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Change management strategies in the implementation of information technologies: comparison between Mexico and Brazil

Estrategias de gestión del cambio en la implementación de tecnologías de la información: comparación entre México y Brasil

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Abstract

The study analyzes change management strategies in the implementation of information technologies (IT) in Mexico and Brazil. The main objectives are to compare these strategies in both countries and discern the main practices employed. To achieve these goals, a mixed methodology combining qualitative and quantitative analysis is used. A textual analysis of theoretical sources is conducted, and the phenomenon is measured through structured surveys with a Likert scale, supported by descriptive and comparative statistics to validate hypotheses. The research contributes to the understanding of how organizations in emerging economies manage technological change. It offers perspectives on the importance of adapting change strategies to specific cultural and economic contexts, revealing key differences in the adoption and adaptation of technology between Mexico and Brazil. This knowledge is vital for leaders and managers seeking to improve the integration of IT into their processes, thus optimizing organizational efficiency and innovation.

Resumen

El estudio analiza las estrategias de gestión del cambio en la implementación de tecnologías de la información (TI) en México y Brasil. Los objetivos principales son comparar estas estrategias en ambos países y discernir las principales prácticas empleadas. Para alcanzar estos fines, se emplea una metodología mixta que combina análisis cualitativo y cuantitativo. Se realiza un análisis de texto de fuentes teóricas y se mide el fenómeno mediante encuestas estructuradas con escala de Likert, apoyadas en estadísticas descriptivas y comparativas para validar hipótesis. La investigación contribuye al entendimiento de cómo las organizaciones en economías emergentes gestionan el cambio tecnológico. Ofrece perspectivas sobre la importancia de adaptar las estrategias de cambio a contextos culturales y económicos específicos, revelando diferencias clave en la adopción y adaptación tecnológica entre México y Brasil. Este conocimiento es vital para líderes y gestores que buscan mejorar la integración de las TI en sus procesos, optimizando así la eficiencia y la innovación organizacional.

Objectives	Methodology	Contribution
The main objectives are to compare these strategies in both countries and discern the main practices employed	A mixed methodology combining qualitative and quantitative analysis. A textual analysis of theoretical sources is conducted, and the phenomenon is measured through structured surveys with a Likert scale, supported by descriptive and comparative statistics	It offers perspectives on the importance of adapting change strategies to specific cultural and economic contexts, revealing key differences in the adoption and adaptation of technology between Mexico and Brazil.

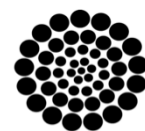| Objetivos	Metodología	Contribuciones
Los objetivos principales son comparar estas estrategias en ambos países y discernir las principales prácticas empleadas	Metodología mixta que combina análisis cualitativo y cuantitativo. Se realiza un análisis de texto de fuentes teóricas y se mide el fenómeno mediante encuestas estructuradas con escala de Likert, apoyadas en estadísticas descriptivas y comparativas	Ofrece perspectivas sobre la importancia de adaptar las estrategias de cambio a contextos culturales y económicos específicos, revelando diferencias clave en la adopción y adaptación tecnológica entre México y Brasil.

Strategy, Change Management, Mexico-Brazil

Estrategia, Gestión del Cambio, México-Brasil

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Introduction

The implementation of information technology (IT) in international organisations presents a unique set of challenges that require effective change management strategies. These strategies are critical to ensure a smooth and successful transition to new technologies, minimising resistance and maximising acceptance and exploitation of these tools. In this regard, several approaches that have been studied in the academic literature stand out.

First, effective communication is recognised as a key pillar in managing technological change. Clarity in communication about the benefits and impact of new technologies is crucial to align all *stakeholders* with project objectives (Kotter, 1996). In addition, the involvement of users from the early stages of the project facilitates greater acceptance of and commitment to change (Lewin, 1947).

Another important strategy is training and skills development. According to Argote and Ingram (2000), providing adequate and continuous training is essential to ensure that employees not only adopt the new technology, but also maximise its potential. Furthermore, cultural adaptation, which considers cultural differences in IT implementation internationally, is crucial to the success of change. Hofstede (1980) argues that understanding and respecting these cultural differences can significantly improve the implementation and adoption of new technologies.

Knowledge management also plays a key role. Nonaka (1994) suggests that the creation and transfer of knowledge within the organisation is vital for adaptation to new technologies. On the other hand, effective leadership, especially transformational leadership, has proven to be a decisive factor in the success of IT projects, as it motivates and guides employees through the change process (Bass, 1985).

Strategic planning and continuous evaluation of project progress are equally important. According to Kaplan and Norton (1992), the use of performance management systems, such as the *Balanced Scorecard*, can help monitor implementation and ensure that change objectives are met.

Finally, resistance to change is a common phenomenon that needs to be carefully managed. Kotter and Schlesinger (1979) propose several tactics for managing resistance, including education, communication and participation.

Brazil, as an emerging economy and one of the largest in Latin America, faces unique challenges in IT implementation. Change management in this context is influenced by country-specific cultural, economic and structural factors. In recent literature, several key strategies adapted to the Brazilian reality for effective IT implementation have been identified.

First, the importance of effective and transparent communication is highlighted in studies such as Silva and Fernandes (2015), who argue that Brazil, due to its cultural and social diversity, it is crucial to tailor change messages to different stakeholders. Employee engagement is also critical, as suggested by Rocha and Molina (2017), who found that change initiatives are more successful when employees are actively involved from the early stages.

Training and development are essential in the Brazilian context. According to Oliveira et al. (2018), training should be continuous and tailored to the specific needs of employees to overcome technological skills barriers. Knowledge management, according to Santos and Filho (2019), is another critical area, especially in large and geographically dispersed organisations, where knowledge transfer can face significant barriers.

Effective leadership is crucial, and in Brazil, the transformational leadership style has been shown to be particularly effective in IT implementation. This type of leadership fosters a shared vision and motivates employees to embrace change (Barbosa et al., 2020). In addition, cultural adaptation is vital. Studies such as Costa and Lima (2016) highlight the need to adapt change management practices to local cultural norms and values to ensure buy-in and commitment.

Strategic planning in Brazil requires consideration of economic volatility and rapid regulatory changes, as indicated by Carvalho and Santos (2021), who highlight the need for flexible and adaptive plans.

