



UPSKILLING AND RESKILLING REQUIREMENT IN LOGISTICS AND SUPPLY CHAIN INDUSTRY FOR THE FOURTH INDUSTRIAL REVOLUTION

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ABSTRACT. Background: For years, the logistics and supply chain industries have been optimized to reduce cost, minimize the carried inventories and increase the efficiency of assets utilization. Besides that, the impact of industrial revolution 4.0 (IR 4.0) has queried for more new skills for a more demanding job scope. In particular, many traditional operation methods have been gradually replaced by automation-based operation. Hence the requirement for upskilling and reskilling became appealing. The present paper discusses the role of upskilling and reskilling during IR 4.0, a method to implement upskilling and reskilling training, the role of the Human Resource Development Fund (HRDF), as well as the challenges faced during the implementation of reskilling and upskilling in the logistics industries.

Methods: Inductive reasoning is employed in the paper, which is backed up by a study of related scholarly journal papers to uncover the Malaysian upskilling and reskilling requirement in the logistics industry during IR 4.0 from both intrinsic and extrinsic lenses.

Results: The paper claims that changing the workplace and workforce, increase employees competitiveness and cost-effectiveness in long term is the main importance of upskilling and reskilling. Nevertheless, firms cannot disregard the needs for technical and human skills as well as the HRDF initiatives. These include the creation of a digital culture with the right training and development to uphold the local experts.

Conclusions: Despite the paper's qualitative approach, the findings will provide a clearer understanding of the upskilling and reskilling requirements for IR 4.0, as well as a foundation for future study. This paper proposes an alternative strategy to diversify the economy and enter IR 4.0 for a developing country that is dependent on a non-renewable source.

Key words: upskilling, reskilling, IR 4.0, logistics management, supply chain management.

INTRODUCTION

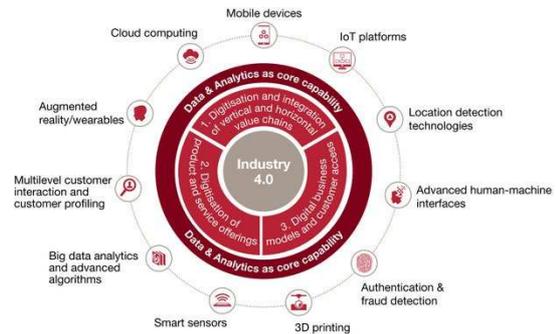
The term "IR 4.0" refers to a new phase of the industrial revolution that emphasises interconnectedness, automation, machine learning, and real-time data. If Industry 3.0 was concerned with the automation of single equipment and operations, IR 4.0 is associated with the end-to-end digitisation of all physical objects and their transformation into digital ecosystems with supply chain partners [Morgan 2019]. IR 4.0, also known as the internet of things (IoT) or smart manufacturing, combines physical production

and processes with smart digital technology, machine learning, and big data to give manufacturing and supply chain management companies a more holistic and connected world. In brief, many activities that once involved humans can now be completed by automation and digitization. Employees have to adapt to such technological changes; for instance, they need to learn how to employ big data and machine learning to cater for technological advancement. Despite that, the majority of Malaysian employment is still relying on semi-skilled employees, while the proportion of skilled employees in Malaysia is at about 28 percent. This number definitely has

to be improved to cater for IR 4.0 development [John 2020].

Five main innovations are projected to have a major effect on logistics and supply chains and are currently at various levels of preparation and implementation across business sectors: IoT, artificial intelligence, autonomous robotics, enterprise wearables, and additive manufacturing [World Economic Forum 2017]. A wide variety of these innovations are now influencing manufacturing processes, logistics, and supply chains. Consumer expectations for goods, factory operations and footprints, and industrial supply chain management are all being reshaped to unparalleled degrees and at the greater speed [Wahab et al. 2020]. Thus, industry experts and leaders believed that IR 4.0 such as automated robots, autonomous systems, and additive manufacturing would revolutionize conventional methods of generating value.

