Revista
Torreón Universitario
ISSN 2410-5708 / e-ISSN 2313-7215
Year 13 | No. 38 | October 2024- January 2025

Lessons in innovation and entrepreneurship from China

Erick Manuel Tardencilla Marenco
PhD in Documentation: Archives and Libraries in the Digital Environment
National Autonomous University of Nicaragua, Managua (UNAN-Managua)
https://orcid.org/0000-0002-6889-4915
etardencilla@unan.edu.ni

Submitted on august 24th, 2024 / Accepted on august 30th, 2024
https://doi.org/ 10.5377/rtu.v13i38.19305

Keywords: Digital transformation, innovation and entrepreneurship, UNAN-Managua, digital talents-Nicaragua.

ABSTRACT

Digital transformation has become a key driver for economic and social development worldwide, and Nicaragua is no exception. This document aims to discuss how Nicaragua can move towards a prosperous digital future, learning from China's experience and adapting its strategies to the local context. China, as a global leader in technology and digitalization, has seen exponential growth in its digital economy, driven by favorable government policies, investment in technological infrastructure, and a vibrant startup ecosystem.

China's focus on creating an enabling environment for innovation, which includes public-private sector collaboration as well as fostering digital skills education, offers valuable lessons for Nicaragua. Through the adoption of emerging technologies, such as artificial intelligence and e-commerce.

In addition, the development of training programs and the promotion of an entrepreneurial spirit are critical to cultivating local talents in digital technology. By learning from successful Chinese strategies, Nicaragua can build a more robust digital future, one that not only drives

economic growth but also contributes to social inclusion and sustainable development. This article highlights the experience of a delegation of Nicaraguan technology specialists, who visited China to learn about the strategic vision and collaborative approach necessary to achieve an effective digital transformation in that country.

INTRODUCTION

Digital transformation has become a global phenomenon that impacts all sectors of society, from the economy to education and governance. In this context, Nicaragua faces the challenge and opportunity to integrate digital technologies into its economic and social development. This paper presents the lessons learned from China's experience in innovation and digital entrepreneurship and the reflection on how to adapt in Nicaragua, a country that seeks to strengthen its economy and improve the quality of life of its citizens through digitalization.

China has emerged as a global leader in the digital economy, with impressive growth that has brought its digital economy to account for approximately 40% of its Gross Domestic Product (GDP) (Nishikawa, 2023). This growth is no coincidence, it is the result of proactive government policies, investment in technological infrastructure, and a business ecosystem that fosters innovation. The Chinese government has implemented strategies that include digitizing the industry, promoting tech startups, and creating a favorable environment for research and development. According to a report by the Chinese Academy of Information and Communication Technologies, China's digital economy reached a record value of 50.2 trillion yuan in 2022 ($6,887,860,458,118.31 U.S. dollars), nearly doubling in size from 2017 (Nishikawa, 2023).

Nicaragua, for its part, has begun to adopt digital technologies in its education system and economy. Since 2006, the country has worked to close the digital divide in education by implementing mobile digital classrooms in schools, which has allowed thousands of students to access technological tools (Brecha Cero, 2024; La Gaceta, 2024)2024. However, for Nicaragua to achieve sustainable and effective development in its digital economy, it is essential to learn from China's successful strategies. This includes creating an enabling environment for innovation, where the public and private sectors collaborate in developing digital skills and fostering entrepreneurship.

Education plays a fundamental role in this process. Digital skills training is crucial to prepare future generations of Nicaraguans for an increasingly digitized labor market. Training programs that integrate digital skills in classrooms can help cultivate an entrepreneurial and creative spirit in young people, which is vital for the growth of the digital economy (La Gaceta, 2024). In addition, the use of emerging technologies, such as artificial intelligence and

e-commerce, can diversify the Nicaraguan economy and improve the competitiveness of its companies in the global arena.

China's experience in the digitalization of public services also offers valuable lessons for Nicaragua. With more than 926 million users of digital government services in 2022, China has demonstrated how digitalization can improve efficiency and transparency in public administration (Nishikawa, 2023). Implementing a similar system in Nicaragua could facilitate access to essential services and improve the quality of life of citizens.

