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ORIGINAL ARTICLE

DRIVERS OF HUMAN RESOURCES 4.0: TECHNOLOGICAL, ORGANISATIONAL & ENVIRONMENTAL OF HUMAN RESOURCES 4.0 AT MALAYSIAN PRIVATE COMPANIES

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ABSTRACT – This study aims to evaluate and measure the Driver of Human Resources 4.0: Technology, Organization and Environment. Besides that, the study also suggests the better Driver Human Resources 4.0 to increase at the company in future. Meanwhile, these research objectives were found 1) to identify the relationship between technological drivers with Human resource 4.0. 2) To investigate the relationship between organisational drivers with Human resource 4.0. 3) to analyse the relationship between environmental drivers and Human resource 4.0. The theoretical model used was the Technology-organization-environment (TOE) Theory. The methodology for this research that has a quantitative method using a questionnaire survey by google form with has five (5) Likert scales. The questionnaire surveys by google form were sent to Malaysian private companies. This research used descriptive statistical analysis convergent validity and mean value analysis, correlation testing, which have been automatically generated by Smart PLS software version 3.3.2 statistical software to test the hypothesis for this research. From the tests that have been conducted, Driver Human Resources 4.0: Technology, Organization and Environment are the variables that affect the Human Resources in happening in Malaysian Public Companies. At the end of the study, the research questions were answered, and specific recommendations were made for the case technology. The most efficient recruiting networks have been identified as a result of this research, the most appropriate selection strategies have been suggested, and adequate retention techniques have been explored. In addition, some additional ideas have been given for future research for example the sense of accelerating the pace of transition, organizational factors may play a major role in the creation of an environment conducive for learning and innovation in a company nowadays.

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INTRODUCTION

The human beings are overwhelmed by technological advances, and every day we face new sophisticated technological structures that impact our everyday lives. Industry 4.0 significantly influences the business environment and a massive change in the labour market can be observed (Morrar et al, 2017). As a natural result, traditional manufacturing methods are experiencing a massive transformation that will change the way businesses view production (Council, 2017). The fourth industrial revolution is based on data. Due to many expectations, these developments have caused, logistics' new technological developments are considered an important phenomenon (Nagy et al, 2018). Today's essential skills will cease to be so in the future, and the workforce is expected to have new skills in IT, data analysis, etc. How it can be collected and analysed and used to make and develop the right decisions has become a competitive factor.

Industry 4.0 (I4.0) technologies should be used to successfully help the organisation's technical transitions meet sustainable growth targets. This transition process impacts industrial processes and significantly influences employment quality and alters workers' aspirations in a business (Azmi et al 2018). Besides, the dangers of reliance on work-related technologies for employees and their family well-being have been shown. However, I4.0 technologies pose a challenge because they are relatively recent, and production firms face difficulties such as expertise shortages, financial limitations and organisational problems in I4.0 ventures (Morrar et al, 2017). Using new technology as they apply to I4.0 seems to build a room for creativity that increases companies' competitiveness on human resources.

Furthermore, the journey to Industry 4.0 is often an evolutionary one that 'virtualises' functions and processes at different times. The technology used must be flexible to optimise the trade-off between system performance, such as the load and operational perimeter that a system can manage and the associated costs. An unexpected effect seems to be traceable and acts like the gap due to the nature of new knowledge needed for its activities. This gap starts to stand out since it is inconsistent with the third industrial revolution's main activity. Although many scholars believe that Industry 4.0 will do more than hurt, it still draws people's attention to the fact that it appears to pose some potential negative challenges (Li et al, 2017). In a nutshell, industrial technology and work computerisation have dislocated a substantial

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portion of human resources, contributing to a modern reconfiguration of everything. On the other side, though, the newest developments can contribute to the growth of new employment and new development fields. There is also a significant effect on environmental conservation (Sima et al., 2020). Hence, the research objectives as follows:

1. To identify the relationship between technological drivers with Human resource 4.0.
2. To investigate the relationship between organisational drivers with Human resource 4.0.
3. To analyse the relationship between environmental drivers and Human resource 4.0

Through this study, it is clear that few existing studies have shown that the introduction of new emerging technology is an advancement that will help improve efficiency and increase quality human resources 4.0 competitiveness. Often analysts think these innovations have harmful consequences that can contribute to human resources on the development. The introduction of such new technologies in combination with environmental drivers Industrial Revolution (IR) 4.0 and according to observation will add several structural changes (challenges) to the efficiency of the development of human resource at Malaysian private companies. As many manufactures surround this organisation, they need at least better data organisations than their competitors.

