sciendo

National University of Political Studies and Public Administration
Faculty of Management

An Analysis of the Effects of the Fourth Industrial Revolution on Vietnamese Enterprises

Khanh Tuan VUONG [1], Shaheen MANSORI [2]

[1] HUTECH University, 475A Dien Bien Phu, Binh Thanh District, Ho Chi Minh City, VN; vk.tuan@hutech.edu.vn (corresponding author)

[2] Malaysia University of Science and Technology, Encorp Strand Garden Office, No 12, Jalan PJU 5/1, Kota Damansara, 47810 Petaling Jaya, Selangor, MYS; shaheen.mansori@must.edu.my

Abstract: The objective of this empirical study is to analyze the role of the industrial revolution 4.0 (IR4.0) on Vietnamese enterprises. The IR4.0, which relates to the breakthrough of the Internet of Things and artificial intelligence, has brought about changes in the manufacturing industry and had a significant impact on Vietnamese enterprises. A review of previous studies combined with secondary data has been applied for analyzing and supporting the evidence of the impact of IR4.0 on Vietnamese enterprises. The analysis has provided evidence that aside from its beneficial opportunities, the IR4.0 will create many challenges for Vietnamese enterprises, impacting management, operations, and the manufacturing sector. The concept of IR4.0 and its impact on enterprises and economies should be considered and the IR4.0 will accelerate the process of technological innovation. This is derived from the nature of the IR4.0, which is based on digital technology and integrates all intelligent technologies. It is evident from the data analysis and the synthesized information that Vietnamese enterprises in IR4.0 have advantages and opportunities to access the new technologies. In adapting to the requirements stemming from this revolution, enterprises should increase their investment in applying new technologies to take opportunities into the current market. Due to this issue, Vietnamese enterprises need to change and be innovative in their overall strategy, adapt and make good use of the benefits and opportunities, provide solutions to the new challenges, and achieve the competitive advantages within the IR4.0. Based on the outcomes of this study, management practitioners and researchers can refer to and apply these findings for future in-depth studies of how IR4.0 is affecting Vietnamese enterprises and make relevant recommendations.

Keywords: 4.0 Industrial Revolution; digital technology; Internet of Things; change management; Vietnam.

Introduction

IR4.0 is the basis for the new industrial revolution that is targeted at digitalization and its integration of the value chain (Jovanovski et al., 2019). According to Nagy et al. (2018), it is currently being witnessed that the new era of industrial digitalization has dawned, and companies are embracing this concept with increased investment in the hardware and process solutions that allow its processes, machines, employees, and even the products themselves. Thus, allowing this to be combined into a single integrated network for data collection, data analysis, the review and evaluation of its development, and overall performance improvement. There is a significant objective for introducing IR4.0 into actual practice, this is to improve business competitiveness (Vrchota, Volek, & Novotná, 2019), as well as the relationship and its connection of new and leading technologies in the value chain. Services, automation, robotics, artificial intelligence, the Internet of Things (IoT), and associated manufacturing are the key elements that will redefine businesses in diverse industries (Sima et al., 2020). If the enterprise successfully adapts to the evolution of IR 4.0, it can achieve business intelligence and success.

How to cite

Vuong, K. T., & Mansori, S. (2021). An Analysis of the Effects of the Fourth Industrial Revolution on Vietnamese Enterprises. *Management Dynamics in the Knowledge Economy,* 9(4), 447-459. DOI 10.2478/mdke-2021-0030

ISSN: 2392-8042 (online)

www.managementdynamics.ro

https://content.sciendo.com/view/journals/mdke/mdke-overview.xml

Jovanovski et al., (2019), enabling different types of innovations, combined with the implementation of IR4.0 promotes the development into processes in which the key interfaces, and its relationship, differs from the earlier version which promoted independent business elements is now achieved. Earlier the leading big corporations that possess the suitable resources and strategies available for development, recognized the significance of adopting the new practices. The adoption and implementation of information technology through all aspects of our lives and business have seen the emergence of qualitative and quantitative changes on a significantly large scale that this process has come to be known as the Fourth Industrial Revolution, or Industry 4.0 (Maresova et al., 2018). It has been noted that in recent decades, manufacturing and production systems have gradually adopted information technology support instruments. With the need to control greater numbers and more complex technologies, the consideration of multi-site production and the support of the logistic processes have developed into more complex tasks. The inevitable role of IT (Information Technology) within enterprises has transformed both working conditions and efficiency, its critically important is (Nagy et al. 2018). IR4.0 has been defined as the conduit to the future generation of the industry providing increased flexibility within manufacturing, associated with mass customization, improved quality, and enhanced productivity (Ulewicz & Novy, 2017; Stasiak-Betlejewska, Parv, & Gliń, 2018).

According to Nagy et al., (2018), the focal aim of Industry 4.0 is to provide improvements in terms of automation and operational efficiency, as well as effectiveness. The emerging Industry 4.0 concepts is an umbrella term for a new industrial paradigm that embraces a set of future industrial developments including Cyber-Physical Systems (CPS), the Internet of Things (IoT), the Internet of Services (IoS), Robotics, Big Data, Cloud Manufacturing and Augmented Reality. The adoption of these technologies is essential to the development of more intelligent manufacturing processes, which includes devices, machines, production modules, and products that can independently exchange information, trigger actions, and control each other, thus enabling an intelligent manufacturing environment.

