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Industry 4.0, Digitalisation, Transport Logistics and the Intervening Factors in the Revitalisation Drive to Manufacturing Firms in Zimbabwe: Exploratory Insights from a Harare Brickmaking Company

PATRICK MUZVIMBIRI[1]

Abstract

This article explores and discusses the linkage between logistics and other factors, such as digitalisation, influencing the strengthening of the manufacturing companies in Zimbabwe. It argues that the Fourth Industrial Revolution, driven by advanced technology and efficient logistics can revitalise Zimbabwean manufacturing firms. The key point of this article is that digitalisation of manufacturing firms in Zimbabwe can go a long way in the reinvigoration of the sector along with good logistics. Data were gathered using a qualitative research design with a bias towards the interpretive research design. The qualitative design allowed for the use of interviews and open-ended questionnaires to generate data from stakeholders within manufacturing companies. The study had a population of 26 supervisors and used a sample of 13 supervisors from Homestyle Bricks, a local Harare brickmaking company. Evidence on the reinvigoration of manufacturing firms, from the sources show three critical aspects that are digitalisation, clustering, and logistics. The article concludes that manufacturing firms need to digitalise to survive the global wave of technological revolution

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sweeping across the global village as failure to do so can signal a discord in logistics and the supply chain. The study concludes that Zimbabwean manufacturing firms can either revitalise through clustering or perish in a bid to monopolise their market strength. It is recommended that there be an inspection on the digitalisation of firms to ensure their survival in the forthcoming industrial revolution.

Keywords: digitalisation strengthening technology equipping revolution monopoly

INTRODUCTION

Historically industrial revolutions have resulted in changing patterns of specialisation growth and employment (Banga and Velde, 2018). This was followed by the second industrial revolution endowed with electricity that enabled mass production based on the division of labour. As technology evolved manufacturing was automated with electronics and information technology bringing in the information communication technology (ICT) the third revolution (*ibid.*). The first industrialisation was coupled with mechanisation and steam power with labour shifting from manual to machine-based tasks (Banga and Velde, 2018). A period from 1990 can be characterised as the digital age as the years from that period saw the emergency of big data being in-cooperated into all facets of industry and life in general (Hirt and Willmott, 2014). The last decade has seen disruptions in the manufacturing industry with sectors that were once analogue now digitalising and opting to embrace the digital revolution. The digital age has changed the competitive dynamics of industries, including the logistics and transport services (Hofman and Osterwalder, 2017).

A host of innovative newcomers such as Amazon and Alibaba who invest in technology supported warehouses and transport (Cichosz, 2018). Transport and logistics, however, remain a trillion-dollar market that enables global trade but has been slow to integrate industry 4.0 advancement (Deloitte Digital GmbH, 2015). While companies in the Global North have leveraged these advancements to cut operational costs Zimbabwean manufacturing firms have struggled to keep pace due to infrastructure challenges, outdated policies, and limited investment in digital transformations. Missing in literature is the perspective that logistics needs to interact with digitalisation to move with the ever-changing technology in a bid to tackle skills mismatch. With the rest of Africa embracing the Fourth Industrial Revolution of technology, Zimbabwean manufacturing firms have been presented with a window of opportunity to strengthen through equipping their logistics via digitalisation.

The aim of the study was to understand the drivers of the revitalisation of manufacturing industry in Zimbabwe. The study answers the research questions that, how has digitalisation improved the manufacturing sector in Zimbabwe? What have been the barriers to digitalisation and the revitalization of the manufacturing sector? The participants were chosen basing on their understanding of the digitalisation of companies in Zimbabwe at Homestyle Bricks. This article argues that the digitalisation combined with efficient transport and logistics can offer a pathway to revitalising Zimbabwean manufacturing firms. The argument of the article is that technological revolution is on a full global scale and companies must evolve or perish. For Zimbabwean firms, embracing technology is no longer optional, it is a necessity for value addition, improved service delivery, and long-term competitiveness.

LITERATURE REVIEW

Literature review shows the researcher the past questions and directions from the past studies done and guides the current research to avoid doing what has been done (Blackstone, 2015). The literature in the study is focused on the digital transformation, the digitalisation of logistics in manufacturing industry and the challenges of the digital transformation.