Digital transformation in Nicaragua presents both challenges and opportunities. By learning from China's experiences in innovation and digital entrepreneurship, Nicaragua can chart a path to a more connected and prosperous future. Collaboration between the government, the private sector, and educational institutions will be essential to cultivate the necessary digital talents and build a robust digital economy that benefits all Nicaraguans.

This article promotes reflection on how Nicaragua can move towards a more prosperous digital future, learning from China's experience and adapting its strategies to the local context, highlighting the importance of a comprehensive strategy that fosters innovation and entrepreneurship in the digital age.

DEVELOPMENT

In the context of technological development and international collaboration, the "Seminar for Talents in Digital Technology" has become a key platform for knowledge exchange and capacity building in Nicaragua. This seminar, organized by the Ministry of Commerce of the People's Republic of China, was held in Beijing from June 30 to July 13, 2024, and its main objective is to train professionals and public officials in the use of digital technologies and the development of the global digital industry.

Nicaragua's participation in this seminar includes a delegation from the National Council of Universities (CNU), as well as government institutions such as TELCOR, ENATREL, and INATEC. During the event, participants had the opportunity to attend conferences addressing crucial topics such as China's socio-economic situation, economic and trade cooperation, and the development of artificial intelligence and the digital economy (CNU, 2024; Telcor, 2024; UNAN-Managua, 2024). These sessions not only provide a deeper understanding of Chinese policies and strategies but also highlight the importance of international cooperation for sustainable development and human well-being.

The seminar has also focused on the modernization of traditional industries and digital transformation, offering attendees tools and knowledge that can be applied in the Nicaraguan context. The integration of new technologies and innovative approaches is critical to the

development of a robust digital ecosystem in Nicaragua, which promotes economic growth and social inclusion.

These resources highlight the relevance of the seminar and its potential impact on the development of technological capabilities in Nicaragua, as well as the importance of collaboration with China in the digital sphere.

Lectures were held that exposed the history of China, what China's system of government was like before the opening, and its reform for the modernization of China. Dialogues were put in situ about how the people of China have suffered, among which, the episode that this population lived about the use of food ration coupons to have the basic supply of society was mentioned, this rationing worked until 1995. Later, conferences were given that gave details of national progress and how, little by little, the whole country came together to have a uniform vision towards mutual progress, having only one thing in mind, to have a new concept of development "centered on the people".

During the seminar, the lectures complemented each other, always talking about the reform and technological revolution that took place in China. In such a way, colloquiums were held aimed at learning about the transformation of the country and its learning from other nations to define its engines of economic development, such as industrialization, urbanization, internationalization, and modernization of infrastructure. Likewise, examples of digital cities created throughout the Chinese territory were given, mentioning the city of Shenzhen as an example of a digital city and commerce.

In this context, it was very common to address the issue of Artificial Intelligence (AI) and its definition according to the needs of the Chinese people, defining it as a broad scientific concept and as a technological strategy, therefore, first-world countries are investing money in neuroscience research at the national level. Multinational companies invest on large scales for the development of chat systems based on artificial intelligence developed by OpenAI, an example of this can be Chatgpt (Olmos, 2023).

The first year that is considered pivotal to the launch of artificial intelligence was 1956 when the Dartmouth Conference was held, where the term "artificial intelligence" was coined. This event is considered the official birth of the field and experts addressed a lot of this topic (UNESCO, 2023). However, the current lawsuit is currently being discussed.

Within the lectures given, it was mentioned that artificial intelligence at the beginning of 2023 was compared to a baby for its initial development, however, its generative form after a year, its progress was compared to an adolescent, revealing its exponential growth in a short time. Within this context, the development of robotics was indicated to create robots with

better calculation capacity than that of humans, which makes the development of AI technology a trend, bringing very high benefits in the future than those of now. A relevant quote was made about Alan Turing and his proposal to distinguish artificial intelligence from human beings, this scientist from the United Kingdom, 1950 proposed that a machine could be considered intelligent if it could deceive a human interrogator into believing that it was interacting with another human being (Oppy & Dowe, 2021).

Different companies were visited, such as China ELECTRONICS, SUPERMAP, CETC TECHNOLOGY, and MINDRAY MEDICAL. All with the same objective, to add to China's digital transformation with comprehensive day-to-day development. However, they are companies that are destined for different areas of development such as medicine, national security, software, and hardware development, design of transformers for the treatment of renewable energy, among other tasks.

