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# Journal of Human Resources Training

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## Presentation of Content

In the fist article we present, *Impact of intellectual capital on the performance of SMEs in Nezahuacoyotl*, by HERNÁNDEZ-CALVA, Paz Verónica, with adscription in the Universidad Tecnológica de Nezahualcóyotl, the next article we present, *Organizational change: a sociologycal perspective*, by DÍAZ-GONZÁLEZ, Claudia, ORDAZ-PICÓN, Carla and ALATORRE-HERRERA, Raquel, with adscription in the Tecnológico Nacional de México/Instituto Tecnológico de León, the next article we present, *Gender differences in career choice: An agent-based model*, by QUINTERO ROJAS, Coralia A. & VIIANTO Lari A., with adscription in the Universidad de Guanajuato, the next article we present, *Perception of body image and quality of life according to body mass index and breast reconstruction of breast cancer survivors*, by BOJÓRQUEZ-DÍAZ, Cecilia Ivonne, DÍAZ-LÓPEZ, Karina de Jesús, BARRERA-HERNÁNDEZ, Laura Fernanda and QUINTANA-LÓPEZ, Victor Alexander, with adscription in the Instituto Tecnológico de Sonora, Universidad Autónoma de Baja California, Universidad de Sonora.

## Content

Article **Journal of Human Resources Training**
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# Impact of intellectual capital on the performance of SMEs in Nezahuacoyotl

# Impacto del capital intelectual en el desempeño de las Pymes de Nezahualcóyotl

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**Abstract**

The large enterprises have competitive advantage in their performance through the development of knowledge, experiences, skills, values, practices, and quality of the relationships established by their employees. This makes it necessary for small companies to retake this practice so they can measure their results considering non-financial indicators, such as Intellectual Capital. The goal of this research was to measure the impact IC makes on the performance of SME's industrial companies in Ciudad Nezahualcoyotl. This investigation was mixed; the qualitative was applied in the subject exploration stage and the quantitative was of a non-experimental type through the application of a questionnaire to gather information on performance indicators and elements of IC in SME's in the industrial sector. The results obtained show that the coefficient of determination is acceptable between learning and growth, and internal processes, in terms of the degree of determination of internal processes and the elements of IC; structural capital and relational Capital are the cause of process improvement. Nevertheless, this does not happen with Human Capital. Therefore, this research can be expanded to make a proposal for actions of improvement in these two elements of IC.

**Intellectual Capital (IC), Organizational Performance, Strategic Map (Balanced Scorecard)**

**Resumen**

Las grandes empresas tienen ventaja competitiva de su desempeño a través del desarrollo de conocimientos, experiencias, competencias, valores, prácticas y calidad de las relaciones que establecen sus empleados, por lo que es necesario que las pequeñas empresas retomen este ejercicio y puedan medir sus resultados con indicadores no financieros, como es el Capital Intelectual, el objetivo de este trabajo fue medir el impacto que tiene el capital intelectual en el desempeño de las pequeñas empresas industriales de ciudad Nezahualcóyotl. Esta investigación fue mixta, el método cualitativo para la etapa de exploración sobre el tema y cuantitativa de tipo no experimental, mediante la aplicación de un cuestionario, para la obtención de información sobre los indicadores de desempeño y elementos del Capital Intelectual en pymes del sector industrial. Los resultados obtenidos muestran que el coeficiente de determinación es aceptable entre Aprendizaje y crecimiento y procesos internos, en cuanto al grado de determinación de los procesos internos y los elementos del capital Intelectual; se tiene que el capital estructural y el capital relacional son causa del mejoramiento de los procesos; sin embargo no sucede así con el Capital Humano. Se puede ampliar esta investigación y realizar propuesta de acciones para mejorar los elementos del capital intelectual.

**Capital Intelectual (CI), Desempeño Organizacional, Mapa Estratégico (Balanced Scoredcard)**

**Citation:** HERNÁNDEZ-CALVA, Paz Verónica. Impact of intellectual capital on the performance of SMEs in Nezahuacoyotl. Journal of Human Resources Training. 2023. 9-23:1-11.

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## Introduction

Human Capital is the main generator of value within organisations, as pointed out and demonstrated by research conducted by: Bontis, N. (2000) who demonstrated that intellectual capital has a direct relationship with business; Edvinsson, L. and Malone, M. (1997) who demonstrated that intellectual capital has a positive effect on the performance of organisations and on knowledge sharing; however it is necessary to quantify the benefits and improvements that it brings to companies in terms of results, in order to give an objective idea to company owners that the investments they make in Intellectual Capital have positive effects on the performance of the people in their organisation, so the following hypothesis is proposed:

H1: Organisational performance is related to Intellectual Capital in SMEs in Ciudad Nezahualcóyotl.

The state of the art of the subject shows different models for the measurement of intellectual capital in companies, being four of the most used in some existing proposals: Intellectual Value Added Coefficient (VAICTM), Pulic (1998); Skandia's Navegator Model, Leif Edvinsson (1991); the calculation of Intangible Value (VCI), Thomas Parkinson cited by Demuner F. R. (2017), where it is necessary to have indicators that allow measuring the value of intangible assets, but they consider numerical indicators for their use, elements that most SMEs lack, the proposal is to use the Balanced Scorecard, Kaplan (1996) for measuring the impact of intangible assets on the performance of small businesses, as they consider financial indicators, but balance these indicators with other non-financial indicators.

## Theoretical framework

*Definition of Intellectual Capital*

Early researchers defined intellectual capital as the knowledge, experience and information possessed by people within an organisation that represent a competitive advantage for organisations when they add value to the organisation. Some authors who handled these elements in their definition were:

Bontis (2000): The capture, codification and dissemination of information, to acquire new competencies for process re-engineering.

Stewart (2000): The sum of what everyone in the company knows and provides the company with a competitive advantage in the marketplace.

Sullivan (1998): Knowledge that can be converted into future benefits.

When trying to incorporate other elements to the concept of intellectual capital and not only talk about knowledge, information and experience, it is beginning to be understood that intellectual capital includes all intangible assets, being called in this way, since they produce value to the company, but they cannot be observed and represented in a quantifiable way in the balance sheets. Among the authors who take up this idea we have:

Roos (1997): Defined as the sum of a company's hidden assets that are not fully captured or represented in the balance sheet.

Sveiby (1997): Intangible assets as invisible assets including employee competence, internal and external structure.

Kaplan (2004): "Intangible assets encompass such diverse elements as patents, copyrights, employee knowledge, leadership, information systems and work processes" (p.243).

The idea is generated that in addition to human capital there are other elements involved in intellectual capital, this can be seen in the definitions of some authors, such as these:

According to Rivero (2009): It is the effect of the combination, that is to say, the synergy of all the knowledge that an organisation brings together, all the experience accumulated in its members, their capacities, skills, motivation and commitment, values, etc., applied to work. All that it has achieved in terms of relationships, processes, discoveries, innovations, market presence and influence and recognition in society. Quoted by Monagas (2012).

Bueno (2008): Accumulation of knowledge that creates value or cognitive wealth possessed by an organisation, composed of a set of assets of an intangible nature or knowledge-based resources and capabilities, which when put into action, according to a certain strategy, in combination with physical or tangible capital, is capable of producing goods and services and generating competitive advantages or essential competencies for the organisation in the market (p.53).

Bontis (1998): The causal relationship between human, relational and organisational capital.

Thus, it is understood that intellectual capital is not only knowledge, information and experiences of the people in an organisation, but also has to do with the way in which the company promotes the development of new competences, values and practices in the employees, as well as the quality of the relationships that the employees maintain with the different agents in the market and with society in general, producing a competitive advantage for the organisation.

From this we can deduce the components that are part of the intellectual capital, and that have a casual relationship as mentioned by Bontis (1998).

*Components and elements of intellectual capital*

There is a controversy between the elements or as mentioned by some authors dimensions of Intellectual Capital and the definition of the same, one of the authors who has worked most on the definition and how to measure these elements is Bueno (2011), he proposes four components for the IC, being these: Human Capital, Structural Capital, Relational Capital and Entrepreneurship and Innovation Capital, it is important to mention that this proposal is based on this author for considering that they have elements that can exist in our object of study, industrial SMEs in the municipality of Nezahualcóyotl; however it is important to point out that there are other classification proposals, such as Muhammad (2015) who obtains a proposal from different authors and mentions that the subcomponents of intellectual capital are:

Human Capital, Customer Capital, Structural Capital, Social Capital and Technological Capital, Edvinsson and Malone (1997) defined the elements of Intellectual Capital, in human capital and structural capital. They divided structural capital as follows: Organisational capital and customer capital or firm-customer relationships. In this paper each component is defined as follows:

- Human capital. The elements of this component cited by Bueno (2011) are as follows: Aptitudes, which are the knowledge that people in an organisation possess (know-how); capabilities which are the abilities, skills and talent that the person develops basically as a result of experience and practice, also known as soft skills of staff (know-how); finally the values and attitudes that lead people to perform the activities within the organisation (being + being) are considered mental models supported by schemes, paradigms and beliefs that condition the way in which individuals see the world.

- Structural or Organisational Capital. Bueno (2011) states that structural capital is divided into organisational capital and technological capital, the elements of each are defined below: Organisational capital is composed of four elements 1) the culture of the people within the organisation and determines their behaviour and the results of the company or organisation, 2) the organisational structure which represents the ways and processes of formal organisation of the company, 3) organisational learning, which is the ability to acquire new skills and knowledge in order to respond to the dynamics of organisational change and development, 4) processes, which is the set of activities carried out by the company or organisation, 4) processes, which is the set of activities carried out by the company and which are aimed at internal customers (staff), external customers (consumers and buyers) and suppliers. The most relevant processes (logistical, technical, administrative, commercial, etc.) will be determined on the basis of the organisation's value chain; Technological Capital is made up of four basic elements:

- 1) effort in R&D (research and development) research is understood as the activities that are undertaken to increase knowledge about reality and development is the application of this knowledge to develop new processes, products or services, 2) technological endowment, which are the knowledge, methods and techniques that the organisation incorporates to make processes more efficient and effective, including the incorporation of technology that has not been developed internally in the R&D processes, 3) intellectual and industrial property, which represents the levels of legally protected knowledge and which gives the company the right to exploit it, 4) technological vigilance or competitive intelligence, which is the ability of people to cope with change, turbulence and uncertainty in the environment, also known as competitive intelligence or organisational intelligence processes to cope with change, turbulence and uncertainty in the environment.

- Relational capital. According to Bueno (2011), relational capital is made up of business capital and social capital; Business Capital is the value of the relationships that the company maintains with the agents that are linked to it, it is made up of six basic elements: 1) relationships with customers who demand or may demand the company's goods and services, 2) relationships with suppliers who are the suppliers of the resources needed for the production process or service it provides, 3) relationships with shareholders, institutions and investors who are in the company's or organisation's market, 4) relations with allies that are collaboration agreements that the company makes with other institutions or organisations, 5) relations with competitors that are businesses in the same sector or related sectors, 6) relations with employees as internal clients and through which it seeks to develop attitudes and capacities contemplated in human capital. Social capital is made up of the following elements: 1) relations with public administrations, 2) relations with the media and corporate image, 3) relations with environmental defence institutions, 4) social relations, 5) corporate reputation.