The Fourth Industrial Revolution (4IR) is a melting pot that the physical, digital, and biological areas are merged and promotes sustainable growth for industry driven by globalisation (Puksoy *et al.*, 2020). For instance, Zimbabwe's adoption of solar-powered systems in the agricultural and manufacturing sectors showcases how digital technologies contribute to sustainable growth despite resource constraints. Transport and logistics have gone through stages so has the manufacturing industry that has relied upon transport and logistics to move goods from the supplier to the customer (Remane *et al.*, 2017). Although digital technology has gained momentum in both academia and practice it lacks consensus with respect to its definition (Osmendsen *et al.*, 2018). Scholars view it as a strategy, or a business model there is no actual definition for the technological revolution. The scholars mention the use of new digital technologies to enable major business improvements (Fitzgerald *et al.*, 2014). An example of this in Zimbabwe is the collaboration between the Zimbabwean government and tech companies, like Econet Wireless that has focused on advancing digital payment systems and mobile services to stimulate economic growth.

Bharadwaj *et al.* (2013) argue that digital technology is not about a single technology, but major changes based on a combination of information, computing, communication and connectivity. Not all technologies in digital transformation have to be digital systems (EC, 2018). The provenance of the digital

transformation of manufacturing industry dates back to the emergence of internet contrary to the inception of the first industrial revolution that brought about a new energy. In Zimbabwe, the use of Internet of Things (IoT) applications in industries like mining has been explored, with the potential to automate operations and improve productivity. The Fourth Industrial Revolution has initiated a new technological era namely digitalisation, rather than giving birth to a new energy (Puksoy *et al.*, 2020). The concept of Industrial 4.0 was postulated by the German government in 2011 articulating Germany's high-tech strategy for 2020 (Puksoy *et al.*, 2020).

The fourth industrial stage was named Industry 4.0 after identifying the first three stages as mechanisation, electrification and communication (Puksoy *et al.*, 2020). The use of smart technology and computers for storage of records and ideas in manufacturing has changed the industry and encouraged low cost and allowed easy access to information (Puksoy *et al.*, 2020). Zimbabwe is now in the early stages of embracing Industry 4.0, with local companies exploring 3D printing and automated manufacturing processes to stay competitive**.** This can revitalise manufacturing industry as it encourages smart production and delivery of products to the consumers easily hence reinvigorating worn out Zimbabwean manufacturing industry.

The primary competitive edge was cost for manufacturing during the 20th century was firms focused on high volume production and cost minimization during this era (Puksoy *et al.*, 2020). Inventory Control Systems were made with computerised reorder point (ROP) were sufficient for basic manufacturing and planning the needs of companies (Puksoy *et al.*, 2020). Logistics went through revolutionary steps before reaching its latest breakthrough Logistics 4.0 (Puksoy *et al.*, 2020). The first stage was mechanisation of transportation, in the 19th and 20th

century equipped with the steam engine as the main mode of transport, the second stage was the automation of the handling systems during the 1960s driven by the electric power and the spread of mass production techniques in manufacturing completed by automation of cargo handling (Puksoy *et al.*, 2020).

The third phase was the emergence of the system of logistics management in the 1980s computers and information technology led the systematisation of logistics activities and initiated warehouse management systems and transport management systems into logistics (Puksoy *et al.*, 2020). In Zimbabwe, logistics has improved with the introduction of GPS tracking in delivery trucks that has reduced fuel consumption and improved delivery times. The fourth stage is now in its early stages it is dominated by Internet of Things and Internet Services (IoT & IoS) these are the main drivers of logistics 4.0 (Wang, 2016). Hofmann and Rusch (2017), have noted two dimensions of logistics operation physical supply chain and the digital value chain dimension. The physical supply chain dimension involves the autonomous and self-controlled logistics system automated trucks and automated handling of systems for example price picking robots (Hofman and Rusch, 2017). A case in point is the implementation of smart warehouses in Zimbabwe by companies like National Foods, where automation systems for inventory management have been introduced to improve operational efficiency and reduce stockouts. The digital dimension entails sensor and machine data that are collected from the physical dimension of supply chain and it is a crucial input for strategic business decisions (Hofman and Rusch, 2017).

