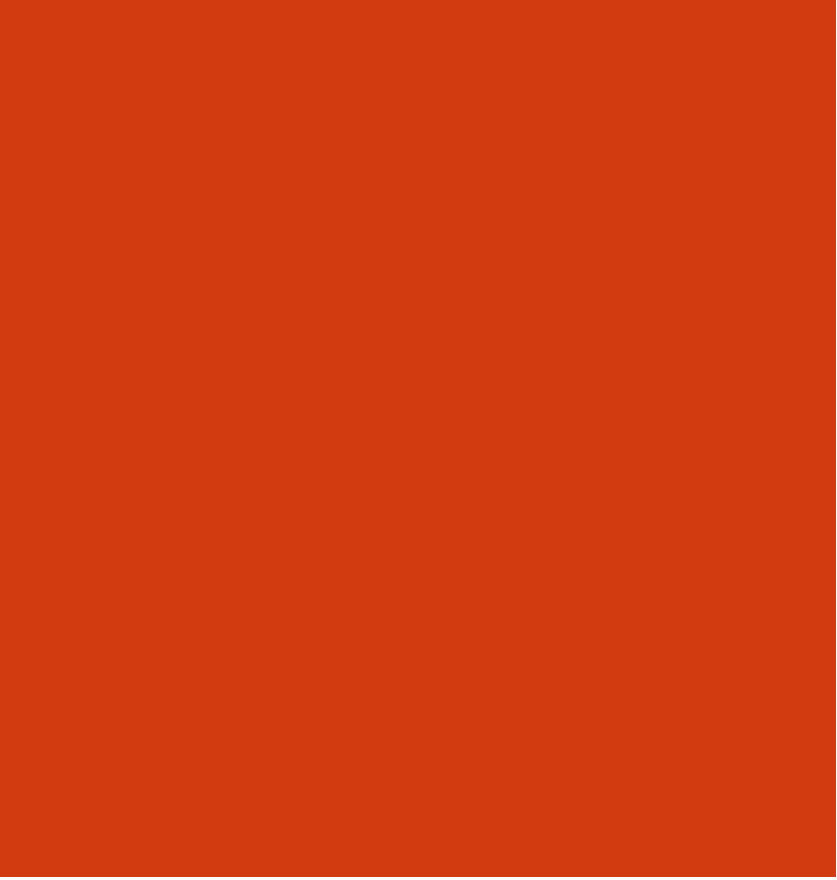


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## Content

Article	Page
<b>Urban renewal to turistification: Oaxaca de Juárez's historic downtown</b> CORTES-MATIAS, Fanny Antonia S. & RIVERA-LÓPEZ, Faustino Benjamín <i>Tecnológico Nacional de México - Instituto Tecnológico de Oaxaca</i>	1-14
<b>Framework for addressing the challenges of digitalization in organizations</b> PÉREZ-JIMÉNEZ, Carlos & ALONSO-CALPEÑO, Mariela Juana <i>TECNM - Instituto Tecnológico Superior de Atlixco</i>	15-27
<b>Digital technologies for business development: modern marketing</b> GUTIÉRREZ-CIGARROA, Dionisio Lenin & POSADAS-RODRÍGUEZ, Guillermo <i>Tecnológico de Estudios Superiores de Chicoloapan</i>	28-35
<b>3D printing as a motivator didactical resource for engineering students</b> HERNÁNDEZ-MENDOZA, José Refugio, CAMERO-BERRONES, Rosa Gabriela, SOTO-HERNÁNDEZ, Ana María and REYES-MENDEZ, Victoriano <i>Tecnológico Nacional de México - Instituto Tecnológico de Ciudad Madero</i>	36-45



## Urban renewal to turistification: Oaxaca de Juárez's historic downtown

### De renovación urbana a turistificación, centro histórico de Oaxaca de Juárez

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#### Abstract

The city of Oaxaca, renowned for its rich history and cultural diversity, has undergone a major transformation in recent years. Seeking urban renewal and increased tourism, authorities have dramatically altered the character of the historic city center. This study analyzes Oaxaca's urban renewal and resulting turistification, as well as the socioeconomic and cultural impacts on local residents, with a focus on the historic downtown. Qualitative research methods like interviews, observations, and analysis of historical documents were used, along with quantitative data assessing tourism's effects. While urban renewal can provide economic revitalization, an overemphasis on tourism leads to 'touristification,' generating tension between tourism interests and local needs. The findings indicate a rise in Oaxaca's tourism, attracting investment and renewal, but also leading to increased housing costs, resident displacement, and potential cultural loss. Citizens are divided: some welcome economic growth, while others believe tourism undermines Oaxaca's essence. This analysis aims to understand the interplay between urban renewal and tourism in places with deep cultural and historical roots.

#### Resumen

La ciudad de Oaxaca, famosa por su historia y diversidad cultural, ha pasado por una importante transformación reciente. Las autoridades, buscando la renovación urbana y atracción turística, han alterado la dinámica del centro histórico. Este estudio analiza la renovación urbana de Oaxaca y su consecuente turistificación, además de los impactos socioeconómicos y culturales en la población local, centrándose en el centro histórico. Se utilizó una investigación cualitativa con entrevistas, observaciones y análisis de documentos históricos, y cuantitativa para evaluar el impacto del turismo. Aunque la renovación urbana puede revitalizar económicamente una ciudad, si se enfoca demasiado en el turismo, surge la turistificación, generando tensiones entre los intereses turísticos y las necesidades locales. Los hallazgos señalan un incremento turístico en Oaxaca, que ha atraído inversión y revitalización. Sin embargo, también ha provocado el alza en precios de vivienda, desplazamiento de residentes y potencial pérdida cultural. Los ciudadanos tienen opiniones divididas: mientras algunos valoran el crecimiento económico, otros creen que el turismo altera la esencia de Oaxaca. Este análisis busca entender la relación entre renovación urbana y turistificación en lugares con profunda cultura e historia.

Urban renovation, Touristification, Heritage

Renovación urbana, Turistificación, Patrimonialización

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## Introduction

Deep in the historic centre of Oaxaca de Juárez lies the Benito Juárez Maza Market, an architectural and cultural jewel that has witnessed profound transformations over time. This chapter arises as a derivative of the qualitative research work developed for the doctoral thesis "Touristification of the Benito Juárez Maza Market". Through this research, the aim is to elucidate the process of touristification that the Benito Juárez Maza Market has undergone, and how urban policies, in their desire to beautify and renovate the historic centre of Oaxaca, have had a direct impact on this iconic space.

Starting from a macro vision, the tourism policies of the state of Oaxaca and the municipality where the capital resides are explored. This research has uncovered revealing clues about the transformation of urban areas as a function of both public and private policies, showing how these strategies have favoured touristification. With a methodology based on the collection of primary and secondary data, the socio-spatial dynamics within the market are analysed, with special emphasis on its recognition as a heritage site within the historic centre. These data, contrasted with updated information from the National Institute of Statistics and Geography, and supported by historical archives and academic literature, form the basis of this chapter.

On a theoretical level, key concepts such as urban renewal, tourism, touristification, patrimonialisation, gentrification and urbanisation are addressed, supported by previous studies related to the city of Oaxaca and other urban centres in Mexico. Within this framework, the chapter proposes not only a diagnosis, but also a critical reflection on the consequences of these tourism-oriented urban renewal policies.

Touristification, as observed in Oaxaca and other Mexican cities, is not an isolated phenomenon. It is a complex reality, the result of political and economic decisions that, while they have boosted tourism, have also posed significant challenges to the preservation of cultural heritage and the well-being of local residents. This research aims to unravel these dynamics and offer a clearer picture of their implications for the social and cultural fabric of Oaxaca de Juárez.

## Methodology

A mixed research approach was chosen, combining qualitative and quantitative techniques. The purpose of this combination was to achieve an in-depth understanding of the phenomena investigated and, at the same time, to support the findings with empirical data. Qualitative techniques such as semi-structured interviews with key actors such as residents of the historic centre and market traders were used for data collection. These interviews provided insights into how urban policies and changes have influenced daily life and commercial dynamics.

Observations were carried out in different areas of the historic centre, especially in the Benito Juárez Maza Market and the historic centre of Oaxaca City in order to capture the daily dynamics and how tourists and locals interact in the renovated space. For the documentary analysis, a review of historical documents from the General Archive of the state of Oaxaca and research on tourism, touristification of Oaxaca and cities in Mexico with the same characteristics was carried out, which helped to trace the evolution of urban policies and interventions in the historic centre in favour of tourism. In addition, quantitative data were considered to analyse tourism growth in Oaxaca, number of annual visitors, tourism expenditure and hotel occupancy, in order to assess the impact of tourism in the city. These data were obtained from official sources and tourism-related organisations.

It is assumed that urban renewal, i.e. the modernisation and improvement of urban infrastructure, can be an effective tool for economic revitalisation. However, when these interventions are mainly oriented towards tourism, the phenomenon of touristification arises.

This phenomenon, understood as the excessive adaptation of urban spaces to satisfy tourist needs to the detriment of local needs, presents tensions between tourism development and the well-being of the resident population.

In summary, the methodology adopted for this chapter offered a panoramic and detailed vision of the process of touristification in the historic centre of Oaxaca, allowing us not only to understand its emergence and evolution, but also its implications for the social and economic fabric of the city.

Before going into the content of this chapter, it is essential to establish conceptual clarity about the notions we will deal with here. Let us begin with the definition of "urban renewal", a term that refers to the process by which urban areas are revitalised and updated, usually through the remodelling or renovation of pre-existing buildings and infrastructure. This process encompasses a set of interventions that aim to transform and enhance the physical, social and economic dimensions of a city or a certain sector of it (Castro, 2020).

Projects that fall under the label of urban renewal can manifest themselves through various actions, such as the demolition of buildings in disuse or deterioration, the construction of new structures, the revaluation of public spaces, and the enactment of social and economic programmes that seek to improve the well-being of the resident population. By contextualising this definition in a specific space, such as Mexico City, urban renewal can be understood as the reconfiguration of urban properties and the implementation of various governmental strategies that aim to intervene in the urban fabric. However, sometimes these efforts are aligned with real estate development interests, which can displace or modify the original character of certain areas (Castro, 2020). In the case of the city of Oaxaca, it has been found that these interventions are for commercial use focused on tourism, accommodation services, restaurants, galleries, cafes and *mezcalerías* in the case study; on the other hand, interventions have also been made to public buildings with the aim of "rescuing" them and preserving their architecture, however their renovation has been focused on increasing the tourist spaces in the historic centre of Oaxaca City.

Yadira Rodríguez examined the urban metamorphoses that have taken place in the historic centre of Oaxaca, following its designation as a World Heritage Site by the United Nations Educational, Scientific and Cultural Organisation (UNESCO). He elaborated a theoretical framework around historic centres and their heritage recognition, his object of study being the urban dimensions which, in his opinion, have undergone significant transformations in the way local residents interact with their environment. I conclude with some reflections and proposals that could contribute to the enrichment of the space in question (Rodríguez, 2017).

The process of touristification in urban centres has been studied in the context of the analysis of the impact of tourism in cities. This process is characterised by the concentration of visitors and tourism-related activities in certain urban areas, which has social, economic and physical-spatial effects on these environments (Calle Vaquero, 2019). Touristification can lead to the deterioration of the urban landscape with the appearance of visual pollution and the shaping of urban scenes that are clearly touristy. It also induces changes in the tertiary sector of the city, with a commercial and hotel reorientation towards visitors to the detriment of the needs of the local population. Other relevant consequences are increased congestion, disruptions in daily life and challenges in the management of tourist flows (Calle Vaquero, 2019). In summary, touristification is a complex process that requires addressing both its continuity manifestations and the disruptive changes derived from the concentration of tourism in urban centres. It is necessary to advance in the comprehensive understanding of its effects and associated challenges. According to Adrián Hernández (2021), touristification refers to the intensification of tourism activity in a specific area, which can trigger changes in the local economy, cultural expressions and social interactions. These transformations can manifest themselves in the reorientation of commercial establishments to meet the demands of tourists, fluctuations in the costs and accessibility of products and services, as well as the eviction of original inhabitants due to real estate development. It is essential to differentiate between touristification and gentrification, as the latter connotes the replacement of the population of lower socio-economic strata by those with higher economic capacities.

Based on the above arguments, it can be argued that: Touristification is the process by which an urban space is progressively oriented towards satisfying the needs of visitors and tourists, rather than local residents. It involves a transformation of the use and dynamics of urban space, which is put at the service of tourist activity.

The process of patrimonialisation consists of the recognition and preservation of cultural heritage, both tangible and intangible, with historical, cultural or natural significance. It aims to protect and promote these assets for future generations, through activities such as documentation, conservation, restoration and heritage education. The affective dimension of heritage, including emotional and experiential connections, is central to this process. Individuals and communities play a vital role in actively engaging with and valuing their cultural heritage. Education also plays an important role in raising awareness and understanding of the relevance of heritage (Gómez, 2014).

There is research in Latin America and Europe on the changes and effects on urban centres and heritage cities, which present similar effects of tourism, patrimonialisation of the historic centre and its consequences (Lira Vásquez, 2014) (Rodríguez Y. , 2017) and the touristification of the historic centre (Yescas, 2018), urban development of the city of Oaxaca (Ramírez M. d., 2013), there is research carried out in Mexico City (Delgadillo, 2018), Querétaro (Hiernaux:-Nicolas & González-Gómez, 2014), Zacatecas, Mérida (Fuentes & Rosado, 2018), San Miguel de allende (De la Torre, 2018), Puebla (Aguilar, 2019) on the process of touristification taking up the above, similar characteristics can be identified in these cities of the Mexican Republic.

### **From urban renewal to touristification**

#### *The historic centre of Oaxaca*

The exponential increase of the tourist industry in a few decades, especially from the 1970s to the present day, has evolved into a complex reality intertwined with different economic and social processes on a local, national and international level.

The inclusion of neoliberal policy in the urban sphere changed the way cities are built, commodifying spaces through the beautification of the city and the accumulation of capital with tourism-oriented urban renewal projects (Aguilar, Ferrusca, Ramírez, & Maya, 2021).

The use of urban heritage as a tourism resource presents opportunities for physical and socioeconomic recovery (Vaquero & Hernández, 1998). In our country, strategies and programmes to promote tourism have been implemented since the 20th century, and one of the main strategies has been to preserve its architectural and cultural legacy, normally located in the city centres.

During the 20th century, Oaxaca took up the indigenous and "colonial" heritage arguments of the political vision in favour of tourism. Urban history and architecture are evidence that it was in this way, so in 1920 the road to Mitla was improved, which passed through the Tule Tree, and the area was beautified with the aim of its "conservation" (Ramírez, 2013).

The ex-governor Genaro V. Vásquez (1925-1928) carried out actions with the aim of promoting Oaxacan identity "paved the way for later governments to use the cultural potentials of Oaxacan territory to promote tourism" (Lira Vásquez, 2014:74).