*Measuring Intellectual Capital in organisational performance*

- A review of the models for measuring intellectual capital in the performance of organisations revealed four main ones: Value Added Intellectual Coefficient (VAICTM) Pulic (1998) which is a tool for calculating the efficiency of the IQ, through its three components, as well as the physical and financial capital employed; Skandia's Navigator Model, Leif Edvinsson (1991) which proposes the elaboration of an intellectual capital report as a complement to the financial report, using a metric system applied to financial capitalisation, towards the client, towards processes, renovation and development and valuation of employees; the calculation of Intangible Value (ICV), Thomas Parkinson. Cited by Demuner F. R. (2017) is a method to measure the value of the brand, the value of intangible assets are obtained from the ability of a company to outperform its competitors that have similar tangible assets. For the use of these measurement models, numerical indicators are required for their use, which as already mentioned SMEs lack them, so it is considered that the fourth model is the most appropriate for this proposal, this being the Balanced Scorecard, Kaplan (1996) that allows the measurement of the impact of intangible assets through the balance of financial and non-financial indicators.

- Balanced Scorecard.

- To demonstrate how intangible assets influence the performance of a company, the Balanced Scorecard (strategic map) was developed, which allows the quantification of intellectual capital from four perspectives, guaranteeing a competitive advantage for companies. Kaplan (2004).

- The financial perspective defines the logical chain by which intangible assets will be transformed into tangible value. Kaplan (2004). It is sought that the established strategy includes in its implementation and execution the improvement of the financial results, they can contemplate the tangible results of the strategy established by the company, the traditional financial indicators that allow to measure this perspective are: Return on Investment (ROI), Shareholder Value, company income and cost of production. Kaplan (1996

- The customer perspective defines the value proposition for the target customer, i.e. whether the customer values quality, on-time delivery, innovation or the production system or processes. It clarifies the conditions that will create value for the customer. Kaplan and Norton (2004). The value proposition of this perspective defines what will improve or make the company different from its competitors in relation to its product, price, service and image.

- The internal process perspective defines the processes that will transform intangible assets into financial and customer results. Kaplan (2004). It is necessary to identify those critical processes that have the greatest impact on the company's results. They fulfil two basic functions within the implementation of the strategy: 1) they produce and deliver the value proposition to its customers; and 2) they improve processes and reduce costs for the productivity component of the financial perspective.

- The learning and growth perspective defines intangible assets and aligns and integrates them to create value. Kaplan (2004). This is where the intangible assets needed to carry out the company's strategy are identified, it is necessary to identify what tasks are needed (human capital), what systems are needed (information systems) and what work environment (organisational capital) is required to support the internal processes of value creation. Kaplan (1996).

**Methodology**

This research had a mixed approach, which is defined according to Creswell, J (2007) as:

One in which the researcher tends to rely on conceptions of knowledge grounded in pragmatism (e.g., consequence-oriented, problem-focused and pluralistic). It employs enquiry strategies that involve gathering data, either sequentially or simultaneously, for a better understanding of the research problems. Data collection also involves retrieving information both numerically (e.g., with instruments) and in text form (e.g., through interviews) so that the final database represents both quantitative and qualitative information (p.29).

The qualitative method was applied for the exploration stage, defining the indicators of Intellectual Capital and performance indicators found in small enterprises in Ciudad Nezahualcóyotl. Based on two theoretical proposals, the Intellectus Model and the Balanced Scorecard, which also allow us to measure the impact of each element of intellectual capital on the results of small and medium-sized enterprises. A theoretical research model was designed and used for this stage, using Atlas.TI.

The quantitative research was non-experimental, through the application of a questionnaire, to obtain information on the performance indicators and elements of Intellectual Capital in SMEs in the industrial sector.The surveys were applied to the owners or decision makers in the SMEs in the municipality of Ciudad Nezahualcóyotl, which according to INEGI data, there are 1,293 small enterprises, of which 8 belong to the primary sector, 93 to the manufacturing industry, 212 dedicated to commerce, 925 that provide services and 55 government agencies, data obtained from the National Statistical Directory of Economic Units (DENUE, 2021), due to the indicators to be studied, it was considered to carry out the study in the manufacturing industry; Considering the classification of the Mexican Ministry of Economy and the criterion of number of employees (11 to 50) in the municipality, the manufacturing sector is mainly made up of companies dedicated to the food industry (25 units), manufacture of metal products (11 units), manufacture of clothing (9 units), manufacture of furniture, mattresses and blinds (7 units).

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The manufacturing industry represents 9.90% of the economic units in the State of Mexico and 9.06% at the municipality level (DATAMEXICO 2019).

A questionnaire made up of 42 items grouped in 4 parts was designed: The first one refers to the performance indicators of the small industrial companies of the municipality, the questions asked allow measuring the results of the internal processes and learning and growth; on which the Intellectual Capital has an impact, for the measurement scale of this section, the results of the company in the last three years had to be considered, and the options used were: increased a lot, increased somewhat, remained the same, decreased somewhat, decreased a lot. The other three remaining parts allow us to measure Intellectual Capital, so it was broken down into each element that makes it up: Human capital, structural or organisational capital, relational capital; in addition demographic questions were added such as: manufacturing sector, number of employees and length of company operations. The Likert scale was used for the answers, ranging from total agreement, almost total agreement, agreement, almost total disagreement and total disagreement.

The finite population formula was used to calculate the sample size, since it is known that there are 93 SMEs in the manufacturing industry in the study area, with a confidence level of 98% and an error level of 2%, the values of p and q are unknown, and the result is as follows:

$$n = \frac{N*z_{\alpha}^{2}*p*q}{e^{2}*(N-1)+z_{\alpha}^{2}*p*q}$$

$$n = \frac{93*2.33_{\alpha}^{2}*.50*.50}{.20^{2}*(93-1)+2.33_{\alpha}^{2}*.50*.50} = 26\ surveys$$

The instrument was presented to 5 specialists for review and assessment, these were PhD teachers and businessmen, then a pilot test was applied to 10 owners of SMEs in the manufacturing sector, taking care that the number of employees and the line of business corresponded, this allowed modifications to be made to the instrument in terms of eliminating items and making changes in the wording of the items. Subsequently, 50 surveys were applied in Ciudad Nezahualcóyotl.

In this process, support was requested from the Department of Economic Development of the Municipality, which has contacts with companies and was applied by surveyors from the Sub-Directorate of Employment and Job Training, only 32 of them were considered, as some had errors and omissions.

## Results

An Excel table was designed with the responses obtained from the 32 surveys for statistical analysis.

The Minitab Statistical programme was used to carry out the descriptive statistical analysis:

Regarding the year in which the SME starts operations and with the help of a frequency table, which is presented below:

**Cuenta de variables discretas: C2**

| C2 | Conteo | Porcentaje | PrcAcum |
|---|---|---|---|
| 1970 | 1 | 3.03 | 3.03 |
| 1984 | 2 | 6.06 | 9.09 |
| 1990 | 1 | 3.03 | 12.12 |
| 1991 | 1 | 3.03 | 15.15 |
| 1993 | 1 | 3.03 | 18.18 |
| 1994 | 3 | 9.09 | 27.27 |
| 1995 | 1 | 3.03 | 30.3 |
| 1996 | 1 | 3.03 | 33.33 |
| 1997 | 2 | 6.06 | 39.39 |
| 1998 | 1 | 3.03 | 42.42 |
| 1999 | 2 | 6.06 | 48.48 |
| 2000 | 1 | 3.03 | 51.52 |
| 2001 | 3 | 9.09 | 60.61 |
| 2010 | 1 | 3.03 | 63.64 |
| 2011 | 1 | 3.03 | 66.67 |
| 2014 | 1 | 3.03 | 69.7 |
| 2015 | 3 | 9.09 | 78.79 |
| 2018 | 2 | 6.06 | 84.85 |
| 2019 | 1 | 3.03 | 87.88 |
| 2020 | 3 | 9.09 | 96.97 |
| Año de operación | 1 | 3.03 | 100 |
| N= | 33 | | |

**Table 1** Percentages by year of initiation of operations. Retrieved from MINITAB

According to the data observed, 50% of the surveyed owners started their operations 20 to 30 years ago. The other 50% are young SMEs that are between 2 and 10 years old.

7) A frequency distribution graph was made for the number of employees of the SME, as follows:

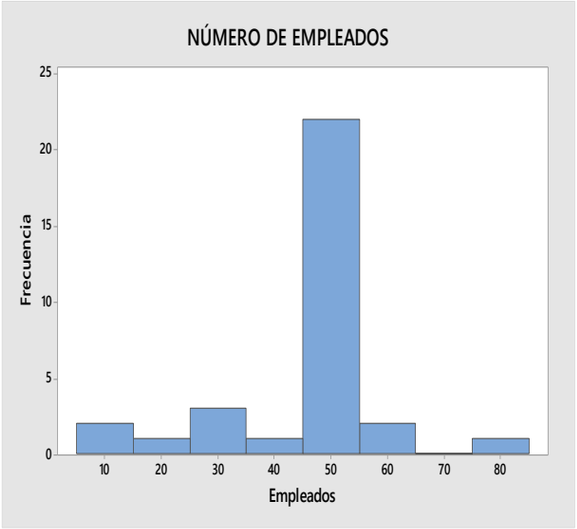


**Figure 1** Frequency distribution graph by number of employees. Obtained in MINITAB

65% of the companies in the sample have 50 employees and 6% of the companies have 25 employees.

The conceptual model of this research was designed, applying Multiple Regression by Partial Least Squares (MCP or PLS) and oriented to the causal-predictive analysis, the result of the variables and the dimensions were considered and related to each other, the model obtained was the following:

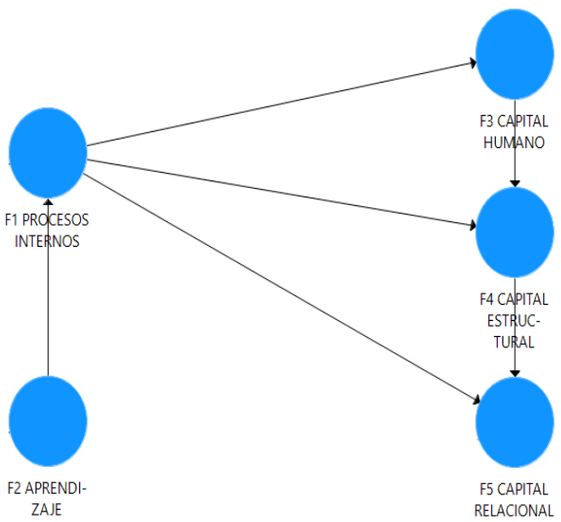


**Figure 2** Conceptual research model. Obtained from CCM or PLS

The model shows that: the learning and growth perspective improves the internal processes of an organisation; these processes require adequate human capital, structural capital and relational capital to function properly; in turn the development of human capital impacts structural capital and the latter impacts relational capital.

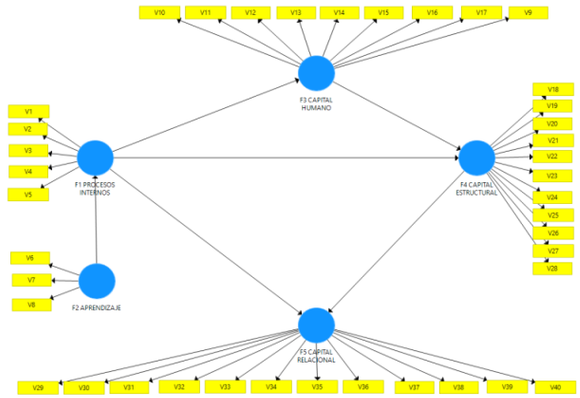

**Figure 3** Conceptual model with independent and dependent variables. Model obtained from MCP or PLS

In this figure we can observe the dependent variables and the independent variables that make up our research model, which were defined in the operationalisation and used in the data collection instrument that was applied to the owners of the SMEs in Nezahualcóyotl city.