Computer added technology has been adopted in African manufacturing companies in Kenya as reported by Banga and Velde (2018), Funkidz a Kenyan furniture manufacturing

company has invested in computer aided design and manufacturing designs as a result the company has diversified into new furniture lines that are completely flat and packable also better in quality. Zimbabwe's furniture manufacturers, such as Sable Industries, have also invested in digital design technologies, leading to the production of innovative products tailored to both local and international markets. Some of the frontend technologies offered by digitalisation can support real time tracking and this can be useful for the supply chain in Zimbabwe through real time tracking of goods and services to customer and the feedback from customers can also be tracked (Hofman and Rusch, 2017). This can impact internal and external logistics. Banga and Velde (2018) have, argued that digitalisation has revived the Kenyan manufacturing industry as it has moved along with technology and survived the global sweep of Industrial 4.0 revolution.

Firms are faced with new technology and its challenges on organisational structures and integration process among other things causing confusion (Pereira *et al* 2018). Integrating new technology requires an amount of investment and time (Puksoy *et al.*, 2020). Implementation of the digital technology requires financing and this can be problematic to companies in the developing countries as any disruptions in the implementation stages can mean collapsing of a plan fully financed. Puksoy *et al.* (2020) argue that any delay or malpractice during the integration process of the new technology into production can result in heterogeneous networks derailing production for good. Monostori et al. (2016) argue that digitalisation may suffer due to security problems these can present a challenge for instance big data being hacked or falling victim to a cyberattack. Puksoy *et al.* (2020) perceives that cyberattacks can cause injuries and loss of life or damage the physical infrastructure. Tuotuk and Hailies (2018) have assessed how economic injuries are the more likely potential outcomes of security breaches through

unauthorised access into data servers leading data modification and forgery.

Puksoy *et al.* (2020) observe how cybersecurity deserves more attention to decrease vulnerability against industrial espionage and sabotage. Industry 4.0 can lead to displacement of workers as these can be outdone by automation this can exacerbate the inequalities already embedded in society (UNCTAD, 2021). There is fear that automation could affect jobs in sectors like agriculture and manufacturing, where manual labour is still prevalent, leading to social unrest in Zimbabwe. Lack of integration of technology into the supply chain has been observed as the main challenge of digitalisation in logistics and manufacturing industry.

CONCEPTUAL FRAMEWORK

Logistics has grown important as a result of globalisation and trade growth the once areas that were bound by geographical specification can now be reached due bilateral agreements in trade. The deregulation has been worldwide (Lianguang and Hertz, 2011). Due to the internet of things and the ever-growing Industry 4.0 logistics and manufacturing firms must strategise so that they may adjust to the demands of e-commerce (Foma and Mohammed, 2018). Flint (2011) argues that logistics and manufacturing companies have been considered as lagging because they have paid no attention to the concept of innovation. Manufacturing firms must learn quicker than their competitors and adjust to their environment. As the industrial concept was developing so too was logistics (Foma and Mohammed, 2018). There is need to develop a logistics concept of organisations that challenge the ongoing and future industrial practices (Foma and Mohammed, 2018). The solution maybe in new operational, organisational, and management standard the physical internet (Foma and Mohammed, 2018). Manufacturing firms face unique challenges such as limited

access to capital, outdated infrastructure, and inconsistent access to technology in Zimbabwe that hinder their ability to fully embrace Industry 4.0. However, opportunities exist for firms to leverage digital technologies like IoT, e-commerce platforms, and automation to overcome these barriers and improve efficiency. The digital transformation theory will be the conceptual framework guiding the study it was propounded by Professor Benalt Montrevil. It stated the need for logistics and manufacturing firms to digitalise their business models in the open to enable real-time tracking and business activities (Foma and Mohammed, 2018). This can produce a mutual goal aimed at minimum cost and effective customer satisfaction (Foma and Mohammed, 2018). This allows firms to track the delivery of goods in real time and enables them to find areas of improvement (Foma and Mohammed, 2018). This transformation could lead to enhanced operational efficiency in sectors like agriculture and mining in Zimbabwe, where logistics plays a vital role in the timely movement of goods. The digitalisation of logistics can help Zimbabwean firms meet international standards and improve their competitiveness in the global market. This framework can guide on how Zimbabwean firms can be revitalised by the digitalisation process in logistics.