According to Nagy et al. (2018), The fourth industrial revolution is based on data. The process of gathering and then analyzing, and conceptualizing to make the right decisions, is utilized as a competitive factor. The origins for a competitive advantage, not only for production on a targeted or totally new basis (e.g., additive production). This also provides the embedding of products with digital services (e.g., in the event of a failure, the machine itself indicates which replacement part should be brought in), i.e., how enterprises short-list the pertinent information from the overall data to provide concise outputs to support decision-making. A major role is played by such aspects as smart products, automation, new ways of communication, or the creation of new business models (Maresova, et al., 2018). Therefore, the role of IR4.0 is significantly important for the continued enhancement of the enterprises and assist people with the most relevant and comfortable life.

According to Nagy et al. (2018), the inevitable role of information technology (IT) is vitally important for enterprises, as it has enhanced efficiencies and upgraded working conditions. According to Vrchota et al. (2019), a critical factor in supporting enterprises in the digital age for the implementation of innovative technologies (the IR4.0) is developing and defining the innovation strategies of enterprises. In Vietnam, the industrial revolution has had an impact on the IT industry, and the information technology industry needs to change and develop. Information technology is present and plays an indispensable role in the management and operation of production and business activities of each enterprise. Vietnamese enterprises need to devote financial resources to invest in the application of information technology in business administration and management. In fact, businesses will initially spend a lot of money but will achieve long-term results.

According to Tran (2016), Vietnamese enterprises are also impacted by competition derived from large corporations seeking a greater market share of not only international markets but its domestic markets alike. To adapt to this situation, Vietnamese enterprises need to ensure they are significantly prepared with financial resources, technology, and personnel. It is noted that Vietnam enterprises will be confronted with many challenges as many Vietnamese companies are small or

Vol.9 (2021) no.4, pp.447-459; DOI 10.2478/mdke-2021-0030

medium-sized they have not previously been impacted by; the value chain of global production; scientific & technological level and innovation capacity are still at a low level. In today's era of IR4.0, Vietnamese enterprises are required to innovate, adopt change, and develop to adapt with the current markets to achieve the benefits of business intelligence and promote stronger growth. They need to adopt and apply the KPI's of the new era technology into their business, management, and manufacturing sectors, to increase their level of competitive advantages. Therefore, this empirical study will have an in-depth review of the role of IR4.0 towards business intelligence to support the Vietnamese enterprises in achieving greater performance, growth, and developing long-term sustainably.

Literature review

The concept of the 4th industrial revolution

According to Cameron et al. (2019), the industrial revolution has been noted over many years in many industries, specifically manufacturing, it has been a scaled revolution with multiple upgrades in new technology. In the early 1800s, the first Industrial Revolution saw the transformation from manual production processes into machine production powered by steam and water engines. The Second Industrial Revolution featured electricity, assembly process lines, and mass production to industry. The third wave, or the Digital Revolution, adopted the capabilities of computers and digital automation in manufacturing. IR4.0 will lead to basic upgrades in the economy, work environment, and skills development

Maresova et al. (2018), has identified the following factors relevant to Industry 4.0: Internet of Things (IoT), cyber-physical system (CPS), information and communications technology (ICT), enterprise architecture (EA), and enterprise integration (EI). The definition of "internet of things" (IoT) can be deemed as the main facilitator of IR4.0 by allowing complete access to the internet through self-managing smart technologies (Qin et al., 2016). Industry 4.0 will have a significant impact along total value chains and define the new beneficial processes; regarding business models, production technology, creation of new jobs, work organization, and workflows. Currently, large volumes of information and data can be sourced, analyzed, and completed daily with the assistance of diverse computing tools. Currently, there is suitable technology available to complete these analysis tasks (e.g., Big Data) (Witkowski, 2017).

The effect of the 4th industrial revolution on the enterprises

In the digital age based on IR4.0, the relationship of an enterprise and its customer are brought closer together. They will be easy to interact with each other to access the products or services by the online platform. The peripheral elements of service and e-customer satisfaction could be indirectly linked via website quality and related issues (Laureti, Piccarozzi, & Aquilani, 2018). Big data; is suitable for large volumes of data that cannot be achieved with typical database software relating to; capturing, storing, managing, and analyzing data. It is more evident through the widespread use of cyber-physical systems in the manufacturing sector. Big Data technologies have witnessed increasingly considered as the leverage for industries in streamlining production process management (Liang et al., 2018). It is noted that the enterprises that implement big data more understand the customer's requirements plus those of the market. When considering digitization and the overall effects on the amassed data to the enterprises, these elements can provide; improved transparency, integration, and functionality provide greater volumes of information concerning its customer requirements and the specific processes required to completely satisfy the requirements. IR4.0 also provides specific new value-creating business areas which will be critical in its future such as product design and development, and data security (Nagy et al., 2018).

IR4.0 is not limited to the local cyber-physical systems or local industry processes, it incorporates; suppliers, manufacturers, logistics service providers, and its workers. One of the initial concerning issues noted by the first practitioners of IR4.0 is the low levels of skilled workers (Gilchrist, 2016).