Each of the companies visited has a growth in technological development and has been strengthened in market strategies inside and outside China, which adds to maintaining China as the second world power. All these companies own their technology and generate their raw material, so the profits they have left each year increase due to the production power they have.

The visit was made to one of the technological cities of China such as Shenzhen, a city very active in digital marketing that works around health and has the technology and raw materials that allow them to produce instruments for hospitals, with technological advances that allow doctors to make accurate diagnoses of their patients and thus avoid health complications. These companies are present in different parts of the country of China, but they are also exporters of medical equipment in different countries in Europe, Asia, and America.

Companies contributing to digital transformation in China

This section mentions the companies to which visits were made, to recognize their contribution to the digital transformation in China.

China Electronics is one of the leading companies in the technology sector in China, playing a crucial role in the country's digital transformation. This company, which is part of a broader conglomerate, specializes in the manufacture and distribution of electronic products, as well as the provision of comprehensive technological solutions. The company offers tender agent services, international trade services, and other business qualifications, catering to liquid crystal displays, integrated circuits, government procurement, military procurement, and other major domestic industries, and building comprehensive service capabilities to meet customers' needs (CECOM, 2024).

The work culture in China, characterized by a strong sense of collectivity and teamwork, also influences the success of companies like China Electronics. The orientation towards collaborative work and the building of relationships through the "guanxi" (network of interpersonal relationships) are fundamental elements that allow the company not only to maintain high operational efficiency but also to foster an environment conducive to innovation (NNROAD, 2023).

In addition, the Chinese government's commitment to the digitalization of the manufacturing industry has been a key factor in China Electronics' growth. Government policies that promote the integration of emerging technologies, such as artificial intelligence and the Internet of Things, have allowed the company to lead in the implementation of innovative solutions in its production processes (Xinhua News Agency, 2024). This approach not only improves the competitiveness of the company but also contributes to the development of new forms of business and services in the global context.

SuperMap, A leading company in the field of Geographic Information Systems (GIS) in China, has demonstrated remarkable growth and success in recent decades. Founded in 1997, SuperMap has become a benchmark in the development of innovative GIS solutions, applying key concepts from the theory, the disruptive innovation proposed by Clayton Christensen. The company has disrupted the market by offering high-quality GIS products at affordable prices, thus democratizing access to this technology. This aligns with disruptive innovation theory, which holds that companies can displace market leaders by introducing simpler, cheaper products or services (SuperMap, 2021).

In addition, SuperMap has taken an open innovation approach, collaborating with universities, research institutes, and other companies to develop advanced solutions. This strategy, which fits with Henry Chesbrough's concept of "open innovation", has allowed SuperMap to access new knowledge and technologies, accelerating its innovation process.

Another key factor in SuperMap's success has been its ability to tailor its products to the specific needs of the Chinese market. This demonstrates the importance of "glocalization," a term that combines "globalization" and "localization," and which involves adapting global strategies to local contexts. In summary, the case of SuperMap illustrates how a Chinese company has achieved disruption and innovation in the GIS market, applying concepts such as disruptive innovation, open innovation, and glocalization. These learnings can be valuable for other companies looking to develop technological solutions adapted to local needs.

CETC Technology, part of the China Electronics Technology Group (CETC), is one of the leading companies in the technology and defense sector in China. Founded in 2002, CETC specializes in the development of information systems, communication technology, and

advanced electronics solutions. Its focus on research and development (R+D) has allowed the company to position itself as a leader in technological innovation, contributing significantly to the modernization of the electronics industry in the country (CETC, 2021).

A key takeaway from CETC Technology is the importance of investment in R+D, which aligns with Michael Porter's theory of competitive advantage. According to Porter, companies that invest in innovation develop unique capabilities that can gain a sustainable advantage in the marketplace. CETC has applied this theory by allocating a significant percentage of its revenues to research, which has allowed it to develop cutting-edge technologies and maintain its competitiveness in a global environment.

In addition, CETC exemplifies product life cycle theory, which suggests that companies must continuously innovate to extend the life of their products. The company has diversified its offerings, developing solutions ranging from defense systems to applications in artificial intelligence and big data, allowing it to adapt to changing market demands.

CETC Technology not only stands out for its leadership in the technology sector but also its strategic focus on innovation and research, offering valuable lessons on how companies can thrive in a competitive environment.