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RESEARCH METHODOLOGY

The study used a qualitative approach with a case study design towards understanding the trends in manufacturing industry and the implementation of Industry 4.0. A case study design as argued by Blackstone (2015) focuses on specific cases in relation to the topic under study. The researcher interviewed supervisors from one manufacturing company on the digital transformation of the Zimbabwean manufacturing industry, how digital transformation has been integrated into manufacturing and the supply chain and found the challenges dealt with throughout the transition from analogue to digital.

The participants were chosen basing on their understanding of the digitalisation of companies in Zimbabwe at Homestyle Bricks. The research had a population of 26 supervisors and used a sample of 13 supervisors in the sample and the participants were sampled purposively. The use of a qualitative approach was to gain the inside view from the supervisors on how digitalisation was reshaping the Zimbabwean manufacturing industry. The study used in-depth interviews to understand how digitalisation can revitalise the manufacturing sector in Zimbabwe. As observed by Strydom (2011) in-depth interviews has a way of getting the native information from participants and in this study, it was used to understand how digitalisation has changed manufacturing in Zimbabwe. The qualitative data collected from the interviews were analysed using thematic analysis, a widely used method for identifying, analysing, and reporting patterns (themes) within the data. Thematic analysis was chosen due to its flexibility and suitability for qualitative research, as it allows for an in-depth exploration of the participants' perspectives. The process involved familiarising with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and writing up the results (Braun & Clarke, 2006). This approach provided a structured way to interpret the data and helped identify recurring trends related to the integration of digital technologies in the manufacturing sector.

The study observed the ethical principle of informed consent that is participants were informed of the aim of the study and agreed to participate. Strydom (2011) observes that ethical principles must be observed by every researcher for the research process to be trusted. The aim of the study was to understand the drivers of the revitalisation of manufacturing industry in Zimbabwe. The study answers the research questions that, how has digitalisation improved the manufacturing sector in Zimbabwe, what have been the barriers

to digitalisation and the revitalization of the manufacturing sector. However, there are several limitations to this study. The sample size of 13 supervisors may not fully represent the broader experiences of all supervisors in the Zimbabwean manufacturing sector, and thus, the findings may not be generalisable. Moreover, the use of purposive sampling introduces the possibility of selection bias, as participants were chosen based on their knowledge of the digitalisation process at a single company that could limit the diversity of perspectives on the topic.

EVIDENCE FROM HOMESTYLE BRICKS: A CASE STUDY

. The study used the findings from Homestyle Bricks a company founded in 2010 and has now moved to become one of the largest and leading manufacturers of cement products in the country.

Homestyle Bricks was founded in 2010 and has now moved to become one of the largest and leading manufacturers of cement products in the country. Homestyle Bricks is located 14.3 kilometres from the Harare CBD along Alpes Road in Harare North. The company has grown over time and it has developed its transport system for delivery of the orders (hsbricks.co.zw). Homestyle Bricks has gone digital in a bid to beat the stiff competition in the cement products manufacturing business. Noteworthy is that the company has not fully digitalised due to the high cost of the implementation of the digitalisation process the research explores the impact that the digitalisation of sales and logistics has had so far. The research sought to explore how the digitalisation process can be incorporated into logistics to distinguish the company from its competitors and give better service delivery.

Computerisation is the backbone of digitalisation and it entails the deployment of information technology and its accessibility.

This is the first step and the prerequisite towards Industry 4.0 Homestyle Bricks has computerised its services and is now available on an official website that can be connected via internet. Eight participants' considered computerisation of services offered by the company as an important creation of an interface that allow real-time data exchange between the company and the clients. From the participants' perspective, clients need to be willing to adapt to technological interfaces. Three participants pointed out that computerisation has moved the company from analogue business dealing to digital dealing whereby customers are creating their orders online and finding what they need online. One participant commended e-business for reducing cases of customers being defrauded of their money by solicitors masquerading as company salesman. Computerisation has led to e-business and enabled e-marketing of Homestyle Bricks products and e-business is growing famous after the COVID-19 pandemic. The findings depicted that Homestyle Bricks are diversifying their business and digitalisation has been the new technic for them to break into new markets and compete with their competitors. Computerisation was reported to be helping the company contact suppliers by the participants as they argued that the company uses computer to computer connection to contact suppliers. This was dubbed as e-procurement by the participants they argued that the company uses digital technology in all stages of supply chain from the sourcing of the raw material to the digital marketing of the final product.