Other research was focused on enhanced internal systems for the enterprises, investment capital to replace labor, the impact of elevated unemployment rates and globalization (Maresova et al., (2018). IR4.0 is seen as the most significant development of the digital era and its online transformation. It has the potential to impact the structure and dynamics of diverse industries through further automation, cyber-physical systems, volume data analytics, sensor networks, iCloud computing, Artificial Intelligence, and the Internet of Things (Cameron et al., 2019). The below figure will provide the stages of the industrial revolution:

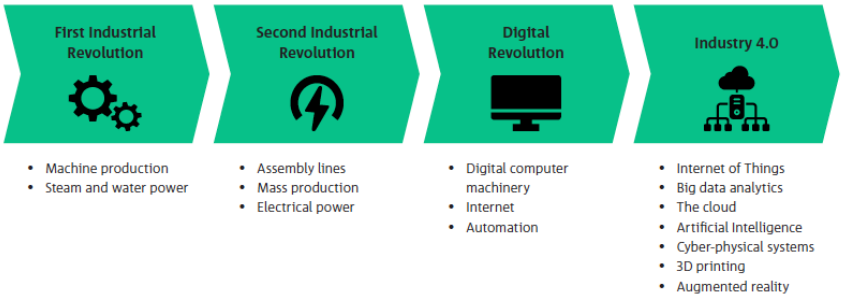

Figure 1. Stages of the industrial revolution (Cameron et al., 2019)

The fourth industrial revolution has a significant impact on the total enterprise, so it is critical to comprehend how the various elements of it can take advantage of the benefits produced by digitization (Nagy et al., 2018). Founded on the revolution of IR4.0, the era of Artificial Intelligence and the Internet of Things (IoT), enterprises have enhancements available to implement into their digital business and implemented into its business and marketing solutions, as well as the overall digital management strategy. It will provide a solution to gain the targeted customers and achieve its goals and objectives. IR4.0 will provide diverse opportunities to enhance its technological level, improving its volume in production, competitiveness against its rivals, creating attractive and potential investment opportunities in the sector of digital technology, Internet of things, etc. These are the fundamental benefits and opportunities available for Vietnamese businesses.

Additional consideration of the fourth industrial revolution on business relations is given and the impact on the enterprises internal business areas. At the level of the supply chain, initially, the link to suppliers and its customers requires analysis (Nagy et al., 2018). There is a notable effect on the Vietnamese economy, currently, its enterprises that are not maintaining pace with the rest of the world and its regional economic development, this will definitely attract significant negative impacts such as; regression in terms of technological capability, declines in production and business value, a notable surplus of unskilled workers, unskilled and low-skilled workers, untrained and re-trained laborers. Enterprises will grow quickly if they adopt the benefits, timely updates in technological trends, and develop products attuned to market demands. In the reverse, if there is little comprehension and maintaining pace with new advanced technologies, enterprises will have to down-scale their business, be faced with a restricted market portion, and potentially be eliminated from the market.

The economic perspectives of Vietnam in the IR 4.0

According to Nguyen (2020), "Industry 4.0 contributes to businesses' efforts in reducing operation and product costs so that profit and productivity are increased, which in turn lead to GDP growth". Vietnam is currently in the process of industrialization, modernization, and deepening integration into the world economy, through the participation in several free trade agreements (FTA) and the proactive preparation of vital platforms allowing access to new technological achievements from the IR4.0. According to Guzikova et al. (2019), Industry 4.0 is having a multifaceted effect on the sustainable development of Vietnam and the Government of Vietnam is trying to create favorable conditions and incentives for Industry 4.0. This can provide general assistance to the Vietnamese economy to effectively participate in the global value chain, as well as benefits for Vietnam to

Vol.9 (2021) no.4, pp.447-459; DOI 10.2478/mdke-2021-0030

promote and enhance its industrial processes, modernize and increase its positive contributions to the country's economic growth.

Embracing positive and modern technological trends, enhancing corporate governance is a key issue that contributes toward the sustained existence and future development of Vietnamese enterprises in this era of IR4.0.

In today's changeable new era, the economy of Vietnam has changed significantly over many years as indicated in the figure below. There is a significant increase in the contribution levels to the Vietnamese economy, which is presented in the following figures.

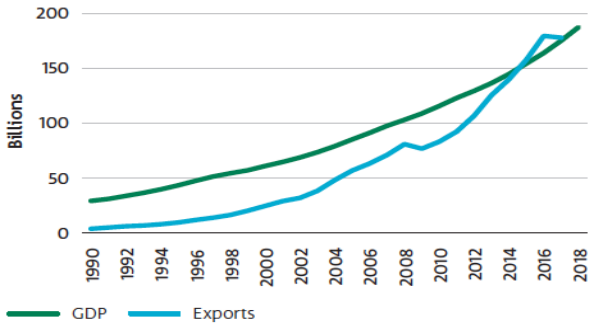

Figure 2. Vietnam GDP and exports (constant 2010 US$), 1990-2018 (Cameron et al., 2019).

It is evidenced in figure (2), there is a significant increase in the GDP and exports from 1990 to 2018. In detail, in 1990, the GDP of Vietnam reached around less than 50 US$, While, in the year 2018, it has reached around below 200 US$. According to Cameron et al. (2019), in 2018 Vietnam achieved 7.08% GDP growth, the highest since 2011 and far beyond the predicted growth for 2018 (6.8%)". From the data, it is evidenced that, the rate of GDP of Vietnam will improve and increase in the next coming years.

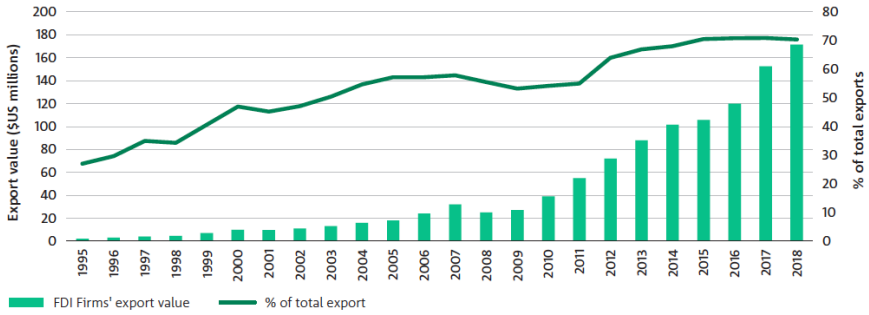

Figure 3. Foreign-invested firms' export value and proportion of total exports, 1995-2018 (Cameron et al., 2019).

