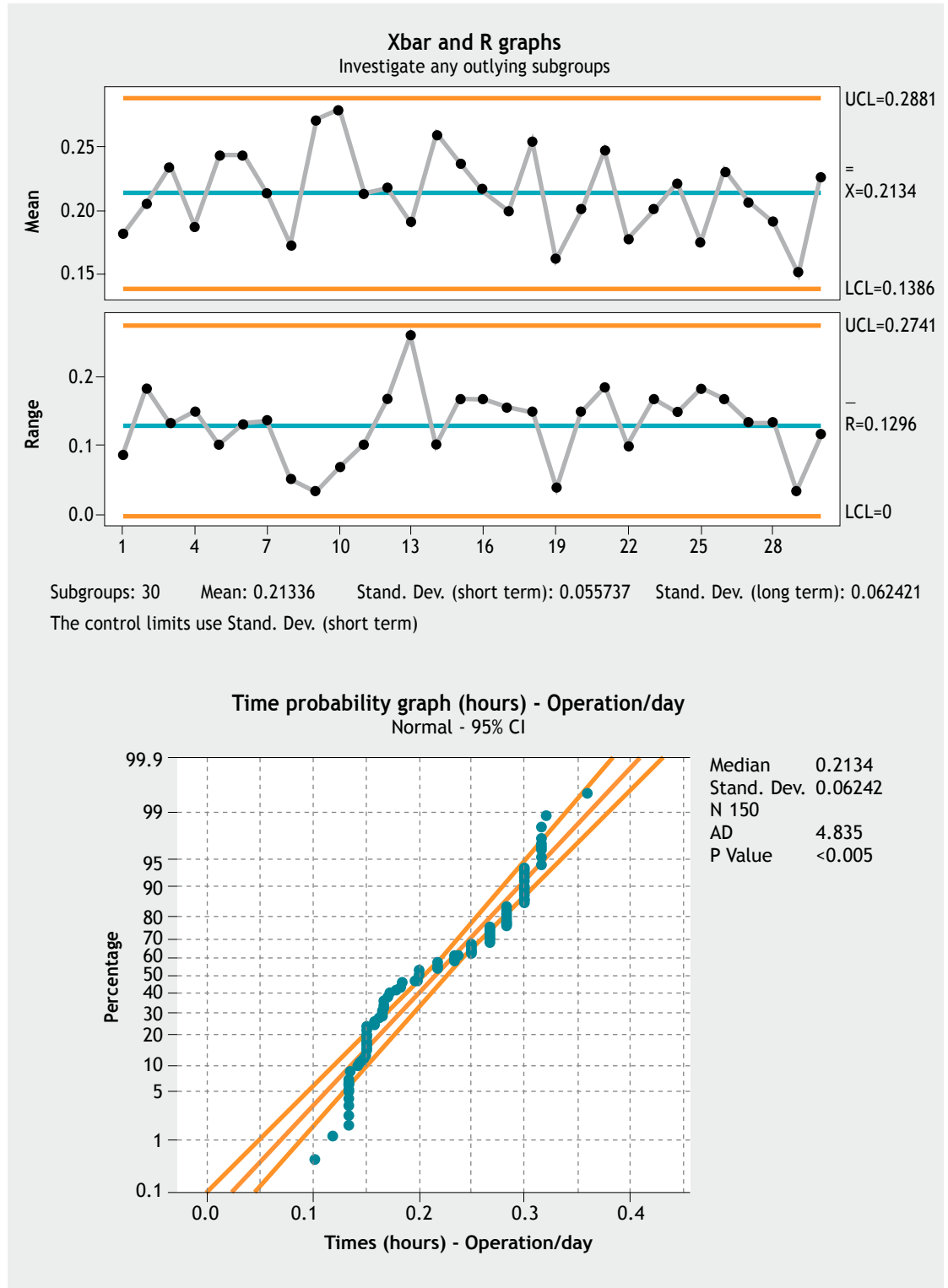
2.2.1. Identification of study data

The first analysis generated from the present research is the study of the data obtained as a result of productivity measurements in each of the analyzed areas. Once the study samples were obtained, a statistical analysis was carried out, with the aim of measuring their status, analyzing levels of dispersion and trends in relation to the normal behavior of the data, as shown in Figure 3.

In this graph, the ratio of the historical average processing time per day (hh/un) analyzed for employees performing the rack cylinder filling activity can be seen over a time interval of 30 days of production operation (*subgroups*). As can be seen, the data does not follow a pattern that can be associated with normal behavior (value $p < 0.005$), which is caused by the lack of systematized procedures for the performance of the activities involved in each of the areas of study. According to the behavior of the data, the reference time values are within the related control intervals (UCL=0.2881; LCL=0.1386), evidencing that a statistical process control (SPC) is occurring (Cortés Martínez, Lobelles-Sardiñas & López-Bastida, 2019), since the associated values are within the range and interval of permissible values for the operating times by the operators. However, values with high variability, such as the value for day 13 (0.28 hrs), for example, can generate shortcomings in future time intervals in terms of the accuracy of the standardized processes, limiting the improvement and evolution of the design and the study of analyzed work. From the present information, improvement opportunities were identified in

Figure 3

Production Control Chart of the cylinder filling activity - Packaging Logistics Center (PLC)



One of the techniques used was the standardization adjustment by calculating moving averages

relation to obtaining a standardized system: when analyzing the range of data ($R=0.1296$), it can be seen that there is a considerable range of data dispersion for the study sample. In accordance with the above, if the objective is to manage productivity factors within organizations, it is necessary to minimize the R value within the study in order to achieve specific measures of accuracy in the monitoring and control of the activities. The previous analysis is carried out for the complementary areas of pipe quality inspection and mobile gas pumping for each of the operators selected within the present investigation.

2.2.2. Initial processing of study information

A second element considered within this research is the processing and retrieval of study information. One of the exposed techniques used for the recovery of the data is known as the moving average standardization adjustment technique (least squares adjustment), as explained by (Rodríguez, Suazo & Santelices, 2016) and shown in Figure 4.