LITERATURE REVIEW

2.1 Overview of Human Resources 4.0

This research aims to discuss how human resource management (HRM) can facilitate efficiency and quality enhancement through organisations' HRM activities. According to Susan (2012), human resource management is the role of an organisation that focuses on recruiting, retaining, and encouraging people who work in a company. Therefore, it is a pragmatic and systematic approach to handling individuals and the workplace's environment and climate. Human resource management encompassed practices intended to maintain and organise the human components within the enterprise. Human resource management is a speciality, a technical practice that has evolved as a vast continuum in modern years, encompassing various fields and integrating a specific aspect of staff management corporate conduct in workplace and labour relations.

2.2 Human Resources 4.0

Nowadays, several scholars have used the term Human Resource Development (HRD) to denote preparation and growth, job advancement and corporate development as an organisation's involvement in its employees' learning as part of the Human Resources Management (HRM) strategy. HRD claims that organisations are human-made institutions that depend on human experience to establish and accomplish their goals and that HRD practitioners are supporters of person and collective work processes and corporate honesty. Logistics 4.0 is defined by digitalised methods, robots and adaptive distribution networks. The new logistic background would have a significant impact on existing and potential workers. It is, therefore, necessary for market leaders to train the workforce for the upcoming changes. Human Resources management is alluded to as an agent of transition in the company and is supposed to support workers to embrace unavoidable improvements and use potential ways to generate value for their businesses (Parham et al, 2018). Although in Malaysia, the company also uses many human resources to achieve its goals and objectives.

2.3 Drivers of Human Resources 4.0

The following are some of the main drivers mentioned by previous researchers in connection with Human Resources 4.0.

2.3.1 Technology

Throughout the perspective of this analysis, technology is more consistent with the assumed behavioural regulation of TPB; that is, the resilience of consumers influenced by the available opportunities to maximise the ability of the proposed innovation(s). Next, that strategic consideration includes internal and foreign development tools (example ICT infrastructures, Web expertise, ICT engineering know-how, usage time and developers) (Li et al, 2017; Gui et al., 2021). Although the t technical expertise goes beyond physical assets; it requires intangible capabilities that can create competitive advantages for innovators because abilities and know-how accompany physical assets and become more challenging to replicate rivals. Nevertheless, as digital networks' activities step beyond fundamental principles, anonymity, protection, and security are core concerns (Morrar et al 2017).

2.3.2 Organization

Organisational variables are subjective that is specifically linked to the quality that utilisation of internal tools. Then, research Geissbauer et al (2016) suggests that three digitalisation elements shape the foundation of the IR 4.0 approach: complete digitalisation of the company's activities, an overhaul of goods and services and more substantial contact with consumers. In order to achieve such research inside the organisation, a plan has to be created. Then improvements in business processes and systems need to be made in order to adjust the various facets of the information technology (IT) infrastructure, data collection, regulatory enforcement and the general corporate culture (Parham et al, 2018). IR 4.0 thus allows organisations to establish a structured digitalisation plan and to be harmonised through Human Resources as a whole.

2.3.3 Environment

Strategists predict and react to macro and micro environmental influences because they also pose opportunities and challenges and strengths and risks to their companies, and form their willingness to evolve and or participate in strategic and or tactical initiatives (Awa et al, 2016) Furthermore, the research established competitive forces and requirements on market participants as strategic conditions and essential drivers of product acceptance. It was observed that the competition from vendors and related companies was not statistically crucial in selecting intranets or extranets. Studies suggest that social encouragement is a significant factor of ICT and a determinant of real acceptance (Sorooshian at el, 2020).

2.4 Technology-organisation-environment (TOE) Framework

T-O-E is a classic concept that suggests a definitive collection of variables that describe and forecast innovation or technology's probability to be implemented (Pudjianto et al, 2011). The researchers claim that the system defines implementation in terms of the array of internal and external innovations and their presumed utility, technological and operational feasibility, sophistication and learning curve, pilot test or experimentation, and visibility or imagination. However, the T-O-E postulate is analogous to the Actor-Network Theory (ANT) postulate, as it highlights complex capacities and the reciprocal involvement between technological and social networks. Next, T-O-E is the only IS paradigm that focuses on social and behavioural constructivism, thus considering the interplay of technical progress and the environmental circumstances (Al-Qirim et al., 2006).