In general view, IR 4.0 is driven by three main elements that are (i) digitisation and integration of vertical and horizontal value chains; (ii) digitisation of product and service offerings; and (iii) digital business models and customer access [Geissbauer et al. 2016]. IR 4.0 digitizes and incorporates operations vertically through the whole organization, starting with product production and ordering and continuing across processing, logistics, and operation. Meanwhile, horizontal integration extends beyond corporate processes to include all core supply chain players, from suppliers to end consumers. It encompasses systems ranging from track and trace technology to real-time automated preparation and execution. The second element which emphasized product digitisation involves both the addition of existing products, such as the addition of smart sensors or contact systems that can be used for data processing software and the development of new digitised products that rely on fully automated solutions [John 2020]. The last element focused on providing disruptive digital solutions such as complete, data-driven services and integrated platform solutions. Figure 1 presents IR 4.0 framework and contributing digital technologies.



Source: Geissbauer et al. 2016

Fig. 1. IR 4.0 framework and contributing digital technologies

IR 4.0 innovations are changing just not the logistics and supply chain environment, but also the world of work. According to a study conducted by Bank Negara Malaysia in 2018, 54 percent of Malaysian employees will be automated in the next 10 to 20 years. In order to adapt to these unavoidable shifts in the workplace, talent upskilling to keep up with digitalization trends is becoming more important than ever [Ramasamy 2018]. In 2020, Randstad Malaysia has carried out an online study with Malaysians to learn about the local workforce's attitudes toward the labour market as well as the difficulties and experiences of job seekers so far. The study's findings revealed that 91 percent of respondents plan to re-skill and upskill themselves, 55 percent are doing so to prepare for how robotics and digitisation will impact their future, 21 percent are looking to improve their occupation or sector that they work in, and 13 percent are afraid of losing their current job due to redundancy. Digital capabilities are critical for moving forward in IR 4.0. Although every business and organization are heading toward digitalization, they all face the same challenge: the need for connectivity and real-time insights through operations, collaborators, goods, and individuals [Randstad Malaysia 2020].

UPSKILLING & RESKILLING OVERVIEW

Cambridge dictionary defined the ‘reskilling’ as the procedure that learns a new skill that enables people to do a different job or give guidance to other people to do a different job; meanwhile, ‘upskilling’ refers to the procedure of learning a new skill or training employees with new skills. Upskilling and reskilling are important during IR 4.0 as most businesses have undergone a significant shift towards digitalization. For instance, IR 4.0 brings the revolution of technology and change the job scope/job profile more towards the internet base or automation base [Sima et al. 2020]. In fact, some of the conventional jobs will turn redundant. Hence, the knowledge and the skill of the employees need to be updated and always explore the new thing in order to stay competitive in the current working environment and for the future career life. The area to reskill and upskill during IR 4.0 may include but not limited to big data analysis, the IoT, app and web-based operation, machine learning, and cloud computing.

To minimise such technological change accompanied by a shortage of talent, mass unemployment and increased inequality, the companies (employers) must hold reskilling and upskilling training to the existing employees. In this regard, the government has the responsibility to cultivate awareness of reskilling advantages, training opportunities, as well as encourage employers to re-train their employees [McKee and Gauch 2020]. In Malaysia, various efforts have been done by the government to assist people in upskilling and reskilling. Back in the year 2015, the Malaysian Federal Budget already announced an employment insurance scheme that will help the employees that are retrenched by the company to do the reskilling and upskilling as reported by the Malaysian Trade Union Congress (MTUC). Alike, the MTUC hopes to help various departments such as the Department of Trade Unions Affairs and Labour Department doing the reskilling and upskilling for the employees in order to prepare for the future of work in the context of IR 4.0 [MTUC, 2018]. In recent years, the Ministry of Human Resource (MoH) indicated

that the Manpower Department Training Institutes (ILJTM) will provide training to assist the employees to upskill, reskill and obtain relevant qualifications that enable them to benefit their career or reskilled for another job [Sivanandam 2019]. The training is expected to assist the Malaysian to face current and future job demand.