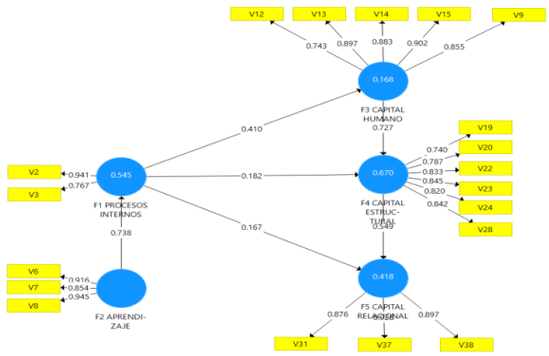


**Figure 4** Conceptual research model with accepted constructs and variables. Retrieved from MCP or PLS

$R^2$ Coefficient of determination was obtained, which allows to measure the percentages of variability of response between the elements of the C.I. in the performance of the organisations, i.e. the standard deviation with respect to the mean. It can be observed that F1 Internal Processes is 0.545, Human Capital 0.168, F4 Structural Capital 0.670, F5 Relational Capital 0.418 of variability in the model.

The graph also shows the constructs with their final variables accepted for having factor loadings >0.7.

| Variable | Name | Operational definition |
|---|---|---|
| F1 | Internal Processes | Operations management processes, customer management processes, innovation processes, regulatory and social processes. |
| V2 | Transactions and number of customers | It involves the selection and acquisition of new customers, as well as maintaining and increasing business with target customers. |
| V3 | Innovation and Product Creation | Innovation and creation of new products produced by the company. |
| **F2** | Learning and Growth | Availability of human capital, availability of information capital and availability of organisational capital. |
| V6. | Employee Growth | The number of employees who bring to the organisation their skills, talents, knowledge. |
| V7 | Investments in ICTs | The investment made by the organisation in the acquisition of systems, databases, network systems that streamline processes and employee productivity. |
| V8 | Productivity | The efficiency of employees in achieving the organisation's objectives and strategies. |
| **F3** | **Human Capital** | It is the knowledge, skills, abilities, talents, values and attitudes of the organisation's staff. |
| V9 | Specialised training | The schooling of the staff is the necessary according to the positions they hold. |
| V12 | Apprenticeships | Employees have the capacity to acquire new skills and knowledge. |
| V13 | Collaboration | Staff performs adequate teamwork within the organisation.. |
| V14 | Communication | Employees have the ability to give and receive information and to share what they know with others. |
| V15 | Sense of relevance | Employees feel part of the company and take ownership of the objectives. |
| **F4** | Structural capital | They are the contributions or ideas made by the staff for the creation, implementation and improvement in culture, structure, procedures, systems and product; they become the property of the company. |
| V19 | Social work climate | The work environment encourages the active participation of all employees. |
| V20 | Organisational design | Formal relationships between employees are structured in an organisation chart and/or other graphical representation. |
| V22 | Organisational guidelines | Staff follow procedures and routines in the performance of activities set out in organisational manuals or other documents containing functions and activities. |
| V23 | Knowledge transfer | The organisation promotes the acquisition and transmission of knowledge among employees. |
| V24 | Customer management policies | There are processes aimed at the acceptance, identification, follow-up and management of clients. |
| V28 | Internet domains | Use is made of ICTs (internet) to publicise and/or market the organisation's products. |
| **F5** | Relational capital | It is the knowledge of the staff to generate relationships between the members of the organisation, with clients, with suppliers, with its competitors, with investors, financial institutions and society that are linked to the company's business. |
| V31 | Distribution network | The company uses different distribution channels for its commercial relationship with customers. |
| V37 | Personnel policies | There are personnel policies that improve attitudes and motivate employee retention and development. |
| V38 | Brand awareness | The degree of market acceptance of the company's brand is known. |

**Table 2** Variables accepted in the Model

| Variable | Name | Operational definition |
|---|---|---|
| **F1** | **Internal Processes** | Operations management processes, customer management processes, innovation processes, regulatory and social processes. |
| V1 | Production and delivery of goods and services to customers. | Production and customer delivery processes. |
| V4 | Environmental responsibility | Responsibility for the environment. |
| V5 | Employee health and safety | Responsibility for the health and safety of employees. |
| **F3** | **Human Capital** | The knowledge, skills, abilities, talents, values and attitudes of the staff of the organisation. |
| V10 | In-house training | Staff have the necessary knowledge to perform their duties. |
| V11 | Experience | The experience of employees is adequate to perform their functions. |
| V16 | Sense of commitment | There is a sense of commitment on the part of employees to the organisation. |
| V17 | Client orientation | There is a permanent attitude on the part of the employees to detect and satisfy the needs and priorities of the clients. |
| **F4** | Structural capital | They are the contributions or ideas made by the staff for the creation, implementation and improvement of the culture, structure, procedures, systems and product, which become the property of the company. |
| V18 | Cultural homogeneity | Employees identify and behave in coherence with the values established in the organisation. |
| V21 | Organisational development | Employees adapt quickly to situations or changes that arise within the organisation. |
| V25 | Supplier management policies | Processes are in place for the identification, technical assistance and management of suppliers. |

| | | |
|---|---|---|
| V26 | Provision of production technology | Technological knowledge is incorporated into equipment and tools necessary for the production of goods and services. |
| V27 | Information and communication technology endowment | Technological developments and applications for information processing are used to improve the organisation's productivity. |
| **F5** | **Relational Capital** | It is the knowledge of the staff to generate relationships between the members of the organisation, with customers, with suppliers, with its competitors, with investors, financial institutions and society that are linked to the company's business. |
| V29 | Customer loyalty | There is a continuous and stable relationship between customers and the company, which results in repeat purchases. |
| V30 | Customer satisfaction | The organisation considers the fulfilment of customer needs to measure its efficiency. |
| V32 | Product and service customisation | The company demands that its suppliers match the products and services they supply to the company's needs. |
| V33 | Supplier responsiveness | There is product innovation, adaptability, flexibility and speed of response of the supplier to the company's demands. |
| V34 | Relations with financial market institutions | There is a relationship with the financial market (physical or virtual place where people's savings are channelled to companies to develop projects) that contributes to the achievement of the company's objectives. |
| V35 | Competitor knowledge | The company has information on its current and potential competitors. |
| V36 | Certifications and Quality Systems | There are models or systems of total quality in the company and official certifications obtained in recognition of the quality achieved. |
| V39 | Environmental codes and certifications | There are explicit environmental standards and codes of conduct, as well as official environmental certifications. |
| V40 | Work-life balance programme | The coordination of work and personal life of the worker is favoured, with organisational policies and practices. |

**Table 3** Variables rejected in the Model

| Factors | Percentage accepted |
|---|---|
| Learning and growth | 100 |
| Internal processes | 60 |
| Human capital. | 56 |
| Structural capital | 35 |
| Relational capital | 20 |

**Table 4** Balance of variables

**Coeficientes path**

Media, desviación estándar, valores t, p valores | Intervalos de confianza | Intervalos de confianza con sesgo corregido

| | Muestra ori... | Media de la... | Desviación ... | Estadísticos... | P Valores |
|---|---|---|---|---|---|
| F1 PROCESOS INTERNOS -> F3 CAPITAL HUMANO | 0.410 | 0.409 | 0.185 | 2.213 | 0.027 |
| F1 PROCESOS INTERNOS -> F4 CAPITAL ESTRUC-TURAL | 0.182 | 0.208 | 0.120 | 1.516 | 0.130 |
| F1 PROCESOS INTERNOS -> F5 CAPITAL RELACIONAL | 0.167 | 0.168 | 0.152 | 1.105 | 0.270 |
| F2 APRENDI-ZAJE -> F1 PROCESOS INTERNOS | 0.738 | 0.737 | 0.086 | 8.610 | 0.000 |
| F3 CAPITAL HUMANO -> F4 CAPITAL ESTRUC-TURAL | 0.727 | 0.708 | 0.108 | 6.724 | 0.000 |
| F4 CAPITAL ESTRUC-TURAL -> F5 CAPITAL RELACIONAL | 0.549 | 0.568 | 0.174 | 3.165 | 0.002 |

**Table 5** Values of the Conceptual Research Model. Retrieved from CCM or PLS

When analysing the results we found that the p-value is less than 0.05 in: F1 Internal Processes and F3 Human Capital; F2 Learning and Growth and F1 Internal Processes; F3 Human Capital and F4 Structural Capital; F4 Structural Capital and F5 Relational Capital so H1: Organisational performance is related to Intellectual Capital in SMEs in Ciudad Nezahualcóyotl can be partially proved.

However the result of p-value of F1 Internal Processes and F4 Structural Capital; F1 Internal Processes and F5 Relational Capital the value is greater than 0.05, a situation that needs to be worked on.

## Conclusions or Discussion

According to the proposed model and the results obtained (Figure 4), it is observed:

The coefficient of determination is acceptable between Learning and growth and internal processes (0.545) i.e. the internal processes of a company are impacted by availability of human capital, availability of information capital and availability of organisational capital.

Regarding the degree of determination of internal processes and the elements of Intellectual capital, it is found that structural capital (0.67) and relational capital (0.418) can be the cause of the improvement of operations management processes, customer management processes, innovation processes, regulatory and social processes, but not Human Capital as the degree of determination is very close to 0 (0.168).

The Model shows the variables that were accepted for having a factorial loading in the range of well <0.75, the variables that were used for the measurement of learning and growth were accepted in their totality 3 out of 3 (100%), in internal processes 2 out of 5 (60%), in human capital 5 out of 9 (56%), in structural capital 6 out of 11 (35%) and in relational capital 3 out of 12 (20%).

The analysis of each variable is required to find out if the rejected variables are not really representative in the model or if the entrepreneur does not give them the importance they should or they were not understood, which is part of the research being carried out.

The hypothesis that is planned "Organisational performance is related to Intellectual Capital in SMEs in Ciudad Nezahualcóyotl" is partially tested as p-values > 0.05 were obtained in: Internal processes-human capital (0.027), Learning and growth-internal processes (0.00), human capital-structural capital (0.00), structural capital-relational capital (0.00), however p values are greater than 0.05 in internal processes-structural capital (0.130), internal processes-relational capital (0.270), so this research can be extended and a proposal for actions to improve these two elements of intellectual capital can be made.

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# Organizational change: a sociologycal perspective

# Gestión del cambio organizacional: una mirada desde la teoría sociológica

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**Abstract**

This paper mainly discusses 2 analytical approaches to the elements that condition change organizational considering the evolution of the different theories of institutional development and their influence on business management models that arose from the development of capitalism in the 20th century and whose main influence derives from the rational-normative models oriented to control to achieve the effectiveness and efficiency in the organization. Therefore, the possibility of change is understood as a process derived of the authority structure itself and not as a process coming from decision-making process or from internal groups. Under this first approach, the rational-normative, elements of the dominant theories of administration in which privileges order and resistance to change based on a series of normative elements that seek efficiency and effectiveness from the control of processes and procedures are preserved. Leadership and authority are built from a designation of functions determined by a hierarchical structure, just like the possibility of sanction in the event of a deviation from the process. On the other hand, the micro approach, which takes up the tradition of political and cultural sociology, in particular, the Crozier and Pfeffer (1990) approaches, recognizes the heterogeneity of goals and actions within the members of an organization and favors the concept of uncertainty and negotiation in the control of those areas that determine the capacity of influence and action of certain groups within the organization, regardless of whether the structure of functions is determined a priori in a specific regulation. In this regard, this work seeks to recognize and resume the contributions of sociology in the understanding of the organizational change (or its resistance), to explain and propose new models of management in organizations that consider tools and forms of communication more open and flexible in the face of the demands of dynamic environments and that the objectives of efficiency and maximization of economic benefits in favor of compliance with other sociocultural values such as social inclusion, gender equality, social and ethical responsibility of the companies themselves that can be better interpreted under the sociopolitical or even systemic models where the change or its possibilities are explained from a series of interactions and negotiations of actors who control the so-called uncertainty zones in the communication embedded in an open system with the environment.

