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WORKFORCE ADAPTABILITY AND LEARNING CURVE IN THE ERA OF INDUSTRY 4.0: AN ECONOMIC STUDY

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Abstract: *The purpose of this study is to examine the factors influencing the workforce's adaptability in digitisation and technological manufacturing system. This research used logit to model the relationship between reward, training, employee resilience, knowledge sharing, age, probationary period, working experiences and workforce adaptability. By using a purposive sampling technique, a cross-sectional survey was conducted with a sample of 140 workforces working in American MNCs in E&E sectors at Penang, Malaysia. Results indicated that training, knowledge sharing, age, probationary period, and working experience are influencing workforce adaptability. Reward and employee resilience have no relationship with workforce adaptability. The study may be useful to the government and organization to prepare the talents for the opportunities of Industry 4.0 and enhance the competitive advantage of an organization. The study that related to workforce adaptability in the Industrial 4.0 era is rather limited. This research makes an early contribution to the area by providing an empirical research result based on the primary data collected from American MNCs at Penang, Malaysia.*

Keywords: *Adaptability, Learning Curve, Industry 4.0, Knowledge Sharing, Training, Employee*

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Introduction

With the rapid pace of robotics and artificial intelligence (AI) innovations, labour-intensive manufacturing is gradually transitioning to the knowledge-intensive system (Sani, 2017). According to BCG (2015), IR 4.0 would cause a rise in labour demand in the mechanical engineering sector in German manufacturing for at least 10 percent over the next ten years (Rubmann et al., 2015). It is expected that the trend will soon be seen in Malaysia. Many organizations find it difficult to obtain or upskill and reskill the current workforces to adapt to and keep pace with the accelerating change.

Workforce adaptability often defined as "the attributes that individuals need to successfully engage in tasks inherent in mini-cycle transitions and maxi cycle stages" within the field of careers (Savickas, 2005). The workforces need to adapt to the change implemented, which is complex as the whole organization has to be actively involved in the digital transformation process (Balasingham, 2016; Davies, 2015). This has contributed to the pressure of adaptive change needed in the organization and employees (Ployhart & Bliese, 2006).

The manufacturing sector is the main contributor to the Gross Domestic Product (GDP) in Malaysia, mainly supported by the increase in the sales of E&E products (Trading Economics, 2019). Economics Impact Survey (2018) predicted that the E&E industry will generate a Gross National Income (GNI) impact of USD12.7 billion and create 157,000 jobs in Malaysia by 2020. Nonetheless, Malaysia is still at the infancy stage in terms of leveraging new technologies and processes. The ability of the workforce to adapt to the future employment landscape is still uncertain (Blann, 2017). The reasons are due to the lack of knowledge and the needs of high expenditure and capital cost for employee's training and upskill (Jacobs, 2017; Sangeetha Amarthalingam, 2017). To some extent, training is seen as a cost instead of investment for some employers (Wong, 2016).

It is imperative for organizations to redesign the jobs and implement training to ensure the workforce can remain resilience and relevant in this high digitisation world (Tristan, 2018). Additionally, leveraging the monetary and non-monetary rewards will also help organizations to retain skillful and talented workforces (Agolla, 2018). To sustain the sector's competitive advantage, the right skillsets are required in the on-going learning effort of the workforce (Marr, 2018) as it provides advantages in the rate of knowledge creation and cost reduction over the life cycle of products (Hatch & Dyer, 2004). As such, the learning processes that involve critical thinking and automation skills are the main drivers to stay competitive in the era of IR 4.0.

There is a lack of research that investigates the drivers of workforce adaptability and learning curve in the era of IR 4.0 (Krachtt, 2018; Muller, Kiel, & Voigt, 2018), especially for developing countries. Further, the overall emphasis of this paper on workforce adaptability and learning curves is aligned with Malaysia's goals in transforming the manufacturing landscape to align with IR 4.0 over the next few years. Hence, this study intends to identify the factors that would influence the level of workforce adaptability and learning process in the digitisation and technological manufacturing system in place to grab the opportunities arising from IR 4.0.