METHODOLOGY

In this study, an inductive reasoning approach was used to determine the upskilling and reskilling requirements in the logistics industry during IR 4.0. Since inductive analysis is seldom used in logistics studies, they suggest that more inductive research be conducted so that the findings may create a common and comprehensive understanding [Kovács and Spens 2005]. Instead of using an idealisation method, as suggested by Ketokivi and Mantere [2010], this study employed an empirical and theoretical contextualisation reasoning approach. An empirical contextualization is carried out with the help of contextual and reliable evidence obtained from previous empirical data. The findings of this study were derived from a relevant definition, which was then applied to the relevant theoretical discourse in terms of theoretical contextualization. Due to the shortcomings of the idealisation method, as well as a lack of analysis and familiarity with the logistics industry's upskilling and reskilling requirements during IR 4.0, a contextualisation approach was developed using specific upskilling and reskilling, logistics industry, and IR 4.0 literature.



Source: Kovács and Spens 2005

Fig. 2. Inductive reasoning process

THE IMPORTANCE OF UPSKILLING AND RESKILLING FOR IR 4.0

Reskilling and upskilling are important to increase company productivity. Research done by Mgiba [2019] indicated that upgrading the existing skill or learning a new skill and increase the knowledge will benefit the individual to be successful in the current working industry or moving to a new position. Moreover, the author also stated that reskilling and upskilling can help the sales and marketing personnel to put more attention on the customer and market, more agile and can be more flexible when facing the changes. In fact, reskilling and upskilling will help to maintain the company sustainability and reduce the hiring cost. The company sustainability can be ensured since the employees who have gone through the reskilling and upskilling training able to match the current business need.

Conduct the upskilling and reskilling training also enable the company to show their concern on the employees' career and their future and to make sure their skill would not turn obsolete. By adopting reskilling and upskilling in the workplace, it will increase motivation, enhance the employee experience, and encourage a higher level of loyalty. The company whether can conduct the training in technical skill and soft skill in order to enhance their ability to work under pressure work and built a strong relationship to the colleague or client. Moreover, learning the different skills bring opportunities for the organizations as well as employees to do better performance and stay throughout the long journey [Nayak 2018]. The importance of upskilling and reskilling towards IR 4.0 from various specific perspective are discussed below:

A Changing Workplace and Workforce

With the implementation of IR4.0, most organizations are attempting to carry out digital transformation in their workplace. The application of advanced technology in the market, such as artificial intelligence, nanotechnology, quantum computing, synthetic biology, and robotics, is regarded as the beginning of IR 4.0 and will gradually

overtake manufacturing technologies developed over the last sixty years [Ghobakhloo 2018, Morgan 2019]. Based on the analysis done by the World Economic Forum, the majority of employers' re-skill and upskill work still concentrated on a small number of existing high-skilled and high-value employees. However, to truly meet the challenge of formulating a successful employee strategy for IR 4.0, industry leaders need to view the human capital investment as an asset rather than a liability [World Economic Forum 2018].

Increase Employees Competitiveness

The company should provide reskilling and upskilling support to its workforce to ensure its competitiveness in this industry. Adopting reskilling and upskilling in the workplace can boost morale, improve the employee experience, and foster a higher degree of loyalty. Furthermore, learning new skills allows the management and employees of a company to improve their work productivity and remain on the job for a longer period [Nayak 2018]. Almost 70 percent of employees said that the training provided by their companies has resulted in brighter professional opportunities in their relevant fields, and 60 percent of employees accepted that enjoyment at work is linked to job learning and development opportunity.

Cost-Effective in Long Term

According to Eshna [2019], if the company replace the salaried employees, it will cost about 6 to 9 months of salary for recruitment. For example, if a company intend to fire an employee who earns about 60,000 per year and recruit the new one, it will cost about 30,000 to 45,000 for recruiting and training. This percentage will be higher based on the educated level and senior-level position. Although the companies still must put more time and money in reskilling and upskilling training, the gained skills always lead to cost-saving in the long run. Moreover, the costs in hiring a new employee involve recruiting, advertising, training, interviewing and so on. Therefore, conduct reskilling and upskilling will reduce the cost of hiring and invest the

money in the right place. This will lead to an increase in future productivity level and future profits.