FDI supports Vietnam's economy. FDI is a small component to contribute the total GDP, it plays a critical role in attracting capital and expertise to value-added industries in Vietnam. According to Cameron et al., (2019), over the last 30 years Vietnam disbursed US$154.5 billion (about 50% of total FDI-registered capital), accounting for approximately 20% of total investment in Vietnamese industry) The mining and quarrying sectors have traditionally been the main beneficiaries of FDI, but now the main beneficiaries are the manufacturing and processing industries.

As noted in Figure 3, it is evidenced that, Vietnam is seen as a lucrative investment destination to international investors as an emerging market, and ranks highly on international investment. The attraction of FDI is closely linked to increased exports – with 70.4% of total exported goods created by FDI firms in 2017.

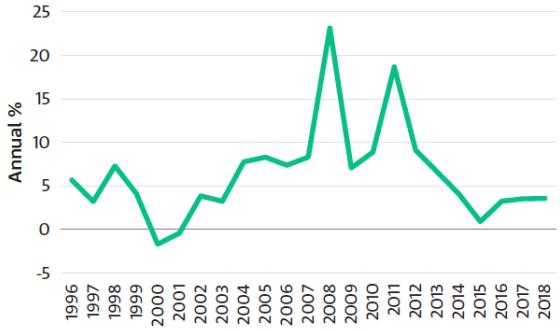

Figure 4. Vietnam inflation, consumer prices (annual %), 1996-2018 (Cameron et al., 2019)

From the data in Figure 4, it is indicated that, in 2008, the percentage of inflation of Vietnam reached below 25%, while in 2018, the percentage of inflation has decreased sharply, it takes to account for below 5%.

The key opportunities and challenges of the IR4.0 for Vietnamese

Enterprises

With Vietnam participating in the IR4.0, there will be challenges and opportunities for Vietnam. Vietnamese enterprises need to focus and change their overall strategy to adapt to new trends in the period of IR4.0. The following issues will present the key opportunities and challenges of IR4.0 on Vietnamese enterprises.

The opportunities

According to Dinh, (2018), IR4.0 provides a significant contribution to technological breakthroughs that will influence and have a strong impact on many countries, governments, businesses, and individuals globally, and provide fundamental changes to the way we live, work and manufacture. Initially from the global implementation of the IR.0, developing a fresh network and operations for the economies based on high-technology applications, Internet of things, artificial intelligence, smart robots, blockchain, cloud computing, etc. As a result, the Vietnamese enterprises can now easily access current modern technology, the corporate management is based on the internet and they can share the information easily.

Secondly, IR4.0 defines a global situation where computers, automation, and people, in general, will collaborate in a whole new way. Robots, or machines in general, are networked to computer systems. The process systems use digital learning algorithms to learn and control machines, requiring very little or even no human intervention. This is the reason many people relate to IR4.0 as the "smart factory". IR4.0 will assist the Vietnamese economy to collaborate effectively in the global value chain, this provides an opportunity for Vietnam to accelerate the process of industrialization and modernization, contributing positively to growth.

Thirdly, IR4.0 supports the enterprises to secure faster and refined production, less human labor force, fuller data collection, coupled with faster decision making. To provide enough data for IR4.0, the machines must have the capability to transfer data to the central system as well as to retrieve data from external sources to control the production. IR4.0 will assure of providing diverse benefits to improve its technological level, improving production capacity, competitiveness against its rivals, developing attractive and potential investment opportunities in the field of digital technology, the Internet, biotechnology. These are fundamental benefits and opportunities available for Vietnamese businesses.

Fourthly, the development in current communication and information infrastructures such as cyber-physical systems, data centers, and cloud computing can assist enterprises in the early

Vol.9 (2021) no.4, pp.447-459; DOI 10.2478/mdke-2021-0030

identification and prevention of issues in product defects and enhancement of productivity and quality. The enterprises can retrieve and analyze the data to identify the relevant information to provide additional benefits for its management, business, and manufacturing.

The challenges

According to Dinh (2018), IR4.0 has inherent new challenges as well for developing countries like Vietnam. Some of the identified challenges are; not keeping pace with current trends, low-cost labor losing its advantage, an ever-increasing technological gap and knowledge leading to deeper social division, etc businesses. They are required to possess the awareness and motivation to adapt and change and to develop the appropriate strategies for the future development of industries, services, and the economy.

Apart from the technological advantages of IR4.0, consideration also must be given to its challenges as well. According to Nguyen & Lưu (2020), "Organizations must adapt and actively change their business operations, improve skills, and constantly apply technology". Caution from enterprises; afraid to expand investment, afraid to spend money to upgrade technology, afraid to hire high-quality personnel, they retain the same operating model. In the long run, this leads to diminished competitive advantages when compared to its rivals, higher costs, fluctuating quality of its products, and the loss of its talent.

The international corporations that have embraced modern technology and are currently branching into Vietnam pose heightened levels of challenge and added competition among the Vietnamese enterprises. Vietnamese enterprises that do not maintain alignment with their economic development regionally or globally will surely encounter negative effects such as a decline in their overall productivity and efficiency. One of the main challenges that enterprises are facing in adopting and implementation of IR4.0 is the shortage of skilled knowledge workers. According to Nguyen, (2020) "the skills and the competency of the labor force need to be constantly improved when they are a part of an Industry 4.0 process". In addition, the traditional low-wage workers who are not capable to be upskilled and reskilled can create another sort of challenge for the government and society as they may cause social unrest and political instabilities.