In the General Archive of the State of Oaxaca, in the documentary collection Government, section secretary of the office of tourism series and committees belonging to box 5155 file number 1 of 1929, official documents addressed to the first protourism committee were found, where the governor requests that the places that can be attractive for tourism be exposed, in addition to entrusting the municipal presidents with the task of beautification, The governor asked the governor to present the places that could be attractive for tourism, as well as entrusting the municipal presidents with the beautification, cleaning and elimination of "mendicity" (Mexico, 1929), as well as a series of official letters requesting collaboration with the tourism committee to promote different areas of the State of Oaxaca, confirming the importance of tourism for the development of roads and highways, facilitating access to the state and not thinking about the use and benefits for communication between local inhabitants.

CORTES-MATIAS, Fanny Antonia S. & RIVERA-LÓPEZ, Faustino Benjamín. Urban renewal to touristification: Oaxaca de Juárez's historic downtown. ECORFAN Journal-Republic of Paraguay. 2023

*Tourism as a development strategy*

Tourism has played a relevant role since the beginning of the 20th century in our country. The state of Oaxaca, with its natural and cultural richness, was part of the strategy to promote this activity, as it was already known how lucrative it could be. After the discovery of Tomb 7 of Monte Alba, in 1929 the road linking the city with the archaeological zone was improved (Ramírez, 2013).

Placido Zarate in 1930 formed the "Comité Local Proturismo", with the aim of promoting the development of tourism, one of the most important works of this administration was the construction of the first airport in the city finished in 1932 (Ramírez, 2013), being this same year the presentation for the first time the "Guelaguetza" dance show where the research done by V. Vázquez, to commemorate the 400 years of the founding of the city of Oaxaca, was retaken (Lira Vázquez, 2014).

During the government of Constantino Chapital (1936-1940), he included the monumental heritage as an attraction for tourism and encouraged research by foreigners in Oaxaca with the aim of promoting Oaxaca by all possible means up to that time (Lira Vázquez, 2014).

From the government of Vicente Gonzales (1940-1944) onwards, the image of the city of Oaxaca was disseminated as a temporary conservatory of an ancestral indigenous culture that, despite the passing of the centuries, preserved its ethnic "purity". This "ancestral culture" develops in an attractive urban atmosphere with "colonial" architecture, but lived by indigenous people of "pre-Hispanic origin" who every year celebrate their "Guelaguetza" and manifest their identity through their customs, traditions, food, clothing, language and handicraft reproduction, visible above all in their "exuberant" markets (Lira Vázquez, 2014). From this period onwards, the tourist objective of beautifying the city is clear; street repairs, remodelling of viceregal buildings, as well as the construction of new ones were carried out, in addition to the necessary infrastructure in the city to support the expected influx of tourists (Ramírez, 2013).

In 1942, the Law on the Protection of Colonial, Artistic and Historic Monuments and Typical Towns of the State was enacted, with the aim of not losing its colonial type, the aforementioned law influenced the decision making process between 1940-1960 (Lira Vázquez, *El discurso patrimonial: una coartada para frenar el desarrollo de la ciudad de Oaxaca*, 2014).

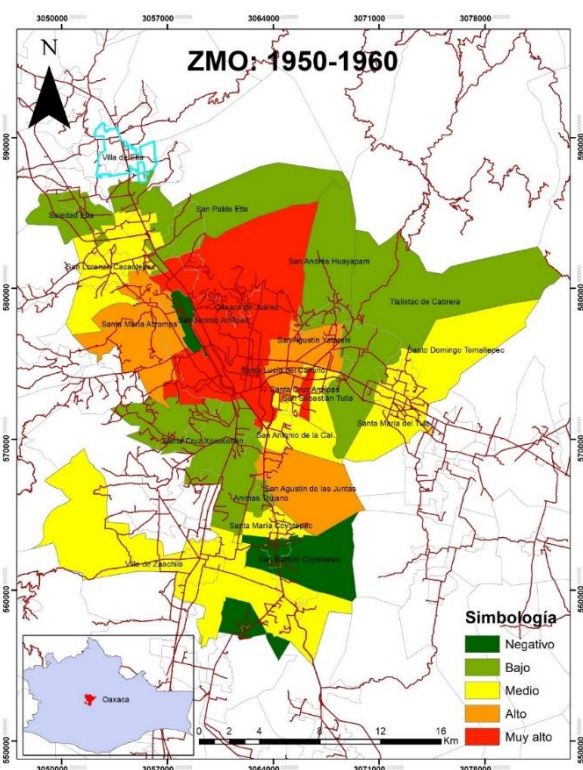
During the administration of Eduardo Vasconcelos (1947-1950), streets such as García Vigil were repaired, the football field and the baseball stadium were built, schools were repaired, the Conzati Garden was built, the Plaza de la Danza, the Health Centre, the Casa Magro was remodelled to house the State Library and the former Convent of San José was transformed into the Oaxacan School of Fine Arts, the Macedonio Alcalá Theatre was remodelled to receive conventions (Ramírez, 2013). These constructions were carried out with the support of municipal authorities during the second half of the 19th century, with the aim of organising and formalising the traders who were out in the open in the squares they occupied at the beginning, in addition to cleaning and beautifying the city's landscape (Drunker, 1988), in synchrony with what was happening throughout the country, as the economic system encouraged work in the fields and in food distribution, the latter being one of the objectives of the creation of public markets throughout the country (Chertorivski, 2013).

Vázquez (2014) highlights the message between the lines of Eduardo Vasconcelos (1947) in his report, which underlay, once again, the concern for tourism "because the state in which the streets of our capital and some of our roads are found, as well as the lack of other services, can bring as a consequence an unpleasant impression to those who visit us, with serious damage to the future of such an important industry" (Vasconcelos 1947 quoted by Lira 2014:78).

At the end of the Second World War, North American economic power grew along with its yearning for adventure, its main attraction until then being the war-torn continent of Europe, made it turn its gaze to the "exotic" Latin American cities and other parts of the world, becoming its preferred destinations.

Attention was focused on what today makes up the historic centre, with it the urban stain was formed around it, from the second decade of the twentieth century, which grew in a disorderly manner (Lira Vásquez, *El discurso patrimonial: una coartada para frenar el desarrollo de la ciudad de Oaxaca*, 2014).

Doctor Jesús Jaime Francisco proposes a period from 1950-1970 of conurbational growth within the municipality, a period when the Guelaguetza was consolidated, the city grew beyond the historic centre, but within the limits of the municipality to which it belongs (Ramírez, 2013). This is demonstrated in map 1, which shows the greatest population growth in Oaxaca de Juárez during the 1950s.



**Figure 1** Population growth 1950-1960 in the Metropolitan Zone of Oaxaca

Source: INEGI, *Population and Housing Census 1950-1960*. Prepared by Mtro. Faustino Benjamín Rivera López

In 1946, the section of the Pan-American Highway corresponding to Oaxaca was inaugurated, consolidating the internal market, thus linking the main economic regions of the state with the city, which led to new settlements at its exits (Ramírez, 2013).

In 1958, construction began on the current airport in Xoxocotlán, as a complement to this work, the Armenta y López street was widened, the work was completed in 1961, and it was not until 1978 that it achieved the status of international airport (Ramírez, 2013).

The penitentiary and the psychiatric hospital were also relocated, the former located in the former Convent of Santa Catalina moved to Santa María Ixcotel between 1956 and 1962, while the hospital was relocated to San Bartolo Coyotepec in 1963, known since then as "Hospital Granja Cruz del Sur".

By the end of 1960 and the beginning of 1970, the city moved from conurbation to metropolitan growth, driven by the increase and diversification of tertiary activities, informal commerce and state bureaucracy.

The city moves out of the boundaries of Oaxaca de Juárez and incorporates others to form the metropolitan area (Ramírez, 2013). As a result of the 1969 flooding of the Atoyac River, in 1971, the river was channelled and filled in, and a sewage and rainwater collector was built on the left bank of the river.

Hotels were set up in the city and water and sewage services were provided, thus indirectly benefiting the inhabitants living near a hotel. However, there was still a lack of infrastructure not only in the city but also in the whole state. The hotels that existed were Marqués del Valle, Victoria on the slopes of Cerro del Fortín, Señorial, Margaritas and Oaxaca Court.

In 1971 the government built the first food market in the city, since colonial times, the government decided to remove the market from the Zócalo and built near the Atoyac River the "Margarita Maza" market known as "Central de Abastos", "this change is consistent with urban development features that are by no means coincidental" (Drucker, 1988:29).

Drucker narrates one of the most relevant changes for the markets in the historic centre of Oaxaca, with the transfer of a large part of the traders to the new building constructed on the banks, with 500 stalls sold to future vendors, this change being necessary to "1) protect tourists, 2) facilitate the transit of automobiles and 3) improve hygiene conditions", leaving a small market in the centre of the city (Drucker, 1988: 28).

Susana Druker's research emphasises the changes found in the traditional system and the transfer of part of the Benito Juárez market from the city centre to the periphery (1978). At the same time, three more zonal markets were built: Sánchez Pascuas (1972), Democracia or "La Merced" (1973) and IV Centenario. In 1972, the Jalatlaco River was piped and the Calzada de la República was built over it.

On March 15, 1976, the city of Oaxaca was declared a Historic Monument Zone. For the construction of the "Auditorio Guelaguetza" (1970), the inhabitants who occupied the space in the Xochimilco neighbourhood were relocated, Zarate Aquino justified the expenditure as "the most powerful instrument of spiritual integration of the Oaxacans", supported by FONATUR, it was the federation who provided the capital for its construction, it was not until 1977 that the construction was completed.

"When making a comparison of the investment made by the federation via FONATUR in Oaxaca City to remodel the historic monuments in the 1970s, we see that the difference in the amount does not vary much with respect to what was invested by the ISSSTE Housing Fund in the same years for the construction of 200 houses. While 17,000,000 pesos were invested to promote tourism, 17,643,000 pesos were invested for the construction of 200 houses. The priority is clear, not only at the local level, but also at the national level, focusing on the importance of investing in tourism in the State of Oaxaca" (Ramírez, 2013:92).

It was not until 1977 with the Hotel Presidente, installed in the former Convent of Santa Catalina, known today as Camino Real, with the increase of hotels, the lighting in the city centre was improved, the telephone service was modernised and the first traffic lights arrived, and the streets and avenues of access to the city were widened and paved (Ramírez, 2013).

In the "Plan Parcial del Centro Histórico de la ciudad de Oaxaca" (1980), he proposed the cancellation of vehicle circulation, favouring the pedestrian, "the pedestrian tourist", with the aim of providing a walk without complications or interruptions through the city centre, observing the architecture, starting from the back of the cathedral, passing through the Casa de Cortés until reaching the former Convent of Santo Domingo (Ramírez, 2013).

During the government of Pedro Vásquez Colmenares (1980-1985), among his most important actions was the promotion of cultural policy, he implemented the creation of the State System of Cultural Houses, the Rufino Tamayo Biennial, the Spring and Band Festivals, opened galleries, encouraged the publication of books and collections, developed an ambitious programme of children's art education, detonated the project of the tourist complex "Bahías de Huatulco" and created the Government Delegations (Hernández, 2012).

At the end of this governmental period, in 1985, the way for cars to walk through the monuments area was closed to cars, making way for galleries, restaurants and bars, and beautification works were carried out in the historic centre of Oaxaca.

Oaxaca's historic centre of colonial characteristics, inscribed by UNESCO as a World Heritage Site in 1987, "it is from this inscription that greater interest was generated in the management, conservation and dissemination of the cultural riches of this area" (Chira, 2019: 67), it is through this declaration that urban changes were generated in the Historic Centre of Oaxaca according to the research "La transformación urbana a partir de la declaración patrimonial: El Centro Histórico de Oaxaca de Juárez" (Rodríguez, 2017), however as it could be it is from decades ago that urban improvement has been thought for tourism while the resident has benefited indirectly.

"Thus the city of Oaxaca has become more and more a collection of hotels, inns, inns and houses of assistance for the tourist: fondas, restaurants, cafés, cantinas, antros, which prefer above all the assistance of the tourist and, of course, a large number of art galleries showing products of the Oaxacan School of Painting, many of whose representatives are determined to patch up the great Oaxacan painters of the 20th century in an effort to sell their paintings to the unwary and uninformed tourist who is increasingly far from penetrating the true universal spirit of Oaxaca" (Lira, 2007:386).

In 1994, the process of integral restoration of the temple of Santo Domingo de Guzmán was made possible when the Secretary of National Defence ceded the property to the Oaxacan government. At the same time, archaeological studies were carried out which confirmed the damage inflicted on the building due to its military function, evidenced by holes resulting from artillery shells. In the area of the old orchard, traces of the original vaults were discovered, along with military artefacts such as grenades and ammunition from different periods.

The ceramics found prompted research into the trade routes and access points to Antequera during the viceregal era. The restoration process, which lasted more than five years, was characterised by the application of 16th century construction methods, passed down through the generations among regional experts, including craftsmen, labourers, carpenters, stonemasons and blacksmiths. Once the interventions were completed, the history of the prominent San Hipólito Mártir, with its heyday in the 17th and 18th centuries, was consolidated. The architectural complex was bifurcated: a religious area, consisting of the main temple and the Chapel of the Rosary, and the Museum of the Cultures of Oaxaca, composed of fourteen rooms articulated around three thematic pillars: ethnography, history and archaeology, mostly located on the upper floor. On the lower level, former areas such as the Sala De Profundis and the refectory have been reconfigured as travelling exhibition halls. In addition, the site houses a restaurant and an auditorium, the latter set up in the space originally intended for the sewer. The Ethnobotanical Garden of Oaxaca (Hernández Ortega, 2021) was created in the spaces previously dedicated to the orchard.

In 1997, the Mezcal Fair was created, bringing together brands from the State, with the aim of promoting local mezcal brands to tourists, since it is held during the week from Monday to Monday of the Cerro, forming an indispensable part of "Las Fiestas de Los Lunes del Cerro" (The Monday Fiestas of the Cerro). Oaxaca de Juárez increased the number of hotels in all categories from 1997 to 2017.

The most significant actions in highways and roads from 2005 to 2007 were the widening of the Cerro del Fortín to four lanes, and the change in the direction of traffic on the international highway, at the point where it crosses the city: the direction of traffic was redirected from an "English cross", both entrances to Oaxaca.

In 2005, the Landscape Recovery Project for the Zócalo, Alameda de León and the atrium of the Cathedral of the city of Oaxaca began, devised by the State Government through the Institute of Cultural Heritage, INPAC, the Municipality of Oaxaca de Juárez through the General Directorate of the Historic Centre, interventions "based on the political and touristic interests that legitimised them" (Ramírez, 2013: 98), again an intervention of this magnitude is carried out disguised as a local interest, with the supposed intention of disappearing marches and sit-ins that annoyed society.

The governor broke with tradition by decentralising the powers by taking them to another space, and decided to build the Administrative City (2005-2008) and the Judicial City (2007-2010), in the neighbouring municipalities of Tlalixtac de Cabrera and Santa María Coyotepec, generating changes in the lives of the municipality's inhabitants.

"With the removal of the Palace, the legislative exercise of the representatives of the State, the public hearings in which the government faced the demands and needs of the people, the signs of discontent and protest and demanding justice or demanding the discharge of some good or service in a community, no longer has a place to be held" (Ramírez, 2013:99).