REQUIREMENTS AND INITIATIVES FOR UPSKILLING AND RESKILLING

Requirements for technical and human skills

Physical engineering, biotechnology, and emerging innovations, such as artificial intelligence (AI), Internet of Things (IoT), big data analytics (BDA), automation, cloud technology, virtual reality, and high-speed mobile Internet, are driving the IR 4.0 (Butt, 2020). These technologies, especially automation and AI, have changed and disrupted the way businesses work, and they are also having a significant impact on how businesses interact with employees in order to enhance efficiency, quality, and safety [Ling and Wahab 2020, Rotatori et al. 2020].

Despite the upbeat outlook, technological advancement has resulted in the abolition of certain job functions and the development of new ones. As a result, in order to stay competitive, businesses must persevere and implement effective training programmes for upskilling and reskilling their current employees [McKinsey Global Institute 2020, Nier et al. 2020]. Current employees must be educated and exposed to the new skills that are needed as a result of the companies' adoption of new technology. Technical skills and human skills are two skill sets that businesses should develop in their employees. According to Kipper [2021], employees with technical skills or hard skills are capable of analysing data, developing software, and detecting system issues, improving security, and maintaining it. Due to a lack of experts, especially in AI and automation programming, IR 4.0 has led businesses to recruit external talent to train and equip employees with the required technical skills to simulate a real work environment [World Economic Forum 2018]. Human skills, on the other hand, are an important component of IR 4.0 [Oztemel and Gursev 2018]. Despite the fact that machines have taken over the

majority of logistics operations, human involvement is still needed because human skills such as critical thinking, emotional intelligence, leadership, empathy, and initiative cannot be replaced by technology. Analytical and problem-solving abilities, as well as adaptability, versatility, creativity, and the ability to work multidisciplinary, are the skills that will keep employees important to the company even as AI and automation overtake their job functions [Rotatori et al. 2020].

Most employees have both technological and human abilities, and they are both inborn in them. However, the arrival of IR 4.0 necessitates upskilling and reskilling. To resolve the current situation, businesses play a critical role in determining the requisite skills based on the various techniques that an organisation employs in order to advance employees' skills to the next stage [Kipper 2021]. Since each employee has unique characteristics and abilities, the human resources unit of a company should be in charge of identifying and implementing the necessary upskilling and reskilling programmes in order to fulfil and utilise employees' hidden abilities. Fostering these abilities is critical in assisting employees in becoming more secure in the age of IR 4.0 and being prepared for the technological ability set requirement transition [Butt 2020].

In the IR 4.0 environment, previous research on technical and human skills identified these two skills as critical skills that needed employees to promote upskilling and reskilling. However, given that young and experienced employees have different sets of skills based on their job experiences, it is not suitable for all employees. Younger employees are more open to learning new skills and knowledge, particularly when it comes to technology adoption. Experienced employees, on the other hand, have a difficult time learning a new skill, especially when it comes to technology adoption. Similarly, experienced employees with valuable expertise can find their skills becoming increasingly obsolete. This could result in a lack of participation on both sides [Oztemel and Gursev 2018]. To address this issue, businesses should conduct an ability gap review. It is a mechanism in

which an organisation is responsible for identifying the skills gap between what is required and what is available in the IR 4.0 setting in order to maintain company development and performance. The analysis can be carried out by proper knowledge exchange management and knowledge skills, which are essential to ensure that information is transmitted smoothly [Bahar et al. 2020]. In the same way, this analysis can be done on two levels: organisational or departmental level and individual level. An assessment of integrated abilities at the organisational or departmental level is used to determine a team's capability in completing a project or meeting expected potential business objectives. On the other hand, at the individual level, it is an assessment of a specific employee's abilities in relation to the present and potential demands of their job functions. It can be decided by a performance assessment and interview for current skills, but it can be determined by consideration of the company's mission and priorities for future skills. This skill gap review can be done internally or by an outside consultant, and it's a great way to evaluate the employees' abilities for reskilling and upskilling [Doherty and Stephens 2021].