2.5 Hypothesis Development

As a consequence of the study, the hope is that the industrial 4.0 transition of the market would significantly affect human resources management practices due to the operating climate. (Berlin, 2018). Next, innovations have a significant effect on people's employment. Only skilled and highly educated staff should be able to monitor these innovations. The capabilities required by companies in Industry 4.0 have evolved due to developments in technology (Azmi et al., 2018). Last, the choice of the T-O-E framework has been guided by their theoretical reasons and their practical approach to the human resources 4.0 approach in the field of content sharing.

H1: Drivers of Human Resources 4.0 have a positive and significant effect on Human Resources 4.0.

2.6 Theoretical Framework

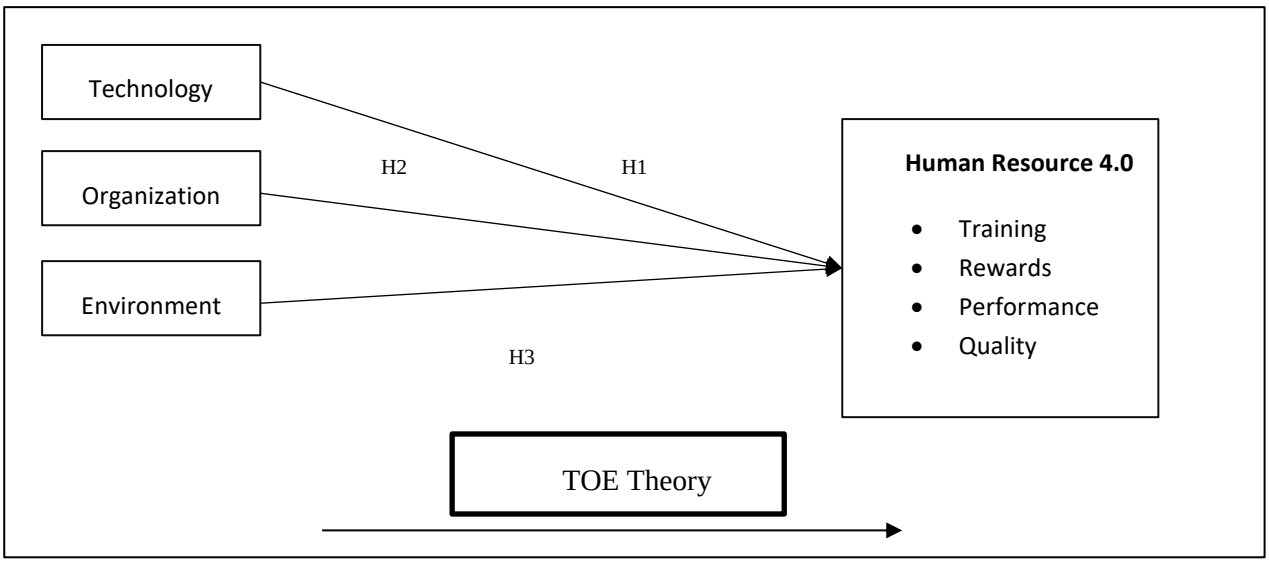

Figure 1: Conceptual Framework

3. METHODOLOGY

The research design is known as the framework or plan for the investigation used to collect and analyse data. The study's research design relies on how analysis is to consider that qualitative or quantitative approaches are used. Researchers use quantitative approaches to collect and interpret results because they have test formulated hypotheses to solve the research question. The questionnaire is critical since the information or evidence that would be gathered together applies to the factor and impact of human resources. Other than that, most researchers used this approach, and inferential and descriptive statistics would be used to gather quantitative analysis results.

For the data collection, that means data would be compiled via an Internet-based questionnaire before giving to the company. This research adopts and adapts the literature questionnaires that have been checked for precision and validity. This research would use the Likert scale to assess respondents ' answers where the value of 1 strongly disagrees, and the

value of 5 is considered to be strongly agreed. To understand more about Technology, Environment and Organization on Human Resources those provide the measurement of that variable and construct which are first the Drivers of Human Resources 4.0: Technology, Organization and Environment (Shows table 1) and second are Human Resources 4.0 were identified from findings of the literature review (Shows table 2).That table shows at appendix.