To revitalise the manufacturing industry through digitalisation of business and the transport system of goods and services in the supply chain Homestyle Bricks has added transparency. This feature of the company comes through online business that can create invoices and online payments. Seven participants indicated that the digitalisation process has placed

the company on the map of Zimbabwe through bringing transparency and order to business as price of the services offered are already online and this curbs confusion and brings consumer satisfaction to the company. One participant argued that the unique aspect of Homestyle Bricks was the visibility and transparency that the digitalisation of the company has brought. The findings showed that the company delivery vehicles have Global positioning system that allows for tracking and positioning of the customers goods this adds transparency and visibility as customers can follow and track their goods. The firm can follow and locate the operators of their transport system for smooth delivery of the goods to the end user.

The story of Homestyle Bricks digitalisation is not one without its challenges and complexities. The integration of Industry 4.0 into the Zimbabwean manufacturing industry has had complexities in terms of inhomogeneous standards and differing standards across the industries has created discord three participants indicated that of resources on the part of the customers to integrate into e-business has somehow made it difficult for the business to be fully digital and transform the landscape that they hoped to open up new or even foreign markets. One participant argued that the data was high and most of the customers of the company are poor urban dwellers interested in securing building material and e-purchase is a bit costly for them. The findings indicated that the suppliers were reluctant to digitalise their business thereby reverting to the analogue procurement due to lack of digital integration on the part of the suppliers. Two participants indicated that the suppliers are reluctant to digitalise as they fear of the future of technology and losing their jobs to technology. Participants argued that the fear of the unknown on the part of the suppliers have had suppliers focusing on mechanical engineering rather than technological advancement.

Logistics 4.0 has primarily faced challenges in its implementation in the manufacturing sector of Zimbabwe. The high demand for technical and organisation attention has hindered the full implementation of logistics 4.0 into the manufacturing sector of Zimbabwe. Participants indicated that the constant need for technical and software solutions have made the digitalisation drive a bit hard to maintain course on as it has a gradual need for technological machinery upgrades. The findings showed that digitalising the supply chain requires many resources that is from hardware to software and all this requires a considerable amount of money.

The participants from Homestyle Bricks indicated that a firm has to deviate from how it operates, its organisational management and apply top of the range IT solutions to meet the requirements of smart supply chain. One participant from the IT department indicated that the barriers faced by smart chain supply and manufacturing in their company was the high introduction and implementation costs in conjunction with strict high end hardware demand for the transportation tracking system. One participant from the transport department indicated that the tracking system of the vehicles is not very recent there is need for drones as they can help the unreliable GPS that sometimes has problems in remote areas. The findings indicated that participants argued that if digitalisation is fully implemented along with good logistics the company can benefit from this as it can save much money due to good logistics services and bring in new customers. Three participants showed that reservations towards digitalisation are caused by the threat of cybersecurity reasons they argued that data is not safe so is e-business.

DISCUSSION

The findings indicated computerisation as the backbone of digitalisation and it entails the deployment of information

technology and its accessibility. Similar to the findings from the study are Schuh *et al.* (2017) that observed that firms replace their isolated technology usage with connected business applications a shift to embedded systems is facilitated. In support of the findings are Schuh *et al.* (2017) who argue that computerisation enables the e-business commonly known as e-marketing that is an increasingly popular model for firms to trade and collaborate with chain partners. The findings indicated that the computerisation of services and logistics was important for the company competitiveness. Consistent with these findings are Radivojevic and Milosavljevic (2019), who postulated that the computerisation of services in Industry 4.0 separates companies from their competitors and allows for the management of processes enabling the automatic identification of data allowing for easy data exchange. The findings indicated that the computerisation of services in the manufacturing sector can lead to the revitalisation of the manufacturing industry in Zimbabwe as this service can open up new markets that were formerly demarcated by physical boundaries.