Figure 4

Example of least squares adjustment and the initial processing of information - Packaging Logistics Center (PLC)

Interaction 1							
Mean	0.131976583	0.05	0.03333333	0.01666667	0.01666667	0.05	0.03333333
Stand. Dev.	0.249771339	0.04547653	0.078361	0.06666667	0.05	0.8	0.05
Min.	-0.242680425	0.04547653	0.9	0.01666667	0.078361	0.01666667	0.03333333
Max.	0.506633592	0.04547653	0.01666667	0.03333333	0.6	0.04547653	0.04547653

Interaction 2							
Mean	0.052640323	0.05	0.03333333	0.01666667	0.01666667	0.05	0.03333333
Stand. Dev.	0.035292945	0.04547653	0.078361	0.06666667	0.05	0.13197658	0.05
Min.	-0.000299095	0.04547653	0.13197658	0.01666667	0.078361	0.01666667	0.03333333
Max.	0.1055797741	0.04547653	0.01666667	0.03333333	0.13197658	0.04547653	0.04547653

Interaction 3							
Mean	0.04272329	0.05	0.03333333	0.01666667	0.01666667	0.05	0.03333333
Stand. Dev.	0.017943811	0.04547653	0.078361	0.06666667	0.05	0.05264032	0.05
Min.	0.015807574	0.04547653	0.05264032	0.01666667	0.078361	0.01666667	0.03333333
Max.	0.069639007	0.04547653	0.01666667	0.03333333	0.05264032	0.04547653	0.04547653

An example of random data retrieval in the analyzed samples is illustrated in Figure 4. As can be seen, three reference values are presented that fall outside the data series and their control limits (0.6, 0.8, 0.9). According to the sample size of the study, the average and standard deviation are calculated, accompanied by the lower and upper limits in which they are found (Min., Max.). The interactions necessary for the retrieval of the values are performed until the entry of the related values in the lower and upper limit range is obtained, as can be seen in Interaction 3 for the related values.

2.3. Phase III: Statistical analysis of study information

The input data illustrated in Figure 4 allow us to identify the levels of dispersion associated with the study sample. To minimize this type of data characteristic and obtain values that fit the standards required for the present study (Niebel et al., 2009 and Arias-Gómez, Villasís-Keever & Miranda-Novales, n.d.) highlighted their importance as the first element in a pilot study, i.e., “random sampling and behavioral analysis of the present study data, so that all elements of the

population have the same probability of being included in the study,” according to the following equation:

$$n = \left[\frac{40 \sqrt{n' \sum X^2 - (\sum X)^2}}{\sum X} \right]^2 \quad (1)$$

Where:

n = Sample size to be calculated
 n' = Number of preliminary study observations
 X = Value of observations
 Σ = Sum of the data

Equation number 1 makes it possible to determine, from a defined data set (random sample extraction), the sample size that must be considered in order to achieve statistically adequate levels of confidence in the experimental research work. From the mathematical calculation (Macgowan & Wong, 2017; Mellor et al., 2011) established that a 95% confidence level and a 5% margin of error can be achieved from the quantitative application presented in Equation 1. In the case of the present research, the extraction of 30 data items for each of the workers and respective sample size calculation is carried out, as illustrated in Figure 5.

Figure 5

Sample size calculation Operator 6 - rack cylinder filling - Packaging Logistics Center (PLC)

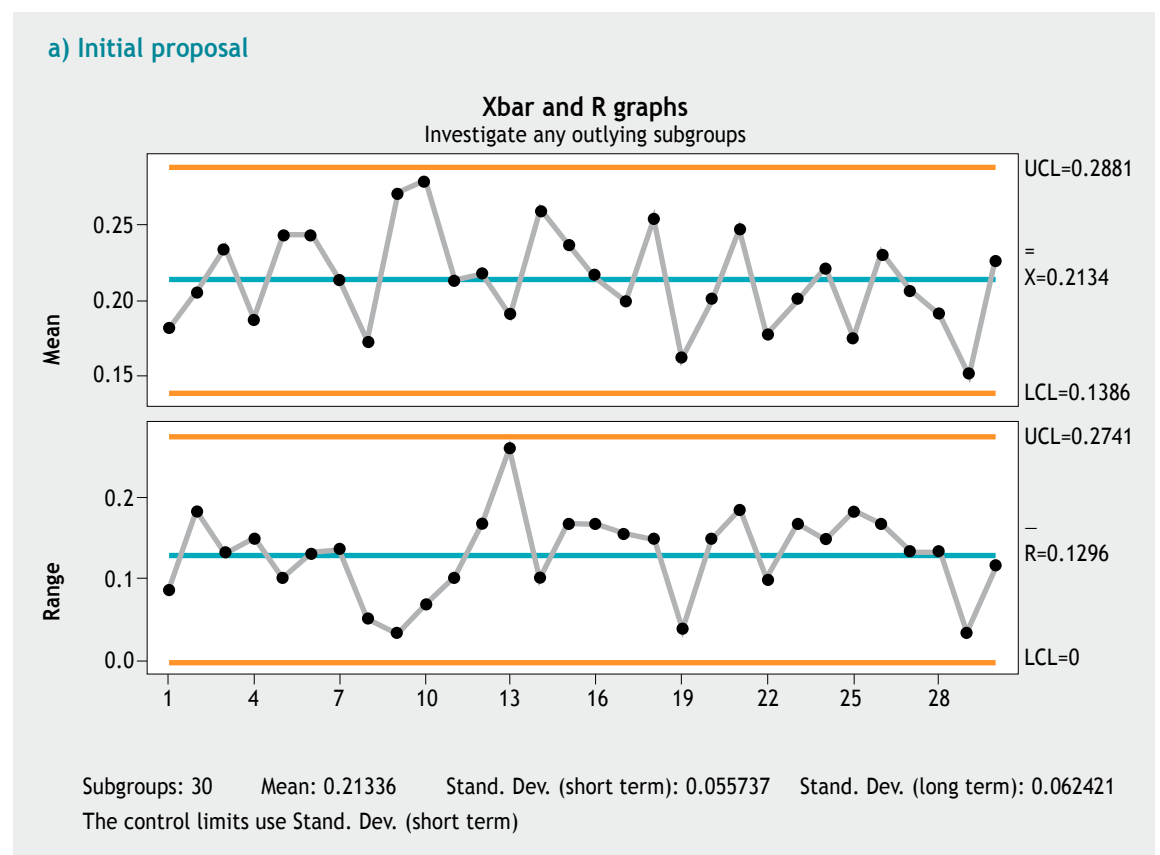
	User	n'	X	X ²	
Mean	Distribution Op 6	1	0.13	0.02	
0.16	Distribution Op 6	2	0.15	0.02	
Stand. Dev.	Distribution Op 6	3	0.12	0.01	
0.052296309	Distribution Op 6	4	0.19	0.04	
Max.	Distribution Op 6	5	0.18	0.03	
0.23586113	Distribution Op 6	6	0.20	0.04	
Min.	Distribution Op 6	7	0.15	0.02	
0.078972203	Distribution Op 6	8	0.36	0.13	
	Distribution Op 6	9	0.15	0.02	
	Distribution Op 6	10	0.22	0.05	
Day 1	Distribution Op 6	11	0.17	0.03	
	Distribution Op 6	12	0.13	0.02	
	Distribution Op 6	13	0.12	0.01	
	Distribution Op 6	14	0.20	0.04	
	Distribution Op 6	15	0.12	0.01	
	Distribution Op 6	16	0.15	0.02	
	Distribution Op 6	17	0.12	0.01	
	Distribution Op 6	18	0.13	0.02	
	Distribution Op 6	19	0.17	0.03	
	Distribution Op 6	20	0.13	0.02	
	Distribution Op 6	21	0.15	0.02	
	Distribution Op 6	22	0.25	0.06	
	Distribution Op 6	23	0.12	0.01	
	Distribution Op 6	24	0.13	0.02	
	Distribution Op 6	25	0.15	0.02	
	Distribution Op 6	26	0.12	0.01	
	Distribution Op 6	27	0.17	0.03	
	Distribution Op 6	28	0.12	0.01	
	Distribution Op 6	29	0.15	0.02	
	Distribution Op 6	30	0.08	0.01	
	Σ	30	4.72	0.82	
					n 171
Therefore, another 171 must be added to the 30 initial data items					
	Total n		201		