**Organizational Change, sociological perspective, power, uncertainty zones**

**Resumen**

En este trabajo se discuten principalmente 2 enfoques analíticos sobre los elementos que condicionan el cambio organizacional considerando la evolución de las diferentes teorías del desarrollo institucional y su influencia en los modelos de administración de empresas que surgieron a partir del desarrollo del capitalismo en el siglo XX y cuya principal influencia se derivan de los modelos racional-normativos orientados al control para lograr la eficacia y eficiencia en la organización. Por ello, la posibilidad de cambio se entiende como un proceso derivado de la propia estructura de autoridad y no de las decisiones o de de los grupos internos. Bajo este primer enfoque, el racional-normativo, se conservan elementos de las teorías dominantes de la administración en las que se privilegia el orden y la resistencia al cambio a partir de una serie de elementos normativos que buscan la eficiencia y la eficacia a partir del control de procesos y procedimientos. El liderazgo y la autoridad se construyen a partir de una designación de funciones determinadas por una estructura jerárquica, al igual que la posibilidad de sanción frente a una desviación del proceso. Por su parte, el enfoque micro, que retoma la tradición de la sociología política y cultural, en particular, los planteamientos de Crozier y Pfeffer (1990), reconoce la heterogeneidad de metas y acciones dentro de los integrantes de una organización y privilegia el concepto de incertidumbre y la negociación en el control de aquellas áreas que determinan la capacidad de influencia y acción de ciertos grupos dentro de la organización, independientemente de que la estructura de funciones esté determinada a priori en una normatividad específica. Al respecto, este trabajo busca reconocer y retomar las aportaciones de la sociología en la comprensión del cambio organizacional (o bien su resistencia), para explicar y proponer nuevos modelos de administración y gestión de la administración en las organizaciones que consideren herramientas y formas de comunicación más abiertas y flexibles frente a la exigencia de entornos dinámicos y que han cambiado los objetivos de eficacia y maximización de beneficios económicos a favor del cumplimiento de otros valores socioculturales como la inclusión social, la equidad de género, la responsabilidad social y ética de la empresas mismas que pueden ser mejor interpretados bajo los modelos sociopolíticos o incluso sistémicos en donde el cambio o sus posibilidades se explican a partir de una serie de interacciones y negociaciones de actores que controlan las llamadas zonas de incertidumbre en la comunicación en un sistema abierto con el entorno.

**Cambio organizacional, modelo político, zonas de incertidumbre en las organizaciones**

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## Introduction

This article is the result of a critical analysis of the theoretical and methodological approaches under which we have sought to understand the phenomenon of change in organisations understood as units or groups that function under a logic of shared interests around a specific purpose, which may or may not be a profit-making purpose. The interest in taking up the micro approaches of sociology seems to have a better explanation of the way in which decisions are distributed within organisations, rather than those approaches of traditional management that seek to reduce the achievement of ends through instruments or measurements that have little to do with the way in which people interact within their areas of influence.

In this sense, this discussion is taken up again, taking as a starting point the existence of political models as a way of explaining other dimensions of change in the organisation and that applies to the functioning of companies that currently face the challenges of understanding the new system of values that govern the operation of the market, the relationship with customers, the relationship with the use of information technologies, knowledge, etc. On the other hand, the emergence of new cultural elements that are marking the action of the subjects and that condition the progress of the changes proposed by an authority; or the pressure they require to provoke it without it having been generated for any purpose within the organisation itself.

Finally, in this work we have sought to interpret change from a socio-cultural and political perspective as a complement to the traditional normative approaches to business management, which are being modified by a set of issues that are difficult to measure, and which, although there are efforts to "regulate" under rationalist instruments, the truth is that they are limited in terms of their control of change. Such is the case of gender equality, harassment at work, social inclusion, accessibility at work, human rights, among others.

In this discussion, the concept of zones of uncertainty proposed in Crozier and Friedberg's model (1971) is recovered and its application appears relevant to explain phenomena of change or resistance within organisations.

Finally, the article proposes a series of topics for discussion that should be considered in the context of change applicable to all organisations in the environment, including, of course, companies as key economic units of local development.

## Evolution of approaches to the study of organisations

The study of organisations has been characterised by the diversity of theoretical approaches used by different social science disciplines.

In this regard, Clarke, et. al (2000), systematises the different stages in the development of organisational theory, which should be reviewed in order to identify their main elements.

The first stage is located between 1870 and 1925, when the problems of organisation were associated with the emergence of the modern company and the professionalisation of management; therefore, the conditions for the formation of its study were strongly linked to the needs of the socio-economic world of the company. At this stage, the disciplines that facilitated the governance of individuals and organisations were consolidated, among them accounting and industrial psychology.

These included accountancy and industrial psychology. This stage was dominated by the consolidation by the classics of management theory of the bureaucratic model of management such as Taylor, Fayol and Weber.

The second stage, known as pre-institutional organisation, comprised a brief period of just twelve years (1927-1939) in which the first empirical research efforts in industry began to be generated, paying special attention to the problems associated with human behaviour at work and its relationship to productivity. However, Clarke points out, we cannot yet speak of organisation theory as an established field of knowledge.

At this stage, there were systematic efforts to study in detail the general conditions affecting human capacity for work and the central causes of performance.

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The importance of informal social organisation was recognised as a determinant of the psychological response of the worker and the social cohesion of work groups. The human aspect of the organisation began to become relevant when two sub-systems were recognised: the formal organisation, comprising the rules, policies and regulations that defined the expected behaviour within the company, and the informal organisation, in which interpersonal relationships, systems of ideas and beliefs expressing the values of the work groups were located.

These approaches reflected a broad influence of sociological theories of a social system that conceived of the organisation as "a system of control to manage conflict and to ensure respect and support for the stated aims of the enterprise" (Clarke, 2000), with the result that this approach had the power to order very different realities.

Conflict and to ensure respect and support for the stated aims of the enterprise" (Clarke, 2000), and thus this approach had the power to order very different realities.

The third stage corresponds to institutionalisation and spanned just over three decades (1937-1973). In this stage, a new formulation was established that reaffirmed the centrality of the concepts of authority, cooperation and consensus, trying to eliminate aspects such as conflict of interests, coercion and force. From now on, authority would be considered as the legitimate right of organisations to influence the informal behaviour of individuals and to guarantee the fulfilment of the aims associated with cooperative action.

These aspects can be clearly seen in the work of Robert Merton and Phillip Selznik, among others, who balance the rational and non-rational elements of human behaviour, in contrast to the definitions inherent in the rationalist model.

At this stage, organisational theory became more complex as it proposed a multivariate analysis to explain uncertainty and variability in organisational structures and performance.

In this way, organisation theory became the scientific discipline in charge of studying organisations, especially their structures, focusing on three main axes of enquiry: context, decisions and behaviour, which would provide observation and analysis tools applicable to all types of organisations, showing its usefulness beyond the traditional disciplinary boundaries.

A fourth and final stage recognises its dynamism and diversity by dividing it into a macro level of analysis that considers the organisation as a totality or unit with undifferentiated and unique behaviour; on the other hand, those who consider the organisation as an entity composed of sub-units with possibilities of independence in their behaviour, interested in the study of the internal dynamics of individual human actors or sub-structures within the organisation. The latter in the tradition of sociological neo-institutionalism represented by Richard Scott (1981), Powell and DiMaggio (1981), March and Olsen.

This approach recognises the centrality of decision-making processes and power relations involving individuals and groups acting freely, thereby giving direction and meaning to the organisation vis-à-vis its environment. Figure 1 contrasts some of the most representative characteristics of the perspectives under analysis:

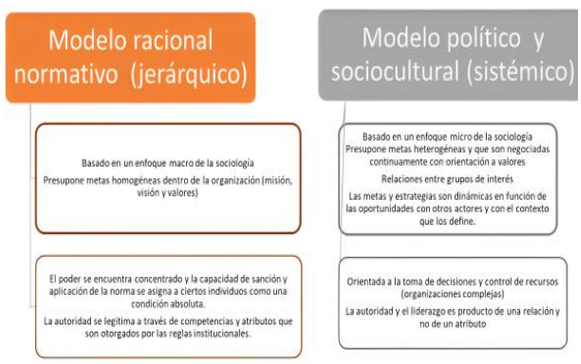


**Figure 1** Main characteristics of the models for analysing organisational change
*Source: Own elaboration*

## Focus on organisational change

The study of organisational change processes has been of great interest as an object of study in the social sciences and management. However, it is possible to identify literature from the discipline of administration or management.

In this respect, and taking up Van de Ven & Poole's classification of approaches, it is possible to recognise two theories with different approaches.

On the one hand, the Life Cycle Theory, which is presented as prescriptive and which we would place in the rational-normative tradition.

The rational-normative model arises as a result of the rationalist tradition of the 19th century under a positivist concept, where its functioning was based on the principles of order and the explanation of mathematical laws. In this way, organisations were understood as units organised under a hierarchical authority with absolute decision-making capacity. We must remember that before the birth of modern companies towards the end of the 19th century, the theory of organisation developed alongside the political theory of the state as the most important entity of modernity, and from there it sought to transfer to the discussion of the administration of other institutions or organisations such as companies. In a way, administrative theory sought to replicate political organisation as a way of guaranteeing order and control for the achievement of ends that in this case would be lucrative in a developing capitalism.

As capitalist societies transformed not only the mode of production, but also social structures and cultural values, it became necessary to introduce new variables into the analysis of organisational change.

By the mid-20th century, political sociology was recognising new approaches such as Systems Theory and the idea of the open system as a way of explaining how organisations respond to change.

By the 1970's, theoretical proposals emerged such as Crozier and Pfeffer (1971) who recovered the concept of system and even one of the most influential texts on the subject, the actor and the system are a reference of this approach. This approach highlights the notion of power relations within organisations where two levels of authority coexist. On the one hand, the authority granted by formal rules through organisational charts and manuals that define the attributions and activities of each of the members of the organisation and grant the implementation of valid rules under a techno-scientific criterion.

For their part, in their work Gutiérrez, et. al (2019) carry out a detailed review of Powell and DiMaggio's neoinstitutionalism proposal where they recover the concepts of the actor and the structure that were taken from the sociological tradition, understanding organisational change as a product of the intentional actions of the actors of the organisation that seek to perpetuate or change institutionalised practices.

**Socio-cultural and political model**

As an alternative to the rational-normative model, a different approach was proposed, whose object of discussion was at the micro level of organisations, where each decision is the result of a negotiated interaction between subjects with different values and motivations in their actions. Thus, the concept of power, which had been widely studied since the 16th century by the main authors of political philosophy, acquired new interpretations in the light of the construction of modern institutions.

Dialectical theory assumes that the entity exists in a pluralistic world of conflicting events, forces and values that compete with each other for domination and control. From this approach, stability and change are constructivist, as they are explained by the balance between the power of opposing entities, which the authors explain as thesis (current state), antithesis (challenge or opposing values, forces or events) and synthesis (new state that combines thesis and antithesis); however, the authors also recognise processes where the current thesis is maintained as well as processes where the opposition mobilises sufficient power to impose the antithesis (Van de Ven & Poole, 2005).

Within the sociological tradition on the theory of action and conflict, the works of Peter Blau (2017), Jeffrey Pfeffer (1993), Crozier and Friedberg (1990) stand out, where the collective action that drives organisational change should not be understood as the result of automatic action, but as "specific solutions that relatively autonomous actors, with their particular resources and capacities ("constructs"), have created or instituted to the problems posed by collective action, in particular that of cooperation with a view to meeting common goals". These solutions are neither the only ones nor the best ones; they are indeterminate and arbitrary". (Crozier and Friedberg, 1990).