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Literature Review

Learning Curve Theory

Learning curve is denoted as the experience curve, or the productivity curve (Chambers & Johnston, 2000). The learning curve effect occurs when the workers learn from performing a repetitive task and time taken to complete the task decrease with each additional time they perform as they have become familiar with the tools and process. The cost per unit decreases at a decreasing rate as the manufacturers increase the production quantity. It enables the organization to attain economies of scale and achieve a competitive advantage by turning the cost reduction into productivity gains.

Learning curve has an inverse relationship with adaptability where the shorter the learning time, the higher the adaptability. According to Griffin & Hesketh (2003), adaptability leads to familiarity with change-related activities and can increase the ease with which change is performed in similar situations in the future. This is also illustrated by the study from Petrou, Demerouti, Peeters, Schaufeli, & Herland (2012) where the accumulation of new skills promotes better performance and efficiency of workers.

Higher adaptability has been reported as bringing better employee performance (Akca, Ozer, & Kalaycioglu, 2018), increasing employee productivity (Sabir, Akhtar, Bukhari, Nasir, & Ahmed, 2014) and leading to competitive advantage (Tariq, Sohail, & Aslam, 2011). In this study, adaptability is served as a proxy for workforce performance or productivity.

Several well-identified studies found that factors such as the structure of training programs, worker's motivation in performing the tasks, prior experience in the task and task complexity will impact the worker's learning process (Anzanello & Fogliatto, 2011). A comprehensive understanding of the workforce learning curve and the factors that impact the worker's learning process can contribute to management decision making in implementing and upgrading the information technologies in the organization to yield better productivity (Ngwenyama, Guergachi, & McLaren, 2007).

Workforce Adaptability

Adaptability is the ability, willingness and/or motivation of a person to alter or fit different social, environmental and task requirements (Ployhart & Bliese, 2006). It can also be characterized as the underlying capability of employees to efficiently adapt and/or predict task-related, environmental and occupational demands based on the cognitive, affective and behavioural resources (Van Dam, 2009).

The level of adaptability of an employee determines productivity (Akca et al., 2018; Ngwenyama et al., 2007; Rok Crenar & Nedelko, 2017). In the era of IR 4.0, the workforce should possess up-to-date knowledge and skills and be open to accept and experience the technology innovation. This enables them to become more agile and can adapt to the advancement of technology efficiently, subsequently increase their productivity (Rok Crenar & Nedelko, 2017).

Past studies suggested that training and experiences can change the individuals' adaptability (Mueller-Hanson, White, Dorsey, & Pulakos, 2005; O' Connell, Mcneely, & Hall, 2008; Van Dam, 2009). Appropriate policies and job-relevant training facilitate employees to adjust to the

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dynamic workplace (Jehanzeb & Bashir, 2013; Kim, Kim, Kim, & Kim, 2016; Prentice & King, 2013). Besides, leaders can enhance employee motivation and capability to perform a task, subsequently increase employee adaptability and proactivity at work (Muthuveloo, Kathamuthu, & Teoh, 2014; Wainaina, 2014, 2015; H. Wang, Demerouti, & Blanc, 2017). Age was found positively related to career adaptability where the accumulation of skills and experience leads to the better performance of older skilled workers (Giniger, Dispenzieri, & Eisenberg, 1983; Rudolph, Lavigne, & Zacher, 2017).

Despite its growing importance for workforce adaptability in the era of IR 4.0, there is a lack of study about workforce adaptability and learning curve theory. Previous studies about adaptability were more focused on life satisfaction (Cabras & Mondo, 2017; Ingusci, Spagnoli, Zito, Colombo, & Cortese, 2019; M. Zhou & Lin, 2016) and depressive symptoms and stress level (Dyson & Renk, 2006; Fiori, Bollmann, & Rossier, 2015; Safavi & Bouzari, 2019). Past adaptability studies were also focused on measuring adaptability by Career Adopt Adaptability Scale (CAAS) (Cabras & Mondo, 2017; Coetzee & Harry, 2014; Coetzee & Stoltz, 2015; Haibo, Xiaoyu, Xiaoming, & Zhijin, 2017; Hou, Leung, Li, Li, & Xu, 2012; Rudolph et al., 2017; Urbanaviciute, Udayar, & Rossier, 2018). There is little attention given to factors influencing workforce adaptability in the context of Malaysia IR 4.0. Thereafter, this research would like to study the determinants of workforce adaptability in the era of IR 4.0.