Mindray Medical, founded in 1991, is one of the leading medical technology enterprises in China, specializing in the development and manufacture of medical equipment and information solutions. The company has grown significantly, becoming a global benchmark in the medical device industry, with a particular focus on innovation and research and development (R+D) (Shenzhen Mindray Bio-Medical Electronics Co., Ltd, 2024).

A key takeaway from Mindray is the importance of investment in R+D, which also aligns with Michael Porter's theory of competitive advantage. Mindray has allocated a considerable portion of its revenue to research, allowing it to develop advanced technologies in areas such as patient monitoring, diagnostic imaging, and anesthesia. This strategy not only improves the quality of its products but also strengthens its position in a highly competitive market.

In addition, Mindray exemplifies the concept of "open innovation," which suggests that companies can benefit from collaborating with other organizations and universities to develop new solutions. The company has established strategic partnerships that have allowed it to access new technologies and knowledge, accelerating its capacity for innovation.

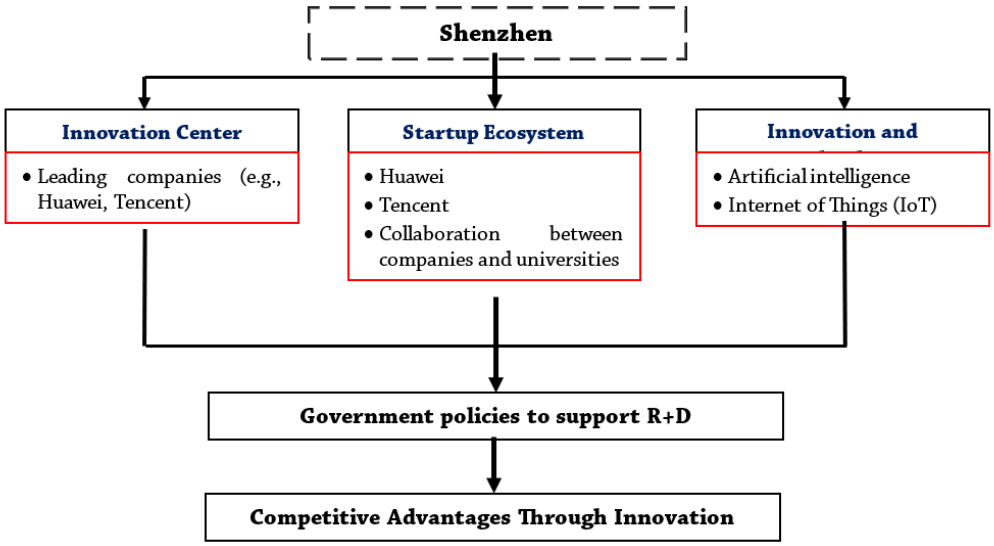
The work culture at Mindray, which emphasizes teamwork and collaboration, also reflects the influence of collectivism on Chinese business culture. This focus on collaborative work has enabled Mindray to maintain a customer-centric approach, tailoring its products to the specific needs of global markets. Not only has this company proven to be a leader in the

medical technology sector, but it also offers valuable lessons on how investment in R+D, open innovation, and a collaborative work culture drive business success.

The Seminar for Talents in Digital Technology contemplated visiting the city of **Shenzhen,** known as the "Silicon Valley of China", which is a city of great economic and technological importance in the country. Founded in 1980 as one of the first Special Economic Zones (SEZs), Shenzhen has experienced skyrocketing growth, transforming from a small fishing village to a modern metropolis and a global hub of innovation (EL UNIVERSO, 2024). The following graph 1 summarizes how the city of Shenzhen is structured as a digital city:

Figure 1

Shenzhen City's Digital Work Structure



One of the highlights of Shenzhen is its startup and technology ecosystem. The city is home to numerous startups and tech giants, such as Huawei and Tencent, that have boosted China's digital economy. This phenomenon can be understood through the theory of open innovation, which suggests that collaboration between companies, universities, and research centers is essential to fostering innovation. In Shenzhen, geographical proximity and a culture of cooperation have facilitated the exchange of ideas and resources, leading to an environment conducive to innovation.