Observations of data behavior and study sample extraction in relation to processing times for rack filling, quality inspections and gas cylinder vacuum filling activities were performed for the study employees in the research time interval. Figure 5 shows an example of the 30 data items obtained for Operator 6 in the rack filling activity (value X). From this information and considering Equation 1, the sample size is calculated (n) to statistically guarantee the reliability of the data (95% confidence, 5% margin of error); it can be seen that 171 operating time records must be taken for Operator 6 to guarantee this statistical objective; as a conclusion, the total sample includes the 30 initial input data items and the 171 data items calculated from Equation 1, generating as a result the 201 total data items for the specific case of the work being studied (Total n).

Once the above observations are made, the total samples are taken and recorded (Total n) for the workers in the related areas, and the operating data for the period of time being analyzed (30 days for 6 months) are generated. This information is recorded again in the times study templates, and the new processing values for the activities are calculated. According to the present investigation and the processing times, the requested data are extracted directly from the records obtained from the biennial study of the field work, applying the times recorded for each operator. The processing values of the activities with their respective statistical processing are illustrated in Figure 6.

Figure 6

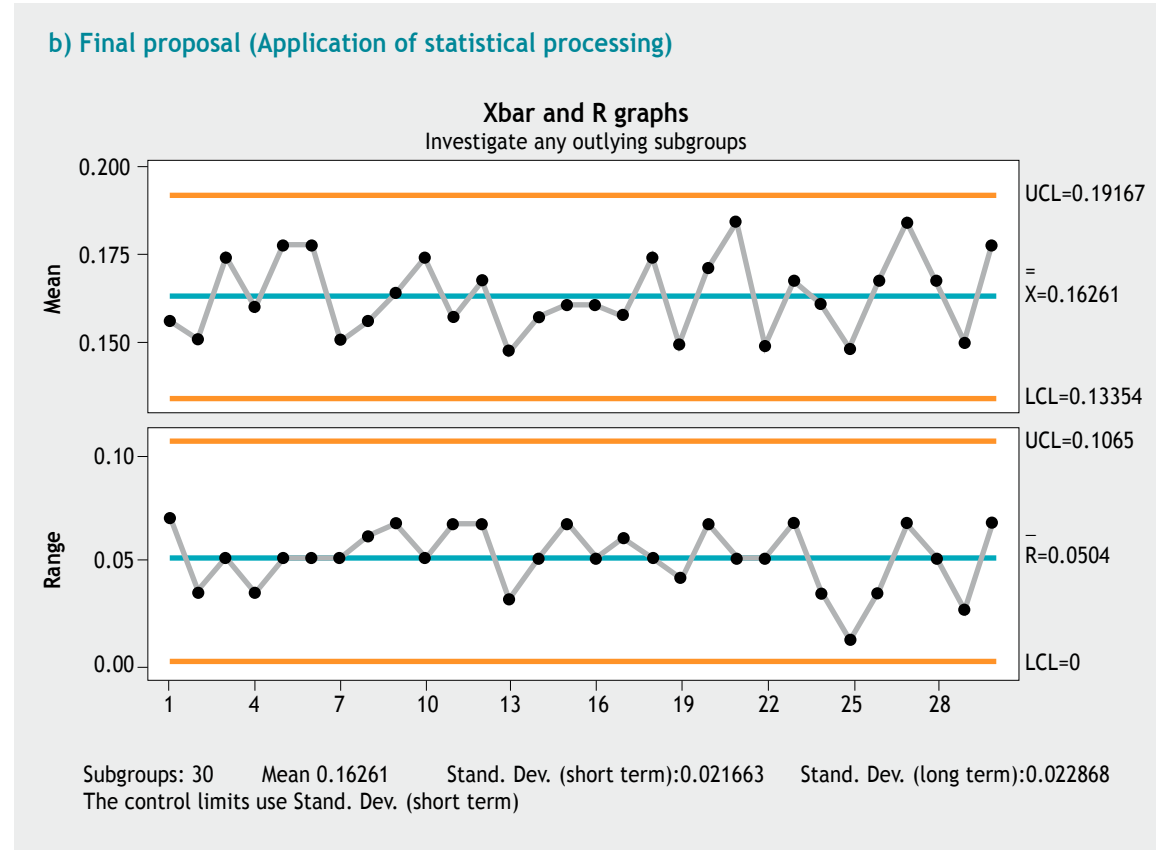
Production Control Chart of the cylinder filling activity - Packaging Logistics Center (PLC)



The initial ($R=0.1296$) and final ($R=0.0504$) dispersion curves are minimized by 61% in the analyzed data

Figure 6 (continued)

Production Control Chart of the cylinder filling activity - Packaging Logistics Center (PLC)



According to the previous results, it can be seen that the initial ($R=0.1296$) and final ($R=0.0504$) dispersion curves are minimized by 61%, according to the difference in the range of the analyzed data, once the statistical processing of the information has been carried out. This, in turn, results in the upper control limit ($UCL=0.19167$) and the lower control limit ($LCL=0.13354$) being lower than the results analyzed in the initial sample. The above is presented as a consequence of the sample size necessary to achieve the desired confidence levels, generating a more specific adjustment of the information obtained. In Figure 6, it can be seen how the production peaks (for example, the range values on day 13 and day 19) present a lower dispersion in relation to the data initially exposed, generating more precise and measurable values within these time periods. The opposite occurs on day 25, where the results point to an increase in the dispersion of data (range); this is caused by the variations in tasks that occur within the activities analyzed at the end of the month, as a result of the increase in activities within the logistics department and the generation of more work within the area of study.