Conceptual Framework and Hypotheses Development

Workforce Adaptability and Reward

Rewards comprise of extrinsic and intrinsic rewards. Extrinsic rewards are related to financial rewards such as based pay, contingent pay, employee benefits; whereas intrinsic rewards are related to non-cash rewards such as recognition, achievement, growth (Armstrong, 2014; Mwai, 2018). A well-designed and fair rewarding system can enhance employee motivation, promote adaptability and reduce resistance level during the change implementation period, thereby improve performance (Armstrong, 2014; Mwai, 2018; Wainaina, 2014).

Muduli (2016) believes that rewards such as skill-based incentive systems are more effective than profit sharing and/or gain sharing. This could be due to employees are rewarded based on the level of acquired skills that are consistent with the workforce agility. The result of his study also reported that organizational practices related variables such as organizational learning and training, reward system, employee involvement, teamwork, and information systems have a positive impact on the workforce agility. This research intended to explore how rewards motivate the workforce to adapt themselves in the era of IR 4.0, hence the proposed hypothesis:

H1: Reward has a positive relationship with workforce adaptability.

Workforce Adaptability and Training

Training attempts to help employees to be more proactive and adaptive (Diamantidis & Chatzoglou, 2018). Training can improve employee's performance (Dermol & Cater, 2013; Manzoor, Wei, & Nurunnabi, 2019) and enhance enthusiasm at work (Tao & Shen, 2014) through acquisition of knowledge, upgrading of skills, understanding of process and procedure, or altering attitude and behaviour (Sabir et al., 2014).

Training can nurture a learning environment that facilitates the acquisition, learning, and sharing of knowledge and skills. Effective training enables employees to gain relevant

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knowledge and skills to perform tasks competently (Mahmood, Choon Hee, Shze Yin, & Syafiq Hanis, 2018; Wright & Geroy, 2001), subsequently enhance their ability to adapt and respond to the changes of the challenging business environment and technology (Alavi, Wahab, Muhamad, & Shirani, 2014; Falola, 2014).

It is noted from past studies that training is positively and significantly related with workforce agility (Muduli, 2016), will develop employees' adaptive behaviour and skills (Muluneh, 2017), will maximise the productivity of employees (Elnaga & Imran, 2013; Sabir et al., 2014) and achieve organizational goals (Colombo & Stanca, 2014; Sepulveda, 2005). Based on the above discussion, the following hypothesis is presented:

H2: Training has a positive relationship with workforce adaptability.

Workforce Adaptability and Employee Resilience

Resilience is one's ability to adapt and/or recover promptly from severe adversity (Cooke, Cooper, Bartram, Wang, & Mei, 2016). Individuals with resilience skills tend to have more positive emotions and are more open to new experiences (Cooke et al., 2016; Tugade & Fredrickson, 2004). Hence, they are able to foster proactive learning (Youssef & Luthans, 2007), and can effectively adapt and cope with major life events and distressing experiences (Fredrickson, Tugade, Waugh, & Larkin, 2003; Waugh, Fredrickson, & Taylor, 2008).

Past studies demonstrated that leadership, learning culture, and a supportive work environment are factors that influence resilient employee behaviours. Leaders that conduct regular performance review with employees and provide support can increase the employees' ability and motivation to support organizational change (Naswall, Kuntz, & Malinen, 2015). Besides, organization that encourages information sharing across employees and thinking out of box tend to improve employee adaptability (Marsick & Watkins, 2003). Positive social supports also foster employees to provide and receive constructive feedback. This enabled the employees to learn from past experiences and subsequently strengthen their ability to effectively respond to the work challenges (Naswall et al., 2015).

The competitiveness of the business environment requires more and more employees with a high level of resilience. The ability of employees to innovate, adapt and respond to changes are believed to be the keys of the success of an organization (Cooke, Cooper, Bartram, Wang, & Mei, 2016; Naswall, Kuntz, Hodliffe, & Malinen, 2013; J. Wang, Cooke, & Huang, 2014). Hereafter, to better understand the relationship between employee resilience and workforce adaptability in IR 4.0, the following hypothesis is proposed:

H3: Employee resilience has a positive relationship with workforce adaptability.