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Finally, resistance to change, a common challenge across cultures, must be addressed through education and participation, a strategy that Pereira and Oliveira (2017) find effective in the Brazilian context.

In Mexico, on the other hand, the implementation of IT in organisations has been a topic of growing importance, marked by a number of specific strategies that address both the cultural and economic context of the country.

The academic literature highlights various approaches and methodologies that have been adapted to the peculiarities of the Mexican environment.

First, effective communication is a fundamental strategy. In the Mexican context, communication must not only be clear and transparent, but also adapted to the high contextuality of Mexican culture, where how something is said is as important as what is said (Hofstede Insights, 2020).

Leadership in Mexican organisations tends to be hierarchical, which highlights the importance of transformational leadership that can effectively guide change (Rodríguez-González et al., 2016). This type of leadership helps to foster a shared vision and mobilise employees towards the goals of change.

Training and development are also critical. Many Mexican companies face the challenge of a workforce that varies widely in digital skills. Customised training programmes are essential to ensure that all employees can adopt and use new technologies effectively (García-Sánchez, 2018).

In addition, cultural adaptation is particularly relevant in Mexico due to the country's internal cultural diversity. IT implementation strategies must consider cultural variations even within Mexico's own regions (Torres et al., 2019).

Knowledge management is a vital tool in change strategy, facilitating the creation, distribution and effective utilisation of knowledge in Mexican organisations (Pérez-Soltero et al., 2016).

Resistance to change is an aspect that is carefully managed in Mexico, where power dynamics and personal relationships play an important role. Strategies that directly involve employees in the change process and allow for participation in decision-making can be more effective (Fernández, 2017).

Change management practices in Mexico also highlight the importance of a systematic and structured approach to change implementation, as suggested by methodologies such as ITIL or PMBOK, adapted to the local context (Jiménez-Castillo, 2020).

Finally, continuous monitoring and evaluation are essential to adjust change strategies as circumstances and implementation results evolve (López-Hernández et al., 2021).

Theoretical framework

In the international scenario, according to the report of the Organisation for Economic Co-operation and Development (OECD) in its annual report of the World Economic Forum 2022, Mexico ranks 37th and Brazil 38th; which makes both economies stand out in Latin America, with Chile 23rd, Costa Rica 28th, Panama 31st, Colombia 33rd, Peru 34th, Argentina 39th and Guatemala 39th. 34, Argentina no. 39 and Guatemala at no. 42.

The International Competitiveness Index (ICM) refers to 10 indicators that are:

- Reliable and objective system of law (Law): Measures the state of public security and legal certainty.

- Sustainable environmental management (Environment): Measures the capacity to relate sustainably and responsibly to natural resources.

- Inclusive, prepared and healthy society (Society): Measures the quality of life of the inhabitants through three areas: inclusion, education and health.

- Stable and functional political system (Political system): Measures democratic legitimacy, representativeness, stability and respect for rights and freedoms.

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- Efficient and effective governments (Governments): Measures the capacity of governments to positively influence competitiveness.

- Efficient factor market (Factor market): Measures the efficiency of factor markets, mainly labour markets.

- Stable economy (Economy): Measures the main economic characteristics.

- World-class precursor sectors (Precursors): Measures the quality and efficiency of the financial, energy, telecommunications and transport sectors.

- Leveraging international relations (International relations): Measures the degree to which foreign relations are capitalised upon.

- Innovation and sophistication in economic sectors (Innovation): Measures the ability to compete in technology-intensive value-added sectors.
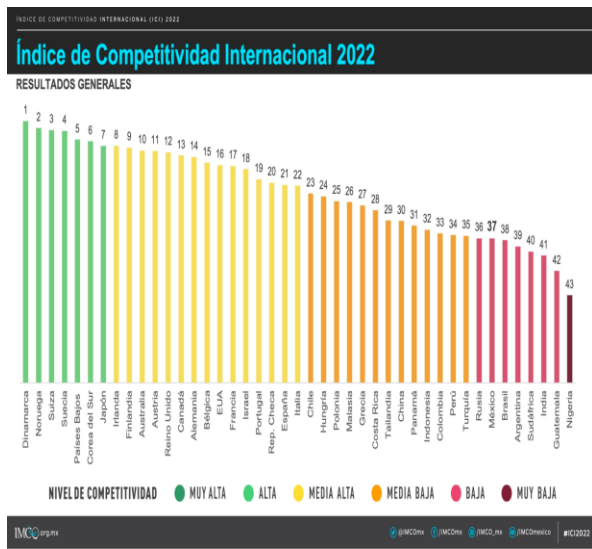
Box 1

Figure 1

International Competitiveness Index 2022

It can be seen in Figure 1, as quoted in the IMCO Report (2022, p.5) that both economies are, "Low competitiveness: Those countries whose scores are between one and two standard deviations below the mean".

Box 2
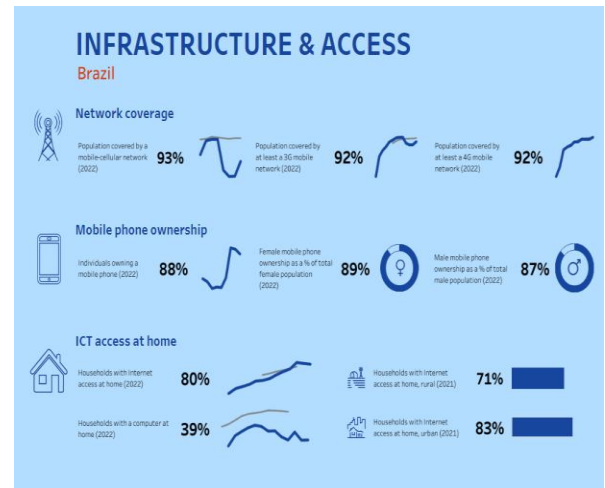
Figure 2

Infrastructure and access

Source: ITU (2022)

Brazil, Infrastructure and access

In Figure 2, the following elements can be observed: in 2022, there is significant network coverage in the field of mobile communications, with 93% of the population covered by a mobile cellular network. There is also widespread access to third and fourth generation technologies (3G and 4G), with 92% of the population covered by at least one mobile network in both cases.

In terms of mobile phone ownership, the adoption of this technology is remarkable, reaching 88% of the general population. It is particularly interesting to note that, broken down by gender, 89% of the total female population own mobile phones, while for the male population this percentage stands at 87%.