Once the Government Palace was vacated, it was modified to house the Palace Museum, the Space for Diversity, tourist events; the official house of the Governor and his family was refurbished in 2009 to be used as the Governor's Hotel, under the 5-star service standard, and as a tourism school, which housed the "Hotel Training Centre of the University of the Sea" temporarily (Ramirez, 2013), as it is currently closed (Ramirez, 2013).

Continuing with the cultural tourism trend, the new Chamber located at Calle 14 Oriente #1 San Raymundo, 71248 Jalpan de Serra (March 2006), is a complex of three buildings, the most outstanding being the Plenary Hall, built with an investment of \$62.1 million in a space of 1738 square metres, the remaining buildings with a cost of \$221 million, privileging monumentality and not functionality, an example of this is the "liaison building" called "glass cube" with an excess of area without defined function and with high maintenance costs (Ramírez, 2013).

Also the headquarters of section XXII of the National Union of Education Workers left the historic centre, with an investment of \$20.9 million, an area of 3101 square metres was fitted out, in Ferrocarril, El Bajío, 71228 Santa Lucía del Camino, Oaxaca, consisting of three levels for administrative offices, the documentation centre, a bookshop, meeting rooms, presses and an auditorium.

In May 2010, the roof of the Guelaguetza auditorium was built to offer comfort to spectators and make the building profitable for other activities, generally artistic, favoring the commercial spectacle over tradition, at a cost of \$60 million. However, it was only used in 2011, because that same year, due to natural causes or lack of planning, the roof was lifted.

With this Ulises Ruiz intended to turn Oaxaca into a "museum city", however, again the inhabitants benefited indirectly from the introduction of basic services, the urban intervention favoured tourist development, violated not only the demonstrations but also the urban space of the city, which is now in dispute between investors, hotel owners, restaurants, protests and artisans.

In 2015, Ciudad de las Canteras: Paisaje cultural de la Verde Antequera was built, an enclosure, in the words of the State Government, "houses part of the memory of the Verde Antequera. Its rocky scree was used to build buildings such as the Cathedral or the Museum of Oaxacan Painters (Mupo)" (Gobierno del Estado de Oaxaca, 2020), in addition to the Cultural and Convention Centre of Oaxaca and the General Archive of the State of Oaxaca. It is worth mentioning that in 2019 it hosted the Mezcal Fair after 20 years of being held in El Llano Park, in addition to a series of conferences, gastronomic encounters and concerts.



**Figure 2** Andador turístico del Centro Histórico de Oaxaca

Source: 2 Joaquín Rodríguez P., 16 July 2017, Oaxaca

Under the administration of Alejandro Murat, the General Archive of the State of Oaxaca, AGEO, was inaugurated in 2017, "the urban-environmental project takes advantage of its excellent location. The main function of the Archive Building is to conserve and protect the documentary heritage. For this reason, the areas are distributed on four levels, the first for public activities and access to the documents and the upper levels for the archive's own activities", has won the 2017 Special Award for Innovation in Construction, a prize awarded by the CEMEX Building Award to the best construction and development projects worldwide" (Government of the State of Oaxaca, 2020).

Its architecture has also been a tourist attraction, through tours inside and outside the facilities.

Tourism is an essential element in urban planning that brings with it spatial, social and political transformations of the city that aim to satisfy transnational middle-class tourists with greater capital than those of its original inhabitants (Navarrete, 2019).

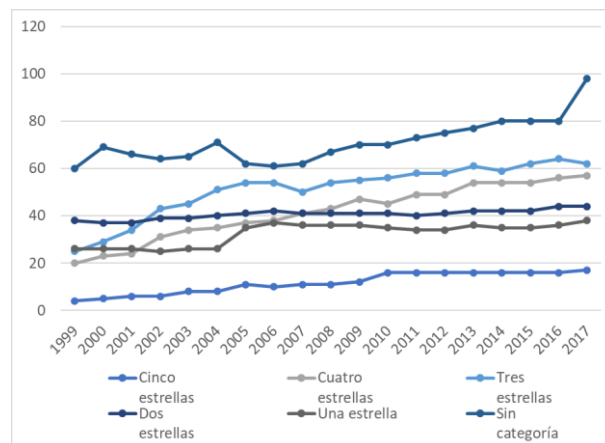
*Impacts of tourism in Oaxaca City*

Analyzing these phenomena becomes necessary to alert about the possibility of "overtourism" or over tourism, where tourism generates more problems than benefits (Calle Vaquero, 2019), in the following images we can observe the tourist walkway during "El desfile de Delegaciones 2019", national and foreign visitors, as well as locals "enjoying the parade".

Oaxaca was named in 2020 as the best city in the world to travel chosen in the first position of tourist taste worldwide in the Travel+Leisure World's Best Awards 2020, in addition to standing as the best city in Mexico to visit, the aspects that were considered were art, architecture, food, drink, history and crafts, placing the city of Oaxaca and its Historic Centre in the tourism spotlight (INFOBAE, 2020).

Tourism is a snowball that seems impossible to stop, once it has been born it continues to develop and grow, it has rolled everywhere in different ways impacting the way of life of the local inhabitants of the tourist centres.

These changes have been analysed and identified with neologisms such as touristification, patrimonialisation, gentrification, globalisation, which characterise each process. The increase in tourism during the last thirty years is notorious, the increase in flights, the improvement of motorways make it easier for visitors to access, and the infrastructure to receive all this tourism has been built in all these years in the historic centre and the surrounding area. The following graph 5 shows the increase in the number of hotels in all categories:



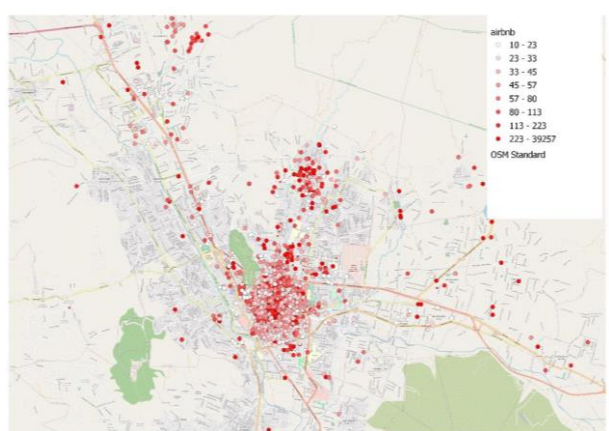
**Graphic 1** Hotels in Oaxaca de Juárez, 1999-2017  
Source: Datur, 2021

In addition to the increase in hotel rooms, the emergence of accommodation platforms such as Airbnb, founded in 2008, arrived in Mexico in 2012, changing the dynamics of booking and accommodation, becoming popular in tourist cities, and Oaxaca has been no exception.

Colonia	2019	2020	2021	2022	2023
Centro Histórico	295	312	330	348	359
Reforma	150	160	170	180	204
San Felipe del Agua	120	130	140	150	146
Santa Cruz Xoxocotlán	100	110	120	130	122
La Soledad	90	100	110	120	119
Arboledas	70	80	90	100	101
Candiani	60	70	80	90	92
Cinco Señores	50	60	70	80	83
El Llano	40	50	60	70	74
Ex Hacienda Guadalupe	30	40	50	60	65
Total	1005	1112	1220	1328	1365

**Table 1** Reported Airbnb distribution in Oaxaca City

Table 1 includes entire houses as private rooms, distributed in the municipality of Oaxaca de Juárez, Etla and Xoxocotlán, they were considered within this count as they are offered as available places in "Oaxaca de Juárez" due to their proximity to the city, prices vary and depend on factors such as number of rooms, location, proximity to the CH, most are concentrated in the historic centre.



**Figure 3** Airbnb in Oaxaca de Juárez distributed by cost, 2023

Source: Airbnb, 2023

In map 2 it can be seen that the prices offered are from 10 dollars, the locations marked in red are the highest price range, however, there is a greater supply concentrated in the historic centre of the city, this is one of the factors why the INEGI in 2020, found several blocks of this same place with less than 10 inhabitants per block, data according to the decline of the municipality to which it belongs, Figure 1.



**Figure 4** Blocks belonging to the centre of Oaxaca de Juárez with less than 10 inhabitants

Source INEGI, 2020

Tourism is a snowball that seems impossible to stop, once it has been born it continues to develop and grow, it has rolled everywhere in different directions impacting the way of life of the local inhabitants of tourist centres. These changes have been analysed and identified with relatively new terminologies: touristification, globalisation, patrimonialisation, gentrification, globalisation, to name a few, terms created to make sense of processes that exist all over the world.

Each of these terms has been studied separately, one as a consequence of the other, conditional, interdependent, all with similar underpinnings, all leading to one trigger, the generation of capital. Culture is now a commodity that tourists are willing to buy through experiences, often locals are willing to sell, without realising that culture is commodified by the presence of tourism and new capital.

A further consequence of the presence of tourism is the increase in the value of land. For Hilda M. Herzer, the change in the value of land for housing plays a decisive role, the phenomenon leads to a rise in prices in renovated areas, including a recovery of the symbolic value of urban centres, for this author gentrification can also be described "as a process of social and spatial differentiation" (Herzer, 2008). At present, commercial and housing spaces in the historic centre of Oaxaca are of high cost, in the municipality of Oaxaca de Juárez there is a supply of houses, mostly with residential characteristics and prices in thousands and millions of dollars.

In 2019 Oaxaca registered a 6.53% growth in tourist arrivals, receiving 5 million 367,649 tourists. In the city of Oaxaca, the arrival of foreign visitors increased by 20.26% with a total of 20,715 more people (Gobierno del Estado de Oaxaca, 2021).

The impact of tourism is not only economic, it can be observed in the streets of the historic centre of Oaxaca City, a great offer of hotels, restaurants, galleries, cafes, bars, coffee shops, exchange houses, among other services installed in order to satisfy the needs and desires of tourists who come to this destination. Even the public markets have modified their function with the purpose of obtaining benefits from the visitors.

Tourist activity has also had an impact on the symbolic reconstruction of space. Tourist sites are often constructed and promoted as places of fantasy and escape, and idealised images of these places have been created in popular culture.

This idealised image can have negative consequences, such as the exploitation of local culture and the perpetuation of cultural stereotypes and prejudices (Harvey, 2006), as was found by Carolina Hernández in traditional markets in the central valleys of Oaxaca (2017); within this research we propose to find evidence of the touristification within the MBJM, and the consequences it has had for its tenants, collaborators, authorities, neighbours and Oaxacans.

Each of these terms has been studied separately, one as a consequence of the other, conditional, interdependent, all with similar underpinnings, all leading to one trigger the generation of capital. Culture is now a commodity that tourists are willing to buy through experiences, often locals are willing to sell, without realising that it is changing, it is that culture alone, their own, that is changing because of the presence of tourism and new capital.

Another consequence of the presence of tourism is the increase in the value of land. Herzer the change in the value of land for housing plays a decisive role, the phenomenon leads to a rise in prices in the renovated areas, even a recovery of the symbolic value of the urban centres, for this author gentrification can also be described "as a process of social and spatial differentiation" (Herzer, 2008), currently the commercial and housing spaces in the historic centre of Oaxaca are of high costs, in the municipality of Oaxaca de Juárez there is a supply of houses, mostly with residential characteristics and prices in thousands and millions of dollars.

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### Conclusions

The city of Oaxaca has been subject to a profound urban transformation in recent decades, guided by public policies focused on boosting tourist activity.

Interventions in the historic centre have shaped a process of touristification that has had mixed results for the local population. While these measures have allowed for economic revitalisation and a repositioning of Oaxaca as a tourist destination, they have also led to problematic impacts such as an increase in the cost of living, displacement of residents and loss of the socio-cultural identity of the historic centre.

Touristification has reconfigured public spaces and altered traditional commercial dynamics to suit tourist interests. Thus, a tension is generated between these urban policies and the safeguarding of the welfare and rights of local inhabitants. There is an imminent need to critically analyse these tourism-linked urban renewal processes in terms of their multidimensional impacts.

There are ambiguous effects of tourism-oriented urban renewal policies when touristification takes precedence over local needs. A holistic approach is required that balances tourism promotion with the protection of citizen welfare and community identity.

The city of Oaxaca has undergone a profound urban transformation in recent decades, guided by government policies that seek to promote tourism activity through the renovation and enhancement of the historic centre.

These policies have materialised in various interventions such as the remodelling of historic buildings, pedestrianisation of streets, beautification of squares and other public spaces. While these actions have positioned Oaxaca as an important tourist destination, they have also shaped an accelerated and complex process of touristification.

Touristification has brought with it problematic effects for the local population, such as an increase in the cost of living, displacement of native residents, and the progressive loss of the socio-cultural character and identity of the historic centre.

The case of Oaxaca can serve as a reference point for investigating similar problems in other Mexican cities. The ambiguous impacts of putting touristification before citizens' needs. Integral approaches are required that balance tourism promotion with the quality of life of the community.

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## Framework for addressing the challenges of digitalization in organizations

### Marco para afrontar los desafíos de la digitalización en las organizaciones

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#### Abstract

Many organizations are currently making efforts to achieve digital transformation, but a high percentage do not achieve the expected results. The aim of this article is to outline the actions that, according to existing literature, should be implemented in organizations to face the challenge of digitalization. A classification of barriers to digitalization is proposed and a conceptual framework that covers four categories, each of which comprises five phases. Each phase describes the actions that could be undertaken within organizations. The suggested actions are discretionary, which means that there is the freedom to choose among them depending on the nature and requirements of each organization. The contribution of this work consists in the integration of elements from various perspectives, models and frameworks into a logical and coherent structure to address the challenges of digitalization in organizations.

**Digitalization in organizations, Barriers to digitalization, Conceptual framework for digitalization**

#### Resumen

Muchas organizaciones realizan actualmente esfuerzos para lograr la transformación digital, pero un alto porcentaje no obtiene los resultados esperados. El objetivo de este artículo es delinear las acciones que, según la literatura existente, deben implementarse en las organizaciones para enfrentar el desafío de la digitalización. Se propone una clasificación de barreras a la digitalización y un marco conceptual que abarca cuatro categorías, cada una de las cuales comprende cinco fases. Cada fase describe las acciones que podrían emprenderse dentro de las organizaciones. Las acciones sugeridas son discrecionales, lo que significa que se tiene la libertad de elegir entre ellas en función de la naturaleza y los requisitos de cada organización. La contribución de este trabajo consiste en la integración de elementos de diversas perspectivas, modelos y marcos en una estructura lógica y coherente para abordar los retos de la digitalización en las organizaciones.