Workforce Adaptability and Knowledge Sharing

Knowledge sharing is referring to the collaboration with other employees to put up with the organization's knowledge application, novelty, and competitive advantage (Jackson, Chuang, Harden, & Jiang, 2015) to design innovative ideas, implement new plans and resolve problems. (S. Wang & Noe, 2010).

In the continuous automation of the manufacturing system, the processes become highly complex and intertwined. This resulted in the need of adaptability workforce equipped with the knowledge to deal with the increasing complexity environment (Hecklau, Galeitzke, Flachs, &

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Kohl, 2016). Organizations ought to emphasize on employees' interaction and knowledge sharing behaviour across the workplace (Kumar & Rose, 2012).

Knowledge sharing behaviour has a significant impact on the relationship of knowledge sharing propensity and individual performance (Henttonen, Kianto, & Ritala, 2016). Aladwan (2017) revealed that knowledge sharing and continuous learning commitments can improve individual competencies, increase job satisfaction, and subsequently help to cope with the challenges arises from the business environment. Malik & Kanwal (2018) also revealed that organizational support for knowledge sharing can lead to employees' job satisfaction. The result showed that the mediating function of the employee's interpersonal adaptability is greater than the mediating impact of the learning commitment.

Contrary to previously published studies, Ford, Myrden, & Jones, (2015) demonstrated the employees are focus on their current job and its focal behaviour, this will cause them don't have additional resource to allow on knowledge sharing activities. In the same vein, Ford, (2008) in his study notes some employee may partial knowledge sharing/hiding, they are shares some knowledge but at the same time, they are withholds come knowledge. Partial knowledge sharing and hiding knowledge may cause miscommunication, wrong information may incur in communication process. This problem may delay the process of learning and adaption. Based on numerous previous studies, it shows that knowledge sharing would influence workforce adaptability, this study hypothesized:

H4: Knowledge sharing have an influence to the workforce adaptability.

Workforce Adaptability and Age

Demographic characteristics such as age and education level are assessed in most empirical studies of behavioural sciences. Zacher (2014) found that older workers with longer tenure have more work experience and thus more adaptable to their careers than young workers. Conversely, Beier & Ackerman, (2005); Sharit, Czaja, Nair, & Lee, (2003) reported older worker might be less adaptive compare with younger worker due to the latest technology level, training course and the leaning environment were not suitable for them. Based on the review of the above literature, the following hypothesis is presented:

H5: Age has an influence to the workforce adaptability.

Workforce Adaptability and Probationary Period, Working Experience

The probationary period is a fixed-term duration levied on newly hired workers and is part of the working experiences. It helps employers to examine the compatibility between employees and jobs before invested heavily in them. Workers with probationary positions are more effective and less likely to leave because of the higher wages attached to probationary jobs (Loh, 1994).

Adaptability has been identified as a factor that influenced the relationship between prior related work experience and job performance (Dokko, Wilk, & Rothbard, 2009). Work experience enhances the performance and productivity of employees (Dokko et al., 2009; Giniger et al., 1983; Parent & Lovelace, 2015) while minimising the negative work habits such as absenteeism, accidents, stress, and turnover (Byron, 2005; Giniger et al., 1983).

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Skirbekk (2004) found lower productivity in senior employees due to reduced cognitive skills, yet their experience and job knowledge enable them to remain highly competitive in their field of expertise. This indicated that experience could mitigate the impact of deteriorating cognitive abilities (Salthouse, 1984). To better understand the relationship between probationary period, working experience and workforce adaptability in IR 4.0, the following hypotheses are proposed:

H6: Probationary period has a positive relationship with workforce adaptability.
H7: Working experience has a positive relationship with workforce adaptability.

Research Method

Measure of The Constructs

The data were collected through a survey instrument. The items in the questionnaire were adapted from previous studies to ensure content validity. The pretest was conducted with five respondents and two academicians to confirm the face validity and content validity of the variables.