Security issues and challenges, this is quite pertinent as data is now ubiquitous, how data can be securely exchanged between systems. The purity of data: whether the data is modified to be untrue or not, the data volume is too large, how to process and store, data from places without the Internet, how to collect, etc. These are the issues that enterprises need to consider highlighting these problems.

Updating new technology trends, changing the way of corporate governance is a key issue that decides the existence and continued development of Vietnamese enterprises in the era of IR4.0. Technology has impacts in many areas; in which e-commerce is changing user behavior and habits.

Methodology of empirical study

In this empirical study, the synthesized information will be analyzed with secondary data (Cameron et al., 2019). This method also uses material from different sources to synthesize the information that can support this study. Based on previous studies and the secondary data, this study will be applied to gain the landscape of the issues. Performing a scoping review will generate an overview and a summary of up-to-date studies focusing on IR4.0 in business and economics. It is evident from the data analysis and the synthesized information that the synthesized information will be utilized in the application of the analysis, providing the real situation and recommendations for Vietnamese enterprises as well as policymakers.

Based on previous studies and the secondary data will analyze the total picture of society as well as the economy of Vietnam. The secondary data has been used to analyze whether the IR4.0 has

impacted enterprises and provided relevant solutions to assist the enhancement of their strategy to adapt to the current market.

The importance of IR4.0 in the Vietnamese enterprises

The role of the digital age on the Vietnamese economy

Özüdoğru, Ergün, and Ammari (2018), a new era of digitalized data-based enterprises supported by digital interfaces and data-based enhanced services delivering the actual products at the core is expected from the implementation of the vision and concept of IR4.0 globally. In the revolution of IR4.0, there is advancement in technology; Vietnamese enterprises will gain positive benefits if they adopt the new technology. This data noted below will present many elements for the overall perspectives of the economic development in Vietnam as well as Vietnamese enterprises.

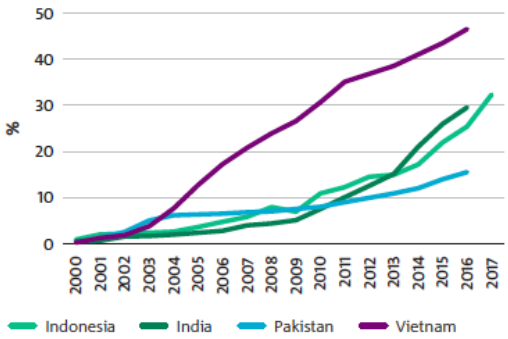

Figure 5. Population using the Internet (%) by country, 2000-2017 (Cameron et al., 2019)

Based on the data from Figure 5, it is noted that the percentage of Population using the Internet with the most popular was Vietnam when compared with many countries are Indonesia, India, Pakistan. In 2019, the population using the Internet in Vietnam has reached around 48%.

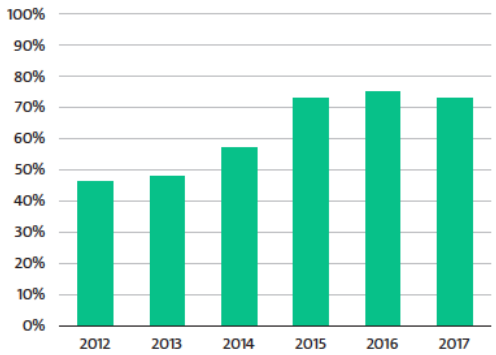

Figure 6. Business usage of online public services in Vietnam (%) (Cameron et al., 2019)

The data in Figure 6 has indicated that the business usage of online public services in Vietnam reached just under 50% in 2012. However, in the year 2017, it increased to a higher level of online public services of approximately 70%. Consequently, internet usage has become more popular in Vietnam, based on the evolution of IR4.0. It is beneficial for the government, businesses, and citizens to take advantage of the internet of things in their overall activities in their life.

The Internet will assist in identifying, suppliers, manufacturers, and the customer will create a single digital ecosystem where all relevant data and information can be stored and accessed on-demand, typically in Icloud where coordinated activities are as efficient as possible. But consulted experts have deemed this as not being a realistic process in the foreseeable future by the experts

Vol.9 (2021) no.4, pp.447-459; DOI 10.2478/mdke-2021-0030

consulted (Nagy et al., 2018). Therefore, in the digital age, Vietnamese enterprises will be required to develop their business based on the digital platform to provide conveniences and benefits for their targeted customers.

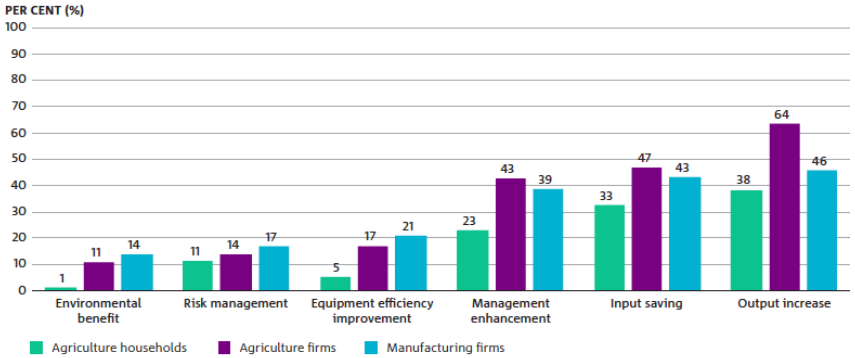

Figure 7. Reasons why enterprises should adopt digital technologies (Cameron et al., 2019)

The data from Figure 7 has identified that the key reasons why an enterprise adopts digital technology are the output increase, input saving, management enhancement, equipment efficiency improvement, risk management, and environmental benefit. Therefore, in the digital era, it's a benefit to human beings if they apply it to their activities.