2.4. Phase IV: Construction of the initial matrix: observed and basic times

One of the essential phases within this research is the generation of the times and methods study matrix for the analysis of the recorded data and obtaining the desired production standards for each of the areas analyzed. Records of the operating times for each of the activities are shown in Figure 7 for each of the operators, in each of the months analyzed.

Figure 7

Initial times and methods study matrix - Observed Time and Basic Time Calculation - Packaging Logistics Center (PLC)

ACTIVITY #	ELEMENT-PROCESS DESCRIPTION	OPERATOR	RATING SCALE	Times (hours) - Average Operation/day											Observed time	Basic time
				1	8	13	17	19	22	25	29	F	N			
1	Quality Inspection - piping	Distribution Op 1	1	0.24	0.24	0.26	0.27	0.28	0.26	0.27	0.28	1	65	0.26	0.26	
2	Quality Inspection - piping	Distribution Op 2	1	0.24	0.25	0.25	0.24	0.25	0.24	0.23	0.25	1	81	0.24	0.24	
3	Quality Inspection - piping	Distribution Op 3	1	0.21	0.24	0.26	0.28	0.25	0.25	0.25	0.23	1	104	0.25	0.25	
4	Quality Inspection - piping	Distribution Op 4	1	0.23	0.22	0.25	0.24	0.21	0.21	0.24	0.20	1	137	0.23	0.23	
5	Quality Inspection - piping	Distribution Op 5	1	0.22	0.24	0.24	0.25	0.26	0.27	0.23	0.24	1	120	0.24	0.24	
6	Rack cylinder filling	Distribution Op 6	1	0.14	0.15	0.13	0.13	0.14	0.15	0.14	0.15	1	201	0.14	0.14	
7	Rack cylinder filling	Distribution Op 7	1	0.13	0.12	0.15	0.14	0.13	0.12	0.15	0.16	1	317	0.14	0.14	
8	Rack cylinder filling	Distribution Op 8	1	0.20	0.15	0.14	0.16	0.15	0.17	0.15	0.16	1	403	0.16	0.16	
9	Rack cylinder filling	Distribution Op 9	1	0.16	0.18	0.15	0.16	0.16	0.13	0.15	0.14	1	92	0.15	0.15	
10	Rack cylinder filling	Distribution Op 10	1	0.15	0.18	0.16	0.19	0.17	0.17	0.15	0.15	1	134	0.16	0.16	
11	Mobile Gas pumping	Distribution Op 11	0.8	0.19	0.22	0.20	0.20	0.19	0.23	0.19	0.21	1	89	0.20	0.16	
12	Mobile Gas pumping	Distribution Op 12	0.8	0.16	0.22	0.21	0.25	0.16	0.23	0.22	0.18	1	226	0.20	0.16	
13	Mobile Gas pumping	Distribution Op 13	0.8	0.17	0.15	0.14	0.16	0.18	0.19	0.16	0.19	1	148	0.17	0.13	
14	Mobile Gas pumping	Distribution Op 14	1	0.18	0.19	0.18	0.18	0.19	0.19	0.18	0.19	1	172	0.19	0.19	
15	Mobile Gas pumping	Distribution Op 15	0.8	0.16	0.19	0.18	0.17	0.17	0.16	0.15	0.15	1	156	0.17	0.13	

Figure 7 illustrates the template and time recording of each of the operators for one month of analysis. According to the information obtained previously, 5 operators were analyzed for each of the activities being studied (quality/piping inspection, rack cylinder filling, mobile gas pumping). Within the PLC logistics department, a study was carried out with the production manager in relation to the work rate of each of the study participants (*Assessment Scale*) in order to identify the speed with which the work is performed by each of the operators. The calculation of this type of elements is established according to the assessment of the processing of the activities and the historical records kept at the organization. The historical records of operating time (*Times (Hours) - average operation/day*) is illustrated for each of the employees on each of the days analyzed: the information is recorded for the 30 days of work of each of the operators during the 6 months of the study and is presented in a summarized form, as shown in the example of the present template, with the values referring to days 1, 8, 13, 17, 19, 22, 25 and 29 of work. The F value of the study refers to the number of units analyzed per unit of time; in this case each gas cylinder has its own independent operating time, so it is assigned a value of 1. The total sample size of the statistical treatment is known as the N value in the number of replications to be taken for each day of operation, for each operator. As can be seen, this sample size value varies for each type of person, associating the behavior of the operating data for each of them with the associated dispersion measures. Finally, calculations of *Observed Time (O.T.)* and *Basic Time (B.T.)* are made, based on the following equations:

$$O.T. = \frac{\sum_{i=1}^n X_i}{n} \quad (2)$$

$$B.T. = [O.T.] * [Assessment Scale] \quad (3)$$

The International Labour Organization (ILO) has determined a schedule with the main supplements for the workstation

The values for Equations 2 and 3 presented above allow the calculations to be identified that are associated with the processing times of each of the operators. The Observed time is known as “rigid” operating time, the characteristic of which does not take into account any factor or element pertaining to the design of the workstation or characteristics of the operator. In the case of Equation 3, the assessment scale for each of the workers is considered, according to their motor skills in performing the assigned functions.

2.5. Phase V: Study of time tolerances at the workstation: Supplements

Within the times and methods study, one of the main activities for the correct investigation of the workstation design involves breaking down the activities to be performed by each of the employees, in relation to the profile required within the company. When a process of immersion and study of the activities of the workstation is initiated, (Novillo, Álvarez & Zurita, n.d.) argue that three fundamental elements must be considered for correct performance at the workstation: education, the ability of the human body and training. And it is with regard to this last element that organizations nowadays seek to generate “real” production indicators in business decision-making. The International Labour Organization (ILO) has determined, according to previous studies, a schedule with the main supplements for the workstation, which are listed below (Estellés, Palmer, Albarracín & Romano, 2013).

Figure 8

Supplement matrix - International Labour Organization (ILO)

CONSTANT SUPPLEMENTS			
		Men	Women
1	For personal needs	5	7
2	Fatigue-based	4	4
VARIABLE SUPPLEMENTS			
		Men	Women
3	Due to working in a standing position	2	4
4	Due to abnormal posture		
	Slightly uncomfortable	0	1
	Uncomfortable (inclined)	2	3
	Very uncomfortable (lying down, stretched out)	7	7
5	Use of force or muscular energy (lifting, pulling, pushing). Weight lifted in kilos		
	2.5	0	1
	5	1	2
	7.5	2	3
	10	3	4
	12.5	4	6
	15	5	8
	17.5	7	10
	20	9	13
	22.5	11	16
	25	13	20
	30	17	max.
	35.5	22	

6	Poor lighting		
	Slightly below the calculated power	0	0
	Well below	2	2
	Absolutely insufficient	5	5
7	Atmospheric conditions (variable heat and humidity)	0-10	0-10
8	Intense concentration		
	Work with a certain degree of precision	0	0
	Precise or tiring work	2	2
	High-precision work	5	5
9	Noise		
	Continuous	0	0
	Intermittent and loud	2	2
	Intermittent and very loud	5	5
	Shrill and loud	5	5
10	Mental stress		
	Moderately complex process	1	1
	Complex process - attention divided among many projects	4	4
	Very complex process	8	8
11	Monotony		
	Slightly monotonous work	0	0
	Fairly monotonous work	1	1
	Very monotonous work	4	4
12	Tedium		
	Slightly boring work	0	0
	Boring work	2	2
	Very boring work	5	5

Source: Estellés et al., 2013.