Data Collection and The Sample

This study drew its sample from the population of workforces working in American MNCs in E&E sectors at Penang, Malaysia. The American MNCs in E&E sectors at Penang was the target as they have consistently invested in Malaysia since 1972, with the highest concentration reported at Penang and 74 percent of the companies are intended to make more investments towards IR 4.0 over the next two years (Economic Impact Survey 2017/18, 2018).

According to Sekaran (2003), the sample size needed in multivariate research should be several times (preferably 10 times or more) as large as the number of variables in the study. G*Power was used to determine a sample size of 141 as having the required statistical power of 0.90 for the testing of our model. The self-administered questionnaire was distributed to the employees working in the American MNCs in E&E sectors at Penang. In total, 280 questionnaires were distributed and 145 were returned. Five were discarded because the questionnaires were not completed, thus giving an effective response rate of 50 percent.

The sample consisted of 45 males (32 percent) and 95 females (68 percent). There were 63 respondents (45 percent) between the ages of 21 to 30 years old, 52 respondents (37 percent) between 31 to 40 years old, and 25 respondents (17 percent) aged more than 40 years old. The majority of the respondents (86 percent) possessed a Bachelor's Degree. Most respondents work in the department of Procurement (20 percent), followed by information technology (17 percent), and the rest 88 respondents (63 percent) are from various functional areas in respective companies. In terms of working experience in the E&E industry, there were 52 respondents (37 percent) between 0 to 5 years of experience, 40 respondents (29 percent) between 6 to 10 years of experience, and 48 respondents (34 percent) with more than 10 years of experiences. There were 56 respondents (40 percent) believe that their current job is more likely related to Big Data, 29 respondents (21 percent) are associated to the Internet of things, 17 respondents (12 percent) are involved in Horizontal and Vertical System Integration, and the rest 38 respondents (27 percent) are linked to other areas of IR 4.0. Most of the respondents (94 percent) are with less than 10 years of experience in the respective area of IR 4.0.

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Model Estimation

The dependent variable for this study is dichotomous, namely taking a value of 1 or 0. Hence, a logit model is used to verify our propositions, as follows:

$$log\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots\cdots + \beta_k X_k$$

which P is the probability of a workforce adaptability (hereafter 'adaptability' is used to represent the dependent variable). The Xs are explanatory variables hypothesised to influence the probability of awareness (see Table 3 for the explanatory variables); the βs are the coefficients to be estimated. The dependent variable measures whether the respondents have workforce adaptability (value = 1), or otherwise (value = 0). Thus, P/(1 − P) is the odds ratio that the respondents do have workforce adaptability or that they do not. The explanatory variables (X_s) are assumed to be exogenous. The data from the questionnaires was converted into a binary format (1,0) to fit the model estimation.

The logit model specification for this study as below:

$$\begin{aligned}\text{Adaptability} = {} & \beta_0 + \beta_1\, Reward + \beta_2 Training + \beta_3 Employee\ Resilience \\ & + \beta_4 Knowledge\ Sharing + \beta_5 Age + \beta_6 Probationary\ Period \\ & + \beta_7 Working\ Experience + \varepsilon\end{aligned}$$

Table 1: Description and measurement of the independent variables

Variable	Description	Abbreviation
Reward	Reward is the monetary and/or non-monetary system adopted by organizations. The dummy is assigned a value of 1 if the respondent's organization has reward system, and 0, otherwise. Measurement instrument adopted from Muduli, (2016)	*REWARD*
Training	Training is the organization's learning environment that enables employees to gain knowledge and learn skills. The dummy was given a value of 1 if the respondent's organization has training as learning environment and 0, otherwise. Measurement instrument adopted from Muduli, (2016)	*TRAIN*
Employee Resilience	Employee Resilience is the ability of the employee to cope with stress and pressure. The dummy was given a value of 1 if the respondent able to cope with stress and pressure in his/her working environment and 0, otherwise. Measurement instrument adopted from Tonkin, Malinen, Naswall, & Kuntz, (2018)	*EMRESI*
Knowledge Sharing	Knowledge Sharing is the propensity and actualized behaviours of employees in sharing knowledge with other organizational actors. The dummy was given a value of 1 if the respondent's organization has knowledge sharing as working place culture and 0, otherwise. Measurement instrument adopted from Henttonen, Kianto, & Ritala, (2016)	*KNOWSHA*
Age	Age is the actual year of age of the employee Test in 3 groups which are 21-29, 30-39,40-55	*AGE*
Probationary Period	Probationary Period is the fixed contract duration for the newly hired employee. The dummy is assigned a value of 1 if the respondent has probationary period when accept the new job., and 0, otherwise.	*PROBA*
Working Experience	Working Experience is the years of involvement that the employee had in the workplace.	*WORKEX*