In support of these findings are Wang (2016), who postulated that the computerisation of services is like a wave that knows no boundaries as it allows for automatic identification, Real-time location, automatic data collection connectivity and integration of the data into business services this allows for the break through into markets that were formerly not reachable. The findings indicated that computerisation has led to e-procurement a service that separated the firm under study from its competitors as everything is now procured using the internet and end to end computer use. Consistent with the findings are Chibani *et al.* (2018), who postulated that e-procurement technologies have become popular in manufacturing with manufacturing firms using this technology for e-sourcing, e-auction and electronic data interchange with suppliers online.

The findings from this study showed that technology integration is in its early stages in Zimbabwean manufacturing firms but if this drive continues at the same pace, it can revitalise the manufacturing industry.

Consistent with the study are Xu *et al.* (2015) that postulates that the impact of computerisation and use of internet can be seen in the rise online procurement and purchases as the companies started seeing the internet as opportunity, they integrated the internet and computers into their businesses and implemented e-business. The findings indicated that the company had used computerisation to create and platform to place orders and receive updates on the availability of goods and services this is innovative and not many manufacturing companies in the same line of trade have been able to reach these heights.

In support of the findings are Chen *et al.* (2012), that argue that gaining a competitive advantage in e-commerce means finding a balance of the of the right item price, customer service and delivery time therefore, e-commerce includes innovative and highly scalable e-commerce platforms. The findings indicated that the company is able to fulfil orders through its online services. Consistent with the findings are Yang (2012), that argued that the overall goal of e-commerce is to help companies develop global sales network, and logistics infrastructure that support efficient fulfilment to provide enterprise with information and data of various business activity that is online order activity to minimize business and transaction cost. The implementation of digitalisation in the manufacturing sector in Zimbabwe presents a ray of hope for the revival of the industry that was heading for extinction as the digitalise creates a chance for Zimbabwean manufacturing companies with intensive logistics services to reach new markets and excel.

To revitalise the manufacturing industry through digitalisation of business and the transport system of goods and services in the supply chain Homestyle Bricks has added transparency. This feature of the company comes through online business that can create invoices and online payments. The findings indicated that there is computer to computer services. In line with these findings are Chibani, *et al.* (2018), that postulates that the electronic data interchange used by manufacturers is a computer-to-computer exchange of business documents in a standard format and it enables firms to reduce transaction costs, improve information transparency efficiency. The findings from the study indicated real-time visibility of events as part of the transparency on the company's logistics and delivery of services. Concurrent with the findings are Schul *et al.* (2017)' who postulated by aggregating the real-time information a corresponding contextualisation transparency is enhanced for faster decision making and time effective delivery of services. The findings indicated that the logistics offered by the firm under study has a real-time tracking system that allows the tracking of goods and services between the company and the end user to avoid goods being lost in transit due to unforeseen reasons. Supporting these findings are Ringle (2020), who postulated that firms can locate and monitor the direction of fleet operators and vehicles further allowing for the optimized vehicle scheduling and routing. The integration of these tracking and tracing functions into the company's logistics services have given hope that digitalisation of logistics and manufacturing companies can revitalise manufacturing industry in Zimbabwe due positive feedback and cost and time effective transparent service delivery.

The story of Homestyle Bricks digitalisation is not one without its challenges and complexities. The findings indicated that the integration of Industry 4.0 into the Zimbabwean manufacturing industry has had complexities in terms of inhomogeneous

standards and differing standards across the industries has created discord three participants indicated that of resources on the part of the customers to integrate into e-business has somehow made it difficult for the business to be fully digital and transform the landscape that they hoped to open up new or even foreign markets. Ringle (2020), is in support of the findings by arguing that the integration of Industry 4.0 and smart logistics faced hindrances from lack of resources and understanding of digitalisation on the part of suppliers and end users with some still sceptical and protective about data being at risk. The findings indicated that there were concerns about the suppliers fearing to lose their importance in the future and hence the focus on mechanical advancement of their companies rather than the technological advancement. In support of the findings are Chibani *et al.* (2018), who postulates that there is a challenge resulting from a changing of the balance of power with suppliers afraid of losing their importance as Industry 4.0 is not concerned with their competence. It is understood that if properly integrated Industry 4.0 is the future of the factory and can reconfigure the Zimbabwean industry and create a global landmark on the local scene with a systematised industry well-coordinated and advanced enough to conquer the global market.

