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Industrial Revolution (IR) 4.0: Opportunities and Challenges in Online Business †

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Abstract: This article aims to foster an understanding of Industrial Revolution (IR) 4.0 and the opportunities and challenges it creates for online business. This study employed a qualitative approach using library research. Google Scholar and ResearchGate were used to collect and search past studies. The article selection process focused on relevant recent research and used keywords such as Online Business, Industrial Revolution (IR) 4.0, and Opportunities and Challenges in Online Business. Approximately 80 articles were found in the Emerald Insight database. The ProQuest database contained 20 articles, 100 articles were found in the Google Scholar database, and 10 articles were found in the ResearchGate database. Following the screening, 24 publications were chosen for further discussion. It was discovered that few studies had been conducted on this subject. The results revealed that internet-based companies will be assisted in developing their smartness and efficiency through IR 4.0, also known as the new industrial revolution. Organizations will be able to use data in real time within supply chains and economies that also operate in real time. They will become more sustainable and their operating conditions will improve, earning them the contemporary consumers' trust and loyalty as they offer opportunities for personalization. Online companies were anticipated to grow tremendously because not only were easier and more convenient transactions permitted, but also significantly improved product offerings were made feasible by the IR 4.0 system. Online businesses should seize these opportunities and overcome the challenges to maximize their business performance. When examining the potential advancements, researchers have foreseen that IR 4.0 features both opportunities and challenges, although the opportunities to be gained far outweigh the challenges. Thus, further research should be conducted to gauge the impacts of the opportunities and challenges associated with IR 4.0, and a proper course of action should be suggested.

Keywords: online business; Industrial Revolution (IR) 4.0; opportunities and challenges in online business

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1. Introduction

An unprecedented technological revolution in human history is the fourth industrial revolution; dubbed IR 4.0, it will quickly advance into combinations of digitalization technologies in fields such as engineering, physics, and biology, thereby creating completely new possibilities. Through IR 4.0, a context will be created whereby the production chain's worldwide processes occur both online and physically, blending together into a flexible and seamless system. Not only does IR 4.0 refer to processes and devices that are smart and connected, it also involves a far more expansive mentality and affects profoundly the worldwide structures of politics, society, and economics. Major advantages and a considerable

effect on global economics are likely to result from IR 4.0, while it is simultaneously influencing the realization of a host of innovations in various fields, including quantum computing, gene sequencing, renewable energies, and nanotechnology [1]. After the conceptualization of IR 4.0 was made public in 2011, the concept grew and developed to the extent that some of the theories have become actual applications. The wide-ranging ways that this new industrial revolution has been applied in so many areas has affected approximately everyone, although differently. National and international developments are taking place as people become acclimatized to the realization of IR 4.0. Growing evidence indicates that while innovations have been introduced, there are clear and robust connections between the advancement of technology, government policy, and the market [2].

Academics, business owners, governmental agencies, and public groups continually discuss the issues related to the now worldwide Industry 4.0. Economists, for example, are paying increasing attention to the impacts that the concept of Industry 4.0 is having on international and state economic systems, specific industrial fields, work, and capital markets. Recent years have witnessed a significant change in the worldwide industrial context due to the developments in technology and innovative production processes. Despite the emergence of Industry 4.0 as a concept, this subject has been underexplored by academics. Thus, it has not yet been comprehensively defined, nor has consensus on the topic been achieved [3].

Rapid changes are occurring within the landscapes of many businesses and these extend across the whole value chain. This encompasses research and development (R&D), production, logistics, and customer services, among others, and causes the costs of transactions and deliveries to reduce considerably. Manufacturing is likely to be affected substantially by IR 4.0, which will alter considerably the processes of production, as well as cause real-world and digitized features to converge, thus creating the Internet of Things (IoT), or a universal internet [4]. This development will be controlled in domestic environments despite encompassing every factory-based activity via the internet, because changes to the manufacturing methods can be achieved with the new forms of technology connecting the physical and online environments. All aspects of industry—from the infrastructure of manufacturing to healthcare—will be impacted through this IoT-led process of control. For example, Industry 4.0 can reduce considerably the costs of transactions and deliveries within the commercial field. Secondly, the characteristics of IR 4.0 mean that in terms of investment, technology should be a highly rewarding sector, with substantial future investments potentially enhancing the digitalization and internet segments in particular. Furthermore, an organization can gain a major advantage through IR 4.0, since this concept features the capacity to analyze data in real time. Organizations can also become increasingly visible, monitor activities autonomously, as well as increase their production levels and competitiveness. Organizations, sectors, and countries all rely on innovation. Numerous aspects will potentially be greatly enhanced through IR 4.0, while workplaces will be transformed if it is implemented [5].