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Results

The estimated coefficients and odds ratios, with their robust standard errors, are reported in Table 2. The Wald X2 statistic is 16.6100 with a p-value of 0.0201, which suggests that the estimation is significant overall. The Linktest was implemented immediately after the logit regression for model specification. The test reveals no problems with the specification.

Table 2: The coefficient estimates from the logistic regression and the associated odds ratios

Variables	Reporting coefficient			Reporting odds ratio		
	Coefficient		Standard Error	Odds Ratio		Standard Error
COSTANT	-0.1860		0.8239	0.8302		0.6840
REWARD	-0.0253		0.6220	0.9750		0.6064
TRAIN	1.5595	**	0.7532	4.7566	**	3.5826
EMRESI	0.5672		0.6797	1.7633		1.1986
KNOWSHA	-1.4632	*	0.7780	0.2315	*	0.1800
AGE	-1.0092	**	0.5087	0.3645	**	0.1854
PROBA	-0.4778	*	0.2483	0.6201	*	0.1540
WORKEX	0.8867	**	0.4461	2.4271	**	1.0828
Number of observations			140			140
Wald $X^2(8)$			16.6100			16.6100
Prob > X^2			0.0201			0.0201
Pseudo R2			0.0856			0.0856
Log pseudo-likelihood			-88.7344			-88.7344

Table 2 above shows that Five out of seven explanatory variables are statistically significant in affecting employee's workforce adaptability in era of IR 4.0. Two show positive impacts, namely, *TRAIN* and *WORKEX*. Three has a negative impact: *KNOWSHA, AGE* and *PROBA*. Literature review shows that *EMRESI* and *REWARD* expected to have a positive effect on employee's workforce adaptability in era of IR 4.0. However, results show that the relationship between *EMRESI, REWARD* and level of employee's workforce adaptability in era of IR 4.0 is not significant.

Discussion and Implications

Training (TRAIN) is one of the most statistically significant variables (at the 5 percent level) in our impression. It is widely believing that formal training provided by the organization can let the employee more easily to adapt new information and knowledge in the area of IR 4.0. As Malaysia has launched Industry4WRD on Oct'18, 2019, most of the American MNCs, Penang are transforming the talents for the rapidly evolving technological workplace by training. These results are in accord with recent studies (Alavi et al., 2014; Mahmood et al., 2018; Wright & Geroy, 2001) indicating that effective training enables employees to gain relevant knowledge and skills to perform tasks competently and subsequently enhance their ability to adapt and respond to the changes of the challenging business environment and technology. Hypothesis

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H2 is confirmed by the research which shows that the odd ratio of employees' workforce adaptability increases by 4.76 times for company which provide training, ceteris paribus.

Another important finding was that knowledge sharing is negatively influencing the workforce's adaptability. These results are contradicting with those of previous studies (Henttonen et al., 2016; Malik & Kanwal, 2018). These relationships may partly be explained by Adoptive Cost Theory which employees are focus on their current job and its focal behaviour, this will cause them don't have additional resource to allow on knowledge sharing activities (Ford et al., 2015). Individuals will prioritize their tasks by allocating resources (such as attention, effort, and ability) to adapt to the environment and environmental needs. Most of the time, knowledge sharing just a part of company culture and not the main task of employee, this may cause the employee less to allocate their resources on knowledge sharing. Furthermore, some employee may partial knowledge sharing/hiding, they are sharing some knowledge but at the same time, they are withholds come knowledge (Ford, 2008). Partial knowledge sharing and hiding knowledge may cause miscommunication, wrong information may incur in communication process. This problem may delay the process of learning and adaption; it also may become obstacle for workforce adaptability. Hypothesis H4 is confirmed by the research which shows that employees' workforce adaptability is decreased 76.85 percent for organization which implement knowledge sharing as working culture, ceteris paribus.