A performance measurement is generated for each employee

The supplements matrix shown in Figure 8 is divided into two main categories: The first refers to *constant supplements*, which are the time factors present at the workstation on a permanent basis: 1) *for personal needs*, in relation to the time that the employee requests to use the restroom, advice in relation to the execution of specific tasks or any situation other than the performance of the work activities; 2) *fatigue-based*, where the performance of work activities generates as a result both physical and mental exhaustion, which must be considered in the study tolerance.

A second category in the matrix is the *constant supplements*, which are characterized by being values present at the workstation, in which the proportions (%) assigned vary according to the type of work and the way in which it is performed. The categories within this type of supplements are: 3) working in a standing position, 4) abnormal posture, 5) use of force or muscular energy, 6) poor lighting, 7) atmospheric conditions, 8) intense concentration, 9) noise, 10) mental stress, 11) monotony, and 12) tedium. The factors of the previous supplements were analyzed and studied at each workstation, in the company of the production coordinator and in relation to the gender and population being studied. The results are shown in Figure 9.

The results shown in Figure 9 illustrate the results of the supplement studies for the activities investigated within the company. The determination of the constant supplements is made according to the gender of the worker (male/female); within the workstations, activities were identified where the tasks were performed in a standing position by the participants over a

Figure 9
Supplements matrix - Packaging Logistics Center (PLC)

		SUPPLEMENT(S) MATRIX												Total	Supplement (%)
		Constants				Variables									
Activity	Name	1	2	3	4	5	6	7	8	9	10	11	12	Total	Supplement (%)
Quality Inspection - piping	Distribution Op 1	7	4	4	2	0	0	0	0	0	1	0	2	20	1.2
Quality Inspection - piping	Distribution Op 2	7	4	4	2	0	0	0	0	0	1	0	2	20	1.2
Quality Inspection - piping	Distribution Op 3	5	4	2	3	0	0	0	0	0	1	0	2	17	1.17
Quality Inspection - piping	Distribution Op 4	5	4	2	3	0	0	0	0	0	1	0	2	17	1.17
Quality Inspection - piping	Distribution Op 5	5	4	2	3	0	0	0	0	0	1	0	2	17	1.17

		SUPPLEMENT(S) MATRIX												Total	Supplement (%)
		Constants				Variables									
Activity	Name	1	2	3	4	5	6	7	8	9	10	11	12	Total	Supplement (%)
Rack cylinder filling	Distribution Op 6	5	4	2	0	0	0	0	0	2	0	1	0	14	1.14
Rack cylinder filling	Distribution Op 7	5	4	2	0	0	0	0	0	2	0	1	0	14	1.14
Rack cylinder filling	Distribution Op 8	7	4	4	1	0	0	0	0	2	0	1	0	19	1.19
Rack cylinder filling	Distribution Op 9	7	4	4	1	0	0	0	0	2	0	1	0	19	1.19
Rack cylinder filling	Distribution Op 10	5	4	2	0	0	0	0	0	2	0	1	0	14	1.14

		SUPPLEMENT(S) MATRIX												Total	Supplement (%)
		Constants				Variables									
Activity	Name	1	2	3	4	5	6	7	8	9	10	11	12	Total	Supplement (%)
Mobile gas pumping	Distribution Op 11	7	4	4	0	4	0	0	0	0	0	1	2	22	1.22
Mobile gas pumping	Distribution Op 12	5	4	2	0	3	0	0	0	0	0	1	2	17	1.17
Mobile gas pumping	Distribution Op 13	5	4	2	0	3	0	0	0	0	0	1	2	17	1.17
Mobile gas pumping	Distribution Op 14	7	4	4	0	4	0	0	0	0	0	1	2	22	1.22
Mobile gas pumping	Distribution Op 15	5	4	2	0	3	0	0	0	0	0	1	2	17	1.17

The current problem presented by the 'Packaging Logistics Center' (PLC) is the lack of a system for controlling, monitoring and standardizing of the processing times

considerable period of time, resulting in the values for each of the tasks presented. In the case of Factor 4, shortcomings were identified in the ergonomic designs of the workstation (chairs) for the quality inspection (piping) and rack cylinder filling activities. For Factor 10, the study was carried out and it was found that the inspection of gas cylinders requires a considerable degree of attention for its correct execution, specifically during the gas inspection activity. The characteristic of monotony of the work is present in the rack cylinder filling and mobile gas pumping tasks. Finally, and according to the study with personnel and operation coordination, the levels of motivation of those in charge were studied, with the results shown for Factor 12.

2.6. Phase VI: Matrix development in the times and methods study

In this research stage, the production standards corresponding to the operating times for each of the employees are analyzed and determined, including the supplements (%) in relation to the time tolerances within the work study. As a preliminary analysis, a detailed study of each of the activities performed at the workstation is carried out, using the engineering tool for the creation of detailed flow charts. The operational sequence, persons responsible, associated times and distances, wait times, storage, quality inspections and mobilized loads are described. Once the previous elements have been identified in each of the study times, the Standard Time (ST) (hours/unit) and Standard Units (SU) (units/hour) are calculated within the time matrix, based on the following equations:

$$S.T. = B.T. * [Supplement] \quad (4)$$

$$S.U. = [T.E.]^{-1} \quad (5)$$

Once the results are obtained from Equations 4 and 5, the performance indicators for each of the operators within each of the activities in this study are analyzed. A measurement of the performance values (number of units/month) produced by each of the employees is generated and compared to the results of the indicators established by the organization within the study. The results are shown in Figure 10.