In terms of access to Information and Communication Technologies (ICTs) at home, 80% of households have access to the Internet. However, when looking at the availability of computers at home, it is evident that 39% of households have this technological resource. It is important to highlight the differences between urban and rural areas, with 83% and 71% of households having access to the Internet at home, respectively. These indicators, collected between 2021 and 2022, provide a detailed overview of the penetration of communication and information technologies in society, underlining the importance of addressing existing gaps to ensure equitable and widespread access to these fundamental tools in the digital era.

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Box 3

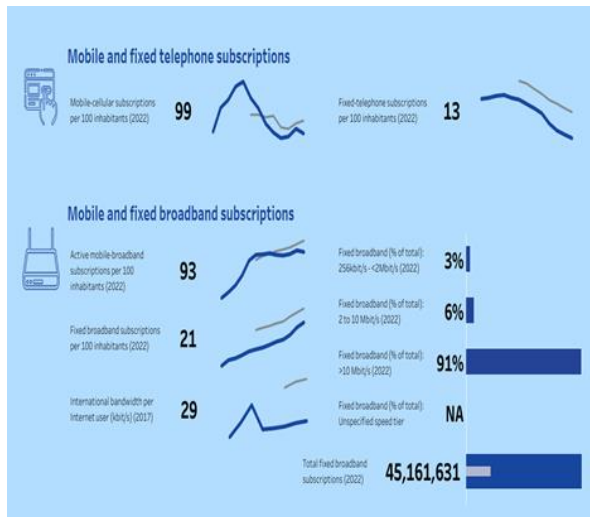**Figure 3**

Infrastructure and access (part two)

Source: (ITU, 2022)

In Figure 3, the following elements can be observed with regard to mobile and fixed telephony subscriptions: mobile telephony penetration is significant, reaching 99% of subscriptions per 100 inhabitants. In contrast, fixed telephony subscriptions show a lower proportion, at 13% per 100 inhabitants.

In the area of connectivity, active mobile broadband subscriptions reveal a high level of adoption, reaching 93% per 100 inhabitants. On the other hand, fixed broadband subscriptions show a share of 21% per 100 inhabitants, indicating a considerable but lower presence compared to mobile broadband.

In terms of international bandwidth per internet user, 2017 data reflect an average of 29 kbit/s. In relation to fixed broadband, a diversified distribution according to speed is evident, with 3% corresponding to speeds between 256 kbit/s and <2 Mbit/s, 6% to speeds from 2 to 10 Mbit/s, and a prominent 91% to speeds above 10 Mbit/s. It is important to note that an unspecified percentage of fixed broadband subscriptions do not have a given speed.

In terms of total fixed broadband subscriptions in 2022, a total of 45,161,631 subscriptions are recorded, underlining the importance and prevalence of fixed broadband connectivity today. These indicators provide a comprehensive view of the telecommunications infrastructure, evidencing the strong positioning of mobile telephony and the growing relevance of broadband in global connectivity.

Box 4
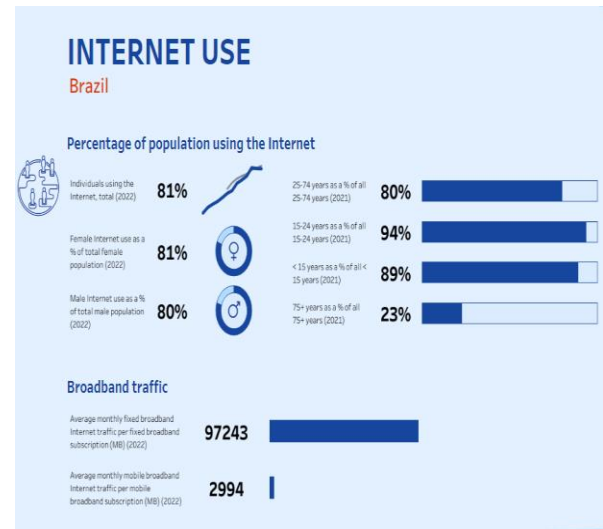
Figure 4

Internet use

Source: (ITU, 2022)

In Figure 4, the following elements can be observed, Internet use has established itself as an integral part of contemporary life, with an impressive 81% of the general population making use of this valuable tool by 2021. This trend is reflected equally between genders, with 81% of men and 80% of women using the Internet over the same period. Significantly, as segmented by age group, 94% of the population aged 15-24 years use the Internet, showing a particularly high adoption in this age group. Meanwhile, 89% of the population aged 25-74 also make use of the technology, indicating a strong presence across a range of demographic groups. However, it is notable that among individuals aged 75 and over, the percentage of Internet users decreases significantly to 23%.

In terms of traffic and broadband, the average monthly fixed broadband per subscription reaches 97,243 MB, underlining the capacity and breadth of fixed broadband connections available. On the other hand, the average monthly mobile broadband subscribed by Internet traffic in 2022 stands at 2,994 MB, highlighting the continued relevance and demand for mobile connectivity.

These indicators provide a comprehensive view of penetration and trends in internet usage, as well as the infrastructure that supports this connectivity today. The disparity in internet adoption between different demographic groups highlights the need for equitable approaches to ensure comprehensive digital inclusion in society.
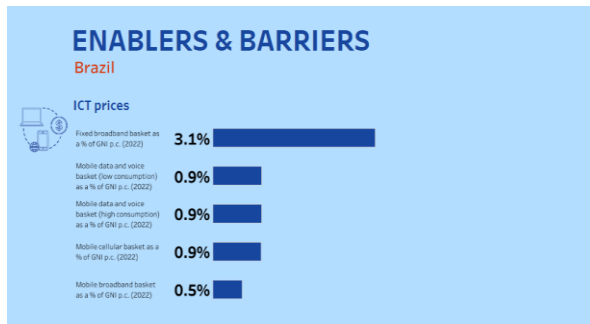
Figure 5
Enablers and barriers

Source: ITU (2022)

In Figure 5, the following elements can be observed in the area of ICT prices: the fixed broadband basket accounted for 3.1% of gross national income (GNI) per capita in 2022, indicating a moderate level of expenditure associated with this stable and fixed connectivity service. On the other hand, the costs of voice services on low-consumption mobile phones, as a percentage of GNI per capita, were 0.9%, indicating relatively low expenditure relative to national income. Similarly, the basket of mobile voice and data for higher consumption was also 0.9% of GNI per capita, demonstrating sustained investment for those requiring more robust mobile communication services.