4. RESULTS

4.1 Response Rate

The response rate calculates the number of people who respond to a given call-to-action and the number of people who contributed to the questionnaire. However, the total of the questionnaire where have given to Malaysian private companies is 500. However, only 111 respondents have answered that questionnaire. The response rate is 22.2 per cent which is acceptable for a social science survey.

4.2 Data distribution

Data distribution contains numbers, columns, charts and graphs used to define, arrange, summarise and display raw data. Data distribution is most commonly used to analyse the central trend or position of data calculated by mean, mode, median, standard deviation, excess kurtosis and skewness like table 1 shows.

Table 1: Descriptive Statistics

Construct	Item Code	Item	Min	Mean	Median	Standard Deviation	Excess Kurtosis	Skewness
	Tech1	Our company have good infrastructure in applying the Industrial Revolution (IR) 4.0 technology.	4.00	4.51	5.000	0.498	-2.009	-0.165
Technology	Tech2	Our company provide knowledgeable personnel or expertise and well training employees to handle Industrial Revolution (IR) 4.0 technology.	4.00	4.62	5.000	0.485	-1.774	-0.508
	Tech3	Our company shares Industrial Revolution (IR) 4.0 infrastructure's database for various applications.	4.000	4.703	5.000	0.457	-1.214	-0.899
	Org1	Our company's top management has a vision of using Industrial Revolution (IR) 4.0 technology.	3.000	4.189	4.000	0.729	-1.076	-0.312
Organization	Org2	Our company's top management formulate a strategy for the adoption of Industrial	2.000	4.333	4.000	0.715	-0.133	-0.746

Construct	Item Code	Item	Min	Mean	Median	Standard Deviation	Excess Kurtosis	Skewness
		Revolution (IR) 4.0 technology.						
	Org3	Our company's top management use Industrial Revolution (IR) 4.0 technology to monitor the company's goals and objectives.	2.000	4.180	4.000	0.738	-0.599	-0.439
Environment	Env1	Initiative and implement of industrial Revolution (IR) 4.0 technology in our company are supported by government laws and regulation.	2.000	3.613	4.000	0.851	-0.468	-0.314
	Env2	The government have provided incentive to pursue the use of industrial Revolution (IR) 4.0 technology in our company.	2.000	4.000	4.000	0.644	0.759	-0.411
	Env3	By using industrial Revolution (IR) 4.0 technology, our company' organisation needs can easily require.	2.000	3.441	4.000	1.028	-1.188	-0.168
	HR1	Our company has technology 4.0 to facilitate idea exchange among employees.	3.000	4.117	4.000	0.668	-0.756	-0.140
Human Resources	HR2	Our company has technology 4.0 to determine a fair rewarding system.	3.000	4.126	4.000	0.645	-0.614	-0.126
	HR3	Our company has technology 4.0 to improve employee's development and training.	3.000	4.009	4.000	0.678	-0.805	-0.011

Construct	Item Code	Item	Min	Mean	Median	Standard Deviation	Excess Kurtosis	Skewness
	HR4	Our company has technology 4.0 to show employee's productivity information.	3.000	4.072	4.000	0.667	-0.742	-0.084

4.3 Demographic Profiles

Demographic profile on table 2 shows that the 111 respondents agreed their company used the technology to manage the Human Resources. Meanwhile, the highest gender is male. Then, respondents from 41-50 years old are also highest in that company. Next, that table shows the highest of Qualification are from Postgraduate Degree. Next, the highest position in the company is Human Resources admin and Human Resources Executive.

Last but not least, the highest year respondents in the company are from less than 3-5 years. Lastly, the table also shows what technology company use are Artifical Intelligence, Augmented Reality, Blockchain, Machine Learning and ERP.