**Digitalización en las organizaciones, Barreras para la digitalización, Marco conceptual para la digitalización**

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## Introduction

Businesses are undergoing a digital transformation driven by mega trends, from the initial digitisation of physical information to today's end-to-end digitisation. The new wave of digitisation impacts all organisational aspects and business networks, requiring their reinvention to remain competitive. This involves the transition to digital platforms, data-driven improvement based on customer feedback and the establishment of diverse communication channels (Halpern and Valderrama, 2018). However, although companies invest in digital transformation initiatives, a high percentage of them do not achieve the expected results (Tabrizi et al., 2019). Recent studies suggest that the main problems of digitisation in organisations are related to four relevant categories:

- 1) Employee and customer resistance to change (Blyukov, 2021; Enders et al., 2020; Frick et al., 2021; Liakhovych, 2020; Minakov and Suglobov, 2021; Parviainen et al., 2017; Talwar et al., 2020; Wang, 2022).
- 2) Lack of digital skills and training affecting leadership, management, creativity and IT competence; and generating difficulties such as: service disruptions and staff burnout (Drydak, 2022; Hulla and Ramsauer, 2020; Lebedeva and Federation, 2019; Ollerenshaw et al., 2021; Parida et al., 2021; Sousa and Rocha, 2019).
- 3) Data protection, IT security, system integration and compatibility represent major risks in the digitisation of organisations (Agarwal et al., 2019; Bouncken et al., 2019; Cordoba et al., 2019; Draper and Raymond, 2020; Edu et al., 2021; Kannadhasan, et al., 2022; Khadam et al., 2019; Nieves et al., 2019; Pavlykivska et al., 2021; Shibl et al., 2021; Yang and Zhang, 2022).
- 4) Investment in technology, resources and human capital is a major challenge in business digitalisation (Almeida et al., 2020; Björkdahl, 2020; Camisón-Haba et al., 2022; Charochkina et al., 2021; Faruk et al., 2022; Grahn et al., 2021; Kvasha et al., 2021; Parida et al., 2019; Sergeev and Shirobokova, 2020).

This paper proposes a framework consisting of a classification of barriers and a phased framework that aims to help organisations overcome the various challenges they face during their digitisation process.

## Theoretical framework

According to studies by Caputo et al. (2021), Cybovskiy (2022), Lertpiromsuk and Ueasangkomsate (2022), Parida et al. (2021) Sotnyk et al. (2020), Moss et al. (2021) and Karimi and Walter (2015), theories on technological innovation, strategic management, digital transformation and digital business models, as well as interdisciplinary approaches combining economics, law and business theory, are the basis for research on solutions for business digitisation.

Meanwhile, studies by Bazan and Estevez (2021), Felli et al. (2022), Kocbek et al. (2019), Yulianto et al. (2021), Veitaitė and Lopata (2020), Snihur and Wiklund (2019) and, Argyropoulos et al. (2019), suggest that important models in researching solutions to business process challenges can be categorised into: process modelling (e.g., Industry 4.0, DDSA, CMMN, BPMN), infrastructure and alignment (e.g., remote resources, infrastructure alignment, EM) and, context-aware and knowledge-based approaches (e.g., unstructured processes, complex event processing, strategic management theory, knowledge-based information systems engineering).

Furthermore, other authors suggest that various frameworks, focusing on business model innovation, portfolio considerations and multilevel factors, can guide the overcoming of important problems in business digitisation (Bican and Brem, 2020; Bouncken et al., 2019; Broekhuizen et al., 2021; Linde et al., 2020; North et al., 2019; Olsson and Bosch, 2020; Parida, 2019; Parviainen et al., 2022; Trenerry et al., 2021; Verhoef et al., 2021; Volberda et al., 2021; Zimmermann et al., 2021), as shown in Table 1.



Autor	Proposal
Bican y Brem, 2020	A conceptual framework on digital readiness, digital technology and digital business models to address change in a sustainable way through digitisation.
Bouncken et al., 2019	A conceptual matrix for portfolio considerations of enterprise business model digitisation.
Broekhuizen et al., 2021	A multi-disciplinary and multi-stakeholder perspective to create collaborative solutions for digital transformation.
Linde et al., 2020	A three-phase framework to help companies assess digital business model opportunities and make informed decisions about business prospects.
North et al., 2019	A framework to help SMEs assess their level of digital maturity and the capabilities associated with each level to enhance digital growth.
Olsson y Bosch, 2020	A strategic decision framework to successfully navigate digital transformation by evolving existing ecosystems and creating new ecosystems around new technologies.
Parida, 2019	A framework that links digitalisation, business model innovation and sustainability in industrial environments.
Parviainen et al., 2022	A four-step Digital Transformation Model: positioning, definition of objectives, analysis of the current state and implementation of a roadmap to achieve the objectives.
Trenerry et al., 2021	A multi-level framework involving individual, group and organisational factors can help guide a successful digital transformation in organisations.
Verhoef et al., 2021	It proposes to create specific organisational structures and performance metrics to successfully overcome the challenges of business digitalisation.
Volberda et al., 2021	A framework for strategising in the new digital competitive landscape that emphasises the interplay between cognitive barriers, digital routines and organisational changes.

**Table 1** Frameworks and models that propose different tools to face the challenges of digitalisation in organisations

Source: Own elaboration with information from the authors

**Methodology**

To determine which tools organisations can use to address the challenges of digitalisation, a conceptual framework was constructed for this particular case based on Adom et al., 2018; Collins and Stockton, 2018; and, Sui and Chua, 2019; following five steps:

- 1) Identify the main problems (already defined in the introduction)

- 2) Identify the relevant models or frameworks to address those problems (already listed in the theoretical framework).
- 3) Identify the key concepts (Barriers)
- 4) Relate the solutions to the corresponding challenges.
- 5) Design a visual representation to form the conceptual framework.

**Results and discussion**

Based on a literature review of selected authors different barriers were identified for each category as shown in table 2.

Category 1 Barriers	Identified by
Lack of trust in management, fear of job loss and work-life balance.	Blyukov, 2021
Preference for routine, cognitive rigidity, emotional response and short-term focus of employees.	Enders et al., 2020 Frick et al., 2021
Lack of competence, interest, motivation, lack of understanding of change and uncertainty.	Liakhovych, 2020
Insufficient knowledge, fears of low ROI, lack of funding and infrastructure, and cybercrime.	Minakov y Suglobov, 2021
The socio-cultural challenge of new technology and the technical challenge of mastering it.	Parviainen et al., 2017
Functional (use, value, risk, characteristics, age) and psychological (tradition, image, education, religiosity).	Talwar et al., 2020
Behaviour protective of the effects of change, due to fear or misunderstanding of its benefits.	Wang, 2022
Category 2 Barriers	Identified by
Lack of awareness of digital services and outcomes and their benefits.	Drydakis, 2022
Lack of qualification and competence requirements for employees.	Hulla y Ramsauer, 2020
Lack of digital skills and competences, skills gap between recent graduates and those in demand.	Lebedeva y Federation, 2019
Insufficient understanding of digital technologies, lack of skills needed for digital adoption, lack of skills and knowledge to upgrade and implement technologies and identify their value.	Ollershaw et al., 2021
Lack of understanding of how digitalisation can create, deliver and capture value for the organisation.	Parida et al., 2021
Lack of innovation, leadership and management skills.	Sousa y Rocha, 2019
Category 3 barriers	Identified by
Attacks due to lack of security in systems and data leakage or modification by unauthorised parties in the network.	Agarwal et al., 2019
Lack of integration of digital technologies into organisational structures and senior management.	Bouncken et al., 2019
The need for systems to safeguard assets from IT security threats and for secure data storage and transmission.	Cordoba et al., 2019

Risks of employees sharing their access data, disabling security measures or mishandling classified information.	Draper y Raymond, 2020
Insufficient backup power, firewall protection and security audits.	Edu et al., 2021
Client-side Trojan programmes, as they can bypass or subvert the authentication and authorisation protocols used in a transaction.	Kannadhasan, et al., 2022
The challenges of secure and efficient management of large amounts of data.	Khadam et al., 2019
Weak data protection on platforms, lagging IT security developments, the challenges of cloud data storage, encryption methods and the impact of data protection regulation.	Nieves et al., 2019
The challenge of reconverting the organisation, collection, processing, storage and use of data and administrative and accounting policies to adapt them to digitisation.	Pavlykivska et al., 2021
Current use of incompatible data models and legacy systems; few resources for the development of global projects to handle continuous integration.	Shibl et al., 2021
Lack of effective data security protection leading to data leakage.	Yang y Zhang, 2022
<b>Category 4 barriers Identified by</b>	
Unmet demand for talent and lack of implementation of new ways of working; lack of flexibility of digital products and services, and; cybersecurity and privacy vulnerabilities for new products, services and ways of working.	Almeida et al., 2020
Imbalance between the pursuit of greater efficiency through digitisation and the pursuit of organisational growth, leading to misidentification of skills, assets and data.	Björkdahl, 2020
Inability to access or insufficient funding to standardise corporate information to comply with regulations, which affects the organisation's reputation and competitiveness.	Camisón-Haba et al., 2022
Delays in technological transformation due to digital disparities by size of organisations, low digital adoption, poor infrastructure, insufficient government support and inter-sectoral technology gap.	Charochkina et al., 2021
SMEs' difficulty in mobilising substantial resources, which limits their effective digitisation.	Faruk et al., 2022
Organisations find it difficult to use resources efficiently and effectively to cope with digitisation, and allocate limited resources to identify and assess value creation from digitisation.	Grahn et al., 2021
Limited innovative potential in organisations, scarcity of resources to innovate and difficulty in accumulating and applying innovative potential for digitisation.	Kvasha et al., 2021
Inequitable distribution of activities and functions, cost and revenue sharing models, procurement, value creation and value capture by and for digitisation.	Parida et al., 2019
Incompetence and low interest of many employees in digitalisation, the high investment risks required, the low level of technology and the predominance of medium-sized and low-skilled labour in company processes.	Sergeev y Shirobokova, 2020

**Table 2** Categorization and relationship between the challenges and the tools to face them proposed by the authors reviewed

Source: Authors' own elaboration with information from the authors

Table 3 below breaks down the elements that can be used to address the challenges related to resistance to change (which have been synthesised into more general barriers to facilitate the analysis), in accordance with the scope of the frameworks and models indicated by the authors in table 1.

Elements for tackling barriers	Author of the framework or model
<b>Barriers: Employment factors</b>	
Organisational solutions for change management	Bouncken et al., 2019
Categorise dimensions of digital transformation in the organisational framework.	Broekhuizen et al., 2021
Interpret market signals to anticipate required changes in the way of working and address sources of resistance early on.	North et al., 2019
Focus on the potential benefits and competitive advantages of new technologies when moving towards digitalisation.	Parida et al., 2019
Implement strategies and continuously monitor and adjust based on feedback.	Parviainen et al., 2022
<b>Barriers: Cognitive and Emotional Factors</b>	
Engage diverse disciplines.	Broekhuizen et al., 2021
Understand and address resistance factors by deploying resources and capabilities before implementing change.	North et al., 2019
Understand the benefits of digitalisation and communicate them to all stakeholders.	Parviainen et al., 2022
Reframe cognitive frameworks to help people imagine new models of digital work and business.	Volberda et al., 2021
<b>Barriers: Competitive factors and uncertainty</b>	
Enhance knowledge sharing.	Bican y Brem, 2020
Strategically build core capacities, essential to facilitate the transition to digitisation and seize opportunities.	Olsson y Bosch, 2020
Identify areas where resistance is greatest and understand the reasons behind it.	Parviainen et al., 2022
<b>Barriers: Economic and infrastructure factors</b>	
An integrative perspective can help to overcome barriers of this type.	Broekhuizen et al., 2021
Assessing Risks in the Business Model, Modelling Finance by analysing new scenarios and formalising control mechanisms.	Linde et al., 2020
<b>Barriers: Technological and socio-cultural challenges</b>	
Integrate digital technologies into business models and processes.	Bouncken et al., 2019
Incorporate the perspectives of various stakeholders	Broekhuizen et al., 2021
Develop training programmes, communication strategies and change management initiatives.	Parviainen et al., 2022
Develop new digital assets and capabilities to demonstrate the value of digitisation.	Verhoef et al., 2021

<b>Barriers: Functional and psychological factors</b>	
Adapt activities to business models	Bican y Brem, 2020
Adapt the digital business model to manage risks.	Linde et al., 2020
Barriers: Protective behaviour.	
Promoting sustainable digitalisation.	Bican y Brem, 2020
Assessing the Value of the Digital Opportunity Identifying perceived needs of employees and customers.	Linde et al., 2020
Fostering a culture of adaptability and innovation to mitigate resistance through a continuous and proactive approach to transformation.	North et al., 2019

**Table 3** Proposals for addressing the challenges of digitalisation in organisations  
 Source: Prepared by authors

Table 4 shows a breakdown of the elements that can be used to address the challenges related to the lack of digital skills and training (which have been synthesised into more general barriers to facilitate the analysis), in accordance with the scope of the frameworks and models indicated by the authors in table 1.

<b>Elements for tackling barriers</b>	<b>Author of the framework or model</b>
<b>Barrier: Lack of awareness of digitisation</b>	
Promote knowledge sharing	Bican y Brem, 2020
Promote collaboration across disciplines.	Broekhuizen et al., 2021
Assess the digital opportunity, its risks and Refine the Value Proposition to guide workforce readiness.	Linde et al., 2020
Recognise the importance of digital skills and make them a key part of the company's digitalisation strategy.	Parviainen et al., 2022
<b>Barrier: Lack of labour skills</b>	
Strategic implementation of digital technologies	Bouncken et al., 2019
An aligned organisational framework can guide training appropriately.	Broekhuizen et al., 2021
Plan training based on financial analysis and formalise training mechanisms.	Linde et al., 2020
Develop a conceptual framework to identify skills required for digitisation and develop a training programme.	Parida et al., 2021
Develop a training programme to improve the skills of the workforce.	Parviainen et al., 2022
<b>Barrier: Digital skills gap</b>	
Embrace continuous learning and adaptation.	Bouncken et al., 2019
Identify digital skills needs early by monitoring technology trends to align and implement training and development programmes.	North et al., 2019
Develop a conceptual framework to identify skills required for digitisation and develop a development programme.	Parida et al., 2021

Assess the current digital skills of the workforce and identify where training is needed.	Parviainen et al., 2022
Fostering Digital Agility can promote a culture of continuous learning and adaptation, addressing the skills gap.	Verhoef et al., 2021
<b>Barrier: Lack of understanding of digital technologies</b>	
Enhance knowledge sharing	Bican y Brem, 2020
Introduce employees to success stories from other organisations to highlight the importance of digital technologies and skills and their benefits for staff.	Parida et al., 2021
Integrate new digital technologies alongside training and education programmes with an emphasis on the benefits for employees and the business.	Olsson y Bosch, 2020
The creation of new routines can foster a culture of continuous learning and adaptation.	Volberda et al., 2021
<b>Barrier: Misunderstanding of the value of digitisation</b>	
Support individualised approaches to training, capacity building and role and function allocation to emphasise the benefits of digitisation..	Bican y Brem, 2020
<b>Barrier: Lack of leadership and innovation skills</b>	
Implement the training programme and continuously update it in line with the evolving digital landscape.	Parviainen et al., 2022
Train different organisational levels in: New business opportunities, Project management, Risk management, Efficiency and effectiveness, Networking, Talent management, Motivation and satisfaction, Communication, Career management, Multicultural employee leadership, Emerging technologies, Decision-making tools, Big data analysis, Organisational change, Strategic management, Social and relational knowledge, according to their roles and responsibilities.	Sousa y Rocha, 2019

**Table 4** Proposals to address the challenges of lack of digital skills and training in organisations  
 Source: Own elaboration based on authors

Table 5 below breaks down the elements with which the challenges related to data protection, IT security and systems integration and compatibility can be addressed (which have been synthesised into more general barriers to facilitate the analysis), in accordance with the scope of the frameworks and models indicated by the authors in table 1.