Although innovations in technology regularly enhance productivity and make people more prosperous, these can alter at a pace that creates substantial pressures as the labor resources adapt. Considerable injustices could arise from IR 4.0, while it risks dismantling the labor market. If the whole economy features automated replacements for human staff, widespread redundancies will occur. As IR 4.0 progresses, factory staff will adopt modified work roles with new demands, while they will operate in much-changed working environments or organizations compared to those of today. The necessity of finding innovative and successful methods of production, as well as dealing with issues such as uncertain security, aging populations, and climate change, will lead to the robust growth of IR 4.0. Internet-based companies and their proprietors are likely to face both difficulties and opportunities through this revolution. Thus, the objective of this paper is to examine the literature pertaining to IR 4.0 within online business, as well as the business-related opportunities and challenges associated with IR 4.0.

2. Research Methodology

This study used a qualitative method based on library research. Researchers conduct several tasks at this stage of the methodology, including collecting, identifying, analyzing, formulating, and critically evaluating relevant previous studies. Emerald Insight, ProQuest, Google Scholar, and ResearchGate were used to collect and search past studies. The article selection procedure focused on relevant previous studies and utilized keywords such as Online Business, Industrial Revolution (IR) 4.0, and Opportunities and Challenges in Online Business. Approximately 80 articles were found in the Emerald Insight database. The ProQuest database contained 20 articles, 100 articles were found in the Google Scholar database, and 10 articles were found in the ResearchGate database. Following the screening, 24 publications were chosen for further discussion. It was discovered that few studies had focused on this topic. Information from other databases, such as websites and periodicals, was also retrieved. Data was extracted at two levels, namely dimensions and research findings. Through this methodology, it is hoped that this study will assist other researchers to gain a deeper understanding of the topic and draw a comprehensive conclusion.

3. Online Business

Nowadays, most human activities, including those related to business are being supported through technologies. Most businesses employ technologies to connect with almost all their business partners, including their customers. Since the end of 2019, online business has expanded due to the COVID-19 outbreak, during which the world has undergone quarantines, lockdowns, and standard operating procedures (SOP). The ability of organizations and individuals to engage across the globe is perhaps the most important development in an increasingly digitalized landscape [6]. Furthermore, it has been noted that businesses in almost all industries are becoming increasingly aware of the benefits of expanding their services beyond their four walls, practicing contactless transactions, and conducting operations with the use of recent technology. In addition, online businesses have exploited and should exploit technology via the Fourth Industrial Revolution (4IR or IR 4.0) to connect their business systems directly to customers, employees, and suppliers. Machine-to-machine communications (M2Ms) can occur on a large scale with the use of IR 4.0, including features such as fabrication and manufacturing using newly developed forms of smart technology. The Internet of Things (IoT) and industrial Internet of Things (IIoT) have experienced integration, enabling communications to improve, automation to increase, and production to gain far more flexibility, making it possible for products to be highly customized [7]. Online business would exponentially improve due to not only effortless and convenient transactions but also the considerably enhanced product offerings enabled by IR 4.0-related manufacturing and production systems.

4. IR 4.0 and Online Business

One feature of the age of cyber-physical systems is IR 4.0, within which smart devices, systems of storage, and production facilities can become networked. Thus, information can be exchanged autonomously, activities can be initiated, and each part of the network controlled by the others [8]. IR 4.0 has been described as the most recent trend in manufacturing technology automation and data interchange. Furthermore, three key aspects of IR 4.0 have been identified, as follows: vertical and horizontal value chains have been digitalized and increasingly integrated; products and services have been digitalized; and new business models have included innovation and digitalization [9].