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According to this perspective, organisational change is the product of collective action rather than the imposition of norms, visions or even values within an institution or organisation. The possibility of generating new ways of working will depend on cooperation (or negotiation) between actors who control strategic resources, also called "zones of uncertainty", and thus generate relations of power and dependence.

**Power as a factor of change**

According to Crozier and Friedberg (1990), "the essential thing about power is its relational character, not that it is an attribute of the actors. It is not an abstract relation, but a situated and therefore contingent relation to the actors and the structure in which they act. Power is a relationship of exchange, hence of negotiation.

Power in an organisation is defined by the ability to control resources (zones of uncertainty). These resources can be of all kinds (individual, cultural, economic, social, etc.) which are available to an actor due to its overall social situation and which define the temporal, spatial and social framework in which it must at all times circumscribe its strategy.

Power in turn, together with the action capabilities of individuals of groups within an organization, depends on the control they can exert over a source of uncertainty that affects the organization's ability to achieve its own objectives. Thus, the more crucial for the organization is the area of uncertainty controlled by the individual or group, the greater will be its power.

In this regard, Hall and Tolbert (2009) dedicate an important part of their analysis of organizations to the conformation of power structures as key elements in decision-making processes and leadership construction.

**Zones of power or uncertainty**

Within the political model, the dimension of power is a fundamental aspect due to the methodological difficulties that arise when trying to operate and measure such a complex phenomenon. In this regard, Crozier (1990) posed power as an exchange relationship and therefore reciprocal in which the terms of the exchange may favor one of the parties present, but in which, at the same time, neither party is totally disarmed in relation to the other.

This approach involves determining the sources of power in the system and then estimating how much of each source each actor possesses. Since power derives from resources (material and symbolic) one can estimate power by estimating the resources it controls through various social actors. If uncertainty reduction is important, then power should accrue to those subunits that can reduce uncertainty and for which there are few substitutes (Crozier: 1990).

Change or reform initiatives represent an opportunity for the creation or acquisition of new forms of relationships and, above all, new capabilities that imply the rearrangement and hierarchization of the organization's goals. Change offers the possibility of modifying the control of areas of uncertainty based to a large extent on a new distribution of power within the organizational framework.

For Crozier and Friedber (1990), power resources are linked to the control of the so-called "zones of uncertainty", i.e. all those factors which, if left uncontrolled, would or could threaten the survival of the organization and/or the stability of its internal order and which are unpredictable for the organization. Thus, the main zones of uncertainty can be located in six vital activities: competencies, management of relations with the environment, internal communications, formal rules, the organization's finances, the organization's internal order, and the organization's internal order, all of which are unforeseeable for the organization.

There is no hierarchy of these aspects, so their influence may vary depending on the situation that pressures change, as can be seen in Figure 2.


**Figure 2** Uncertainty zones in the Crozier and Friedberg model
*Source: Own elaboration*

Competence refers to the power of the expert, the possessor of specialized knowledge such as that derived from experience in the management of political-organizational relations, both internal and external. It consists in the recognition, by the other organizational actors, that some possess the qualities suitable to perform certain roles. Moreover, it arises from the idea that, because of his competence, a given actor is indispensable in the role he plays. This would be a competence given by the formal power structure.

The management of relations with the environment refers to the ability to define or foster alliances with other organizations, or to establish the issues on which conflict with them will arise. In general, the management relations that some actors must necessarily assume on behalf of the organization. Those who perform these tasks find themselves in the so-called "marginal secant" position participate, in fact, in two systems of action, one within the organization and the other constituted by the relationship between the organization and the environment.

Internal communications refer to the control exercised over the channels of communication, an action developed by those who have the ability to distribute, manipulate, delay or suppress information. Formal rules are the area in which the "rules of the game" for conflict resolution and negotiations with other organizational actors are established and interpreted. This is where the margins of discretion to apply the rules are controlled and interpreted.

Financing refers to the control of the channels through which money flows to finance the organization. Control over this zone of uncertainty often depends on the privileged contacts that certain actors manage to establish with external funding sources. Sometimes the external source directly controls this zone of uncertainty and thus exercises a certain amount of power over the organization. In the second, no one is in that position and control passes into the hands of those actors in the organization itself who are at the forefront of fundraising operations.

Recruitment is an area of uncertainty in that it decides who may or may not join the organization, who will have a career in one of the organization's branches, and what the requirements are for that purpose.

Power resources are concentrated in these six areas according to the model, and although they are almost always controlled by a small number of people who make up the formal authority structure, they may be dispersed among actors in the organization, which is often exploited in negotiations with leaders. In other words, it is not enough to establish and distribute tasks in organizations; control over resources and decision-making must also be exercised in order to constitute legitimate authority.

Under this interpretation it is assumed that organizational change is more a product of the action capabilities of groups within the company or organization that manage to negotiate control of some of the areas of strategic uncertainty in the organization and therefore press for the creation of new objectives.

**Organizational change in the 21st century**

This review has discussed the relevance of the concept of the power dimension in the control of an organization's resources as a key element for change.

For the 21st century, the zones of uncertainty have increased towards another key aspect such as the control of knowledge and the use of technological resources that further widen the possible areas of negotiation within an organization.

Faced with these new scenarios, it is less likely that change can be controlled, let alone standardized.

In recent years, perspectives on organizational change have focused their analysis on the creation of informal leadership, the capacity to manage innovation processes and new technologies as new zones of uncertainty that would be added to the traditional factors of power. Interactions between actors in organizations become increasingly difficult to manage from the structure and acquire different meanings that provoke conflict and require new forms of leadership and negotiation.

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In this regard, the study by Lennon, E.; Hopkins, L.; et. al. (2023) explored the dimensions of organizational change from the introduction of more flexible communication practices in a public organization and its relationship with models of leadership and innovation-oriented decision making.

The emergence of new values and demands from society has diversified and therefore the organizational system has become less tolerant and therefore more conflictive as can be seen in numerous problems in companies such as high staff turnover, low productivity, shortage of capital, low innovation rates, harassment at work, gender inequality and few policies aimed at social inclusion.

## Conclusions

The sociological perspective of organizational change helps to understand a greater number of variables affecting organizational change due to the micro analysis of the processes of negotiation between the actors involved in the control of resources within an organization.

The concept of uncertainty zones seems to be valid from an analytical and applied point of view to provide a methodology for the direct observation of change phenomena, or not, within organizations.

Although this article did not carry out a field study to measure the six zones of uncertainty proposed by Crozier and Friedberg, it is possible to extend the proposal to two more elements within the model. The first one refers to knowledge as a power resource in the organization (which could be explained from the competence zone, although it is not limited to it) and that of technological resources, which is associated with the organization's ability to communicate more quickly with its environment by making use of digitalization in its processes, which tend to be poorly controlled by conventional structures.

Finally, and supported by the sociological theories of change and the new issues on the agenda of organizational development focused mainly on the management of intellectual capital, it is possible to identify points of concurrence to explain the trend towards more inclusive forms of management in decision making and the definition of different organizational structures in accordance with the needs of the 21st century society.

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# Gender differences in career choice: An agent-based model

# Diferencias de género en la elección de carrera: un modelo basado en agentes

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**Abstract**

In general, women's decisions about their professional future are complicated by subjective factors such as gender norms. These norms imply unequal access of women and men to resources, rights and freedoms, since they are behaviors that end up becoming strongly rooted in society. The social norms in force in the context in which a woman operates can largely determine her professional future. In this context, in this article we will analyze the gender differences observed in educational choices through a dynamic agent-based model in which women of a generation make their career's choice influenced by external factors. The results show the great impact of traditional gender norms on the time necessary for societies to have at least 50% of women choosing to continue their educational and professional training.

**Social norms, Gender Inequality, Agent-based modeling**

**Resumen**

En general, la decisión de las mujeres sobre su futuro profesional se complica debido a factores subjetivos como las normas de género. Estas normas implican un acceso desigual de mujeres y hombres a los recursos, derechos y libertades, pues son conductas que terminan por arraigarse fuertemente en la sociedad. Las normas sociales vigentes en el contexto donde se desenvuelve una mujer pueden determinar en gran medida su devenir profesional. En este contexto, en este artículo analizaremos las diferencias de género observadas en las elecciones educativas mediante un modelo basado en agentes dinámico en el cual las mujeres de una generación eligen carrera influenciadas por factores externos. Los resultados muestran el gran impacto de las normas de género tradicionales sobre el tiempo necesario para que las sociedades tengan al menos un 50% de mujeres optando por continuar con su formación educativa y profesional.

**Normas sociales, Desigualdad de género, Modelación basada en agentes**

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## Introduction

Most of the decisions individuals make involve trade-offs, which make them evaluate the opportunity costs of choosing between exclusive options. In addition, there are various elements of the environment, both objective and subjective, that influence such decisions. For example, in the case of higher education, we are faced with different types of choices, starting with the choice between continuing to study or working; if we choose to continue studying, other dilemmas arise: which career to choose, at which university, in the city where I live or elsewhere, and so forth.

In the case of women, the decision about their professional future seems more complicated as other subjective factors come into play, such as gender norms, which are social norms that define acceptable and appropriate actions for women and men in a given social context. These norms shape women's and men's generally unequal access to resources and freedoms, thus affecting their voice, power and sense of self (Heise and Cislaghi, 2017). Gender norms emerge and are reproduced through everyday interactions among members of society and between them and their environment. They are thus behaviours that become so strongly embedded in society that they are reflected in formal and informal institutions.

In the first case, they translate into legal discrimination, i.e. laws and regulations that prevent women from achieving the same economic prosperity as men. According to the World Bank's Women, Business and the Law 2022 report, some 2.4 billion working-age women do not have equal economic opportunities, and 178 countries continue to have legal barriers that prevent them from fully participating in the economy. In 86 countries, women face some form of work restriction, and 95 countries do not guarantee equal pay for work of equal value (World Bank, 2022).

In the second case, these are informal norms, i.e. behaviours that society expects each individual to have depending on whether they are male or female (United Nations Population Fund, 2020). These are "rules" that are unwritten and govern the behaviour shared by members of a given group or society. They are informal, often implicit rules that most people accept and abide by (The Social Norms Learning Collaborative, 2021). Social norms are sometimes so strong that individuals abide by them in order not to suffer the penalty of being singled out, or excluded from their social environment for differing behaviour. Indeed, "if others believe that one should conform, the reaction to non-conformity may range from mild displeasure to active or even extreme punishment. The extent of social reaction varies according to how important or central a norm is to social life, how entrenched it is, and what kind of real or perceived harm disobedience creates. The combination of punishment (mild, serious or absent) and a person's sensitivity to the norm will determine individual compliance" (Bicchieri, 2017, p. 32).

> "Discriminatory gender norms are preserved not only through the rules of behaviour in everyday life that children quickly internalise - in the home, school, workplace, markets and other public places - but also through wider social institutions. These include organised religion, traditional social structures (e.g., chiefs' courts), education systems and the media" (United Nations Population Fund, 2020, p.19).

Undoubtedly, social norms influence human behaviours that determine the well-being, health and opportunities of individuals; consequently, the social norms prevailing in the context in which a woman operates can determine to a large extent her career path. In this context, in this article we will analyse the gender differences observed in educational choices. To do so, we will build a dynamic agent-based model in which women of one generation make career choices influenced by external factors, such as institutions or the behaviour they observe in the women around them, both contemporary and from the previous generation. This model is an extension of the basic framework developed in Quintero Rojas and Viianto (2020).

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The rest of this paper is organised as follows. In section 1 we develop and simulate the agent-based model in different social contexts. In section 2 we present the results of the model simulations and the econometric analysis of the generated dynamics. Finally, in section 3 we present our conclusions.