The findings indicate the existence of barriers to the implementation of Industry 4.0 and logistics 4.0. Logistics 4.0 has primarily faced challenges in its implementation in the manufacturing sector of Zimbabwe. The high demand for technical and organisation attention has hindered the full implementation of logistics 4.0 into the manufacturing sector of Zimbabwe. Consistent with the findings are Oleśków-Szłapka *et al.* (2019), who argued that Industry 4.0 primarily leads to constantly high demands relating to organisational, technical and software solutions that can be costly at times for manufacturing sectors that have not been doing well after the

pandemic. The findings indicated that the full implementation of Industry 4.0 is hindered by the need for organisational change of concepts and management. Concurrent with the findings are Oleśków-Szłapka *et al.* (2019), who claimed that a company has to change how it operates, its organisation of management and apply latest IT solutions and these include high end software and hardware that is costly in most cases. From the aforementioned it should be noted that the integration of Industry 4.0 is not without its shortcomings it has its difficulties but if they are addressed digitalisation can reposition Zimbabwe's manufacturing sector on the global market and lead to economic growth as digitalised marketing can have a global reach.

CONCLUSIONS AND RECOMMENDATIONS

The article concludes that manufacturing firms needs to digitalise to survive the global wave of technological revolution sweeping across the global village as failure to do so can signal a discord in logistics and the supply chain. The study concludes that Zimbabwean manufacturing firms can either revitalise through clustering or perish in a bid to monopolise their market strength. The study concludes that the expansion of Industry 4.0 has broken down barriers and made it easier for companies to break into new markets and this is just the thing needed by Zimbabwean manufacturing industry to harness e-commerce and reposition the Zimbabwean manufacturing industry on a position that can propel economic recovery and growth. . The study offers the recommendations that follow as shapers of the future direction. The digital transformation of firms is crucial for their survival in the era of the Fourth Industrial Revolution. Regular inspections to evaluate the progress and effectiveness of digitalisation initiatives can ensure that companies are on track to leverage advanced technologies. Such inspections can help identify gaps in infrastructure, skills, or processes and provide actionable insights to address these challenges. Firms

can remain competitive in a rapidly evolving global market, where digital capabilities are becoming a key differentiator, through this approach. This approach is particularly vital for manufacturing industries, where digitalisation can enhance logistics, streamline operations, and improve supply chain management.

Small and medium enterprises often lack the financial resources and technical expertise needed to implement digital transformation strategies effectively. Government assistance in the form of subsidies, grants, or technical support can play a pivotal role in enabling these businesses to adopt new technologies. Such support could include training programmes, access to affordable digital tools, and partnerships with technology providers. Helping SMEs navigate the complexities of digitalization enables governments to foster innovation, boost productivity, and create a more resilient economy. This is especially critical as SMEs form the backbone of many economies and their survival is essential for overall economic growth.

Affordable and reliable internet access is a cornerstone for enabling e-commerce and other digital business models. Governments should regulate internet service charges to ensure fair pricing, particularly in developing regions where high costs can act as a barrier to digital adoption. By making internet services more accessible, businesses can expand their online presence, reach wider markets, and enhance customer engagement. This measure would not only propel e-commerce but also contribute to bridging the digital divide, fostering inclusivity in the digital economy.

The success of digital transformation depends heavily on a skilled workforce capable of leveraging new technologies. Firms should invest in training and development programmes to equip

their employees with essential digital skills such as data analytics, cybersecurity, and artificial intelligence. Continuous learning initiatives can help employees adapt to technological advancements while boosting their productivity and job satisfaction. Moreover, a digitally skilled workforce positions firms to innovate and compete effectively in the global market. Public-private partnerships (PPPs) offer a collaborative platform for fostering innovation and resource sharing in the journey toward digital transformation. Governments can partner with private sector players to develop infrastructure, provide training programmes, or fund research into emerging technologies. Such partnerships can accelerate the pace of digital adoption by pooling resources and expertise from both sectors. Additionally, PPPs can help address challenges such as funding gaps or technological barriers that individual firms may struggle to overcome alone. Encouraging these collaborations allows economies to build strong ecosystems that foster sustainable growth in the digital age.

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