As for the mobile broadband and mobile cellular baskets, both accounted for 0.9% and 0.5% of GNI per capita, respectively. These numbers reflect a proportionately lower cost relative to other communication and connectivity services, evidencing a distribution of ICT expenditures where fixed broadband may represent a slightly more significant expense compared to mobile services.

Box 6
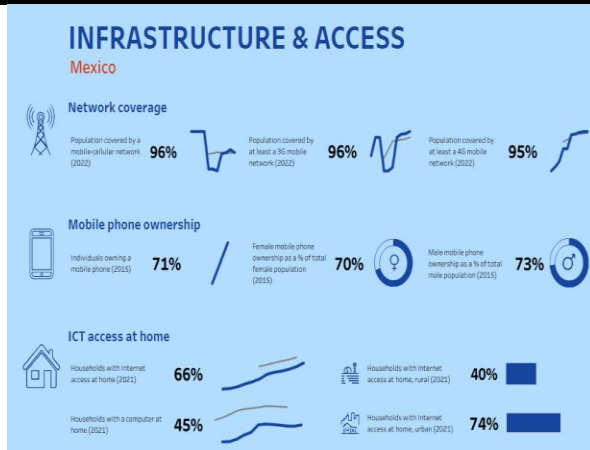
Figure 6
Mexico, infrastructure and access

Source: ITU (2022)

In Mexico, as shown in Figure 6, network coverage in 2022 has shown significant progress in mobile connectivity, with an impressive 96% of the population covered by a mobile cellular network, underlining the wide availability of communication services. In addition, access to next generation mobile networks shows solid progress, reaching 95% of the population covered by at least a 4G mobile network and 96% by a 3G mobile network, thus providing a solid infrastructure for access to advanced data and services.

In terms of mobile phone ownership, 71% of the population owns a mobile phone, demonstrating a high adoption of this technology in society. However, when analysed by gender, a slight disparity is revealed, with 70% female ownership compared to 73% male ownership, showing a minimal gender gap in this aspect.

Household access to ICTs has improved markedly, although with significant differences between urban and rural areas. In 2021-2022, 66% of households had Internet access at home, while access to computers at home stood at 45%, indicating a potential need for the provision of computer equipment.

The gap between rural and urban areas is evident, with 40% of households in rural areas having access to the Internet at home, compared to 74% in urban areas. These figures highlight the importance of policies and measures to promote equity in access to technology, ensuring that all sectors of the population can benefit equally from the opportunities offered by ICTs in the home environment.

Box 7
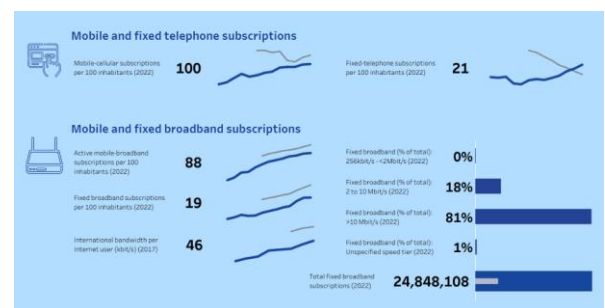
Figure 7
Infrastructure and access (part two)

Source: ITU (2022)

In Figure 7, the following elements can be observed, mobile and fixed telephone subscriptions have been a fundamental element in the digital fabric of our society.

Lino-Gamiño, Juan Alfredo, Valdez-Barreto, Víctor Hugo, Ríos-Silva, Luis Octavio and Méndez-González, Carlos. [2024]. Change management strategies in the implementation of information technologies: comparison between Mexico and Brazil. Journal Computer Technology. 8[20]-1-17: e20820117.
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In particular, mobile phone subscriptions per 100 inhabitants show a rate of 100%, indicating full penetration in the population. However, this rate contrasts with fixed telephony subscriptions, which reach only 21% per 100 inhabitants, revealing a significant disparity in the adoption of these technologies.

On the other hand, active mobile broadband subscriptions have reached an impressive 88% per 100 inhabitants, demonstrating the growing reliance on and use of high-speed connections in mobile environments. Meanwhile, fixed broadband subscriptions show a lower percentage at 19% per 100 inhabitants, suggesting that there is still considerable room for expansion and improvement of fixed connectivity.

In terms of international bandwidth per internet user, an average of 46 kbit/s was recorded in 2017, an indicator that may be crucial for assessing the efficiency and capacity of connections for global data exchange.

In the fixed broadband landscape, there is a positive evolution towards higher speeds: in 2022, 0% of connections were in the 256 kbit/s to <2 Mbit/s range, while 18% were between 2 and 10 Mbit/s. A remarkable 81% of connections were above 10 Mbit/s, evidencing substantial progress in the availability of significant speeds in fixed connectivity. In addition, a small percentage of 1% remained unspecified in terms of speed.

Finally, total fixed broadband subscriptions by 2022 reached 24,848,108, marking a milestone in the expansion of fixed connectivity in the population. These data reflect the complexity and diversity in the adoption of communications technologies, as well as the continued need to improve infrastructure to ensure robust and efficient connectivity for all users.
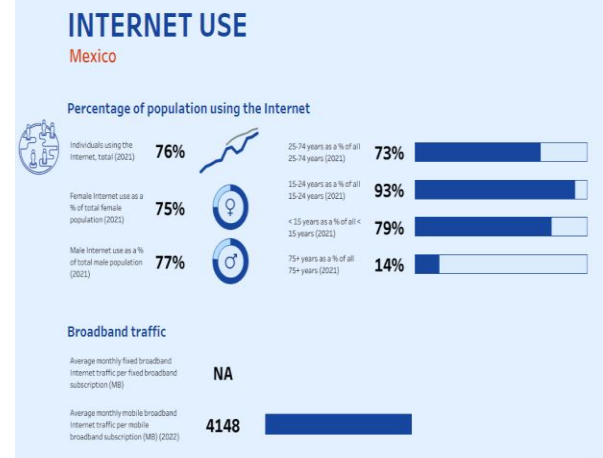
Figure 8

Mexico, infrastructure and access, Internet use

Source: ITU (2022)

In Figure 8, the following elements can be observed, in the year 2021, the widespread use of the Internet was notable, with 75% of the individual population making use of this fundamental tool. Within this group, 75% of men and 77% of women were recorded as using the Internet, reflecting slightly higher participation by women.