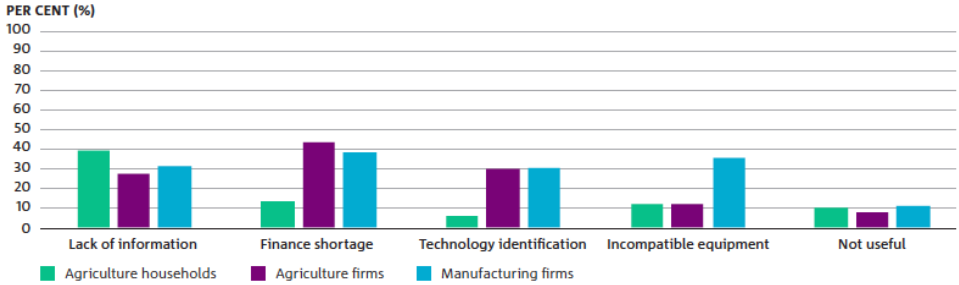

Figure 8. Top challenges to digitalization in Vietnamese agriculture and manufacturing firms (Cameron et al., 2019).

As noted in Figure 8, there are many significant challenges to digitalization in Vietnamese agriculture and manufacturing enterprises. There is a lack of information, finance shortage, technology identification, incompatible equipment, and irrelevant data.

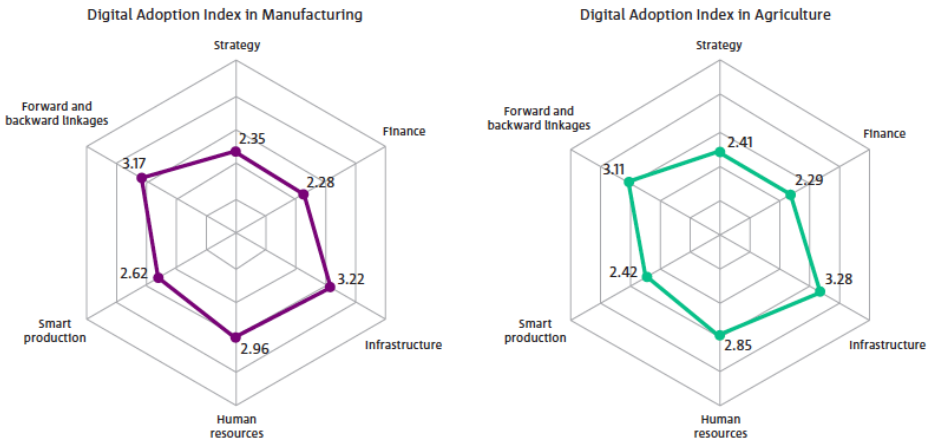

Figure 9. Digital adoption levels across dimensions in Vietnam's leading companies (Cameron et al., 2019)

Note: Adoption level: Level 1 – Outsider; Level 2 – Beginner; Level 3 – Intermediate; Level 4 – Experienced; Level 5 – Pioneer/Expert

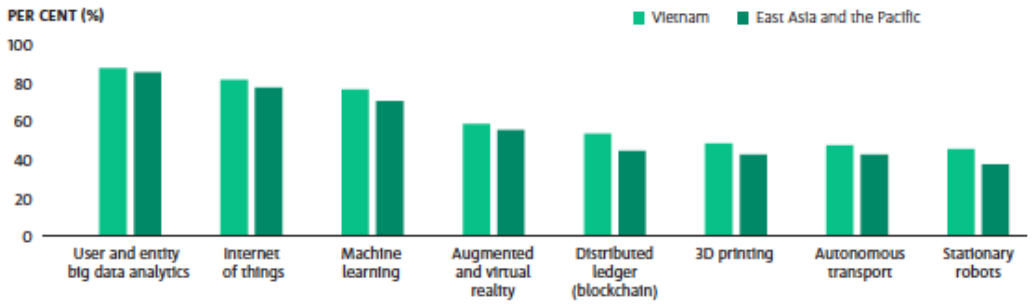

Figure 10. Share of large companies (%) adopting emerging digital technologies in Vietnam and East Asia/the Pacific
(Cameron et al., 2019).
Note: This data only represents digital adoption within large companies (in terms of revenue and/or number of employees), not small or medium sized businesses

From the figure (10), it is evidenced that, the top three groups that share of large companies (%) adopting emerging digital technologies in Vietnam and East Asia/the Pacific are: user and entity big data analytics, internet of things, and machine learning. As the evidence from the data, it is indicated that the share of large companies (%) adopting emerging digital technologies in Vietnam that they have applied equivalence with East Asia/Pacific.

Conclusions and discussions

The IR4.0 is evolving at an exponential rate in every field, with every industry being significantly impacted in Vietnam. Applying its high level of technology and its automation in production stages is now considered the choice of enterprises in the implementation of the IR4.0. Automation is an inevitable trend in production and the IR4.0 technology platform has provided many opportunities for Vietnamese businesses, to connect and participate in the global chain. The IR4.0 will create comprehensive change from the market structure to the methods of production, consumption, and management. This is an opportunity for Vietnam to improve labor productivity and the competitiveness of traditional industries as well as access to the world markets on digital/internet platforms enhancing rapid growth and durable added value firms. Vietnamese enterprises need to develop innovative overall strategies, including its management capacity, technology, and new processes for accessing and analyzing databases to optimize their businesses. They need to catch up and maintain the current trends of the IR4.0 to benefit from the opportunities, survive and develop sustainably in the long term.