The results shown in Figure 10 illustrate the standard operating time (ST) (worker performance) in relation to the time taken by the operator, according to the times study within the observations made. This type of indicator establishes the real operating time of the worker in the correct performance of the task, in each area of study: quality inspection, rack cylinder filling and mobile gas pumping. In addition, the organization's target indicator is illustrated, which relates the production indicators established by the organization, according to the methodology presented in Table 1, to the production ratio projected in an operating time of 24 days/month. When analyzing the performance of the *pipe quality inspection* activity, it can be seen that the organization's target indicator (720 units/month) is achieved by Operator 4 within this process, with a production performance of 768 units; Operators 1, 2, 3 and 5 fail to comply with this target, with production performance values of 576 units, respectively. Within the analysis carried out for the *rack cylinder filling* activity, there is evidence of a degree of compliance higher than that established by the organization's target goal by Operators 6, 7, 8, 9 and 10, with production values of 1052, 1066, 990, 974 and 1028 units/month, respectively. For this specific analysis case, and according to the results achieved, immersion and research with the employees is carried out to promote good manufacturing practices for the evolution of the performance of the operation being analyzed and the continuous

Figure 10

Standard Operating Time Results - Packaging Logistics Center (PLC)



improvement of the production standard for each of the processes analyzed. Finally, the analysis for the *mobile gas pumping* activity is presented, where it is shown that the goal was reached in 80% of the cases, the standard production values of which for Operators 11, 12, 13 and 15 were 960, 1152, 1152 and 1152 units/month, respectively; the non-compliance of one of the employees (worker 14) was evidenced, with a production performance of 768 units/month.

Different strategies are established to improve rates of work

2.7. Phase VII: Analysis of the results, generation of the production standards and presentation of the value proposal

Within the matrix analysis and the generation and development of the times and methods study, it is important to highlight the identification of needs and opportunities for each of the study activities. The analysis of the causes of non-productive factors within the organization is presented in the Pareto diagram in Figure 2. According to the above, it can be identified that 80% of the causes of non-productive times are due to machinery, transport and procedures failures, with values of 44%, 25% and 12%, respectively. In the solution and minimization of the results of the non-productive times identified, a list was made with the main proposals for improvement, according to the in situ surveying and the generation of solution proposals. The results are presented in Table 2.

Table 2

Solutions strategy matrix - Packaging Logistics Center (PLC)

Area	Cause - Pareto	Cumulative percentage	Causal description	Improvement strategy
Rack cylinder filling	Machinery failures	44%	The purge valves present deterioration, due to the lack of preventive maintenance plans, directly affecting the operating system and industrial process. This causes the operator to have to move to obtain a replacement valve, which affects the filling process and its continuity. (Average travel time per day: 6 minutes/day).	1. Change and replacement of rack equipment valves for cylinder filling, to optimize the process.
			The gas transfer connectors are deteriorated, due to the lack of quality and guarantees of the products offered by the suppliers. They must use temporary connectors and go to the warehouse to get them. (Average travel time per day: 3 minutes/day).	2. Change and replacement of product connectors for cylinder filling, to optimize the process.
Mobile gas pumping	Transport failures	69%	There are constant repetitive movements from the production area to the distribution area (Area 8). (Average travel time per day: 120 minutes/day/operator).	3. Ground pipeline direct supply system from the warehouse area (raw material) - production - distribution system.
Rack cylinder filling/ piping inspection/ mobile pumping	Procedure failures	81%	There are problems in determining standards to control the production of the organization's workforce. There is no systematic control of the production indicators for each of the operators. Bottlenecks are created within the production line.	4. Determination of production standards and calculation of ideal production levels, according to the times and movements study.

According to the results obtained, various types of strategies are established that must be implemented within the organization to improve work rates and increase the productivity of the department, based on regular training, the study of procedures, standards, product analysis and the study of efficient work methods, among others. The above analysis is carried out for all the activities in the present investigation. The results are shown in Table 3.

Table 3

Matrix of standard production indicators - Packaging Logistics Center (PLC)

Activity	Operator	Activity performance (monthly)	Organization target (monthly)	Percentage of compliance	Ideal activity performance (monthly)	Compliance indicator (times study)
Quality Inspection - piping	Distribution Op 1	↓ 576	720	80%	614	NON-COMPLIANT
Quality Inspection - piping	Distribution Op 2	↓ 576	720	80%		NON-COMPLIANT
Quality Inspection - piping	Distribution Op 3	↓ 576	720	80%		NON-COMPLIANT
Quality Inspection - piping	Distribution Op 4	↑ 768	720	107%		COMPLIANT
Quality Inspection - piping	Distribution Op 5	↓ 576	720	80%		NON-COMPLIANT
Rack cylinder filling	Distribution Op 6	↑ 1,052	960	110%	1,022	COMPLIANT
Rack cylinder filling	Distribution Op 7	↑ 1,066	960	111%		COMPLIANT
Rack cylinder filling	Distribution Op 8	↓ 990	960	103%		NON-COMPLIANT
Rack cylinder filling	Distribution Op 9	↓ 974	960	101%		NON-COMPLIANT
Rack cylinder filling	Distribution Op 10	→ 1.028	960	107%		COMPLIANT
Mobile gas pumping	Distribution Op 11	↓ 960	960	100%	1,037	NON-COMPLIANT
Mobile gas pumping	Distribution Op 12	↑ 1,152	960	120%		COMPLIANT
Mobile gas pumping	Distribution Op 13	↑ 1,152	960	120%		COMPLIANT
Mobile gas pumping	Distribution Op 14	↓ 768	960	80%		NON-COMPLIANT
Mobile gas pumping	Distribution Op 15	↑ 1,152	960	120%		COMPLIANT

Table 3 shows the total results in relation to the production indicators for the Packaging Logistics Center (PLC). As can be seen in the quality inspection-piping area, there is a lack of compliance in relation to the ideal production performance by 80% of the workers. Activity performance indicators vary by 80% for operators 1, 2, 3 and 5, respectively. According to the above, the administrative department of the company has decided, in the present case, to continue working under the organizational production target indicator and to consider improvement strategies for the current process, in relation to the identified shortcomings: the correct identification of cylinders, valve revision system (identification of caps), safety labels and revision protocols are some examples of the training plans that the department operating personnel should receive.