Evidently, a business may use competency management software (CMS) to monitor employee competencies, conduct online training, and map out the skillset required for each employee. According to Wahab et al. [2021], when employees are assigned a new job role without the necessary skills due to a lack of company support, it can be a risk to the company, particularly in the manufacturing, construction industries, and healthcare. CMS assists the company in forecasting potential risk, allowing the appropriate department within the organisation to take the required steps to prevent any potential issues. This form of software can also be set up so that employees can see appropriate training and optional skills. It allows employees to increase their worth as employees by upskilling and rescaling. Most significantly, CMS can be used to forecast potential ability requirements by making upskilling and reskilling as a routine company procedure [Bohlouli et al. 2017].

Initiatives funded by the Human Resource Development Fund (HRDF)

The Human Resources Development Fund (HRDF) was established in 1993 to provide various training and development programmes for employees throughout the country in order to upskill and reskill their skills in order to meet current business needs and strategies, especially in the era of IR 4.0 It is important to improve employees' skills in order for them to be more competitive and valuable in the job market [Azizan et al. 2021]. HRDF is committed to achieving its vision of being the country's leading authority on human capital growth by providing learning and human resource development through funding, skills enhancement training, evaluations, promotional programmes, and education. The HRDF is a pool of funds made up of HRD levies raised from manufacturing and service sector employers. HRDF requires any employer to register to ensure the employees' welfare is defended. HRDF is the entity under the MoH that is in charge of training the existing and future workforce to help Malaysia become a high-income economy. When an employer fails to comply, they will be fined RM10,000 in the situation where they attempt to delay or ignore the monthly grant request [HRDF 2021].

Malaysia's government has mandated the establishment of the HRDF. As a result, businesses that fall into the government's designated category must participate in this initiative. The HRDF invests directly in numerous upskilling and capacity-building programmes for all industries, as well as technical training courses, in order to expand the country's skilled workforce [Azizan et al. 2021]. The ultimate aim is to bind employees together and train them for potential industrial demands (i.e., IR 4.0). The HRDF offers a variety of skill-building programmes that support employees. For example, HRDF is responsible for providing resource-rich information sharing and, as a result, creating a skill development atmosphere for employees across the country in order to create

a professional and resourceful workforce [Man 2020].

As a result, HRDF will continue to be a key player in efforts to provide appropriate training for Malaysian employers and employees as they prepare for the arrival of IR 4.0. The use of emerging technology has reshaped the future of jobs since the introduction of IR 4.0 in 2011. This is because automation and AI have reduced the need for employees to perform repetitive tasks, resulting in higher company productivity and, as a result, a slowing economy [Man 2020]. HRDF is emphasising the requisite training set to equip employees with the right skills and resources needed by businesses in meeting the IR 4.0 environment, as the use of automation and digital technology grows. According to a survey conducted by the World Economic Forum in 2018, IR 4.0 will develop new work roles that will involve new skills, as well as change the way employees conduct themselves in day-to-day operations. As a result, HRDF takes the lead in ensuring that local employees are adequately trained by supplying and educating them with a set of training aimed at reducing their reliance on manual labour [HRDF 2021].

To date, HRDF has developed the Industrial Skills Framework (IndSF) to identify and analyse the appropriate upskilling and reskilling programmes that employers and employees need in order to prepare for IR 4.0. HRDF is currently assisting the country in achieving IR 4.0 by providing training and funding to ensure the growth of high-impact human resource initiatives. The HRDF's strategic map initiative was created to enable more employers to train their employees to deal with the digital age [John et al. 2020]. Adequate upskilling and reskilling training is critical, particularly in the private sector, to ensure that employees are prepared to work in the IR 4.0 environment. Without a doubt, HRDF has worked with a variety of stakeholders, including the Ministry of Higher Education, industries, and the private sector, to create more dynamic upskilling and reskilling training programmes for employees to keep their skills up to date. For example, the HRDF sectorial training committee was in charge of

establishing the IndSF and advising on the relevant training and activities that the industry considered necessary to meet the IR 4.0. As a result, both the private and public sectors in Malaysia must recognise the importance of skill creation for their employees in order to remain competitive [HRDF 2021].