Data by age group reveal significant differences in Internet access. Seventy-nine percent of those under 15, 93% of those aged 15-24, and 73% of individuals aged 25-74 made use of the Internet, highlighting the progressive increase in use as age decreases.

However, Internet use among those aged 75 and over showed a significantly lower rate, with only 14% participating in the use of this technological tool, indicating possible generational gaps or access barriers that may require specific attention.

In terms of traffic and bandwidth, the monthly average of fixed broadband per subscription is not available (NA), which may reflect a lack of specific data or variability in measurement. On the other hand, average monthly mobile broadband subscribed reached 4148 MB in 2022, underlining the steady growth in mobile data usage and demand, which may indicate a preference for mobility and constant connectivity among internet users.

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Box 9

ENABLERS & BARRIERS
Mexico

Figure 9

Enablers and barriers.

Source: ITU (2022)

In Figure 9, the following elements can be observed, prices in the ICT sector are presented as percentages of gross national income (GNI) per capita, showing their relative impact on a country's economy. In 2022, the fixed broadband basket represented 2.1% of GNI per capita, reflecting its moderate weight in terms of user expenditure.

On the other hand, the cost of voice services on low-consumption mobile phones, as a percentage of GNI per capita, was 1.2%, indicating a relatively low expenditure compared to national income. Similarly, the basket of mobile voice and data for higher consumption was also 1.2% of GNI per capita, reflecting a sustained level of investment for those demanding higher mobile communication services.

As for the mobile broadband and mobile cellular baskets, both accounted for 1.2% and 0.5% of GNI per capita, respectively, showing a relatively smaller share relative to other communication services. These data highlight the diversity in costs associated with ICTs, where fixed broadband may represent a slightly more significant expense compared to other available communication services.

The implementation of IT has revolutionised the way organisations operate and relate to their environments. Mexico and Brazil, as two of the largest economies in Latin America, have experienced a growing adoption of IT in various sectors. This article explores change management strategies in IT implementation in both countries, analysing similarities, differences and best practices.

Both Mexico and Brazil have experienced a rapid evolution in IT adoption in recent years. From process automation to cloud migration, organisations in both countries are looking to improve efficiency, competitiveness and innovation through technology.

IT-focused change management tracks the management of these systems within the organisation concerned, focusing on how to make information systems work properly, and is increasingly being used to implement strategies for a digitised world.

The management of change that will be discussed here refers to a comparison between the countries of Mexico and Brazil, how they differentiated themselves by their own means to generate greater progress despite the circumstances, identifying, formulating, implementing and monitoring all these strategies that make the organisational culture generates greater presence. Implementing a correct management generates advantages, and there are methodologies that bring together models and structures that help organisations.

The study will allow to identify the factors that influenced the difference in competitive and business development between Mexico and Brazil, presenting a comprehensive list of variables that could intervene in the results that are known today.

Research questions

- Will the application of KM using IT be a triggering agent for the development of growing economies of scale?

- What are the main change management strategies used in the implementation of IT's in Mexican and Brazilian companies?

Objectives

- To analyse and compare change management strategies in the implementation of IT in Mexican and Brazilian companies.

- To identify the main change management strategies used in the implementation of IT in Mexican and Brazilian companies.

Therefore, the **single hypothesis** is drafted.

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H0: Being developing economies with similar characteristics (FEM,2022), both economies applying change management strategies have evolved in parallel.

Instrument

Collect information on IT integration in an organisation, considering the following aspects:

- Institutional Social Networks

- Telephony

- Website (Extranet)

- Intranet

- E-mail

- Clear communication

- Vision and direction

- Informed decision-making

- Empowerment

- Motivation

- Integrity

- Leadership skills development

- Time management

- Change management

- Evaluation and continuous improvement

- CRM strategy

- SCM strategies

- ERP strategies

    Likert scale:

    Participants should respond to each survey item using a 5-point Likert scale, where:

1 = Strongly disagree

2 = Disagree

3 = Neither Agree nor Disagree

4 = Agree

5 = Strongly agree

Item Rationale:

- *Institutional Social Networks:* Institutional social networks are an important tool for internal and external communication in organisations. They can be used to share information, generate engagement with employees and customers, and create a culture of collaboration.

- *Telephony:* Telephony is an essential tool for business communication. A good telephony infrastructure can facilitate communication between employees, customers and suppliers.

- *Website (Extranet):* An organisation's website is its calling card to the world. It should be clear, concise and informative. The extranet, on the other hand, is a secure platform that allows employees and partners to access confidential information.

- *Intranet:* The intranet is a private network used by employees of an organisation. It is a secure space where employees can share information, collaborate on projects and access corporate resources.

- *Email:* Email is a basic tool for business communication. A good email infrastructure can help employees stay organised and productive.

- *Clear communication:* Clear communication is essential to the success of any organisation. Employees must be able to communicate effectively with each other and with customers.

- *Vision and direction:* Vision and direction are critical to the success of any organisation. Employees must know where the organisation is going and what is expected of them.

- *Informed decision making:* Organisations must make informed decisions based on data. IT can help organisations collect, analyse and visualise data to make better decisions.

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- *Empowerment:* Empowering employees is essential to the success of any organisation. Employees must feel empowered to make decisions and solve problems.

- *Motivation:* Employee motivation is essential to the success of any organisation. Employees must feel motivated to work hard and achieve their goals.

- *Integrity:* Integrity is essential to any organisation. Employees must act with integrity at all times.

- *Leadership skills development:* The development of leadership skills is essential to the success of any organisation. Leaders must be able to motivate, inspire and empower their employees.

- *Time management:* Time management is an important skill for any employee. Employees must be able to manage their time effectively in order to be productive.

- *Change management:* Change management is an important skill for any organisation. Organisations must be able to manage change effectively to adapt to new conditions.

- *Evaluation and continuous improvement:* Evaluation and continuous improvement are essential to the success of any organisation. Organisations must constantly be evaluating their processes and looking for ways to improve.

- *CRM strategy:* CRM strategy is a set of processes, policies and technologies that enable organisations to manage their customer relationships.

- *SCM strategies:* SCM strategies are a set of processes, policies and technologies that enable organisations to manage their supply chain.