Four key implications of IR 4.0 for businesses have been introduced: the expectations of customers, enhancing products, collaborating on innovations, and types of organizations [1]. The demands of consumers are undergoing dramatic shifts, which companies must accommodate if their transparency is to increase and new customer behavioral patterns are to be recognized. The connections between a business organization and its partners will be revolutionized by IR 4.0, so greater customization will come to be expected. Businesses can now provide clients with digital previews of products so that customized

orders can be placed. As a result, Malaysian businesses are being forced to rethink and change the strategies they use to deliver products and services [10].

In recent years, the number of entrepreneurs has grown. The competition platform has also shifted from traditional to digital, allowing companies and businesses to acquire a larger market share by utilizing new technology capabilities. Online business is an example of a digital means of doing business. It also acts as a viable entry point into the realm of cross-border business. The relevance of digitization and the Internet of Things (IoT) to businesses has been underlined by the fourth industrial revolution (IR 4.0). In this context, IR 4.0 allows entrepreneurs to venture into more online business opportunities. Online entrepreneurs can explore other potential jobs and businesses, such as online retail consignor, content creator, and social media influencer [8].

Although it is fairly challenging to transition to IR 4.0, this must be done properly. Online business is one of the opportunities that can be pursued as it allows someone to start an online operation that links them with individuals worldwide. Entrepreneurs can now start their own firms through virtual organizations and no longer need to rely on jobs supplied by the government or private institutions. Through virtual organizations, online entrepreneurs may also be able to offer job opportunities to others.

5. IR 4.0 and Opportunities in Online Business

In the context of business operation, embracing IR 4.0 enables business operations to improve by creating, adopting, and integrating technological solutions. Some businesses may be concerned about the cost and complexity of using IR 4.0 in their online business. However, the adoption of IR 4.0 has created greater opportunities for businesses in terms of increased productivity, improved product quality, lower operating costs, and achieving a competitive advantage. This revolution will increase organizational efficiency by ensuring agility, adaptation, and alignment with other organizations, which benefits businesses by enabling them to acquire a competitive edge [6]. Integrating IR 4.0 technology into any business may require time and effort, but this may be highly rewarding for businesses as IR 4.0 can be used to manage their daily operations and business decisions. Furthermore, IR 4.0 allows businesses to market and compete both locally and globally [11]. It has also been remarked that IR 4.0 can fulfill the customer's needs and meet the demand for company sustainability.

Customers' needs can be fulfilled because of the substantial time reductions, i.e., from when a customer orders a product until it reaches them. The old ways of making phone calls, sending emails, and completing forms are being eliminated from the customer buying process. By simply using technology, the completion time becomes faster and easier, which is convenient for businesses and their customers. In addition, information is easily restored and retrieved, especially for any subsequent orders. Thus, by providing better and more convenient services using IR 4.0 technology, businesses can be more efficient and competitive, resulting in more sustainable and improved organizations. For instance, through the use of artificial intelligence (AI), customer choice predictions and higher profits can be achieved through the consumer insights that can be optimized by company marketers [12].

Moreover, business performance can be improved. Businesses will perform better during IR 4.0. Another benefit they will encounter is the optimization of production [13]. Using nine major technological advances—such as autonomous robots and the Internet of Things (IoT)—IR 4.0 can increase automation and reduce the reliance on people, who are susceptible to making errors. Businesses may utilize big data and analytics to manage large amounts of data, develop insights, and formulate business plans [14]. It has also been noted that machine learning assists businesses to gain an understanding of consumer behavior and be more proactive in adapting their marketing tactics. Using IR 4.0 allows businesses to focus on their core operations. It can also enhance the capacity to boost efficiency and manufacture a wide range of higher-quality items more quickly. Another advantage of IR 4.0 is that it reduces the operating costs due to its higher level of automation, for which

fewer personnel are needed, resulting in less waste and greater efficiency. This aligns with a study which found that IR 4.0 may help to reduce business operational costs [15].