Next, the results indicated that *AGE* is negatively associated with the workforce's adaptability. Younger employees learn new knowledge and new technologies faster than older employees. In particular, IR4.0 involves a lot of new knowledge in digital technology, artificial intelligence (AI), and Robotic Process Automation, employees need to quickly master relevant knowledge and skills, and generation Z readiness on the arrival of the Industrial Revolution 4.0 is at a high level compared with others (Yunos & Din, 2019). Young employees may have higher ability to learn, more persistence, curiosity, resourcefulness and initiative; hence they are more adaptive to the changing work environment and can perform the tasks at a faster rate. This has increased their productivity consistently and lead to efficient task performance. Malaysia is heading towards a digital economy yet is facing a potential shortage of skilled workers. Government should provide more incentives and training to retain the older employees while organizations need to engage and support them to continue to be up skilled and reskilled. This aids the older employees to stay relevant in the workplace and easily adapt to the disruption brought by IR 4.0. Hypothesis H5 is confirmed by the research, which shows that the young employees have 63.55 percent higher workforce adaptability level compare with older employees, ceteris paribus.

One interesting finding is probationary period (PROBA) has a negative relationship with workforce adaptability. However, this result has not previously been described. A possible explanation for this might be that requiring a probationary period may lower the morale of new employees and reduce performance. New employees in the probationary period may feel pressured, resulting in lower confidence in their work, resulting in higher turnover rates, lower productivity and lower work quality. At the same time, this may also reduce the work adaptability of these employees. Future studies on the relationship between PROBA and workforce adaptability are therefore recommended. Hypothesis H6 is rejected by the research, which shows that probationary period has a positive relationship with workforce adaptability. Results show that level of employees' workforce adaptability will increase 38 percent if no probation period or shorten probation period incur, ceteris paribus.

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The results of this study indicate that working experience has a positive relationship with workforce adaptability. This finding is consistent with that of Skirbekk (2004) who found lower productivity in senior employees due to reduced cognitive skills, yet their experience and job knowledge enable them to remain highly competitive in their field of expertise. This indicated that experience could mitigate the impact of deteriorating cognitive abilities (Salthouse, 1984). Hypothesis H7 is confirmed by the research, which shows that the odds of workforce adaptability are increased by 2.43 times for employee who has more working experience, ceteris paribus.

Contrary to expectations, the result of this study indicated that reward, and employee resilience, were not statistically significant. It is possible that the study focused only on the American MNCs in E&E sectors at Penang listed by American Malaysian Chamber of Commerce (AMCHAM), which to some degree reflects a homogeneous population that may restrict the generalizability of the result. Future research should be undertaken on a larger population to gain a better understanding of the possible impact on workforce adaptability.

Conclusion

This study set out to gain a better understanding of the factors influencing workforce adaptability in the digitisation and technological manufacturing system. The study makes a theoretical contribution by revealing the workforce adaptability's determinants: knowledge sharing, age, probationary period, and working experience.

This study is in line with Malaysia's goals to accelerate the adoption of IR 4.0. The findings act as the indicator for the government and organization to recognize factors influencing the workforce's adaptability in the era of IR 4.0. It also draws the attention of human resources practitioners to nurture knowledge sharing culture and develop more training and upskilling programs related to IR 4.0. This is to help the workforce to develop the critical skill sets and boost working productivity and efficiency. These findings could be helpful to the stakeholders to focus on the workforce who will be the driving force for the accelerated disruption of new technologies.

This is the first study to report an association between workforce adaptability and learning curve in the era of IR 4.0. Despite its exploratory nature, this study offers some insight into the determinants of workforce adaptability. This study has only considered American MNCs in the E&E sector at Penang. With a relatively small sample size, caution must be applied, as the findings may not be applicable to the wider population. It is suggested that the association of these factors is investigated in a cross-national study involving other manufacturing and services sectors.

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