Elements for tackling barriers	Author of the framework or model
<b>Barrier: System security and data protection</b>	
Align activities with business models.	Bican y Brem, 2020
Integrate digital technologies into business models.	Bouncken et al., 2019
Multi-stakeholder perspectives, helping to identify data protection solutions.	Broekhuizen et al., 2021
Understand customer operations and value proposition orientation to assess system and data security implications.	Linde et al., 2020
Detect potential data protection, security and compliance issues in market signals to take action.	North et al., 2019
Develop a conceptual framework to guide secure practices in systems and data.	Parida et al., 2021
Identify the current state of data protection measures and systems integration.	Parviainen et al., 2022
<b>Barrier: Competence and behavioural management of employees</b>	
Promote sustainable digitalisation.	Bican y Brem, 2020
Identify risks, adapt business model operations and formalise mitigation and control mechanisms.	Linde et al., 2020
Prioritise the integration of robust data protection and IT security measures during organisational transformation.	North et al., 2019
Develop a conceptual framework for employees to understand the importance and place of the competencies and behaviours required for digitisation.	Parida et al., 2021
<b>Barrier: Understanding and integrating digitisation</b>	
Integrating digital technologies into business models	Bouncken et al., 2019
Engage non-business stakeholders, such as consumers and society.	Broekhuizen et al., 2021
Introduce employees to success stories from other organisations to help them understand the benefits of digitalisation and how it should be integrated into the business.	Parida et al., 2021
Understand the importance of data protection and systems integration in the digitalisation process.	Parviainen et al., 2022
The implementation of new Organisational Forms can ensure effective coordination and management of digital operations.	Volberda et al., 2021
<b>Barrier: Incompatibility of systems and resources</b>	
Aligning activities with business models	Bican y Brem, 2020
Integrating digital technologies into business models	Bouncken et al., 2019
An aligned integration perspective and organisational framework considers security and compatibility as integral components.	Broekhuizen et al., 2021

Evolve systems together with the internal and external ecosystem to progressively resolve incompatibilities.	Olsson y Bosch, 2020
Develop a conceptual framework to guide a smooth integration and transition of systems and resources.	Parida et al., 2021
Big Data analytics capabilities can help manage and protect data while ensuring compatibility and integration of systems.	Verhoef et al., 2021
<b>Barrier: Infrastructure requirements</b>	
An aligned integrative perspective and organisational framework considers security and compatibility as integral components.	Broekhuizen et al., 2021
Model the finances of the digital operation based on sensitivity analysis and scenarios to implement infrastructure and guide the required contractual operations.	Linde et al., 2020
Develop a plan to enhance data protection measures and improve systems integration.	Parviainen et al., 2022
<b>Barrier: Regulatory compliance</b>	
Perspectives from various stakeholders, help identify relevant regulatory requirements.	Broekhuizen et al., 2021
Identify success stories to guide compliance, create a conceptual framework for your own case and identify obstacles to address them comprehensively.	Parida et al., 2021
Implement the plan and continuously monitor and adjust based on changes in legislation and regulations.	Verhoef et al., 2021

**Table 5** Proposals to address the challenges of data protection, IT security and systems integration and compatibility in organisations

Source: Own elaboration based on authors

Finally, table 6 breaks down the elements that can be used to address the challenges related to investment in technology, resources and human capital (which have been synthesised into more general barriers to facilitate the analysis), in accordance with the scope of the frameworks and models indicated by the authors in table 1.

Elements to address barriers	Author of the frame or model
<b>Barrier: Lack of investment in new ways of working.</b>	
Align activities with business models	Bican y Brem, 2020
Focus on value creation and proposition, organisational solutions for change management.	Bouncken et al., 2019
Strategically transform ways of working to capture opportunities and gain competitiveness.	North et al., 2019

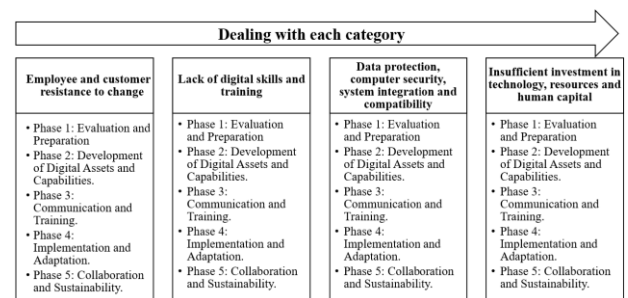
Recognise the need for investment in new ways of working, identify the gaps between the current state and the required state, plan a roadmap and implement it.	Parviainen et al., 2022
Investment can be guided by the need to rethink Cognitive Frameworks, build new Routines and implement new Organisational Forms for digitalisation.	Volberda et al., 2021
<b>Barrier: Lack of investment in security of digital products and services</b>	
Supporting individualised approaches	Bican y Brem, 2020
An integrative perspective supports strategic investment by considering the wider impact on business models.	Broekhuizen et al., 2021
Recognise the need for investment in digital product and service security, identify gaps between current state and required state, plan a roadmap and implement it.	Parviainen et al., 2022
<b>Barrier: Lack of investment in digital infrastructure</b>	
Strategic implementation of digital technologies	Bouncken et al., 2019
Strategically move from mechanical, electrical and electronic to the use of software, data and AI for improved process efficiency and development of new products and services.	Olsson y Bosch, 2020
Recognise the need for investment in digital infrastructure, identify the gaps between the current state and the required state, plan a roadmap and implement it.	Parviainen et al., 2022
<b>Barrier: Lack of investment in resources for digitalisation</b>	
Applying digital to sustainable practices	Bican y Brem, 2020
Involving various stakeholders ensures that investment decisions consider the interests of different parties.	Broekhuizen et al., 2021
Identify early strategic investment areas in technology trends to align resources with emerging opportunities.	North et al., 2019
Recognise the need for investment in digitisation, identify gaps between the current state and what is required, plan a roadmap and implement it.	Parviainen et al., 2022
Investment can be guided by the need to develop Digital Networking Capacity, enabling collaboration and sharing of resources in the digital ecosystem.	Verhoef et al., 2021
<b>Barrier: Lack of investment in human capital for digitisation</b>	
Align activities with business models	Bican y Brem, 2020
Assess the training needs required by the digital opportunity and the new business model and refine their implementation.	Linde et al., 2020
Develop early human capital to capture value in digital growth opportunities.	North et al., 2019
Recognise the need for investment in human capital, identify gaps between current and required state, plan a roadmap and implement it.	Parviainen et al., 2022

<b>Barrier: Lack of investment in technology for business processes</b>	
Align activities with business models, Apply digital to sustainable practices.	Bican y Brem, 2020
Organisational solutions for change management	Bouncken et al., 2019
The organisational framework provides a structured way to plan investments by categorising dimensions such as digital transformation.	Broekhuizen et al., 2021
Assess risks on required investments in technology, resources and human capital, modelling finances based on analysis, scenarios and impact of investments.	Linde et al., 2020
Recognise the need for technology investment in processes, identify gaps between the current state and the required state, plan a roadmap and implement it.	Parviainen et al., 2022

**Table 6** Proposals to address the challenges of investment in technology, resources and human capital in organisations

Source: Own elaboration based on authors

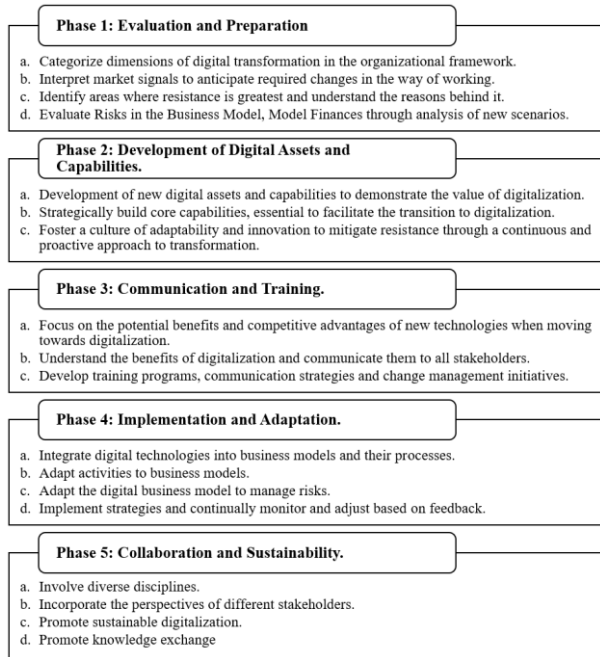
Based on the analysis of elements to address the barriers to digitalisation in each category, the model shown in figure 1 was developed, which involves the different elements proposed by the authors of the frameworks and models reviewed. These elements have been related, synthesised and included in a five-phase process to address the challenges of digitisation in organisations for each category, which constitute tools for this purpose.



**Figure 1** Model for addressing the challenges of digitalisation for each category

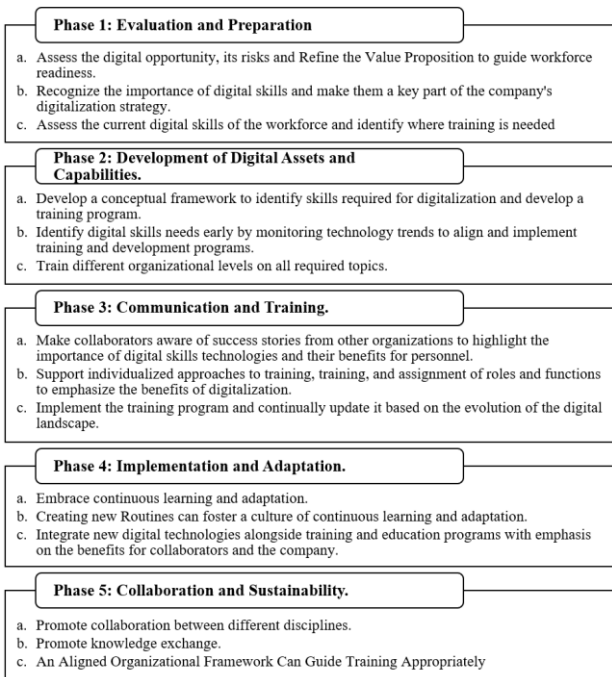
Source: Prepared by the company

Figure 2 shows the activities to be carried out in each phase to address the challenges of category 1: Resistance of employees and customers to change..



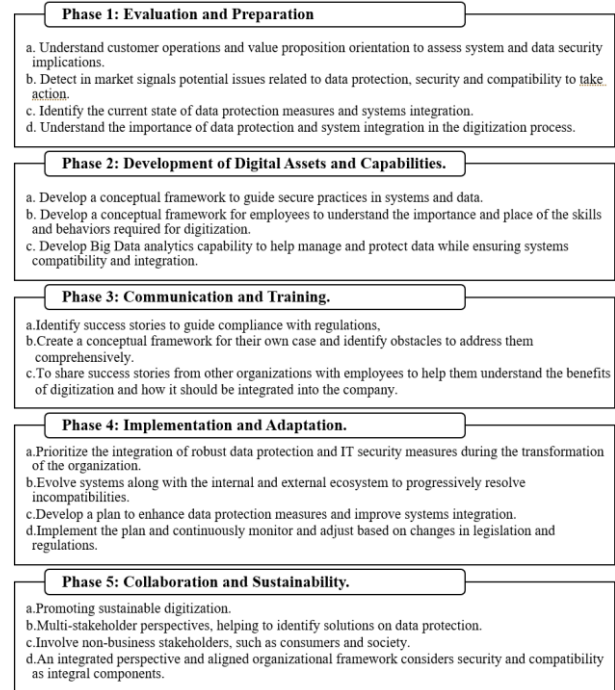
**Figure 2** Activities for each phase to address the challenges of category 1: Resistance of employees and customers to change  
*Source: Own elaboration*

Figure 3 shows the activities to be carried out in each phase to address the challenges of category 2: Lack of digital skills and training in organisations.



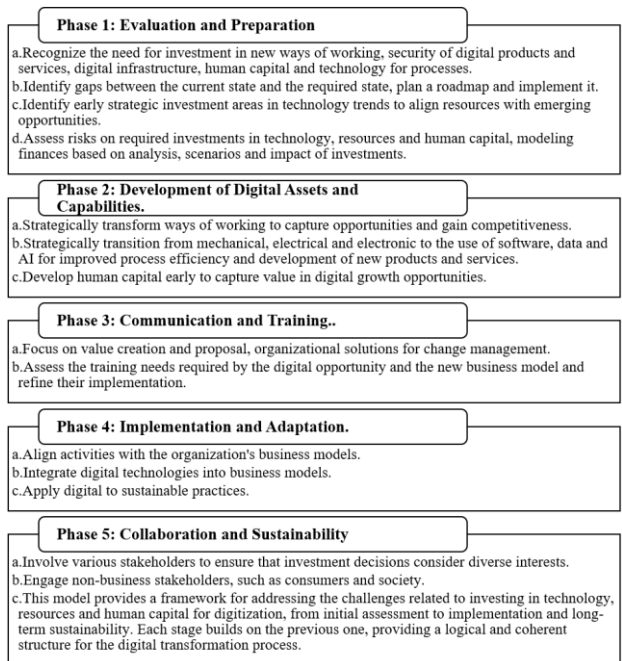
**Figure 3** Actividades por cada fase para afrontar los desafíos de la Category 2: Lack of digital skills and training in organisations  
*Source: Own elaboration*

Figure 4 shows the activities to be carried out in each phase to address the challenges of category 3: Data protection, IT security, system integration and compatibility.



**Figure 4** Activities for each phase to address the challenges of category 2: Lack of digital skills and training in organisations  
*Source: Prepared by the authors*

Figure 5 shows the activities to be carried out in each phase to address the challenges of category 4: Challenges related to investment in technology, resources and human capital.



**Figure 5** Activities for each phase to address the challenges of category 4: Challenges related to investment in technology, resources and human capital in organisations  
*Source: Own elaboration*

As a result, an integrated model is presented that discerns and classifies various barriers to digitisation within organisations into four distinct categories. Also, a five-phase framework, based on the various perspectives, models and frameworks suggested by the chosen authors, is proposed to address the challenges faced by organisations in the digitisation process for each category, these are the tools that organisations can use to address their challenges to digitisation. This framework aims to provide a rational and coherent structure for addressing the challenges within each category, thus helping organisations to streamline their own process. In addition, organisations can prioritise the relevant category of challenges on a case-by-case basis and build on the progress they have already made, making it easier for them to implement their efforts to remove barriers to digitisation based on the tools proposed.

## Conclusions

Different studies have identified a large number of barriers, challenges and problems that are found around the digitisation processes of organisations, and all this variety needs to be synthesised and classified for the attention of different stakeholders in the field. This paper integrates a model that identifies and classifies the different challenges posed by digitisation in organisations into four categories.

This model is complemented by a framework composed of five phases for each category and is based on the different proposals of the selected authors, thus providing a logical and coherent structure to address the different challenges in each of these categories.

The proposed framework is flexible and allows to choose the most relevant category of challenges for each organisation and to build on the progress they have already made to facilitate the implementation of their process of removing barriers to digitisation.

As future work, an empirical study involving different types of organisations at different stages of progress towards digitisation is proposed in order to validate the relevance and usefulness of the proposed framework, receive feedback and make any necessary corrections to make it a useful and easily applicable tool to facilitate the digitisation of organisations.