## 1. The model

Given the socio-cultural context of gender norms and the consequent heterogeneity among agents, in this contribution we turn to agent-based modelling (MBA). This approach allows us to create, analyse and experiment with artificial worlds of heterogeneous agents through computational simulations. This allows us to investigate how the interactions between these agents and their environment give rise to the patterns observed in the real world (Hamill and Gilbert, 2016), while facilitating the conduct of social experiments while avoiding the difficulties and ethical issues that would arise when conducting them in the real world (Gilbert, 2008). In this research, the model we will build will allow us to generate possible future scenarios and study the effects of gender norms on women's career choice, as well as the time in which the simulated society would manage to close the gender gap.

The model is dynamic and built on the NetLogo platform. The artificial society is made up of various generational cohorts. Its basic elements are as follows. Environment: Each generation is composed of 2500 families, arranged in a closed network of 50 by 50. Each family then always has 8 neighbouring families, regardless of their position in the network. Agents: In all families there is a mother and a daughter, who are the relevant members for the phenomenon we want to study. They are the ones who make the decision whether or not to follow the social gender norm. The pattern is repeated generation after generation and the analysis covers 40 generations. Decision rules: The young women of each generation in this simplified society must decide whether to pursue higher education and enter the labour market or to adopt the traditional gender norm of dropping out of school and taking up housework (housewife). In this case, dependence on male providers would be replicated, with the corresponding limitations on women's freedom and empowerment.

### *1.1 Social norms and their influence on decision making*

Decision-making is probabilistic and influenced by three external factors: family, neighbours and institutions. Each factor can influence up to 33% of the agent's decision probability. There is also an idiosyncratic component independent of the influence of these external factors. Thus, with a 1% probability, girls will randomly choose whether or not to follow the traditional gender norm. Young women make their decision, one by one, following a random order. When all agents of one generation have made their choice, the next generation begins.

*Influence of the family*

The most immediate influence is that of the family, as the young woman will to some extent take as an example the decision made in the past by her mother on whether or not to follow the traditional gender norm. Thus, if the mother pursued higher education, her daughter is 33% more likely to do so. Conversely, if the mother chose the role of housewife, her daughter is 33% more likely not to continue her studies and to take on the traditional role.

*Influence of neighbours*

Each young woman observes the decisions made by the girls in her neighbourhood, made up of the 8 families surrounding her. Each family has an influence of (33/8) %. The roles chosen by both generations are taken into account, depending on whether the neighbours have already made their choice or not yet. If they have already made their choice, this is the observed behaviour, otherwise the role chosen in the past by the mother of the family is taken into account. For example, if all the neighbours chose to continue their education, the young woman would be 33% more likely to continue her studies as well. If only 3 out of 8 neighbours continued their studies, they would be 11% more likely to make the same choice, and so on.

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*Influence of institutions*

Finally, formal institutions, such as the education system or public policies regarding education and gender equality, will also have some impact on the decision of the agents. Similarly, young women will be influenced by other social elements such as the media, culture (films, books, comics, television, etc.), language, among others. This is summarised by a parameter varying between 0% and 100%, the value of which is fixed at the start and held constant throughout the simulation. A value of 0% would mean that agents are 33% more likely to choose the traditional gender norm and be housewives. This would mean that both the educational system and the information transmitted by the authorities, the media, the culture, etc., are oriented in that direction, reflecting the idea that the ideal is for women to be housewives. In contrast, a value of 100% implies an education system that increases the likelihood of girls deciding to continue their studies by 33%. A neutral system would correspond to a value of 50%, which would translate into an additional 16.5% probability for each option.

## 2. Results of the social simulations

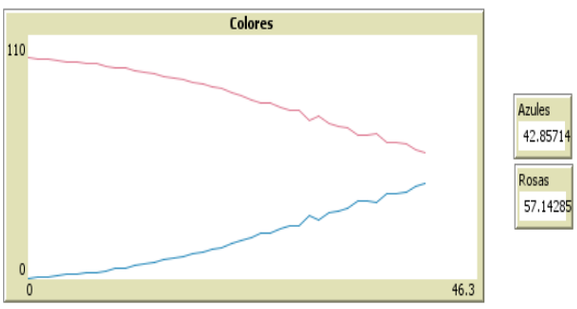
In this section we will study the evolution of society, under various assumptions, in order to assess how long it would take to evolve towards a situation with more highly educated women, which in our modelling would correspond to a society with smaller gender gaps.

### *2.1 Initial setting: traditional absolute gender role*

In this configuration, we assume that we start from a very traditionalist society where all women of the previous generation assumed a traditional gender role, i.e. none of them went on to higher education because they chose to be housewives. While this is an extreme situation, it gives us a baseline of how long it would take for society to change this social norm. Also, remember that social norms vary according to time and place, so it is possible to find societies tending towards this configuration in certain historical contexts.

In the simulations, agents who choose to continue their professional training are represented in blue, while those who choose a traditional gender role are represented in pink. In graph 1 we can see that, if we start from a situation where the education system, culture, institutions, among others, favour the gender norm where women choose to drop out of school and do housework, the evolution towards a society with more educated women is extremely slow. After 40 generations (approximately 800 years) we would have an average of 43% of women choosing to continue their studies, against 57% who choose a traditional gender role.

That is, the social norm is so strong that only in the very long term would there be a noticeable change, driven only by the idiosyncratic component, which implies that only 0.5% would choose to continue their studies, so their daughters would have a 33.5% chance of making the same choice; the effect would be even greater if there are more agents in the neighbourhood who have chosen to continue their education. This will influence future generations, as there will be more agents with neighbours who chose to study. This means that, little by little, this option is spreading among the population, both through family and environmental influence. In this way, very slowly, the social norm is also changing and is no longer absolute. However, the convergence towards a society where at least 50% of women choose to continue their vocational training is only achieved after 50 generations (approximately one millennium).




**Graphic 1** Evolution of a society with an absolute traditional gender role
*Source: Own elaboration*

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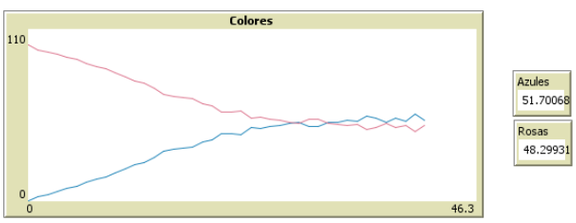
Graphic 1 shows the composition of the simulated society after 40 generations. What is most noticeable is the geographical distribution of the agents, as we can see that clusters have been formed where traditional families predominate (pink areas) and others where more liberal ones predominate (blue areas). In the real context, a similar division can be observed between urban and rural regions.

**Figure 1** Final situation of a society with an absolute traditional gender role
*Source: Own elaboration*

### *2.2 Initial context: predominant traditional gender role*

However, if the influence of external factors is not absolute towards dropping out, but there is still a clear bias towards choosing the traditional gender norm, the process is accelerated considerably. Assuming an educational influence of 5%, this would imply that the probability of women in the first period (generation) deciding to continue their studies rises from 0.5% to 2.15%. In this case, convergence occurs about 30 generations later, as shown in Figure 2.




**Graph 2** Evolution of a society with a predominant traditional gender role. Source: Own elaboration.

Furthermore, given this influence, the balance is skewed towards educated women, who account for 52%. This seems to translate into larger blue clusters, as shown in Figure 2.

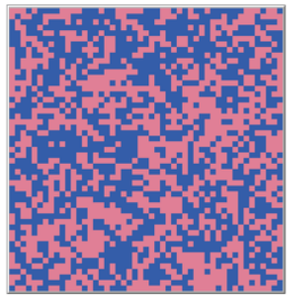
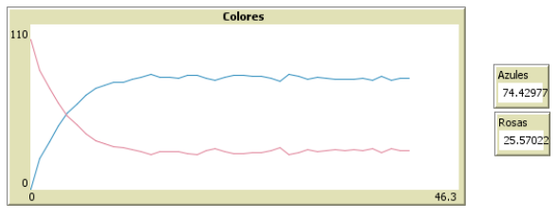


**Figure 2** Final situation of a society with a predominant traditional gender role
*Source: Own elaboration*

### *2.3 Initial context: neutral social environment*

If the institutional system were neutral, in the sense of favouring both options in the same way, the convergence process is surprisingly fast compared to the previous cases. This is because in the first generation alone, the probability of continuing studies increased from 2.15% to 17%. Figure 3 shows that after about 15 generations (approximately 300 years) a stable situation is reached in which 75% of the female population decides to continue their studies.




**Graph 3** Evolution of a socially neutral society
*Source: Own elaboration*

In congruence, Figure 3 shows that traditional areas are few and no longer dense.

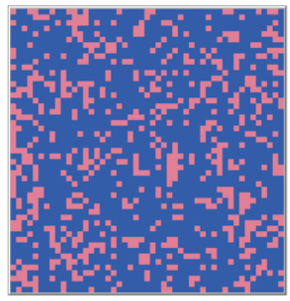


**Figure 3** Final situation of a society with a neutral social environment
*Source: Own elaboration*

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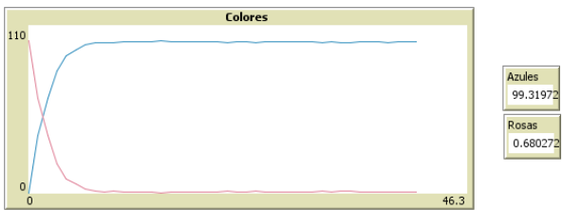
*2.4 Initial context: fully progressive social environment*

Finally, in the case where women were strongly encouraged institutionally to choose to continue their vocational training. Figure 4 shows that the long-term equilibrium is reached in about 7 generations (about 140 years).




**Graphic 4** Evolution of a society with a fully progressive social environment
*Source: Own elaboration*

In this context, with clear policies and messages aimed at closing the gender gap, less than 1% of women choose to be housewives, as can be seen in Figure 4.

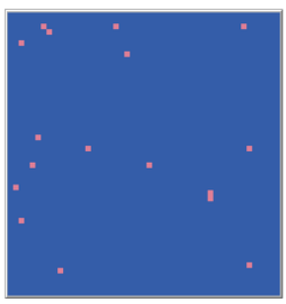
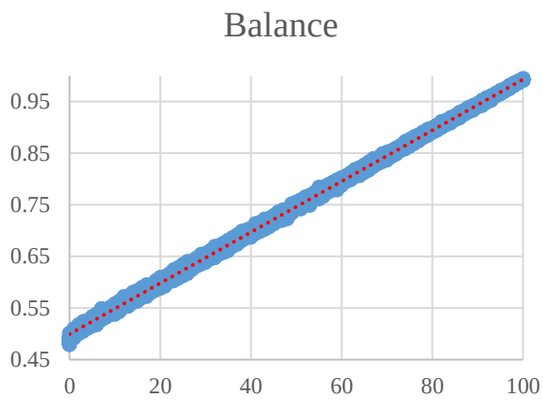


**Figure 4** Final situation of a society with a fully progressive social environment
*Source: Own elaboration*

*2.5 Econometric analysis of the model dynamics*

In order to extend the analysis, we will evaluate the impact of public policies in favour of women's higher education on the convergence of society towards an egalitarian situation. To this end, the model was simulated for each educational value between 0% and 100%, in variations of 1%; 60 generations were considered and, in order to obtain a convergence towards the mean, each value was repeated 50 times. In total, 5050 simulations were performed.

As a reference value for the convergence of the population, the average of generations 50 to 60 was taken and the first generation to reach that value was detected. Thus, Figure 5 shows the equilibrium as the percentage of women who chose to continue their education once convergence was reached. The graph also shows some variance in relation to the different values taken by the equilibrium in the 50 replications for each percentage value of education.