- *ERP strategies:* ERP strategies are a set of processes, policies and technologies that enable organisations to integrate their information systems.

Methodology to be developed

The present research work is classified as mixed, using a quantitative and qualitative context:

- Qualitative. For the present work, an integral theoretical text analysis is carried out. It is conducted in a natural environment without controlling the observed phenomenon, i.e. the company is analysed as referred to in the phenomenological part, on the other hand, it is inductive through the readings.

- Quantitative. Firstly, the measurement of the phenomenon is established by means of a Likert scale supported by a descriptive and comparative statistical analysis of variances, in order to test a hypothesis, with the intention of analysing an objective reality, in order to generate results on the phenomenon studied.

Mixed research integrates both quantitative and qualitative research, which is used when a greater understanding of the problem is required, as quantitative data allows for statistical analysis of the data or, as in this case, through surveys to answer the research questions and make the necessary hypotheses.

According to this perspective, the quantitative approach in research is characterised by its emphasis on objectivity, deductive process, numerical measurement, statistical analysis and orientation towards 'type' cases to achieve generalisations (Hernández, 2014).

Integrating both approaches can provide a fuller and richer understanding of the study phenomenon. This is known as methodological triangulation, where qualitative and quantitative findings are used to mutually corroborate and enrich each other's understanding of the research problem, for research evaluation and the power to test theories or hypotheses.

Giving the meaning of variables in linear wording and comparing the criteria used is important.

Population and sample.

Applying formula 1

Formula 1:

$$n = \frac{Z_{\alpha}^2 \times p \times q}{e^2} \qquad [1]$$

n= Sample size sought.

N= Size of the Population or Universe.

Z= Statistical parameter that depends on the Confidence Level (CN).

e= Maximum accepted estimation error.

p= Probability of the event occurring.

q= (1-p) = Probability of the event not occurring.

95%

Margin of error 5%

$$\frac{(1.96)^2(0.5)(0.5)}{(0.15)^2} = \frac{0.9604}{0.0225} = 42.68$$

42.68 Enterprises to be surveyed.

The sample was obtained by consensus with the owners or managers of the companies, this sample is non-probabilistic as it does not obey standardised formulas, it is only the representation of the Universe, it is known that there will be bias, as it is not in a deterministic state.

Results

Similarities in the IT Change Management Strategies

- Understanding Value: In Mexico and Brazil, IT change management strategies focus on communicating the value of new technologies to employees. This includes highlighting how IT will improve processes, reduce workload and increase collaboration.

- Comprehensive training: In both countries, training is essential. Providing employees with adequate training in the use of new tools and systems ensures a smoother transition and minimises resistance to change.

- Stakeholder Involvement: Including employees in the decision-making process and design of technology solutions helps to identify specific needs and create a sense of ownership in implementation.

Differences in IT Change Management Strategies

- Culture of Technology Adoption: In Brazil, the technology culture may be more entrenched in certain sectors due to a greater emphasis on innovation. In Mexico, although technology adoption is on the rise, there may still be a more extensive cultural change process in some organisations.

- Agility in Implementation: In Mexico, companies may be more willing to adopt agile approaches to IT implementation due to their inclination towards flexibility and adaptability compared to Brazil, where processes may be more structured.

- Access to Resources: Differences in the availability of financial resources and IT talent could influence the planning and execution of change management strategies in both countries.

Best Practices and Conclusions

- Engaged Executive Leadership: Active support from executive leaders is essential to demonstrate the importance of digital transformation and foster buy-in among employees.

- Ongoing Communication: Maintaining open and constant communication about the goals, benefits and progress of IT implementation will help keep employees informed and motivated.

- Impact Assessment: Conducting an impact assessment at an early stage and adjusting strategies according to the results will contribute to the success of the implementation.

The calculation shows that there is not enough evidence to conclude that the mean of the variable mail Brazil is higher than mail Mexico at the 0.1 significance level.

Uncertainty in the estimation of the difference in means: Two confidence levels are provided for the estimation of the difference in the means of two samples. At the 80% confidence level, the true difference can be said to be between -0.42073 and 0.070731. At the 90% confidence level, it can be stated that the difference is greater than -0.42073.

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Data distribution: It is suggested to compare the location and means of the samples to identify any discrepancies. In addition, it is recommended to look for unusual data before interpreting the test results.

The importance of considering uncertainty in estimating differences in means is emphasised, as well as the need to examine the distribution of the data and look for outliers before making conclusive interpretations.

Social Networks

The hypothesis test also does not allow us to conclude that there is a significant difference in means between social networks Brazil and social networks Mexico. However, a confidence interval for the difference in means is provided, suggesting that there is some uncertainty in the estimation of this difference. It is recommended to examine the distribution of the data and look for outliers before making definitive interpretations.

Thus, we do not find sufficient evidence to conclude that the mean of social networks Brazil is higher than that of social networks Mexico at a significance level of 0.1.

The confidence interval estimates the difference in the sample means at two confidence levels. With a confidence level of 80%, the true difference can be said to be between -0.21700 and 0.26700. At a 90% confidence level, the difference can be said to be greater than -0.21700. The distribution of data makes it advisable to compare the location and means of the samples and look for unusual data before interpreting the test results.

As seen in Figure 13 the hypothesis test does not provide sufficient evidence to conclude that there is a significant difference in the means between telephony Brazil and telephony Mexico. However, a confidence interval for the difference in means is provided, indicating some uncertainty in the estimation of this difference. It is recommended to examine the distribution of the data and look for outliers before making definitive interpretations.

As a hypothesis test there is insufficient evidence to conclude that the mean for telephony Brazil is higher than that for telephony Mexico at a significance level of 0.1. The confidence interval provides a confidence interval for the difference in the sample means.

At the 80% confidence level, the true difference can be said to be between -0.12137 and 0.32137. With a confidence level of 90%, it can be stated that the difference is greater than -0.12137.

Web Page

On the other hand, in the comparison of means via Student's t-test for the use of Web Page, the hypothesis test did not find a significant difference between the means of Web Page Brazil and Web Page Mexico, a confidence interval is provided that suggests some uncertainty in the estimation of this difference.

In this case, the indicated confidence interval suggests that the true difference could be in the range from -0.36233 to 0.11233. This means that, at an 80% confidence level, the true difference in means is expected to be within this interval. However, due to this uncertainty, it cannot be stated with certainty that there is a significant difference between the means of the two populations. This is why it is important to consider both the results of the hypothesis test and the confidence interval when interpreting the results of a study or analysis.