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**Digital technologies for business development: modern marketing****Tecnologías digitales para el desarrollo empresarial: el marketing moderno**

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**Abstract**

In 2020, COVID-19 was declared a pandemic, the world came to a standstill and the business sector entered a crisis from which many businesses did not recover and disappeared, this generated an impulse in the search for alternatives to create businesses based on technologies. of digital communication and information. Modern marketing, driven by digital technologies, is essential for business development in the current era. Its advantages include wide reach, precise segmentation, real-time interaction, measurement and analysis, and reduced costs. However, it faces challenges such as market saturation, constant changes in digital trends, privacy and security concerns, depersonalization, and information overload. To succeed, companies must leverage the advantages of these technologies and carefully address their disadvantages, constantly adapting to an ever-evolving digital environment. In modern marketing, strategies are applied with digital technologies that are essential to promote online products, services or brands in the marketplace and ecommerce and reach specific audiences locally or globally, breaking the barriers of international borders.

**Resumen**

En el año 2020 se declara al COVID-19 pandemia, el mundo se paralizó y el sector empresarial entró en una crisis de la cual muchos negocios no se recuperaron y desaparecieron, esto generó un impulso en la búsqueda de alternativas para crear negocios basados en tecnologías de la comunicación e información digital. El marketing moderno, impulsado por tecnologías digitales, es fundamental para el desarrollo empresarial en la era actual. Sus ventajas incluyen un amplio alcance, segmentación precisa, interacción en tiempo real, medición y análisis, y costos reducidos. Sin embargo, enfrenta desafíos como la saturación del mercado, cambios constantes en tendencias digitales, preocupaciones sobre privacidad y seguridad, despersonalización y la sobrecarga de información. Para tener éxito, las empresas deben aprovechar las ventajas de estas tecnologías y abordar cuidadosamente sus desventajas, adaptándose constantemente a un entorno digital en constante evolución. En el marketing moderno se aplican estrategias con tecnologías digitales que son fundamentales para promocionar en marketplace y ecommerce productos, servicios o marcas en línea y alcanzar audiencias específicas en forma local o global rompiendo las barreras de fronteras internacionales.

**Marketing, Marketplace, Ecommerce****Marketing, Marketplace, Ecommerce**

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## Introduction

The digital era has radically transformed the way businesses operate and compete in the global marketplace. In this context, Digital Technologies for Business Development have become a fundamental element for the growth, efficiency and survival of organisations in the 21st century. These technologies span a wide spectrum of tools and platforms, from advanced software and data analytics to artificial intelligence and process automation solutions.

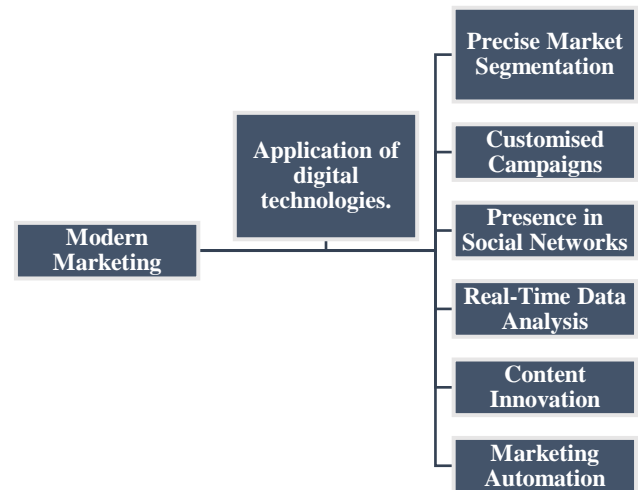
The importance of adopting and leveraging Digital Business Development Technologies lies in their ability to improve productivity, optimise internal processes, facilitate decision-making and open up new business opportunities. Companies that effectively incorporate these technologies can experience greater agility, faster response to market demands and competitive advantage.

In addition, Digital Technologies not only offer internal benefits, but also enable a closer connection with customers, enhancing the user experience and providing opportunities for product and service innovation. In an increasingly dynamic and changing business environment, the ability to adapt and adopt digital technologies strategically has become crucial for the sustainable development and long-term success of organisations. It is indicated that the effective use of Digital Technologies for Business Development is not only an option, but a necessity to stay on trends and meet certain human needs.

### *Description of modern marketing and the use of technologies*

Modern Marketing has been profoundly influenced by Digital Technologies, transforming the way companies promote and market their products or services.

Some important characteristics of how communication technologies have positively impacted the marketing environment are highlighted.:



**Figure 1** Characteristics of the positive impact of technologies for modern marketing

*Source: Own elaboration*

### *Precise market segmentation*

Digital Technologies enable more precise and detailed market segmentation. Thanks to advanced data analysis tools and algorithms, companies can identify specific groups of consumers with similar characteristics, which facilitates the personalisation of advertising messages and marketing strategies.

### *Personalised campaigns*

Personalisation has become essential in Modern Marketing, and digital technologies make it possible to create highly personalised campaigns. From emails to social media ads, companies can tailor their messages based on individual consumer behaviour and preferences, improving the relevance and effectiveness of campaigns.

### *Social media presence*

Social media is an integral part of contemporary marketing. Digital technologies enable companies to build and manage their presence on platforms such as Facebook, Instagram, Twitter and LinkedIn. Direct interaction with customers, content promotion and targeted advertising are possible on an unprecedented scale, providing an effective channel for building and maintaining audience relationships.

### Real-time data analytics

Digital analytics provides businesses with the ability to measure the performance of their campaigns in real time. Through web and social media analytics tools, marketers can evaluate the effectiveness of strategies, adjust them as needed and make data-driven decisions to optimise return on investment (ROI).

### Improved customer experience

Digital Technologies enable the creation of more seamless and personalised customer experiences. From responsive website design to the implementation of chatbots and virtual assistants, companies can improve customer interaction, providing quick responses and tailored solutions.

### Content innovation

Content creation and distribution have undergone a revolution with digital technologies. From blogs and videos to virtual reality, companies have the ability to innovate the way they present their messages, reaching audiences in creative and engaging ways.

### Marketing automation

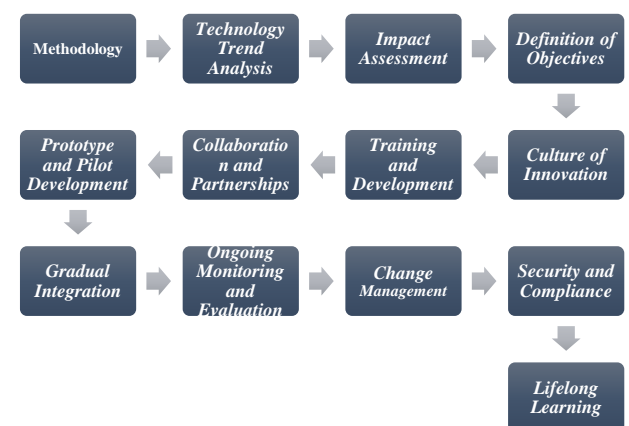
The automation of marketing processes, such as sending scheduled emails or managing advertising campaigns, has become more efficient with Digital Technologies. This allows marketers to focus on more strategic and creative strategies, while operational tasks are managed in an automated way.

Modern Marketing benefits greatly from Digital Technologies by providing tools and approaches that allow for greater precision, personalisation and efficiency in marketing strategies, improving the connection between brands and their audiences.



**Figure 2** Own creation and Source pixart IA platform Methodology on New Technology Trends in Business Development

Business development in the era of new technological trends requires a sound methodology to make the most of the opportunities and face the challenges. A general methodology is presented that is adapted to the specific needs of a business process.



**Figure 3** General methodology for business development  
Source: Own elaboration

#### 1. Analysis of Technological Trends:

- a. Conduct a comprehensive analysis of technology trends relevant to your industry.
- b. Identify emerging technologies that could have a significant impact on your business.

#### 2. Impact Assessment:

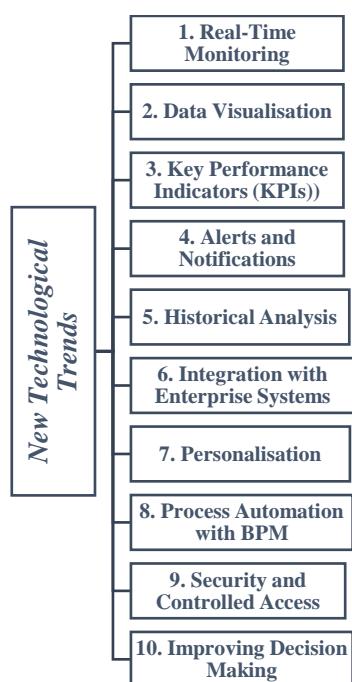
- a. Assess how these trends may affect your operations, products and services.
  - b. Analyse the impact on efficiency, competitiveness and customer relations.
3. Define objectives:
- a. Establish clear and measurable objectives that reflect the use of new technologies.
  - b. Align objectives with the long-term business strategy.
4. Culture of Innovation:
- a. Encourages a business culture that promotes innovation and adaptability.
  - b. Encourages employees to propose ideas and solutions based on emerging technologies.
5. Training and Development:
- a. Provides ongoing training for employees on new technologies.
  - b. Ensure that staff are equipped to use new tools efficiently.
6. Collaboration and Partnerships:
- a. Seek collaborations with technology companies and startups.
  - b. Establish strategic alliances to accelerate the adoption of new technologies.
7. Development of Prototypes and Pilots:
- a. Develops prototypes to test the feasibility of technology solutions.
  - b. Implements pilot projects to assess impact in real situations.
8. Gradual Integration:
- a. Implements new technologies gradually to minimise disruption.
- c. Ensure that integration is compatible with existing systems.
9. Continuous Monitoring and Evaluation:
- a. Key metrics are established to measure the success of technology initiatives.
  - b. Conduct periodic reviews to adjust strategies as needed.
10. Change Management:
- a. Effectively communicate changes to employees.
  - b. Addresses concerns and resistance through effective change management.
11. Safety and Compliance:
- a. Integrates security measures from the outset into all technology initiatives.
  - b. Ensures compliance with relevant regulations and standards.
12. Continuous Learning:
- a. Establishes a cycle of continuous feedback and learning.
  - b. Adapts strategy according to evolving trends and business environment.

This methodology provides a general structure for business development based on new technological trends. It is crucial to adapt it according to the specific characteristics of the company and the environment in which it operates.



**Figure 4** Own creation - technology trends and Source pixart IA platform

Business development is constantly evolving, and emerging technologies play a crucial role in this process. *The new technology trends that are transforming the business development landscape are described:*



**Figure 5** New Technological Trends and Source own elaboration

#### 1. Real-time monitoring:

Real-time monitoring has become a fundamental element for modern enterprises. Monitoring solutions provide instant information on the performance of systems, processes and operations. This enables organisations to identify problems quickly, optimise resources and make informed decisions in a more agile way.

#### 2. Data Visualisation:

Data visualisation has become essential to understand patterns, identify trends and communicate information effectively. Advanced visualisation tools enable companies to turn complex data into understandable graphical representations, facilitating data-driven decision making.

#### 3. Key Performance Indicators (KPIs):

KPIs are crucial metrics for assessing a company's performance. Today's technologies allow the collection, analysis and presentation of KPIs in an automated and real-time manner. This helps companies measure their progress towards strategic objectives and adjust their strategies as needed.

#### 4. Alerts and Notifications:

Automated alerts and notifications systems offer companies the ability to receive instant alerts on important events or changes in data. This enables rapid response to critical situations and improves operational efficiency.

#### 5. Historical Analytics:

Historical analysis provides insights based on past data, which is critical to understanding the evolution of the business and making decisions based on previous experiences. Advanced technologies facilitate the analysis of large historical data sets to identify long-term patterns and trends.

#### 6. Integration with Enterprise Systems:

Enterprise systems integration is crucial to ensure smooth operations. Enterprises are adopting solutions that enable the seamless integration of applications and platforms, improving efficiency and reducing data redundancy.

#### 7. Customisation:

Advanced technology solutions enable personalisation of experiences for customers and employees. Tailoring products, services and processes to individual needs improves customer satisfaction and internal productivity.



8. Process Automation with BPM:

Business process automation (BPM) uses technologies such as artificial intelligence and machine learning to optimise and automate repetitive processes. This not only improves operational efficiency, but also frees up resources for more strategic tasks.

9. Security and Controlled Access:

The growing threat of cyber-attacks has elevated the importance of enterprise security. Companies adopt advanced security technologies, such as encryption, biometric authentication and behavioural analytics, to protect their data and ensure controlled access to sensitive information.

10. Improved Decision Making:

Real-time data collection and analysis, along with effective visualisation and KPIs, contribute significantly to improved decision making. Emerging technologies provide accurate and timely insights that support strategic and operational decisions.

The adoption of these new technology trends in business development not only improves operational efficiency, but also enables companies to adapt quickly to an ever-changing business environment. Those organisations that leverage these technologies will be better positioned for long-term success.

Historical results of Digital Marketing in the world 2000-2023

An overview of the evolution of digital marketing from 2000 to 2023:

Years 2000:

Start of Online Advertising:

Online advertising started to gain popularity with the emergence of banners and pop-ups. Search engines such as Google began to offer advertising programmes.

SEO and SEM:

- SEO (Search Engine Optimisation) became a key strategy to improve search engine rankings.

- SEM (Search Engine Marketing) focused on paid search engine advertising.

Emerging Social Networks:

Platforms such as Friendster and MySpace ushered in the era of social networking.

2010s:

Rise of Social Networking:

Facebook, Twitter, Instagram and LinkedIn became key platforms for digital marketing.

Brands began to use social media to interact directly with consumers.

Visual Content and Video Marketing:

Visual content and video marketing gained importance.

YouTube became a crucial channel for marketing strategies.

Mobility and Mobile Marketing:

The rise of smartphones led to the rise of mobile marketing.

Mobile applications and ads adapted to mobile devices became essential.

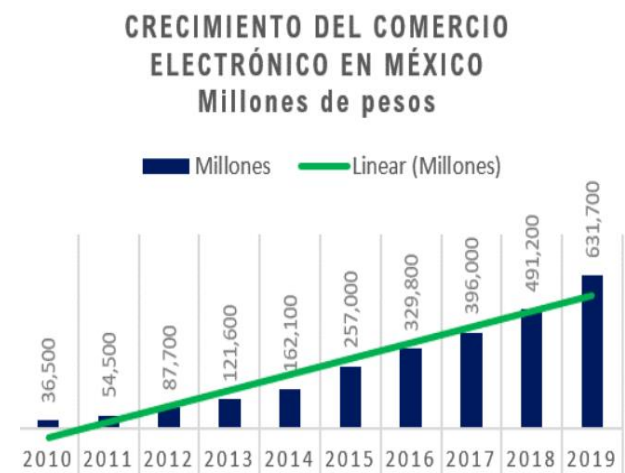


Figure 6 E-commerce in Mexico Source: [https://www.researchgate.net/figure/Figura-3-Crecimiento-de-Comercio-Electronico-en-Mexico-Fuente-Elaboracion-propia-a\\_fig3\\_349234045](https://www.researchgate.net/figure/Figura-3-Crecimiento-de-Comercio-Electronico-en-Mexico-Fuente-Elaboracion-propia-a_fig3_349234045)

2020s:

Artificial Intelligence and Automation:

GUTIÉRREZ-CIGARROA, Dionisio Lenin & POSADAS-RODRÍGUEZ, Guillermo. Digital technologies for business development: modern marketing. ECORFAN Journal-Republic of Paraguay. 2023

Artificial intelligence and automation transformed marketing strategies.