**Graphic 5** Percentage of women in continuing education at equilibrium
*Source: Own elaboration*

By performing a simple ordinary least squares regression, taking the equilibrium value of the percentage of women with higher education ($Women_{ES}$) as the dependent variable and education as the independent variable, an almost perfect fit is obtained, with an $R^2$=0.99928 and an adjusted value of 0.999279. The results are summarised in table 1, where it can be seen that the value of the intercept is basically 50% of the population, while each additional percentage point of education raises this percentage by practically 0.5%. In other words, we have the following relationship:

$$Mujeres_{ES} = 0.4993 + 0.00493506 * Educación \quad (1)$$

| | *Coefficients* | *Value t* | *Probability* | *Inferior 99.0%* | *Top 99.0%* |
|---|---|---|---|---|---|
| Intercept | 0.499 | 4627.4 | 0 | 0.499 | 0.499 |
| Education | 0.005 | 2647.1 | 0 | 0.005 | 0.005 |

**Table 1** Ordinary least squares regression
*Source: Own elaboration*

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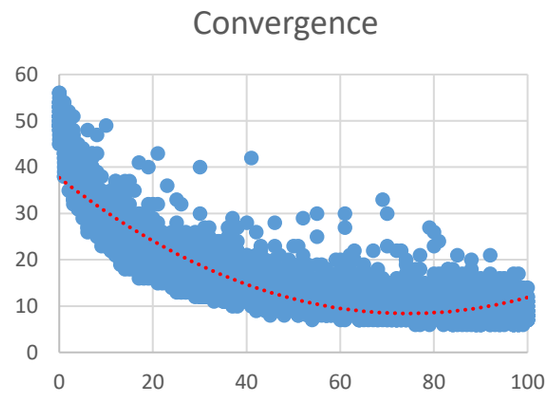
Another element of interest for our analysis is the convergence time of societies towards equilibrium. To study it, we consider the generation in which the average of generations 50 to 60 is exceeded. The graph in figure 6 shows a wide variance in the results obtained in the 50 replications. This is due to randomness; however, there is a clear inverse relationship between the convergence time and the value of education, so that the convergence time decreases with the value of education, but not linearly. Consequently, a quadratic regression was chosen, the results of which are shown in table 2. By regressing a second-degree polynomial equation, considering education and education squared as independent variables, a very good fit was obtained, with an $R^2$=0.8209 and a fitted value of 0.8208. However, despite the better goodness of fit, the model underestimates the results at the beginning, while it overestimates them at the end.[1]




**Graphic 6** Number of generations needed to converge to equilibrium
*Source: Own elaboration*

| | *Coefficients* | *Value t* | *Probability* | *Inferior 99.0%* | *Top 99.0%* |
|---|---|---|---|---|---|
| Intercept | 37.716 | 228.360 | 0 | 37.29 | 38.141 |
| Education | -0.788 | -103.176 | 0 | -0.80779 | -0.768 |
| (Education)2 | 0.005 | 71.640234 | 0 | 0.005 | 0.005 |

**Table 2** Quadratic regression
*Source: Own elaboration*

According to the model in table 2, increasing education by 1% reduces the number of generations needed to converge by 0.7875; in addition to this direct effect, there is a small quadratic correction that reduces this effect by 0.0053; this amount depends on the value of education at that time.

## Conclusions

The organisation of societies is a dynamic process which, depending on elements such as the value system, tradition, mythology, religion, politics, etc., together with the interaction between members of society, produces a series of social norms. These norms are, then, a complex emergent phenomenon that in turn influences the members of society, modulating their behaviour. As a dynamic phenomenon, it evolves and changes over time.

This system of organisation can generate important impediments to individual and social development possibilities, limiting the decision-making options of individuals in important ways. In this article, we have been interested in the historical limitations women face in accessing education and the labour market, with the resulting gender inequality in the standard of living and enjoyment of rights.

Discriminatory norms against women, which may be legal or gendered social norms based on tradition or custom, significantly limit the economic independence, entrepreneurship, inventiveness and initiative, intellectual and academic development of half of the human population, in turn limiting the economic, scientific and social development of humanity as a whole.

Through various social movements, great changes have been achieved in many aspects, but mainly in legal aspects, which lifted the express prohibitions on certain actions. However, a significant part of the social construct underpinning the restrictions is still part of our own decision-making system and acts as internalised constraints. Their persistence is largely due to external elements that influence our behaviour. In a simplified way, in this article we have considered three external influences due to their relevance: the family, our immediate environment and the influence of formal and informal institutions, reflected in the educational system, the media or culture, among others. Their importance lies in the fact that they can, to a certain extent, be modified, through educational policies, for example.

[1] This explains why the estimated intercept is 37 generations, when in reality it is approximately 50 generations.

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Family influence is seen as a generational element based on the choices made by the previous generation, while the choices made by our contemporaries also influence our own.

To study the effect of these external factors on women's educational choices, we constructed an agent-based model, which allowed us to conduct various social experiments and observe the different equilibria to which social dynamics converge. This allowed us to assess the role of gender norms in the convergence towards societies with a higher proportion of educated women. Thus, different initial configurations of society were analysed, going from situations so traditional that no women of the previous generation chose to continue their studies, to such progressive societies where almost all of them abandoned the role of housewife.

The results of the simulations show that, if the educational system does not encourage women at all to continue their studies, we observe that it will take society about 50 generations to reach a situation where 50% of women choose to continue their educational process. On the other hand, if the social system with respect to education were neutral, not biased towards encouraging housewifery, but also not encouraging further education, after 15 generations an equilibrium would be reached where 75% of women would have chosen to continue their education. If, on the other hand, the social system strongly encouraged women's access to education and vocational training, we would observe that after only 7 generations we would have a more equal society, where virtually all women would have chosen to continue their studies.

Our results underline the importance of gender roles and their perception in society to understand the gender gaps historically observed in the incorporation of women in areas such as education, politics, entrepreneurship, etc., despite the fact that in some cases legal impediments have been removed. This is why we consider that public policies must be accompanied by strategies to change the social perception of the roles that we as men and women must assume.

The incorporation of the idea and the image of the educated, scientific, hard-working, enterprising, political woman, not only in the classroom, but also in the media, films, series can be an important trigger in the struggle to eliminate the discriminatory ideological barriers against women that have been erected throughout history.

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# Perception of body image and quality of life according to body mass index and breast reconstruction of breast cancer survivors

# Percepción de la imagen corporal y calidad de vida según el índice de masa corporal y reconstrucción mamaria de sobrevivientes de cáncer de mama

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**Abstract**

Breast cancer survivors present negative changes in body composition that can affect the perception of body image and consequently quality of life. Objective: to evaluate the perception of body image and quality of life of breast cancer survivors according to body mass index and whether breast reconstruction is present or not. Methodology: non-experimental study, with a quantitative and cross-sectional analytical approach in 54 breast cancer survivors. The Hopwood Body Image Scale (2001), WHOQOL-BREF for quality of life, and anthropometry for body composition were used. Contribution: the average age was 56.79 ± 10.00; 84% were overweight or obese. The body image perception score was 8.07 ± 7.55, and the quality-of-life score was 89.45 ± 14.41. The participants have little alteration in body image and are not at the top of the quality-of-life score. Analyzing these alterations will allow the design of future interventions adapted to the context of this population to mitigate alterations secondary to treatments and the disease.

**Breast cancer survivors, Body image, Quality of life**

**Resumen**

Las sobrevivientes de cáncer de mama presentan cambios negativos en la composición corporal que pueden afectar la percepción de la imagen corporal y consecuentemente la calidad de vida. Objetivo: evaluar la percepción de la imagen corporal y la calidad de vida de sobrevivientes de cáncer de mama de acuerdo con el índice de masa corporal y si se presenta reconstrucción de la mama o no. Metodología: estudio no experimental, con enfoque cuantitativo y de tipo transversal analítico en 54 sobrevivientes de cáncer de mama. Se utilizó la Escala de Imagen Corporal de Hopwood (2001), WHOQOL-BREF para la calidad de vida y antropometría para la composición corporal. Contribución: la edad promedio fue 56,79 ± 10,00, el 84% presentaba sobrepeso u obesidad. El puntaje de percepción de imagen corporal fue 8,07± 7,55 y de calidad de vida de 89,45 ± 14,41. Las participantes tienen poca alteración de la imagen corporal y no se encuentran en lo más alto de la puntuación de calidad de vida. Analizar estas alteraciones, permitirá el diseño de futuras intervenciones adaptadas al contexto de esta población para mitigar las alteraciones secundarias a los tratamientos y a la enfermedad.

**Sobrevivientes de cáncer de mama, Imagen corporal, Calidad de vida**

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## Introduction

Breast cancer is the most common cancer in women worldwide. The incidence of this disease has been increasing, with 2.261 million new cases of the disease diagnosed in 2020 (Sung et al., 2021). The increase in incidence is also due to the continuing public health effort to improve early detection testing. Because of this and advances in treatments, the number of survivors has also increased (Tabar et al., 2019). Globally, a survival rate of 89% has been estimated in developed countries; in countries such as Mexico, survival has been 72.2% (Unger-Saldaña et al., 2023; National Cancer Institute, 2022). As the number of survivors increases, it is important to recognise and effectively address long-term sequelae, considering that this population is challenged to deal with treatment side effects and an increased risk of developing chronic diseases (Suh et al., 2020).

The diagnosis of breast cancer is a life-changing event for any individual; the treatment process and the changes it entails in daily activities can have repercussions in different areas of survivors' health (Richter-Ehrenstein & Martinez-Pader, 2021). Some of the complications that this population presents are: increased risk of cardiovascular disease, osteoporosis, hyperthyroidism, diabetes, risk of secondary malignancy, sarcopenia, overweight or obesity (Lovelace et al., 2019). All of the above lead to further alterations in survivors' overall health that in turn impact on emotional well-being.

Post-treatment challenges include changes in body composition. Disease interventions such as chemotherapy, radiotherapy or surgery cause alterations in muscle mass, fat mass and bone mass in this population (Godinho-Mota et al., 2021). It has been reported that after treatment survivors may have a gain of up to 10 kilograms (Ee et al., 2020). In a study by Burkbauer et al. (2022), knowledge of obesity-associated cancer risk, self-awareness of body mass index (BMI) status and willingness to participate in a weight loss intervention were assessed in 122 overweight and obese US breast cancer survivors.

The authors reported that, of the 122 participants, 73 (59.8%) had a BMI of 25.0 to 29.9 kg/m 2 (overweight) and 49 (40.2%) had a BMI ≥ 30 (obese) and patients with obesity were more likely to underestimate their BMI than those who were overweight, 40.8% versus 23.3% ($p = 0.03$). This is of concern considering that it has been reported that for every 5 kg/m2 increase in BMI, the risk of a second cancer diagnosis increases by 7% for obesity-related cancers, 11% for a second breast cancer and 15% for a second oestrogen receptor-positive breast cancer (Feigelson et al., 2021). In addition to these complications, all of the described changes can trigger complex emotions related to self-esteem and perception of body image due to excess body weight which in turn can lead to sadness and concerns about body shape and feelings of loss of femininity. Specifically, body image is a complex term that includes cognitive (thoughts and beliefs about the body), perceptual (how body shape and size are perceived), affective (feelings about the body) and behavioural components, which are the actions people take to care for or alter their body (Yamamotova et al., 2017). When there is a disturbance in body image, there is a disturbance in perception (distortion) and concept (body dissatisfaction), thus there is an inability to accurately assess body shape (Lewer et al., 2017). In breast cancer survivors it has been reported that approximately 74% have body dissatisfaction. In addition, manifestations of altered body image perception have been assessed in comparison to women with other cancers and found to have high levels of body image dysphoria (discomfort, negative feelings) compared to women with other cancers (Guedes et al., 2018; Oers & Schlebusch, 2020).