In addition, Shenzhen has been a pioneer in the adoption of emerging technologies, such as artificial intelligence and the Internet of Things (IoT). The city has implemented government policies that encourage investment in R+D, aligning with Michael Porter's theory of competitive advantage, which emphasizes the importance of innovation in maintaining a leading position in the market.

Shenzhen is an example of how an innovation-friendly environment, combined with supportive policies and a collaborative culture, can transform a region and position it as a global leader in technology.

Innovation and entrepreneurship in China have been topics of growing interest and debate in the academic and business world. From different perspectives, various views can be identified on how China has emerged as a global leader in these areas.

First, the Chinese government's focus on investment in research and development (R+D) has been crucial. In 2019, China invested approximately 279,000 million dollars in R+D, becoming the second largest investor in the world in this area. This investment has allowed China not only to increase its innovation capacity but also to position itself as the country that files the most patents, with 1.3 million applications in 2016 (Lleytons, 2024).

This approach highlights Michael Porter's theory of competitive advantage, which holds that investing in unique capabilities can provide a sustainable advantage in the marketplace.

On the other hand, some experts warn that, despite these achievements, China faces significant challenges. Dependence on foreign technologies and the need to improve the quality of higher education are critical areas that require attention to maintain its innovative momentum (González Peña, 2023). In addition, social and political pressure can influence the innovation environment, as evidenced by recent protests against government policies (Monteros, 2022).

Finally, China's transformation from a copycat country to a leader in innovation reflects a paradigm shift in the global economic model, where the quality of innovation and adaptability are essential to compete in an increasingly complex and dynamic environment (Pérez Palomino, 2023).

CONCLUSIONS

Several key aspects are discussed, such as the importance of investment in research and development (R+D) to foster innovation. This approach has been instrumental in the growth of Chinese companies such as Mindray Medical and CETC Technology, which have proven that R+D can provide a sustainable competitive advantage in the market. In addition, the relevance of collaboration and teamwork in Chinese business culture is highlighted, which translates into an environment conducive to innovation.

Another relevant point is the application of theories such as disruptive innovation and open innovation, which allow companies to adapt to market demands and collaborate with other organizations to develop advanced solutions. China's experience in digitizing industry and using emerging technologies, such as artificial intelligence, is also presented as a role model.

Nicaragua can learn valuable lessons from China's digital transformation, by adopting strategies that have proven effective in growing its digital economy. China has made remarkable progress through significant investments in research and development (R+D), which has enabled leading companies such as Huawei and Tencent to stand out in the global market. For Nicaragua, it is crucial to foster a startup ecosystem that promotes collaboration between government, industry, and universities, like the Chinese model. In addition, cultivating a culture of open innovation and leveraging emerging technologies are strategic decisions that can drive local development. The digitization of sectors such as manufacturing and utilities in China has increased efficiency and transparency, which Nicaragua could replicate to improve its processes. In summary, by implementing policies that incentivize investment in R+D, facilitate access to technology, and promote a collaborative mindset, Nicaragua can strengthen its path toward digital transformation and improve its competitiveness in the global context.

The digital transformation in China has had a significant impact on the personal and professional lives of its citizens. On the personal level, digitalization has facilitated access to essential services, such as education and healthcare, through online platforms and mobile apps. For example, artificial intelligence is used to connect students in rural areas with "super teachers", thus improving the quality of education in disadvantaged regions.

In the professional sphere, digitalization has revolutionized the labor market, increased productivity and creating new employment opportunities in emerging sectors, such as information technology and artificial intelligence. However, it has also created challenges, such as the automation of traditional jobs, which can lead to job losses in certain industries. As businesses adopt digital technologies, the demand for technical skills has increased, highlighting the need for training and continuing education. In addition, the culture of entrepreneurship in China has flourished thanks to digitalization, with a boom in startups innovating and competing in the global market. In short, digital transformation in China is redefining every day and professional life, offering opportunities and challenges that require constant adaptation by the population and institutions.