Similarly, HRDF offered training and development for recent graduates in an attempt to better prepare them with the necessary skill sets to reach the job market [Doherty and Stephens 2021]. In 2016, the Graduates Enhancement Programme for Employability 2.0 (GENERATE 2.0) was launched with the aim of increasing graduate employability by providing them with industry-required skill sets. HRDF also supports disabled people, housewives, and seniors through other programmes. Among the initiatives include, OKU Talent Enhancement Programme (OTEP), Housewives Enhancement and Reactivate Talent Scheme (HEARTS), and National Dual Training System (SLDN) [HRDF 2021].

HRDF has been recognised as Malaysia's leading training service provider, offering more than 15 different types of IR 4.0-related training and development services, including cloud computing, BDA, IoT, cybersecurity, vertical integration, robotic automation courses, and digitalization. Similarly, HRDF is funding training and development initiatives to prepare for the IR 4.0 climate. HRDF, for example, has set aside RM203 million for computer and data professional training and advancement, gender empowerment, data science leadership, and the provision of essential technical skills in information and communications technology [HRDF 2021].

Malaysia is expected to be among the top 20 high-income developing countries in the world by 2050. To achieve this, approximately 43 percent of local employees must be professional employees. At this time, the nation only has 28 percent of qualified employees [John et al. 2020]. With the advent of IR 4.0, Malaysian businesses must be better positioned to achieve a qualified workforce of 35 to 40 percent in order to achieve the status of a developed economy by 2050. Hence,

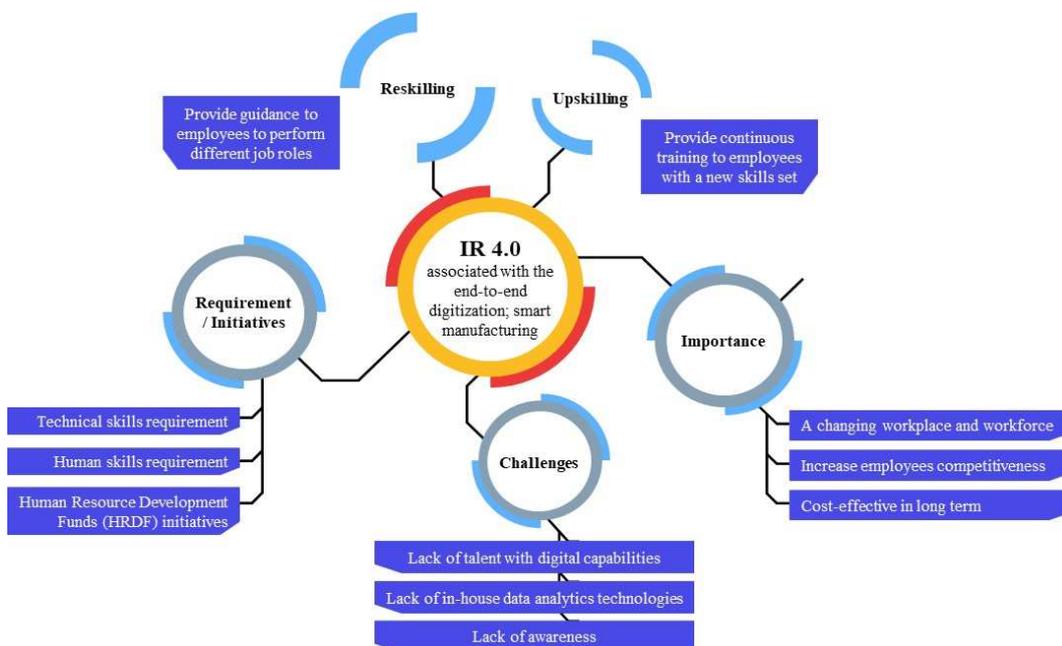
employers must ensure that their employees are reskilled, upskilled, and multi-skilled in order for them to be ready to face and adapt to the IR 4.0 world. Employers must also be dynamic and go above and beyond in training their employees for the IR 4.0 climate in order to stay competitive.