Chatbots, predictive analytics and data-driven personalisation became commonplace.

#### Interactive Content:

Interactive experiences, such as online surveys and immersive content, became more popular.

Augmented reality (AR) and virtual reality (VR) were incorporated into marketing in some sectors.

#### Omnichannel strategies:

Brands adopted omnichannel strategies to provide a consistent experience across all touchpoints.

Real-time customer data integration became essential.

#### To 2023:

##### Focus on Customer Experience:

Digital marketing became more focused on creating meaningful customer experiences.

Advanced personalisation and segmentation became standard.

##### Blockchain in Advertising:

Blockchain technology was used to address issues of transparency and fraud in digital advertising.

##### E-Commerce Growth:

E-commerce experienced a significant increase, with a focus on improving the online shopping experience.

##### Increased Privacy Regulation:

There was an increase in data privacy regulation, with laws such as GDPR and a focus on user consent.

##### Dominance of Live Video:

Live video became increasingly popular for real-time marketing and audience engagement.

Digital marketing has evolved significantly over the years, adapting to new technologies and consumer behaviours. The continuing trend towards personalisation and the integration of emerging technologies will continue to shape the future of digital marketing.



**Figure 7** Own creation - evolution of digital marketing on the pixart platform

## Conclusions

*Clearly explain the results obtained and the possibilities for improvement*

Digital technologies have significantly transformed the modern marketing landscape of business development. In today's digital age, effective implementation of digital marketing strategies is crucial for the success and sustainability of businesses. The accessibility of advanced tools, such as social media, data analytics, artificial intelligence and digital marketing, allow companies to reach different customers regardless of distance, territorial boundaries, cultures, languages, etc....

Modern Marketing, supported by Digital Technologies, is characterised by its customer-centric approach, interactivity, real-time measurement of results and the ability to adapt quickly to changes in the market. Massive data collection and analysis have paved the way for evidence-based decision making, allowing companies to optimise their strategies and allocate resources more efficiently.

Mobility and constant connectivity have opened up new opportunities for real-time marketing, where companies can interact with their customers in an instant and personalised way.

In addition, artificial intelligence has taken personalisation to an unprecedented level, allowing companies to anticipate customer needs and deliver highly personalised experiences.

However, the ethical use of technology and the protection of privacy have become growing concerns. As companies leverage Digital Technologies to collect and analyse data, it is essential to strike a balance between personalisation and respect for user privacy.

In summary, the impact of Digital Technologies on business development, especially in the modern marketing environment, is undeniable. Those companies that effectively embrace these emerging technologies have the opportunity to stand out in a highly competitive marketplace, build strong customer relationships and adapt nimbly to the changing demands of the business environment. However, sustainable success requires not only the adoption of advanced technologies, but also careful consideration of ethics and privacy to ensure long-term customer trust and loyalty.

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## 3D printing as a motivator didactical resource for engineering students

### Impresión 3D como recurso didáctico motivador para estudiantes de ingeniería

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#### Abstract

3D printing technology has become increasingly popular in various fields, including education. One of the main benefits of incorporating 3D printing technology into mathematics teaching is its ability to provide students with a concrete representation of complex concepts such as three-dimensional geometric shapes. This project used a filament 3D printer to create physical objects from an electronic model that is created using computer-aided design software. A pilot test was carried out with two students from the first semesters of engineering. Through the Problem Based Learning methodology, a strategy was proposed to calculate the volume of a three-dimensional body. Two sessions were used to learn the operating principles of an additive 3D printer, as well as its calibration and basic operation. In the laboratory sessions, the participants demonstrated mastery in manipulating the 3D printer, managing to print and use the three-dimensional models to visualize the resolution of the mathematical problems posed. From an interview, the students expressed that they felt motivated with the use of the printer. A unique teaching material was obtained, which opens the range of possibilities for the culture of generation of new teaching material.

#### Resumen

La tecnología de impresión 3D se ha vuelto cada vez más popular en diversos campos, incluido el educativo. Uno de los principales beneficios de incorporar la tecnología de impresión 3D en la enseñanza de las matemáticas es su capacidad de proporcionar a los estudiantes una representación concreta de conceptos complejos como las formas geométricas en tres dimensiones. En este proyecto se empleó una impresora 3D de filamento para crear objetos físicos a partir de un modelo electrónico que se crea utilizando software de diseño asistido por computadora. Se realizó una prueba piloto con dos estudiantes de los primeros semestres de ingeniería. A través de la metodología de Aprendizaje Basado en Problemas se planteó una estrategia para calcular el volumen de un cuerpo tridimensional. Se emplearon dos sesiones para aprender los principios de funcionamiento de una impresora 3D de adición, así como su calibración y operación básica. En las sesiones de laboratorio, los participantes demostraron dominio en la manipulación de la impresora 3D alcanzando a imprimir y utilizar los modelos tridimensionales para visualizar la resolución de los problemas matemáticos planteados. A partir de una entrevista los estudiantes manifestaron sentirse motivados con el uso de la impresora. Se obtuvo un material didáctico único, que abre el abanico de posibilidades a la cultura de generación de nuevo material didáctico.

#### 3D printing, Revolution solids, Prototyping

#### Impresión 3D, Sólidos de revolución, Creación de prototipos

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## Introduction

3D printing technology has become increasingly popular in various fields, including education, and has brought design and manufacturing to a large population, initiating a movement called Maker (Morales Martínez and Dutrénit Bielous, 2017). This technology has proven to be feasible and cost-effective for the construction of prototypes and parts that benefit learning (Rúa R., et al, 2018).

In Mexico, high failure and dropout rates have been observed in the subjects of integral and vector calculus in the first two years of an engineering programme, which has been the subject of ongoing attention (Soto Hernández, et al, 2014). In these subjects, 3D printing technology can offer an alternative solution to traditional teaching methods.

The use of 3D printing is a creative application that favours the imagination and creative thinking of the student, which is the first instance to initiate a project.

The sequence in creative thinking is the succession of stages or phases that are carried out to generate a new and innovative idea or solution, including the use of tools and techniques to promote creativity or the generation of ideas.

In 3D printing, the concern to achieve as a specific purpose the creation of physical objects from a digital model requires a process that involves the participatory action of students. The use of software helps to create three-dimensional objects, and then the detailed elaboration of the nuances already defined in the development of the preliminary screen of the design software takes place. From here, the chosen idea is put into practice using a 3D printer.

One of the main benefits of incorporating 3D printing technology in mathematics education is its ability to provide students with a visual representation of complex concepts (Quezada Batalla, et al, 2018).

For example, 3D printing can be used to create physical models of functions, graphs and geometric shapes (Dilling and Witzke, 2020), which can help students better understand calculus concepts (Candia Garcia, 2022) such as solids of revolution, areas or volumes.

Engineering students may experience cognitive difficulties when studying solids of revolution and multiple integrals in integral calculus. These difficulties may be due to a number of factors, including the conceptual complexity of the concepts involved and the need for spatial visualisation. This capacity for spatial imagination can be difficult to develop, especially for students who do not have a good understanding of geometry from a young age.

This spatial perception involves visualisation, understood as the set of images, processes and skills necessary for students "to produce, analyse, transform and communicate visual information related to real objects, models and geometric concepts" (Roura and Ramirez, 2021, p. 539).

However, by using real three-dimensional forms, a mental image or illustration is recorded, through the relationship of the objects in their physical or geometric form to scale, being a benefit in the generation of knowledge and retention so as not to have only a provisional memory of the content.

Hence the importance of the proposal to use 3D printing technology, as it allows the creation of customised models that can be adapted to the specific needs of each problem or exercise. This level of customisation can enhance the learning experience as well as the understanding of the concepts involved and spatial visualisation skills.

A filament 3D printer was used in this project. This machine uses an additive process to create physical objects from a digital model that is created using Computer Aided Design software. The digital model is divided into thin layers and, as it is printed, each layer of filament is layered on top of the other to generate the height of the model.

The filament is fed through a nozzle which is heated until it melts. The molten plastic is then deposited on the print bed, layer by layer, until the desired object is created. Its use for generating didactic teaching models for mathematics goes beyond the traditional way.

In addition, learning mathematics using active methodologies such as PBL -Problem Based Learning- can help students develop a deeper understanding of mathematical concepts, as it requires them to apply their knowledge and skills in a real context.

This methodology focuses on problem solving as a way of learning. In PBL, students are faced with a real or simulated problem that they must solve using their knowledge and skills. The teacher acts as a facilitator who guides students in the problem-solving process.

In the development of PBL practices, the incorporation of digital tools and instruments allows the implementation of innovative and attractive learning environments that can attract the attention of the student community. The use of the PBL approach forces students to demonstrate sufficient generic and disciplinary competences to develop and build the high-level thinking skills commensurate with the demand of the problem (Surya and Syahputra, 2017).

Therefore, this strategy seeks to strengthen the desirable competences in engineering students, considering the different learning styles. In addition, it encourages their development to successfully follow their school career, while promoting understanding and interest in the management of innovative technologies used in the productive sector.

With this background, the need to carry out a pilot test with engineering students who are studying the subjects of three-dimensional figures, their configuration and modelling, their perception and characteristics was proposed, since, with figures drawn on a surface, or even on a flat screen simulator, students have problems visualising such elements, and, even more so, associating the bodies with their mathematical models. 3D printing provides a real, palpable model.

## Materials and methods

A pilot test was conducted with two engineering students of the Tecnológico Nacional de México, campus Ciudad Madero - ITCM- during the second semester of 2023.

The first student -1CIQ- of second semester of Chemical Engineering in the subject of Integral Calculus; the second student -2CVI- of third semester of Industrial Engineering in the subject of Vector Calculus. Both students were chosen at the convenience of the same lecturer, who chose the topic of solids of revolution for 1CIQ, while 2CVI was assigned a problem of triple integrals in Cartesian coordinates. At the end, they used a semi-structured interview to find out the students' perception of this teaching strategy.

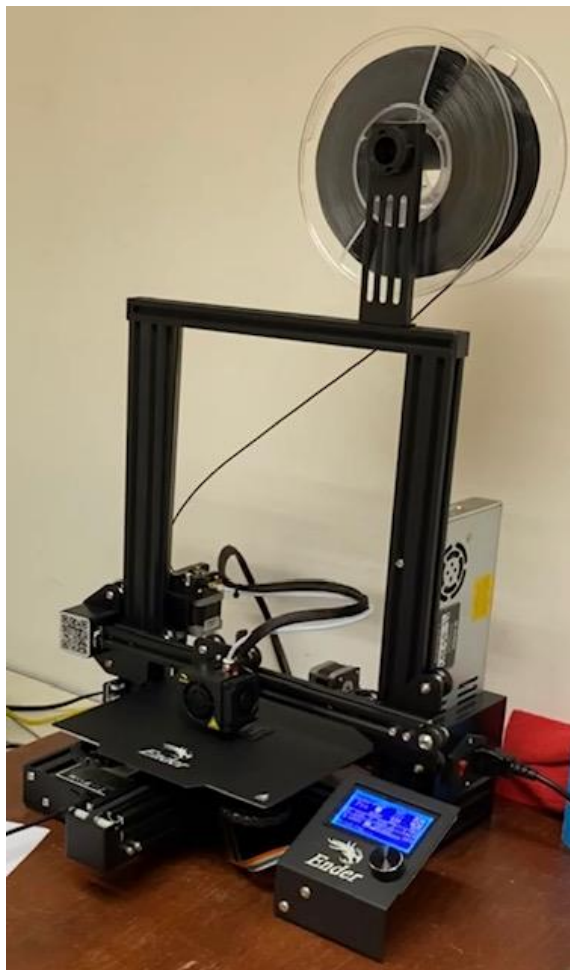
Following the PBL methodology, when they arrived at the subject chosen during the regular courses, the teacher set them a problem to calculate the volume of a three-dimensional body. Simultaneously to the development of the topics in the classroom, six sessions were held in the 3D printing laboratory.

Two sessions were used to learn the principles of operation of the Ender 3 Pro 3D printer, as well as its calibration and basic operation, following the recommendations of Blanco Prieto (2020). The next four sessions consisted of developing three-dimensional models in the free-to-use application Tinkercad and using the 3D printer's Creality software, which is used to divide the model into layers and generate the G-code. In these sessions they also became familiar with adjusting the printing parameters, such as object size, resolution, printing speed, taking care of the humidity in the environment affecting the filament.

As the students had the knowledge about the printing process they received the assigned problem, they used the Tinkercad application to create a three-dimensional model of the solid of revolution or volume solid by means of multiple integrals.

Subsequently, the students proceeded to print the three-dimensional model using the 3D printer with printing volume 220 x 220 x 250 mm, using 1.75 mm PLA filament. This material is one of the most widely used biodegradable polymers (Ayrilmis, Kariz and Kwon, 2019; Palazzo, 2016) as it is less polluting in the emission of particles and organic solvents such as aldehydes, benzenes and others (Azimi, et al, 2016).

Figure 1 shows the print volume, print bed, print head and LCD control screen of the 3D printer. It is worth mentioning that this printer is characterised by its ease of operation, affordable cost and simple assembly.



**Figure 1** Ender 3 Pro 3D printer.  
Source: Own elaboration

Once the model was printed, they proposed a solution to the assigned problem. Subsequently, an interview was conducted with the students to evaluate their experience with the use of 3D printing as an auxiliary tool in the visualisation of models. In this way, through the insertion of 3D printing, prototypes developed by the students were obtained.

These served as a means of testing the topics covered in the Integral Calculus and Vector Calculus class sessions.

## Results

The results obtained in this experience have been divided into two sections: 1) the generation of the prototype, 2) the resolution of the problem and 3) the evaluation of the experience.

### *Generation of the prototype*

The students acquired skills to design and manufacture didactic material using a 3D printer that "has surpassed the virtual simulation... with the advantage of being able to touch and move it" (Cárdenas Escamilla and Alva Rangel, 2018, p. 102).

In the lab sessions, students demonstrated mastery in manipulating the 3D printer autonomously. This was evidenced by their ability to create three-dimensional models with Tinkercad and adjust the printing parameters from Creality.

In addition, they were able to solve the problems they encountered, such as the initial calibration of the 3D printer, as well as identifying the menu options on the LCD screen of the 3D printer. Some situations were related to the levelling, placement and change of filament when it broke due to some cause such as humidity. A drying box was acquired for this situation.

The adjustment of 3D printer parameters such as the number of layers to integrate the object, and thus the fineness of the finish, ended up being decided by the capacity of the equipment and its processing time. Undeniably, trial and error was present throughout the process. The decision on the type of base or support to be used, as in an object whose structure has protruding parts, is indispensable to ensure that the printing is properly completed (Imprimakers, n.d.).

On the other hand, the decision on the type of filler or mesh to be used for printing was associated with the time required, but also with the stability and hardness of the object, which, in this case, was decided by a triangular mesh.