WORK CITED

Zero Gap. (2024, April 16). Nicaragua is committed to the future of education by strengthening the use of technological platforms. Zero Gap. https://brechacero.com/nicaragua-apuesta-a-el-futuro-de-la-educacion-fortaleciendo-el-uso-de-las-plataformas-tecnologicas/

CECOM. (2024). China Electronic Commerce (Beijing) Co., LTD. https://www.ce-com.cn/en/index.php?catid=8

CETC. (2021). Perfil del grupo-China Electronics Technology Group Co., Ltd. https://en.cetc.com.cn/zgdk/1593037/jtjj/index.html

CNU, D. de C. I.-. (2024, July 4). CNU delegation participates in a seminar on digital technology in the People's Republic of China. National Council of Universities - Nicaragua. https://cnu.edu.ni/2024/07/04/delegacion-del-cnu-participa-en-seminario-sobre-tecnologia-digital-en-la-republica-popular-china/

THE UNIVERSE. (2024, May 22). In Shenzhen, China's 'Silicon Valley', Huawei's 5.5G technology is already being tested. The Universe. https://www.eluniverso.com/noticias/economia/shenzhen-silicon-valley-de-china-tecnologia-huawei-55-g-nota/

González Peña, J. M. (2023, March 24). Science and technology in China in the period 2018–2022. Center for International Policy Research. https://www.cipi.cu/ciencia-y-tecnologia-en-china-en-el-periodo-2018-2022/

La Gaceta, D. O. (2024). Mobile Digital Classrooms in Nicaragua: The Future of Education is Now! https://www.lagaceta.gob.ni/aulas-digitales-móviles-en-nicaragua-el-futuro-de-la-educación-es-ahora/

Lleytons. (2024). China: Leader in innovation at a global level. Lleytons - Private international law in Valencia. https://www.lleytons.com/conocimiento/china-lider-en-innovacion-a-nivel-global/

Monteros, M. E. de los. (2022, December 28). The expert Mertens predicts what will happen in China. Diario AS. https://as.com/actualidad/advertencia-del-experto-mertens-sobre-china-es-la-clave-para-todo-el-mundo-n/

Nishikawa, J. C. F. (2023, October 1). Digitalization in China. Center for China and Asia-Pacific Studies. https://cechap.up.edu.pe/noticia/digitalizacion-en-china-por-jose-carlos-feliciano-nishikawa/

NNROAD. (2023, mayo 29). Cultura laboral en China | NNcarretera. https://nnroad.com/es/blog/work-culture-in-china/

Olmos, R. (2023, November 29). ChatGPT turns one year old in the middle of a movie plot, which includes the departure and return of CEO | Diario Financiero. https://www.df.cl/df-lab/innovacion-y-startups/chatgpt-cumple-un-ano-en-medio-de-una-trama-de-pelicula-la-que-incluye

Oppy, G., & Dowe, D. (2021). The Turing Test. En E. N. Zalta (Ed.), The Turing Test (Winter 2021). Metaphysics Research Lab, Stanford University. https://plato.stanford.edu/archives/win2021/entriesuring-test/

Pérez Palomino, C. (2023). Brian Wong, geopolitical strategist and China expert: "An escalation in Taiwan would be to the detriment of all humanity." https://www.20minutos.es/noticia/5134025/0/brian-wong-estratega-geopolitico-experto-en-china/

Shenzhen Mindray Bio-Medical Electronics Co., Ltd. (2024). Mindray Medical: Acerca de nosotros. Mindray. https://www.mindray.com/en/about-us

SuperMap, S. Co., Ltd. (2021). Acerca de SuperMap—SuperMap SIG Software. https://www.supermap.com/es-es/about/?37_1.html

Telcor. (2024, July 10). TELCOR PARTICIPATES IN SEMINAR FOR TALENTS IN DIGITAL TECHNOLOGY - TELCOR https://telcor.gob.ni/telcor-participa-en-seminario-para-talen-tos-en-tecnologia-digital/

UNAN-Managua. (2024, July 4). University delegation participates in Seminar for Talents in Digital Technology in the People's Republic of China. UNAN-Managua. https://www.unan.edu.ni/index.php/notas-informativas/delegacion-universitaria-participa-en-seminario-para-talentos-en-tecnologia-digital-en-la-republica-popular-china.odp

UNESCO. (2023). Artificial Intelligence: Between Myth and Reality. https://courier.unesco.org/es/articles/inteligencia-artificial-entre-el-mito-y-la-realidad

Xinhua News Agency. (2024). Economic Watch: China accelerates digital transformation of the manufacturing sector. https://spanish.news.cn/20240514/a67976ea8dfd456181f30af768cdcc4a/c.html