Although all modern-day companies and organizations are unique, each confronts one major difficulty: all must be able to connect to and access up-to-the-minute details involving procedures, partnerships, the items produced, and people. As such, Industry 4.0 plays a far greater role than merely investing in new technologies and tools to boost online business efficiency—it is about transforming the entire way that online businesses run and grow. However, the effects of the fourth industrial revolution are difficult to anticipate, but expectations should be posited in relation to new, unknown inventions that might alter the perceptions of future online businesses. In conjunction with this, the digital factory and intelligent supply chain are possible outcomes.

From the perspective of the supply chain, digitalized factories and smart supply chains form systems of great flexibility, which create automated performance improvements within larger networks, regulate themselves, and learn about changes in actual or near-real time [16]. Additionally, various applications will potentially be possible for any internet-based business. For instance, real and digitalized environments could be integrated. They could also optimize by reducing their use of materials, power, and a human workforce; become more transparent by viewing demand–supply process information in real time; and allow activities to be monitored and controlled to enable their use in internet-based businesses.

Moreover, IR 4.0 will greatly facilitate all internet-based business operations. Digitalizing, automating, making generally autonomous, decentralizing, and personifying the ways to order, store, produce, and distribute products, as well as conduct consumer relations, will enable extensive horizontal and vertical process integration within the digitalized factories and smart supply chains. Table 1 lists the overall advantages of these innovation-based measures [17].

Table 1. Benefits of online business in the IR 4.0 environment.

IR 4.0 and Benefits for Online Business
- Businesses better organized and managed.
- Production procedures better planned and monitored.
- Savings made on raw materials, other items, energy use, and human laborers.
- Shutdown time and manufacturing bottlenecks eliminated.
- Manufacturing procedures continuously transparent.
- Irrespective of location, every level and unit of the company has ready access to information in real time.
- Transport costs saved; logistical improvements made.
- Manufacturing procedures can be controlled from anywhere across the world.
- Total production costs are minimized.
- The ability to manufacture intelligent products.
- R&D and innovation procedures accelerated by using worldwide digital platforms and open innovation methods to create new forms of ecosystems.
- Consumer preference can dictate the manufacture of items that feature personalization.
- Less likely that products will be “missed”.
- Alterations in the demand from the market can be responded to flexibly.
- Consumer interaction occurs during the full cycle of product development
- Operations become more productive and efficient.
- Companies become more competitive.
- Operations have a less negative environmental effect.
- The tasks and actions undertaken become more attractive.
- Human needs can be better met by enhancing the educational and training levels.
- Society enjoys increased well-being.
- More free time.

6. IR 4.0 and Challenges in Online Business

The normal view of any revolution is that challenges will definitely be encountered. From the first to the third industrial revolutions, the world has faced numerous challenges in ensuring that these revolutions keep pace with the current developments and societal will. Industrial Revolution 4.0 is not without its obstacles, which must be handled by all the parties involved if this new industrial technological transition is to be executed optimally at all levels.

Online businesses are no exception as they also face multiple challenges in the IR 4.0 era [18]. Among these are a lack of technical skills, interoperability, and handling data growth [19]. Furthermore, it has been noted that workforce requirements are constantly changing. Business models can only successfully deploy new technology and maintain operations with the correct people and skills. Therefore, taking these developments into account is challenging. A further issue relates to interoperability, whereby protocol, component, product, and system cannot be separated. Interoperability limits companies' ability to innovate.

Since vendors cannot be replaced by others, the components of a system cannot easily be upgraded, which is a drawback of interoperability. Thus, this is another challenging factor to consider. This article notes other difficulties [19], such as the capacity to handle the growth in data: depending increasingly on artificial intelligence means the faster generation of greater volumes of data and its presentation in various forms. Addressing this is likely to overwhelm many businesses. Systems of artificial intelligence need to feature greater simplicity so that such extensive amounts of data can be managed. Furthermore, any algorithm needs to be able to combine various forms of data covering different ranges of time. Therefore, a further issue needs to be taken into consideration. Although AI is expected to supersede human capacities in every walk of life between 2020 and 2060, this is also considered a warning sign and may create some obstacles for humanity in the future [20]. Moreover, it has also been stated that AI machines could potentially be used irresponsibly and harmfully because they might attract criminals [21]. Therefore, there is no guarantee that technologies can be fully trusted without humans playing a role.