Mayén and colleagues (2022) have insisted on the need to study in depth the property of these materials such as PLA and the treatments they undergo such as the thermal one used in 3D printing. All of the above, considering the angle of the lattice and the temperatures to which it is exposed in additive manufacturing.

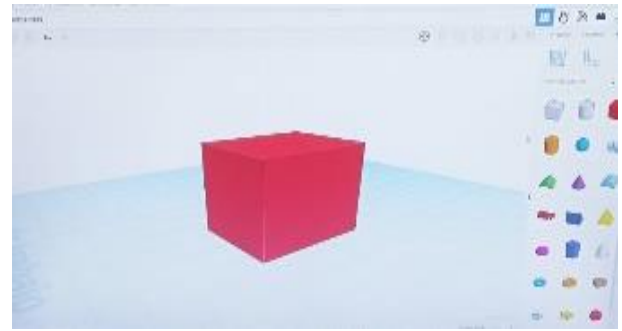
In this case we are dealing with didactic prototypes, but when talking about manufacturing situations for industrial purposes, the need mentioned is evident (Taib, et al, 2023).

In the Integral Calculus course, we started with participant 1CIQ who designed a cylinder in Tinkercad, shown in Figure 2. The dimensions were 2 cm radius and 6 cm height, within the capabilities of the 3D printer, and he was asked to determine the volume of this solid of revolution by means of definite integrals. This full-scale model made it possible to identify the real shape and measurements of an abstract model, as mentioned by Cárdenas Escamilla and Alva Rangel (2018), through the approach of an engineering application problem.



**Figure 2** Tinkercad design of a straight circular cylinder  
*Source: Own elaboration*

In the case of student 2CVI of the Vector Calculus course, the teacher asked him to determine the volume of a rectangular parallelepiped of 3 x 4 x 3 cm in Cartesian coordinates, by means of the triple integral approach. Figure 3 shows the process of constructing the model in Tinkercad.

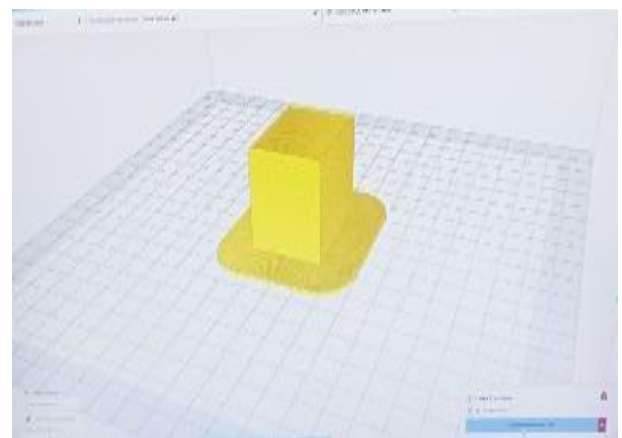


**Figure 3** Tinkercad design of a rectangular parallelepiped

*Source: Own elaboration*

After the models were completed by both students, the corresponding segmentation was carried out using the 3D printer's own Creality programme. The necessary base and the characteristics that allow a feasible and viable printing were also integrated. These elements are associated with the printing time, which for practical purposes should not exceed 3 hours, which is why the process of defining the parameters must be considered in the process of defining the parameters.

In the same way, Creality defines the type of base for the adhesion of the first layer of PLA melted by the printer, which is an additional element to ensure that the print does not detach from the base during the printing process, and is automatically generated in the segmentation stage, as shown in Figure 4.



**Figure 4** Segmentation of the rectangular parallelepiped in Creality

*Source: Own elaboration*

### *Problem solving*

Both products developed in the virtual space focused on the visualisation of concepts included in the subject matter of the class, in order to facilitate the understanding of the abstract contents.



This highlighted the importance of direct experimentation and manipulation of objectives, first through the geometric construction of the contents involved, in order to break down the resistant barrier to learning these subjects.

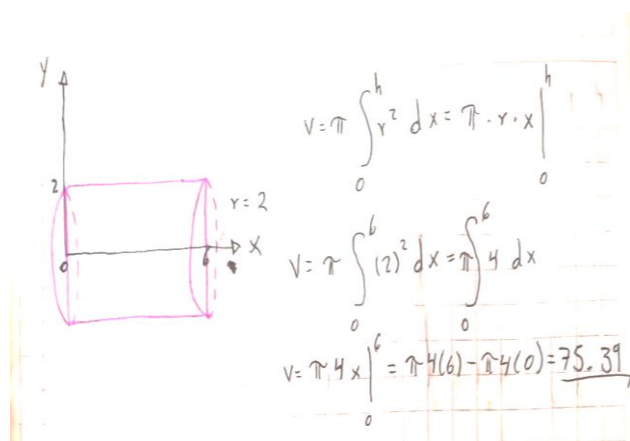
For the first case, the student 1CIQ, the teacher chose a cylinder, as it is a geometric figure frequently used in chemical engineering applications, such as containers in the petrochemical industry, which is predominant in the ITCM environment.

The course lecturer asked the student 1CIQ to use the mathematical model shown in Equation 1 for the manual calculation of the volume of the solid of revolution that represents the cylinder of the case.

$$V = \pi \int_0^h r^2 dx \quad (1)$$

While it is true that this problem could have been solved in a simple way with basic geometric formulae, the aim was to check the result with the physical model easily.

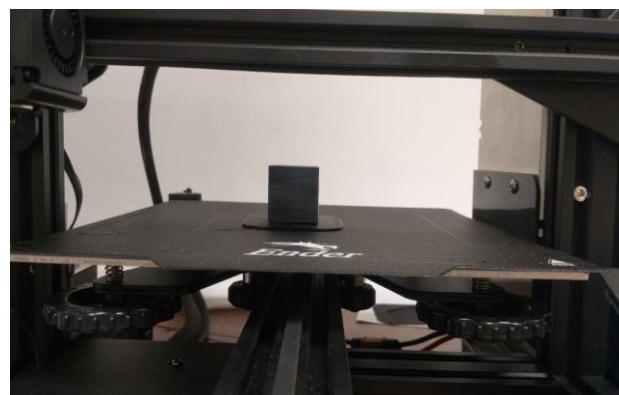
Considering the data provided, with a height  $-h-$  of 6 cm and radius of 2 cm, student 1CIQ solved the problem as shown in Figure 5, obtaining a volume of  $75.39 \text{ cm}^3$ .



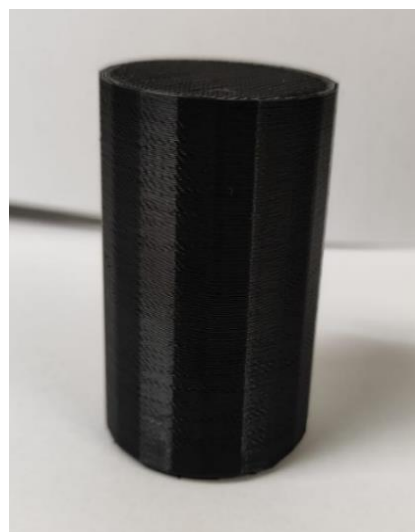
**Figure 5** Volume calculation using the mathematical model.

Source: Notebook of student 1CIQ.

The straight circular cylinder was printed by student 2CIQ as shown in Figure 6 where the base where the additive process started can be seen. Figure 7 shows the finished object.



**Figure 6.** Impression of the straight circular cylinder.  
Source: Own elaboration

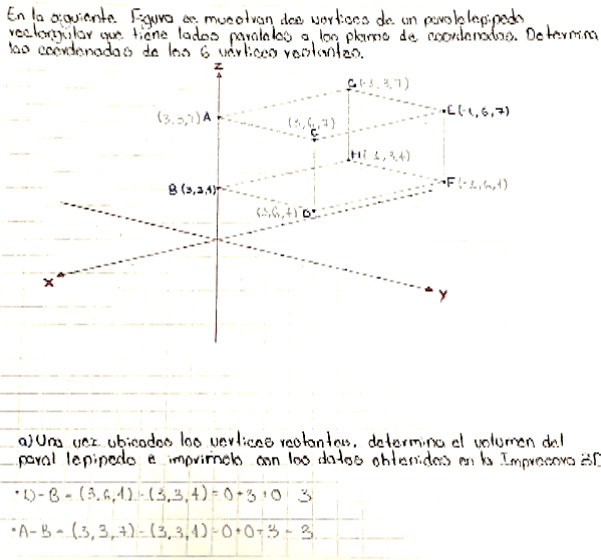


**Figure 7.** Straight circular cylinder printed on Ender 3 Pro 3D printer  
Source: Own elaboration

For the second case, the 2CVI student of Vector Calculus, the problem dealt with the calculation of the volume of a rectangular parallelepiped. Therefore, the teacher asked him to use the mathematical model of Equation 2, which consists of a triple integral.

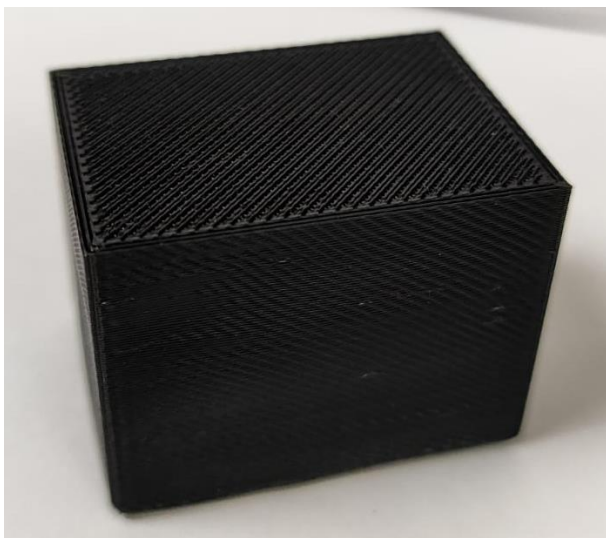
$$V = \int_B^D \int_B^A \int_B^H dx \quad (2)$$

This implied that the student had to locate the rectangular parallelepiped in three-dimensional space. Therefore, he had to define the Cartesian coordinates that limited the object, based on the measurements provided in the problem to be solved. The coordinates of the points were: A (3, 3, 7), B (3, 3, 4), D (3, 4, 6) and H (-1, 3, 4), as shown in Figure 8.



**Figure 8** Notebook design  
 Source: Student's notebook 2CVI

Figure 9 shows the printed rectangular parallelepiped and you can see the triangular lattice of its surfaces, which implies that it is not a compact object, filled with material, but one that has only the surfaces that limit it. This has several benefits, including printing time and material savings, a smaller amount of PLA filament, a smaller amount of PLA.



**Figure 9.** Rectangular parallelepiped printed on the Ender 3 Pro 3D printer  
 Source: Own elaboration

In this problem, the student applied vector concepts, that is, making this model allowed the student to determine vectors between points, magnitude of a vector, in addition to the calculation of the volume, the final objective of this didactic strategy.

Having the printed model, as shown in Figure 9, allowed an associative mental construction between the representation in two-dimensional space - blackboard or notebook -, the electronic version in computer modelling and the real object. This leads to a better appropriation of the subject, minimising conceptual doubts and favouring the specific and generic competence of the subtopic in each of the courses.

*Evaluation of the experience*

During the development of the activity, a marked interest and concern was observed on the part of the students to continue using the 3D printer in other subjects. Based on this genuine interest observed, it is possible to infer that having three-dimensional models to present students with problems and situations with which they can interact in a concrete way strengthens associative spatial skills. These are basic for the approach and resolution of application problems not only in mathematics.

The results of this stage show that the participants were able to use the printed three-dimensional models to solve the problems posed, improving their learning experiences, as stated by Suardiaz Muro, and colleagues (2021).

When the participants were interviewed, they had favourable comments about the experience, in which they stated that they felt motivated. In addition, they expressed their satisfaction at having acquired technological skills and having developed generic competences in the use of technology that previously seemed very complex. They also considered using this tool in the future in their professional life.

From the perspective of the teacher who participated as an advisor to the students, "3D printing can be applied in engineering subjects and is indispensable for design subjects..., it makes the class more dynamic" (Hernández Mendoza, 2023). Likewise, the professor considers that, in many cases, elements or parts that are difficult to obtain are needed and printing facilitates their acquisition. Furthermore, the prototypes can continue to be used for the next semesters in other subjects that allow for designing, building, innovating and perfecting the handling of the Ender 3 Pro printer.

## Conclusions

The experience exceeded expectations for all that was learned. Although it was only a pilot project with two students in two different subjects and from two different careers, it was a practice of close collaboration between students and teachers.

This initial effort of teachers and students is necessary to innovate and be creative in order to understand the teaching and learning process of basic sciences. This way, a unique didactic material was obtained, which opens the range of possibilities to the culture of generating new didactic materials with products that can be designed and built in class.

In both subjects there was the experience of seeing the exhibition in the classroom of the material as a finished product, with its own characteristics of the production process, which motivates teachers to incorporate the methodology used as PBL.

The application or teaching of the course with the support of 3D printing changes the learning environment and generates motivation for student involvement. The didactic strategy is to change the application methodology to give way to model design and fabrication. 3D printing has the potential to revolutionise the way Integral Calculus and Vector Calculus are taught and learned.

By creating physical models of abstract mathematical concepts, students can gain a deeper understanding of these concepts and develop a more intuitive sense of how they relate to the physical world.

While challenges remain, such as the cost and accessibility of 3D printing technology, the potential benefits make it an exciting area of exploration for educators and students alike.

A subsequent challenge is to have more equipment to extend it to whole groups and other subjects, in order to be in a position to carry out some didactic intervention where it is possible to analyse more precisely the benefits of using this type of technology in engineering programmes.

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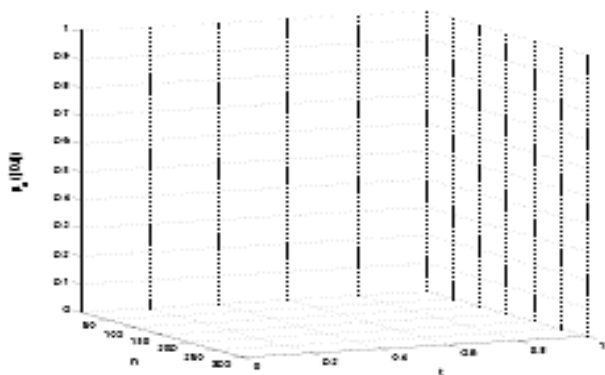
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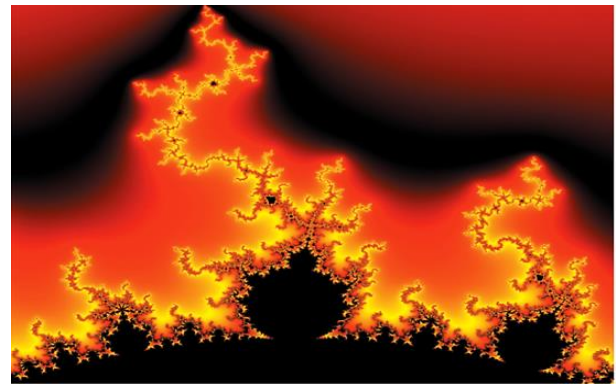
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