CHALLENGES IN UPSKILLING AND RESKILLING FOR IR 4.0

IR 4.0 has far-reaching consequences for the way an organization organizes itself and its distribution model. Companies will need talent with the capabilities to exploit emerging innovations as they become more widely embraced. Companies must ensure that their employees appreciate how the company is transforming and how they can participate in it. With technical advances emerging at a growing pace, companies are finding it extremely difficult to locate talent with the necessary competencies. According to Geissbauer et al. [2016], the most complex difficulties is the absence of digital culture and the right training. In fact, in the marketplace is a rising expertise gap between what businesses need and what talent can provide.

Next, the most significant obstacle in upskilling and reskilling is lack of expertise or competencies in the company's workforce. Aside from individual competencies, organizations must be ready to re-skilling their employees to be IR 4.0. For an instance, it is important to develop in-house data analytics technologies and expertise levels for increasing data analytics capabilities. External partners are also playing their role to support in upskilling and reskilling, such as providing technologies or training, as well plan to acquire outside companies by merge and acquisition [Bahar 2020].

Furthermore, experts and efficient data analytics are needed for data to be used to generate value. This is because data is the entry from a variety of sources in various formats, and there is a need to merge internal data with data from external sources. Thus, another hurdle needs to be faced by organizations. With too many entry points, businesses must take a robust, constructive approach to data protection and related issues, as well as strive to create digital confidence. Besides that, the rise of new ecosystems and the widespread use of data poses serious concerns about cybersecurity. More data collection and exchange touchpoints mean more possible points of entry for an attacker.



Source: original

Fig. 3. IR 4.0 reskilling and upskilling model

Companies would simply not be able to accomplish advanced digitisation without a significant number of efforts in upskilling and reskilling. Over the next five years, advanced deployment of IR 4.0 will become a 'qualifier to compete,' as well as a 'qualifier for financing'. Companies that have not kept up will not only struggle to retain market share but will also face higher capital financing costs. To summarise, Figure 3 depicts IR 4.0 as a basis, as well as the reskilling and upskilling requirement and initiatives, its importance and challenges of IR 4.0.

CONCLUSIONS

This study adopted inductive reasoning methods to assess the criteria and obstacles for upskilling and reskilling in the era of IR 4.0 within the logistics and supply chain industry. The paper met its objectives by describing three key aspects of the logistics industry's upskilling and reskilling requirements in the IR 4.0 era. Two upskilling and reskilling programmes were also highlighted as possible solutions for the logistics industry during IR 4.0. Additionally, a few challenges relating to upskilling and reskilling requirements are also being discussed.

The findings of this study can help practitioners, the private and public sectors, as well as academics, gain a better understanding. Although the focus area for this study focusing on the Malaysian context, the finding might also be useful particularly for the emerging countries. It's because this research could serve as a foundation for potential upskilling and reskilling research in the logistics industry, as well as probably other industries, during IR 4.0. Since this study attempted a basic evaluation of upskilling and reskilling in the logistics industry during IR 4.0, practitioners would have a better understanding of the need for and value of upskilling and reskilling during IR 4.0. Furthermore, the issues raised here can prove to be useful information for top management in making more strategic and creative decisions

Nonetheless, more empirical evidence was required to prove the study's reliability and validity. Furthermore, since it is confined to the logistics sector, future research should take a quantitative approach and a more applied study should be conducted. Future research may include focus groups or panel interviews to produce more significant insights into the logistics industry's upskilling and reskilling expertise during IR 4.0. Despite its limitations, the study certainly added to our understanding of the logistics industry's upskilling and reskilling needs and challenges during IR 4.0. It is hoped that this research would add to the growing body of information in the upskilling and reskilling literature while also broadening the reach of logistics research.

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