Regarding intranet use via Student's t-test, the hypothesis test did not find sufficient evidence to state that there is a significant difference in the means between intranet Brazil and intranet Mexico. However, a confidence interval for the difference in means is provided, suggesting some uncertainty in the estimation of this difference considering.

First, descriptive statistics for both groups are presented. For intranet Brazil, the mean is 6 with a standard deviation of 0.81650 and a sample size of 40. For intranet Mexico, the mean is 6.15 with a standard deviation of 0.7696 and a sample size of 40.

The null hypothesis (H_0) states that the mean of intranet Brazil is not significantly higher than the mean of intranet Mexico. The alternative hypothesis (H_1) states that the mean intranet usage Brazil is significantly higher than intranet usage Mexico. The 80% confidence interval for the difference between the means is -0.37933 to 0.07932. The calculated t-statistic is -6.352, with a p-value of 0.0005. This p-value indicates a very low probability of obtaining a result as extreme as that observed under the null hypothesis, suggesting that there is sufficient evidence to reject the null hypothesis.

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In terms of the difference between the samples, the difference in means is -2.10, with a 95% confidence interval ranging from -2.73 to -1.47. These results indicate that the Intranet mean for Brazil is not higher than the Intranet mean for Mexico; in fact, it is significantly lower.

The hypothesis test failed to provide sufficient evidence to claim that there is a significant difference between the intranet Brazil and intranet Mexico means. However, by providing a confidence interval for the difference in means, the uncertainty associated with estimating this difference is acknowledged. This means that, although insufficient evidence was found to reject the null hypothesis in the hypothesis test, there is still the possibility that there is a difference between the means, but this difference has not been established with sufficient certainty.

For email usage the hypothesis test did not provide sufficient evidence to conclude that there is a significant difference in means between email Brazil and email Mexico.

However, a confidence interval for the difference in means is provided, indicating the uncertainty associated with estimating this difference. This confidence interval suggests that the true difference between the means could be in a specific range, but cannot be stated with certainty due to the nature of the sample and the confidence level selected.

With an 80% confidence level, we can state that the true difference between the means of the Brazil email and Mexico email populations is between -0.11253 and 0.36253. This means that there is an 80% probability that the true difference is within this range.

With a 90% confidence level, we can state that the true difference is greater than -0.11253. This indicates that there is a 90% probability that the true difference between the means is greater than -0.11253. The above shows that the hypothesis test did not find sufficient evidence to claim that there is a significant difference in the means between communication Brazil and communication Mexico. However, a confidence interval for the difference in means is provided, suggesting some uncertainty in the estimation of this difference. It is recommended to examine the distribution of the data and look for outliers before making definitive interpretations.

A confidence interval for the difference in sample means is presented. At an 80% confidence level, the true difference between the means is estimated to be between -0.19028 and 0.29028. This indicates that there is an 80% probability that the true difference between the means lies within this range. At a 90% confidence level, it can be stated that the true difference is greater than -0.19028. This means that there is a 90% probability that the true difference between the means is greater than -0.19028.

Following the narrative the hypothesis test concludes that there is sufficient evidence to state that the mean of vision and direction Brazil is greater than that of vision and direction Mexico at a significance level of 0.1. In addition, a confidence interval is provided indicating the uncertainty associated with the estimation of the difference in means.

A confidence interval for the difference in sample means is provided.

At an 80% confidence level, the true difference between the means is estimated to be between 0.010617 and 0.48938. This means that with 80% confidence, the true difference between the means lies within this range. With a 90% confidence level, it can be stated that the true difference is greater than 0.010617. This indicates that there is a 90% probability that the true difference between the means is greater than 0.010617.

Two-sample t-test for decision making Brazil and decision making Mexico

On the other hand, decision making is compared with the same Student's t-statistic and provides a confidence interval for the difference in the sample means. With a confidence level of 80%, the true difference between the means is estimated to be between -0.050854 and 0.45085.

This means that there is an 80% probability that the true difference between the means lies within this range. At a 90% confidence level, it can be stated that the true difference is greater than -0.050854. This indicates that there is a 90% probability that the true difference between the means is greater than -0.050854. In summary, these confidence intervals provide information on the possible location of the true difference between the means of the underlying populations, at different confidence levels.

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For the empowerment indicator, although the hypothesis test did not find sufficient evidence to claim a significant difference between the means of empowerment Brazil and empowerment Mexico, the confidence interval provides information about the possible location of the true difference between the means.

A confidence interval for the difference in the sample means is provided. At an 80% confidence level, the true difference between the means is estimated to be between -0.58395 and -0.11605. This means that with 80% confidence, the true difference between the means lies within this range. At a 90% confidence level, it can be stated that the true difference is greater than -0.58395. This indicates that there is a 90% probability that the true difference between the means is greater than -0.58395.

For motivation, a confidence interval for the difference in the sample means is provided. At an 80% confidence level, the true difference between the means is estimated to be between -0.31722 and 0.16722. This indicates that there is an 80% probability that the true difference between the means lies within this range. With a 90% confidence level, it can be stated that the true difference is greater than -0.31722. This means that there is a 90% probability that the true difference between the means is greater than -0.31722.

These results provide information on the possible location of the true difference between the underlying population means, at different confidence levels.

For the completeness indicator, a confidence interval for the difference in the sample means is provided. With a confidence level of 80%, the true difference between the means is estimated to be between -0.50842 and 0.058416. This means that there is an 80% probability that the true difference between the means lies within this range. With a 90% confidence level, it can be stated that the true difference is greater than -0.50842. This indicates that there is a 90% probability that the true difference between the means is greater than -0.50842. The hypothesis test did not find sufficient evidence to claim a significant difference in the means between integrity Brazil and integrity Mexico, the confidence interval provides information on the possible location of the true difference between the means, with different levels of confidence.

With regard to Skill development, the hypothesis test suggests that there is sufficient evidence to state that the mean for Skill development Brazil is higher than that for Skill development Mexico.

In addition, a confidence interval is provided to support this conclusion at different confidence levels. A confidence interval is provided for the difference in sample means. At an 80% confidence level, the true difference between the means is estimated to be between 0.034497 and 0.56550. This indicates that there is an 80% probability that the true difference between the means lies within this range.