The internet is an important medium in businesses, especially online operations. However, cyber security requires serious attention as it could create some potential drawbacks for businesses. For example, cyber risk is one of the challenges that should be addressed in any assessment of an organization's IR 4.0 readiness. Contingency plans must be established to prevent exposure to cyber attacks such as from hackers, virus transmission, data breaches, and cyber extortion because cyber risk is caused by online networks, online traffic, and personal information being kept on the internet [6]. The safety and security of systems is also a concern. Unauthorized access causes technological difficulties during production since confidential data could be collected and disseminated without authorization, while the ability to adjust the production process content may be lost due to security breaches. This will endanger production, risk the loss of the consumer's trust, cause significant financial losses, and compromise the organization's reputation. To limit the dangers of misuse and illegal access, companies must maintain contingencies or a recovery backup plan [22].

Another factor that contributes to the challenges of Industry 4.0 is the lack of knowledge of how to adapt to IR 4.0 [23]. This knowledge gap is also a significant reason for the current employees' capacity to perform certain tasks. Employees possess a wide range of competencies and skill sets, but it has been revealed that they do not usually possess the amount of knowledge required for the adoption of Industry 4.0. It has been found that they need to know more about IR 4.0 and gain a better knowledge of what it implies. Understanding and knowing about the concept of IR 4.0, as well as planning for it, are critical for success. However, this requires new skills and continuous learning. It is recommended that training is conducted to teach people how to perform their job tasks smoothly and facilitate the change process [24]. Table 2 summarizes the challenges of IR 4.0 in the context of online business.

Table 2. Challenges to online business in the IR 4.0 environment.

IR 4.0 and Challenges for Online Business
- Lack of technical skills.
- Lack of interoperability.
- Lack of skills in handling data growth.
- Workforce requirements are constantly changing.
- Protocol, component, product, and system not separated.
- Interoperability limits companies' ability to innovate.
- Interoperability limits the possibilities of upgrading system components.
- Lack of contingency plans for cyber risks.
- Unauthorized access causes technological difficulties during production.
- Confidential data is collected and disseminated without authorization.
- The ability to adjust the production process content is lost.
- The lack of knowledge about adaptation to IR 4.0.

7. Conclusions

In summary, this preliminary study obtained various insights on IR 4.0, its opportunities, and its challenges in relation to online business. The study included an introduction and covered online business, IR 4.0, and the associated opportunities and challenges. The findings from the existing literature show that IR 4.0 has created opportunities and challenges. Internet-based companies will be assisted in developing their smartness and efficiency through IR 4.0, also known as the new industrial revolution. Organizations will be able to use data in real time within supply chains and economies that also operate in real time. They will become more sustainable, and their operating conditions will improve, earning them contemporary consumers' trust and loyalty as the companies offer opportunities for personalization. Nevertheless, it is crucial to remember that the advancements involved in this industrial revolution will impact the reality of the future. Moreover, the developments will impact trends of demography, environmental conditions, and the geopolitical sphere, creating new patterns and behaviors within societies and cultures. Therefore, the ability to be prepared in advance for these scenarios should also be considered, as the reduction of the incoming dangers will be critical for future and current generations. Despite the challenges that must be faced by proprietors, these are outweighed by the opportunities to sustain their business and improve performance. To achieve both of these, online businesses should take advantage of the opportunities and overcome the challenges. Further research could be conducted to foresee IR 4.0 impacts on online businesses to enable owners to further improve their business operations while adapting to this industrial revolution. Meanwhile, future studies could investigate the perceptions of internet-based business among the older generations, as well as ways it might be beneficial for them. IR 4.0 has been linked with causing various contemporary problems, including rising job losses; the stratification of society; security threats associated with cyber-attacks; infractions of the rules of privacy, ethics, and society; the dangers of new wars based on invention; as well as a widening rich–poor division in national terms. The truth of these contentions could be investigated in future research.

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