Feelings of sadness and altered perceptions of body image may affect the quality of life of breast cancer survivors, This may be compounded by fear of recurrence and negative feelings due to the way they perceive their body. Some survivors report feeling less physically attractive, less feminine and less confident in carrying out activities of daily living (Camejo et al., 2020). An et al. (2022), examined the associations between body image and quality of life in 354 breast cancer survivors from China.

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The authors found that improved perception of change in body image-related sexual activity, role change and psychological change were significantly associated with improved physical and mental well-being. Hence the importance of actions that address body image issues and help improve quality of life in this population.

An important aspect to highlight is that it has been reported that mainly those women who undergo radical mastectomy (complete removal of the breast), develop greater alterations in the perception of body image and impairment of quality of life (Türk et al., 2018). Therefore, an important aspect for them is breast reconstruction, which consists of the placement of implants or the construction with autogenous tissue (tissue from other parts of the body). The literature has shown that women who undergo breast reconstruction have a better quality of life. Specifically, advanced age, post-menopause, postoperative complications, endocrine therapy, advanced tumour stage and delayed reconstruction are factors that influence decreased quality of life (Wang et al., 2020).

Therefore, the aim of this study is to assess the perception of body image and quality of life of breast cancer survivors according to body mass index and whether or not breast reconstruction is present.

## Methodology

*Study design*

This is a non-experimental, quantitative, analytical cross-sectional design with a non-probabilistic purposive sample.

*Participants*

Fifty-four breast cancer survivors from Mexicali and Tijuana, Baja California participated. Participants were recruited through civil associations and institutional social networks of the Autonomous University of Baja California. Inclusion criteria were that they were over 18 years of age, had a diagnosis of breast cancer stages I to III and had been treated for at least 6 months.

*Assessment instruments*

To ascertain the characteristics of the population, a socio-demographic and health questionnaire was applied, which consisted of questions about age, schooling, menopausal status, among others. This questionnaire also asked about whether or not they had breast reconstruction.

*Body image perception*

Body image perception was assessed with the Hopwood Body Image Scale (2001), which consists of 10 items scored from 0 (Not at all) to 3 (Very much). The response options are on a Likert-type scale and the possible range of scores is from 0 to 30. A high score is considered to indicate greater disturbance with body image.

*Quality of life*

The World Health Organization Quality of Life instrument, short version (WHOQOL-BREF) was used to assess the quality of life of the participants. It consists of 26 items assessing four areas: Physical Health, Psychological Health, Social Relations and Environment. Higher scores are considered to indicate better quality of life.

*Body mass index*

Body mass index was calculated from the weight and height of the participants. Weight was obtained using a Beurer scale, height was obtained using a SECA stadiometer, weight was divided by height in metres and squared. For body mass index categories of norm, overweight and obesity, the criteria of the World Health Organisation were used.

*Statistical analysis*

Descriptive statistics (mean, standard deviation and percentages) were used to characterise the population. Normality of the variables of interest was assessed with the Shapiro-Wilks test. Mann Whitney U test was used to analyse differences in body image perception and quality of life scores according to body mass index categories and according to whether or not they had breast reconstruction considering a $p \leq 0.05$ as statistically significant. All analyses were performed in the statistical package STATA version 12.

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## Results

The characteristics of the participants are shown in table 1. The average age was 56.79 ± 10.00 and regarding their marital status, it was observed that the majority were married (62.26%), 6 participants were widowed (11.32%), 4 were in common-law unions (7.55%), 3 were divorced (5.66%) and 7 were single (13.21%). When asked about educational level, 7 (13.46%) participants had primary school, 8 had secondary school (15.38%), 5 (9.62%) had a technical degree, 12 (23.08%) had completed high school, 17 (32.69%) had a bachelor's degree and 3 (5.77%) had a postgraduate degree.

When asked about menopausal status, 89.36% (n=42) were menopausal and 10.64% (n=5) were premenopausal. Regarding whether they had breast reconstruction only 6 participants (12%) had reconstruction, while 88% had no reconstruction. When analysing body composition, the average weight was 74.61 ± 12.95 kilograms and the average body mass index was 30.05 ± 4.74. When classifying this body mass index according to the World Health Organization categories it was found that only 7 participants (14.29%) had a normal index, 17 participants were classified as overweight (34.69%), 16 as obese grade I (32.65%), 8 as obese grade II (16.33%) and 1 participant as obese grade III (2.04%). Finally, in the results of the body image scale score, it was found that on average the overall score was 8.07± 7.55 and for quality of life 89.45 ± 14.41.

| | $\bar{X}$ ± DE (n) |
|---|---|
| Age | 56,79 ± 10,00 (53) |
| *Marital status* | |
| Married | 62,26% (33) |
| Widowed | 11,32% (6) |
| Unmarried | 7,55% (4) |
| Divorced | 5,66% (3) |
| Single | 13,21% (7) |
| *Schooling* | |
| Primary | 13,46 (7) |
| Secondary | 15,38 (8) |
| Technical | 9,62 (5) |
| High School | 23,08 (12) |
| Bachelor's degree | 32,69 (17) |
| Postgraduate | 5,77 (3) |
| Menopausal status | |
| Premenopause | 10,64% (5) |
| Menopause | 89,36% (42) |
| Breast reconstruction | |
| Yes | 12,00% (6) |
| No | 88,00% (44) |
| Weight (kg) | 74,61 ± 12,95 (48) |
| Height (cm) | 154,93 ± 22,72 (51) |
| Body Mass Index (BMI) | 30,05 ± 4,74 (49) |
| Categorical Body Mass Index | |
| Normal | 14,29% (7) |
| Overweight | 34,69% (17) |
| Obese grade I | 32,65% (16) |
| Obese grade II | 16,33% (8) |
| Obesity grade III | 2,04% (1) |
| Body image scale score | 8,07± 7,55 (53) |
| Quality of life score | 89,45 ± 14,41 (54) |
| $\bar{X}$ Mean; SD Standard deviation | |

**Table 1** Socio-demographic characteristics of the participants

The scores obtained on body image perception and quality of life according to body mass index categories are shown in table 2. The results show that the body image perception score for women with normal body mass index was 3.42 ± 3.77, while for those with overweight and obesity it was 8.43 ± 7.74. The quality of life score for participants with normal body mass index was 89.57 ± 13.35 and 90.64 ± 13.64 for those who were overweight or obese.

| | **Normal 18.5 at 24.9 $\bar{X}$ ± DE (n)** | **Overweight and obesity25 a 29.9 $\bar{X}$ ± DE (n)** | ***p**** |
|---|---|---|---|
| Body image perception | 3,42 ± 3,77 (7) | 8,43 ± 7,74 (41) | 0,10 |
| Quality of life | 89,57 ± 13,35 (7) | 90,64 ± 13,64 (42) | 0,98 |
| p* Mann Whitney U-test | | | |

**Table 2** Body image perception and quality of life score by body mass index category

Table 3 shows the body image perception scores according to whether they had breast reconstruction or not. The body image perception scores were 11.66 ± 6.71 and 7.136 ± 6.98 for those with and without reconstruction respectively. Quality of life scores were 84.66 ± 11.67 in those who had reconstruction and 84.66 ± 11.67 in those who did not. No differences in scores were found between each category.

| | With breast reconstruction**$\bar{X}$ ± DE (n=6)** | No breast reconstruction **$\bar{X}$ ± DE (n=43)** | p* |
|---|---|---|---|
| Body image | 11,66 ± 6,71 | 7,136 ± 6,98 | 0,10 |
| Quality of life | 84,66 ± 11,67 | 90,18 ± 14,92 | 0,34 |
| p* Mann Whitney U-test | | | |

**Table 3** Body image perception and quality of life score according to whether they have breast reconstruction

## Appreciation

Support group adelante. Woman for women group. Stars for love group. Challenge group.

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**Conclusions**

The aim of this study was to assess the perception of body image and quality of life of breast cancer survivors according to body mass index and whether or not they have breast reconstruction. It was observed that participants scored 8.07± 7.55 on the Hopwood Body Image Scale (2001). According to this scale the score ranges from 0 to 30 and a score of 0 means that there is no alteration in the perception of body image. Although the participants in this study were not found to have a high score, the fact that they did not score 0 may be indicative that some participants have impaired body image perception. When analysing these scores according to body mass index, no significant differences were found between those with normal weight and those who were overweight. However, visually, a higher score is observed in those who are overweight or obese. In terms of quality of life, it was observed that the score was very similar in the normal body mass index categories and those who were overweight or obese, so no statistically significant differences were observed. With regard to the classification of whether or not breast reconstruction was present, no differences were observed in body image perception or quality of life scores.

It is important to mention that in terms of quality of life, although the participants have a high score, they are not at the maximum score of 100, which may also indicate that there are aspects of emotional well-being that can be improved. It is also worth noting the limitations of this study, such as the sample size, which it is recommended be increased in order to analyse the differences in these variables, which in previous studies have been found to be affected in this population.

Affections in emotional well-being may mean a decrease in self-care and risk of other complications such as depression (Luza & Palacios, 2023). For this reason, new studies are needed to evaluate in depth the complications in body composition and the relationship with emotional well-being, since an affectation of body composition and emotional wellbeing may be related to the risk of depression (Luza & Palacios, 2023).

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# [Title in Times New Roman and Bold No. 14 in English and Spanish]

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**Abstract (In English, 150-200 words)**

Objectives
Methodology
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**Keywords (In English)**

Indicate 3 keywords in Times New Roman and Bold No. 10

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* Correspondence to Author (example@example.org)
† Researcher contributing as first author.

## Introduction

Text in Times New Roman No.12, single space.

General explanation of the subject and explain why it is important.

What is your added value with respect to other techniques?

Clearly focus each of its features

Clearly explain the problem to be solved and the central hypothesis.

Explanation of sections Article.

## Development of headings and subheadings of the article with subsequent numbers

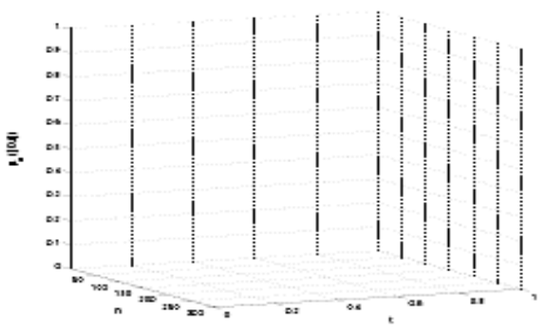
[Title No.12 in Times New Roman, single spaced and bold]

Products in development No.12 Times New Roman, single spaced.

## Including graphs, figures and tables-Editable

In the article content any graphic, table and figure should be editable formats that can change size, type and number of letter, for the purposes of edition, these must be high quality, not pixelated and should be noticeable even reducing image scale.

[Indicating the title at the bottom with No.10 and Times New Roman Bold]



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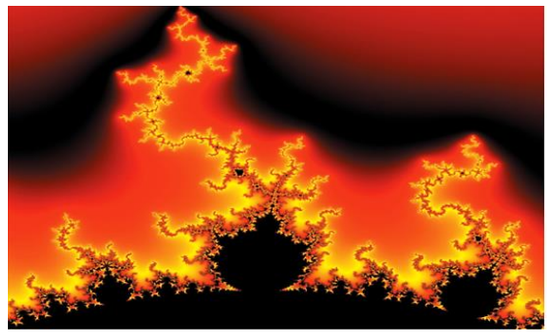

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**For the use of equations, noted as follows:**

$$Y_{ij} = \alpha + \sum_{h=1}^{r} \beta_h X_{hij} + u_j + e_{ij} \qquad (1)$$

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## Methodology

Develop give the meaning of the variables in linear writing and important is the comparison of the used criteria.

## Results

The results shall be by section of the article.

## Annexes

Tables and adequate sources

## Thanks

Indicate if they were financed by any institution, University or company.

## Conclusions

Explain clearly the results and possibilities of improvement.

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