Below are the monetary results in the cost/benefit ratio for each of the implementations (see Table 4). This session shows the results of the implementation of each of the improvement proposals in this research. In the case of Strategy 1, the change and replacement of valves on rack equipment for cylinder filling is established as an action plan. The commercialization and

Table 4

Cost/Benefit Ratio Matrix of the Improvement Proposals - Packaging Logistics Center (PLC)

Improvement strategy	Description of the element/process	Distribution operator	Wage/minute value	Business days worked	Average time savings/day	Profit per year	Total cost of the improvement
1	Rack cylinder filling	6	\$78	288	6	\$705,000	\$874,000
1	Rack cylinder filling	7	\$78	288	6		
1	Rack cylinder filling	8	\$78	288	6		
1	Rack cylinder filling	9	\$95	288	6		
1	Rack cylinder filling	10	\$78	288	6		
TOTAL		5	\$82	288	6		
Improvement strategy	Description of the element/process	Distribution operator	Wage/minute value	Business days worked	Average time savings/day	Profit per year	Total cost of the improvement
2	Rack cylinder filling	6	\$78	288	3	\$352,500	\$770,000
2	Rack cylinder filling	7	\$78	288	3		
2	Rack cylinder filling	8	\$78	288	3		
2	Rack cylinder filling	9	\$95	288	3		
2	Rack cylinder filling	10	\$78	288	3		
TOTAL		5	\$82	288	3		
Improvement strategy	Description of the element/process	Distribution operator	Wage/minute value	Business days worked	Average time savings/day	Profit per year	Total cost of the improvement
4	Quality Inspection - piping	1	\$113	288	29	\$3,335,000	\$1,000,000
4	Quality Inspection - piping	2	\$78	288	29		
4	Quality Inspection - piping	3	\$95	288	29		
4	Quality Inspection - piping	4	\$104	288	29		
4	Quality Inspection - piping	5	\$109	288	29		
TOTAL		4	\$100	288	29		
Improvement strategy	Description of the element/process	Distribution operator	Wage/minute value	Business days worked	Average time savings/day	Profit per year	Total cost of the improvement
4	Rack cylinder filling	6	\$117	288	20	\$1,120,000	\$1,000,000
4	Rack cylinder filling	7	\$109	288	20		
4	Rack cylinder filling	8	\$87	288	20		
4	Rack cylinder filling	9	\$95	288	20		
4	Rack cylinder filling	10	\$78	288	20		
TOTAL		2	\$97	288	20		
Improvement strategy	Description of the element/process	Distribution operator	Wage/minute value	Business days worked	Average time savings/day	Profit per year	Total cost of the improvement
4	Mobile gas pumping	11	\$69	288	94	\$4,559,000	\$1,000,000
4	Mobile gas pumping	12	\$74	288	94		
4	Mobile gas pumping	13	\$78	288	94		
4	Mobile gas pumping	14	\$104	288	94		
4	Mobile gas pumping	15	\$95	288	94		
TOTAL		2	\$84	288	94		
TOTAL						\$10,071,500	\$4,664,000

There is a lack of compliance with the ideal production performance by 80% of the employees

determination of the total cost of the necessary inputs are carried out, with the generation of the budgetary report from three market suppliers and the selection of the appropriate commercial proposal in terms of quality specifications and cost for the needs of the rack cylinder filling activity (\$874,000). This analysis is performed for each of the study scenarios and the calculation of the value proposal.

The results of the study show economic benefits of \$705,000 and \$352,500, in relation to the implementation of Strategies 1 and 2, respectively, generating investment costs of \$874,000 and \$ 770,000. The presentation of Strategy 4 generates economic benefits for the quality inspection, rack cylinder filling and mobile gas pumping activities of \$3,335,000, \$1,120,000 and \$4,559,000, respectively, the investment values (implementation costs) of which are \$1,000,000 for each of the three cases applied. This value is calculated for a projection of the professional staff responsible for the process of adaptation to the times and methods study within a 4-month period of training, coaching and implementation.

3. Conclusions

The methodological development of the times and methods study is an essential tool for determining real production indicators for organizational objectives and strategies. The adaptation and comparative analysis show a restructuring of the production indicators for the quality inspection area of 14.72%, rack cylinder filling of 6.46%, and the mobile gas pumping area of 8.02%. Each of the values above and their orientation in the adjustment and increase (in the case that the performance indicator is higher than the one established by the organization) or assessment and study (in the case that the performance indicator is lower than the one established by the organization) should be reviewed by the organization's strategic planning department, according to the parameters and resources present in the organization.

The design and study of the work allow us to identify the main elements that make up the productivity factors of each of the operators inside the workstation. Factors such as functions performed, ergonomics, related machinery and equipment and current work regulations directly influence the operational performance of the analyzed areas. The analysis of the workstation shows that the correct adaptation of the workstation, as in the case of the rack cylinder filling activity, for example, results in differences in production levels of approximately 10-15% between operators, in relation to finished products/month. Technical and technological characteristics within the processes must be guaranteed for the correct development and effectiveness of the task and their performance.

The divergence of the production values identified within each of the processes is caused by three main elements: the lack of updating and technological development, present in the absence of an industrial infrastructure (ground pipeline system) for the mobile gas pumping area; the lack of updating and availability of raw material in optimal conditions, as identified in the technical and physical failures present in the gas cylinders analyzed; and finally, the absence of a methodical structure for measuring and standardizing production indicators. In accordance with the above observations, improvement strategies have been established for each of the activities studied and the cost/benefit ratio of the present proposal has been quantified, with the total corresponding values of \$4,644,000 and \$10,071,500, respectively.

From the present research, it can be concluded that the learning curve of the operators increases over time, as the last study presented in the year 2018 shows an improvement in total operation times for the related activities of 143 minutes. This is a considerable reduction in

The results achieved show economic benefits

order to boost productivity, control and improvement of the industrial processes, as well as the continuous improvement of the efficiency in the use of manpower.

The study of performance and measurement factors for the development of production levels and their standardization are not always the best option when the objective is to achieve the total optimization of the industrial system being studied. It is important to scientifically complement the research obtained by identifying the study variables and measuring their levels of dispersion. Events and metaheuristic causalities are essential for the planning, control and improvement of the company's production processes. Development methodologies, such as balancing of the production line through "Tabu searches," production scheduling with stochastic demand and sequence levels and the application of the ant colony algorithm in the resolution of the approach to storage, transport and distribution are some examples of solution methodologies currently demanded by the organization as alternatives in optimization and systematic programming.

4. Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

5. Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

6. References

- Arias-Gómez, J., Villasís-Keever, M. Á., & Miranda-Navales, M. G. (n.d.). *Metodología de la Investigación*. Retrieved from www.nietoeditores.com.mx
- Cortés Martínez, R., Lobelles-Sardiñas, G. O., & López-Bastida, E. J. (2019). Propuesta de mejora tecnológica en la recuperación de azufre de la refinería de petróleo de Cienfuegos. *Tecnología Química*, 39(1), 160-182.
- Estellés, S., Palmer, M., Albarracín, J., & Romano, C. (2013). Una revisión de las Tablas de Suplementos de la Organización Internacional del Trabajo | Estellés-Miguel | Dirección y Organización. Retrieved January 27, 2020, from <https://www.revistadyo.es/index.php/dyo/article/view/420>
- Macgowan, M. J., & Wong, S. E. (2017). Improving Student Confidence in Using Group Work Standards. *Research on Social Work Practice*, 27(4), 434-440. <https://doi.org/10.1177/1049731515587557>
- Mellor, N., Mackay, C., Packham, C., Jones, R., Palferman, D., Webster, S., & Kelly, P. (2011). "Management Standards" and work-related stress in Great Britain: Progress on their implementation. *Safety Science*, 49(7), 1040-1046. <https://doi.org/10.1016/j.ssci.2011.01.010>
- Niebel, B. W., Freivalds, A., Del, T., Ibarra, C., & Ana, S. (2009). *Ingeniería industrial: Métodos, estándares y diseño del trabajo Duodécima edición Revisión técnica*. Retrieved from www.mundoindustrial.net
- Novillo, P. A. M., Álvarez, J. C. E., & Zurita, C. I. N. (n.d.). Estudio de tiempos y movimientos de producción para Fratello Vegan Restaurant. *CIENCLAMATRLA*, 5(1), 271-297. <https://doi.org/10.35381/cm.v5i1.267>
- Oliver, M. E., & Mason, C. F. (2018). Natural gas pipeline regulation in the United States: Past, present, and future. *Foundations and Trends in Microeconomics*, 11(4), 227-288. <https://doi.org/10.1561/07000000070>
- Rodríguez, J. P., Suazo, Á., & Santelices, I. (2016). Análisis por medio de la normalización de variables para un modelo de planificación ambiental hídrica estacional. *Obras y Proyectos*, (20), 76-85. <https://doi.org/10.4067/s0718-28132016000200006>

Book Review: Outside Insight

Lyseggen, J. (2019). *Outside Insight*. Madrid: ESIC.
ISBN 9788417513863

Patricia Vargas Portillo

Senior Lecturer. ESIC Business & Marketing School. Spain.
ORCID: [0000-0002-0226-3053](https://orcid.org/0000-0002-0226-3053).

jennypatricia.vargas@esic.edu

Received: February 2020.
Published: June 2020.

The so-called fourth industrial revolution is characterized by its considerable disruptive potential. It should be noted that the third industrial revolution normally associated with the strong digital transformation of the 20th century came about in an entirely different way. The fourth industrial revolution we are currently experiencing marks an unprecedented milestone for all of humanity. It has some unique features, among which we can cite the following examples: the speed of change and its scope and repercussion in terms of management, production and governance processes. There are various effects in terms of business management practices; in this regard, we must consider marketing and the strategy that will undergo important transformations. This digital transformation process that is moving along at breakneck speed has meant the birth of a considerable set of goods and services with new qualities as compared to earlier periods. Among other aspects, they will increase efficiency, improve our personal lives and meet the needs in an optimal manner. In line with this, consumers hold a very prominent position, but so does the discipline of marketing in general. It should be noted that it is easier for this group and discipline to access the digital world.

We must be aware that no matter how much we rely on data and sophisticated technologies, we are faced with a hypothetical situation with prognoses regarding a future that we consider possible, but one for which there is no full assurance that it will ever come to fruition. This statement applies in all aspects to what has been called the fourth industrial revolution. Within it, marketing must be considered. However, what would be viable with the inherent limitations is analyzing the extent to which the prevailing trends can now be projected or programmed, relatively speaking, towards the future. All these matters are masterfully proposed in the work summarized here.

The author of the work is the founder of Meltwater. This company began operations with just 15,000 dollars. Nowadays, it is a very successful company in the business intelligence sector. It is the fourth most important start-up in the world. It has sixty offices on six continents and provides service to around 25,000 customers in over one hundred countries, including both medium-sized businesses and multinational

corporations. It currently employs more than 1400 people. Its dimensions are staggering.

The work being reviewed is arranged in four parts and sixteen chapters. The first part, entitled “A new digital reality,” contains the first three chapters. This part indicates how the world has changed and how the new types of data found on the Internet can be mined in order to obtain a strongly prospective vision. The second part, which discusses the new paradigms for decision-making, includes Chapters four through seven. This second part studies how the access to data in real time in a particular sector or field changes decision-making in several ways. The third part, which refers to Outside Insight in practice, is presented in Chapters eight to twelve. This part refers to a procedure for an approach to environmental data and, in turn, how to include them in more advanced phases. It also indicates different cases in which this technique is being used to make executive decisions in order to develop different goods and/or services, identify risks and make investments in relation to marketing in the broadest sense. The final part of the work, dedicated to the future of Outside Insight, is covered in Chapters thirteen to seventeen. This last section addresses different technical obstacles that must be overcome, what new types of data can be expected and what possible concerns might arise with regard to the phenomenon that we are analyzing.

Digital information is currently of great importance. The Meltwater company, as its founder indicates in the prologue to the work, developed software that would generate a sort of summary of what has occurred in the last twenty-four hours around the world, so that any executive could quickly determine key points with regard to the competition, clientele and their brand. The slogan the brand decided to identify itself with (in my opinion, very appropriate) was “informed decisions.” The aim was for executives to be able to take full advantage of the information found on the Internet.

It could be said that the information found on the Internet, as a whole, is a sort of treasure that provides very useful information about consumers, but there is also a competitive aspect to it. We must be aware that we are not making the most of the potential of all the information found on the Internet. We live in a world that is becoming increasingly more competitive, so any company that is capable of staying ahead of the coming changes will have a clear advantage over its competitors. For this reason, it is basic for companies to know not only how to use external data, but also how to successfully mine information from external sources, and thus not limit themselves to merely internal data.

Lyseggen’s book, the title of which literally means external vision, alludes to a wide variety of business actions conducted in very different areas – such as risk management, occupational health and even national security - and in several different countries. Everything discussed in the monograph is closely related to the processing of information from the environment. Clearly, it could be stated that the external vision is supported by three great foundations, namely: the digitalization of identities and the trails we leave behind when using the Internet; the potential to derive useful information from the data found on the Internet in order to make decisions in practically any area of knowledge; and, to use David Hume’s phrase that knowledge is power, it can be said in our sector that information is power.

We are in an age dominated by an excess of information and data. We now have many tools and instruments to determine what consumers think about companies, and also about certain products. In short, we are faced with a process that provides its own feedback, since the decisions made by the different social actors have an effect on, and in turn change, the environment in which they operate.

Nothing remains permanently unchanged - invariable in terms of its previous state - so making decisions represents, along the same lines, adapting to the competitive environment. Business professionals must accept that the times are changing, and with them, they must be aware of the need to do away with their strongly endogamous perspective that is limited to a large extent to internal information. In fact, companies today must investigate external sources of data that will shape their strategic decisions.

As the author himself states, we must engage in a sort of collection of information from the outside. With it, among other aspects, a new perspective will arise for making decisions of a different nature in our times, predominated by digitalization. Outside Insight is in its infancy. We can say that it has just been born, and thus it has a lot to learn, before its enormous potential can be used. ▢