Regarding the improvement in information technology due to the development of the IR4.0, it is necessary to continuously standardize training and knowledge to meet the requirements of IT human resources. The improvement of skills and knowledge in the IT industry should be carried out in conjunction with universities and Vietnamese enterprises to update the latest knowledge and skills for students and workers promptly.

It is evidenced from the data analysis above, Vietnamese enterprises in IR4.0 have advantages and disadvantages. The key advantages are they have opportunities to access the new technologies, the development of the internet of things, etc. IR4.0 is and will provide opportunities for a digital economy, smart manufacturing, and services; types of economy, industry, agriculture, services, tourism, finance, banking, logistics, robotics, etc. IR4.0 also assists in; increasing labor productivity, production cost savings, and the management of the benefits to the Vietnamese enterprises and their consumers. The key disadvantages are the limitation of its skills in the new era, the management capacity, the out-of-date in technology and there is a high level of competition for Vietnamese enterprises.

As evidenced from the above data; the initial challenge is its employment skills, the previous industrial revolutions witnessed its workers transition from manual to machine operations, line and automation processes, reduction of the production labor force. Although the third industrial

Vol.9 (2021) no.4, pp.447-459; DOI 10.2478/mdke-2021-0030

revolution has reached the level of automation within manufacturing production, many new required occupations within the field of services have taken up the surplus of the labor force and create jobs. But by the fourth industrial revolution, artificial intelligence (AI), IoT and Big Data will consume the majority of the actual work within the service sector. Currently, Vietnamese workers are now faced with the impact of the fourth industrial revolution - with labor requirements for skills at a higher level than that of the previous revolutions. However, the World is continuously changing, so they need to continuously monitor and re-develop to meet these changes, thus adapting with the trend of IR4.0.

Noted from the above information, the role of the digital age and what effects it has on the Vietnamese economy and its society. There is a development in the technology, internet of things, cyber-physical systems (CPS), information and communications technology (ICT), etc. Digitalization will support the change in business, management, manufacturing sector, etc. in Vietnam. The Vietnamese enterprises need to be innovative to adapt to the trend of the IR4.0. The overall changes and their innovation are vitally important and will lend support to the Vietnamese proving positive benefits toward its competition and sustainability in the new era.

Recommendations

In the revolution of IR4.0, Vietnamese enterprises need to adopt the digital era concept as the fundamental criteria for setting up their businesses. Many business models based on new technology have received constant updates, using artificial intelligence (AI), internet of things (IoT), Big Data, Blockchain, etc. within their overall management to facilitate change and adopting new processes of corporate governance, gradually improve the competitiveness, eliminate competitors and achieve heightened-levels within the market. Not only must provide products and services be current and suitable to the trends of the times, but they also need to adapt and change quickly to catch up with the new trends. If Vietnamese enterprises continue to procrastinate and refuse to align with the current number of operating, business, and production models, it is inevitable they will fail and be replaced and or eliminated. Noted below are the identified key solutions as recommendations to the Vietnamese enterprises within the IR4.0.

Firstly, there is a need to adopt the changes in new management methods for Vietnamese enterprises. As a result of the new technology, Vietnamese enterprises need to apply their science and technology, Vietnamese enterprises need to develop new strategic plans, utilize the new management methods that are more suitable in creating value by its quality, and that the methodology is based on the latest technology relative to management, operations, and the manufacturing sector. The enterprise can implement new digital software and processes for administration, coordination, management, and sharing information. This is a preferred start relative to the re-organizing a new management concept for leaders that will set a premise for the successful transformation of the businesses.

Secondly, a fully equipped business that incorporates modern machinery and utilizes current technological managed process equipment enabling the digital transformation. Machinery, the latest equipment managed by current “state of the art” technology, is the key components in the process of transforming businesses, supporting businesses to "survive" in the digital age. Thanks to the new technology, business operations achieve and offer greater flexibility, they minimize its dependency on human resources and realize significant savings in production time and its overall operating costs. Other opportunities are also related to IR4.0. New technologies will significantly impact the working places.

Additionally, there are new innovative types of robots that can interact with humans. This new technology will complement the human activity elements, especially cognition, in combination with other emerging technologies to provide humans with entirely new computer models. Therefore, new skills are required to bridge the gap between physical engineering and computer science, automation learning, and artificial intelligence. Vietnamese enterprises need to develop suitable scientific and technological strategies to incorporate the enhancement of their labor force productivity and to construct and provide advanced scientific and technological foundations.

Hence, Vietnamese enterprises need to prioritize research to define the current levels required to maintain its competitiveness with the latest technology, to optimize its overall business management, operational, processes, and manufacturing divisions. The adopted changes and innovation will further enhance its product quality, achieving beneficial competitive advantages in the current and future markets.

Thirdly, training a qualified skilled labor force in current digital technology allows Vietnamese enterprises to continuously develop in IR4.0. Education and training in the era of IR4.0 demand its workforce to have suitable qualifications, skills, foreign languages, etc. to meet the high-level criteria in jobs that machines cannot replace. A suitable higher educational strategy will develop and support its team that is aligned with the business's requirements. Human resources are a significant factor to facilitate the implementation of the digital world and the digital age for enterprises. Investing in people has never been a non-profit investment. If an enterprise is to be considered successful, the enterprises need to retain a suitably qualified labor force with current technological knowledge, gain the effective use of its machines and equipment, implement its new management methods and adopt the benefits of technology and success.