With a 90% confidence level, it can be stated that the true difference is greater than 0.034497. This means that there is a 90% probability that the true difference between the means is greater than 0.034497.

2-sample t-test for the means of Time management Brazil and Time management Mexico

For Time Management a confidence interval for the difference in the sample means is provided. At the 80% confidence level, the true difference between the means is estimated to be between -0.40174 and 0.20174. This means that there is an 80% probability that the true difference between the means lies within this range.

With a 90% confidence level, it can be stated that the true difference is greater than -0.40174. This indicates that there is a 90% probability that the true difference between the means is greater than -0.40174. These results provide information on the possible location of the true difference between the means of the underlying populations, at different confidence levels.

Likewise for the indicator Change management the hypothesis test did not find sufficient evidence to claim a significant difference in means between change management Brazil and change management Mexico. In addition, a confidence interval is provided to support this conclusion at different confidence levels. A confidence interval for the difference in sample means is provided. At an 80% confidence level, the true difference between the means is estimated to be between -0.36746 and 0.51746. This indicates that there is an 80% probability that the true difference between the means lies within this range.

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With a 90% confidence level, it can be stated that the true difference is greater than -0.36746. This means that there is a 90% probability that the true difference between the means is greater than -0.36746.

For Assessment and Continuous Improvement these results provide information on the possible location of the true difference between the underlying population means, at different confidence levels. A confidence interval for the difference in the sample means is provided. At an 80% confidence level, the true difference between the means is estimated to be between -0.77349 and 0.023491. This indicates that there is an 80% probability that the true difference between the means lies within this range.

With a 90% confidence level, it can be stated that the true difference is greater than -0.77349. This means that there is a 90% probability that the true difference between the means is greater than -0.77349.

A confidence interval for the difference in the sample means is provided in the CRM Strategy indicator. At the 80% confidence level, the true difference between the means is estimated to be between -0.46986 and 0.019857. This indicates that there is an 80% probability that the true difference between the means lies within this range.

With a 90% confidence level, it can be stated that the true difference is greater than -0.46986. This means that there is a 90% probability that the true difference between the means is greater than -0.46986.

The hypothesis test did not find sufficient evidence to claim a significant difference in the means between the CRM Brazil *strategy* and the CRM Mexico strategy.

For SCM the hypothesis test suggests that the mean of SCM strategy Brazil and SCM strategy Mexico with a significance level of 0.1. In addition, a confidence interval is provided to support this conclusion at different confidence levels. A confidence interval is provided for the difference in the sample means. At an 80% confidence level, the true difference between the means is estimated to be between 0.013216 and 0.43678. This indicates that there is an 80% probability that the true difference between the means lies within this range.

At a 90% confidence level, it can be stated that the difference is greater than 0.013216. This means that there is a 90% probability that the true difference between the means is greater than 0.013216.

As for the ERP hypothesis test did not find sufficient evidence to claim that there is a significant difference in the means between the ERP Brazil strategy and the ERP Mexico strategy, a confidence interval is provided that suggests some uncertainty in the estimation of this difference.

The confidence interval provides information on the estimate of the difference in the sample means. At an 80% confidence level, the true difference between the means is estimated to be between -0.30362 and 0.15362. This means that there is an 80% probability that the true difference between the means lies within this range.

On the other hand, with a 90% confidence level, it can be stated that the difference is greater than -0.30362. This indicates that there is a 90% probability that the true difference between the means is greater than -0.30362. In summary, this confidence interval provides information on the uncertainty associated with estimating the difference in the sample means at different confidence levels.

Conclusions

In conclusion, the analysis of change management strategies in IT implementation in Mexico and Brazil reveals several key similarities and differences that can guide organisations in emerging economies to optimise technology adoption and improve their competitiveness. The results show that both countries emphasise the importance of communicating the value of new technologies, providing comprehensive training and encouraging employee participation in the change process. However, significant differences are also observed in the culture of technology adoption, agility in implementation and access to financial and talent resources.

The research shows that understanding the specific cultural and economic context of each country is vital to tailoring change management strategies effectively.

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In Mexico, the inclination towards flexibility and adaptability may facilitate the adoption of agile approaches, while in Brazil, more structured processes may require more detailed planning and execution. These differences underline the need for customised approaches to managing technological change to maximise benefits and minimise resistance.

Impact assessment and continuous improvement are essential practices that must be integrated into any change management strategy. Conducting early assessments and adapting strategies based on the results obtained will contribute significantly to the success of IT implementation. In addition, continuous communication and committed executive leadership are critical factors that can improve employee acceptance and utilisation of new technologies.

In summary, organisations in Mexico and Brazil can benefit from a strategic and contextualised change management approach to IT implementation, which will not only improve operational efficiency and innovation, but also optimise technology integration and long-term organisational performance.

Authors' contribution

Lino Gamiño Juan Alfredo was primarily responsible for the conceptualisation and design of the study, developing the theoretical framework and setting out the main research problems. In addition, he led the writing of the manuscript, including the introduction, the theoretical framework, and the conclusions. She also actively participated in the final revision of the manuscript, ensuring the coherence and accuracy of the document.

Valdez Barreto, Victor Hugo conducted a thorough review of the relevant literature and contributed significantly to the development of the theoretical framework. He was responsible for the development of the results and discussion section, as well as collaborating in the drafting of other parts of the manuscript. He also participated in the final revision of the document, contributing to the coherence and clarity of the work.

Ríos Silva Luis Octavio was in charge of the development and validation of the data collection instrument, ensuring that the surveys and questionnaires were appropriate for the Mexican and Brazilian contexts.

He drafted the methodology section and led the statistical analysis of the data. He also contributed to the final revision and editing of the manuscript.

Méndez González Carlos coordinated the data collection and led the quantitative analysis of the results. He was responsible for the revision and proofreading of the manuscript, ensuring that it complied with editorial and formatting standards. He also participated in the final revision, ensuring the academic quality and accuracy of the document.

Availability of data and materials

Data availability on request at jlino@ucol.mx.

Abbreviations

TI - Information Technology.

GC - Change Management.

CRM - Customer Relationship Management (CRM).

SCM - Supply Chain Management (Gestión de la Cadena de Suministro).

ERP - Enterprise Resource Planning).

TIC - Information and Communication Technologies.

INB - Gross National Income.

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