Limitations and further studies

This empirical study and analysis are based on secondary data. The data we have is not enough information for an analysis of the IR4.0 and there is a limitation given the recommendations and suggestions for Vietnamese enterprises to change and innovate their overall strategy. This general study of IR4.0 is not assessing the "full picture" but only a small section of the effects on Vietnamese enterprises within the industry.

This study has analyzed the industry in general, but further studies need to conduct how other related but separate industries have been affected within the IR4.0. When considering further studies focused on developing an analysis of other specific industries that affect Vietnamese enterprises in the IR4.0, these results can be considered and incorporated into the new studies.

References

Cameron, A., Pham, T. H., Atherton J., Nguyen D. H., Nguyen T. P., Tran S. T., Nguyen T. N., Trinh H. Y., & Hajkowicz, S (2019). *Vietnam's future digital economy – Towards 2030 and 2045*. CSIRO, Brisbane.

Dinh, Q. (2018). *Industry 4.0: Challenges and Opportunities for young people*. https://tuoitrethudo.com.vn/cach-mang-cong-nghiep-40-co-hoi-va-thach-thuc-voi-nguoi-tre-d2042435.html

Gilchrist, A. (2016). *Industry 4.0: The industrial internet of things* (1st Ed.). Apress.

Guzikova, L., Van, L.T.H., Nechitaylo, I., & Dedyukhina, N. (2019). Impact of the fourth industrial revolution on the sustainability of Vietnam's economic development. In *IOP Conference Series: Materials Science and Engineering*. http://dxdoi:10.1088/1757-899X/940/1/012031

Jovanovski, B., Seykova, D., Boshnyaku, A., & Fischer, C. (2019). The impact of industry 4.0 on the competitiveness of SMEs. In *IV International Scientific Conference - Industry 4.0, Summer Session,* Burgas, Bulgaria

Laureti, T., Piccarozzi, M., & Aquilani, B. (2018). The effects of historical satisfaction, provided services characteristics and website dimensions on encounter overall satisfaction: A travel industry case study. *TQM Journal, 30*(3), 197-216. https://doi.org/10.1108/TQM-07-2017-0080

Liang, Y. C., Lu, X., Li, W. D., & Wang, S. (2018). Cyber Physical System and Big Data enabled energy efficient machining optimisation. *Journal of Cleaner Production*, 187, 46-62. https://doi.org/10.1016/j.jclepro.2018.03.149

Maresova, P., Soukal, I., Svobodova, L., Hedvicakova, M., Javanmardi, E., Selamat, A., & Krejcar, O. (2018). Consequences of Industry 4.0 in business and economics. *Economies, 6*(3). 1-14, http://dx.doi.org/10.3390/economies6030046

Vol.9 (2021) no.4, pp.447-459; DOI 10.2478/mdke-2021-0030

Nguyen, H. C. (2020). *A Vietnamese perspective on the evolution of Industry 4.0.* https://vir.com.vn/a-vietnamese-perspective-on-the-evolution-of-industry-40-77078.html

Nguyen, X.T., & Luu, Q.K. (2020). Factors Affecting Adoption of Industry 4.0 by Small- and Medium-Sized Enterprises: A Case in Ho Chi Minh City, Vietnam. *The Journal of Asian Finance, Economics and Business,* 7(6), 255-264. https://doi.org/10.13106/jafeb.2020.vol7.no6.255

Özüdoğru, A. G., Ergün, E., & Ammari, D. (2018). How industry 4.0 changes business: a commercial perspective. *International Journal of Commerce and Finance, 4*(1), 84-95

Qin, J., Liu, Y., & Grosvenor, R. (2016). A Categorical Framework of Manufacturing for Industry 4.0 and beyond. *Procedia CIRP*, 52, 173-178.

Sima, V., Gheorghe, I.G., Subi´c, J., & Nancu. (2020). Influences of the Industry 4.0 Revolution on the Human Capital Development and Consumer Behavior: A Systematic Review. *Sustainability,* 12, 4035. https://doi.org/10.3390/su12104035

Stasiak-Betlejewska, R., Parv, L., & Gliń, W. (2018). The influence of industry 4.0 on the enterprise competitiveness. *Multidisciplinary Aspects of Production Engineering, 1*(1), 41-648.

Tran, A. S. (2016). The impact of the fourth industrial revolution to Vietnam. http://ncif.gov.vn/en/Pages/NewsDetail.aspx?newid=19311

Ulewicz, R., & Nový, F. (2017). Fatigue Resistance and Influence of Cutting Technology on the Mechanical Properties of Modern Steels Used in the Automotive Industry. *Procedia Engineering*, *192*, 899-904.

Vrchota, J., Volek, T., & Novotná, M. (2019). Factors Introducing Industry 4.0 to SMEs. *Social Sciences,* 8, 130. https://doi.org/10.3390/socsci8050130

Witkowski, K. (2017). Internet of Things, Big Data, Industry 4.0–Innovative Solutions in Logistics and Supply Chains Management. *Procedia Engineering*, 182, 763-769.

Received: September 14, 2021
Accepted: December 10, 2021

© 2021 Faculty of Management (SNSPA), Author(s). This is an open-access article licensed under the Creative Commons Attribution-NonCommercial-NoDerivs License (http://creativecommons.org/licenses/by-nc-nd/4.0/).