Table23: Demographic Profile

Item	Frequency	Percentages
Is your company using technology to manage Human Resources		
Yes	111	100
Gender of respondent		
Male	64	57.66
Female	47	42.34
Age of respondent		
30 - 40 years old	33	29.73
41 - 50 years old	50	45.05
Less than 30 years old	21	18.92
More than 50 years old	7	6.31
Qualification of respondent		
Diploma	20	18.02
Postgraduate Degree	46	41.44
Pre-University/STPM/A-Level	2	1.80
Secondary/SPM/O-Level	9	8.11
Undergraduate Degree	34	30.63
Position in company		
Director	3	2.70
Finance associate	3	2.70
Human Resources admin	32	28.83
Human Resources assistant manager	23	20.72
Human Resources executive	32	28.83
Human Resources manager	15	13.51
Technical Coordinator	3	2.70
Years in company		
3-5 years	45	40.54
6-10 years	21	18.92
Less than 2 years	38	34.23
More than 10 years	7	6.31
What technology that our company use		

Item	Frequency	Percentages
Artifical Intelligence, Augmented Reality, Blockchain, Machine Learning and ERP	42	37.84
Phone systems, IT Services (Server), Cloud computing (Notion) Business class email (@vega-tec.com), Business internet,	7	6.31
RPA	29	26.13
sistemHR.com	33	29.73
Grand Total	111	100

4.5 Model Measurement

Two forms of validity were being analysed to test the measurement model: the convergent validity and discriminant validity.

4.5.1 Convergent Validity

The loadings analysis generally calculates the convergence of the calculation, the Variance Extracted (AVE), and the composite reliability. The loading were all higher than 0.959, the composite reliability were all higher than 0.8, and the AVE of all constructions was all higher than 0.5, as indicated in the result (see Table 3).

Table 3: Convergent Validity

Construct	Item code	Outer Loading	AVE	CR	Cronbach's Alpha
Environment	Env1	0.915	0.679	0.86	0.779
	Env2	0.918			
	Env3	0.597			
Human Resources	HR1	0.948	0.888	0.969	0.958
	HR2	0.951			
	HR3	0.959			
	HR4	0.911			
Organisation	Org1	0.957	0.895	0.962	0.942
	Org2	0.953			
	Org3	0.927			
Technology	Tech2	0.899	0.717	0.882	0.807
	Tech3	0.695			
	Tech1	0.927			

4.5.2 Discriminant Validity

Table 4: Discriminant Validity: Heterotrait-Monotrait Ratio

	Environment	Human Resources	Organisation
Environment			
Human Resources	**0.587**		
Organization	0.458	**0.58**	
Technology	0.481	0.318	**0.32**

Note: Diagonal Values are the square-root of AVE; off-diagonal value is the correlation coefficient.

The result shows that the highest value Heterotrait-Monotrait Ratio of Human Resources to Environment is 0.587. Beside that value of Organization to Human Resources is 0.580 where it is highest than Organization to Environment. Last, the value of Technology to Organization is 0.320, where it is the highest value than Technology to Human Resources as a result seen in Table 4 that the discriminant validity has been determined.

4.6 Common Method Bias

The inflation variance factor (VIF) is also used to measure the collinearity of the formative variables. VIF indicates whether or not the data has a bias. After being calculated by SmartPls, the value of VIF for the Environment is 1.441, for the Organization 1.277 and Technology 1.234. (See table 5). This indicates that the data have no bias and no problem bias.

Table 5: Common Method Bias

	VIF
Environment	1.441
Human Resources	1.277
Organisation	1.243

4.7 Structural Measurement

4.7.1 Hypotheses Testing Results

As indicated, we used impact sizes and confidence intervals as part of our reporting (see Table 7). Hypothesis H1, H2 and H3 state that there are H1 which means technology effect on human resources. Technology (β = 0.017, t = 0.260, p > 0.05, f^2 = 0). The use indicator was negligible, describing 60.9% of the variation in use. The findings H1 not supported. Next, H2 are organization on human resources (β = 0.378, t = 4.927, p< 0.01, f^2 = 0.202) and H3 are environment of human resources (β = 0.397, t = 5.160, p< 0.01, f^2 = 0.197) and the positively interpreted satisfaction describes 70.2 % of the variability in enjoyment. That shows the H2 and H3 are supported. (See table 6).

Table 6: Summary of Hypothesis Testing

							Interval Confidence		
Hypotheses	Path	Std. Beta	Std. Deviation	t-Statistics	p-value	Bias	2.50%	97.50%	Decision
H1	Tech->HR	0.017	0.066	0.260	0.795	0.010	-0.114	0.143	Rejected
H2	Org->HR	0.378	0.077	4.927	0.000	-0.006	0.241	0.536	Accept
H3	Env->HR	0.397	0.077	5.160	0.000	0.002	0.242	0.525	Accept

Note p<0.05

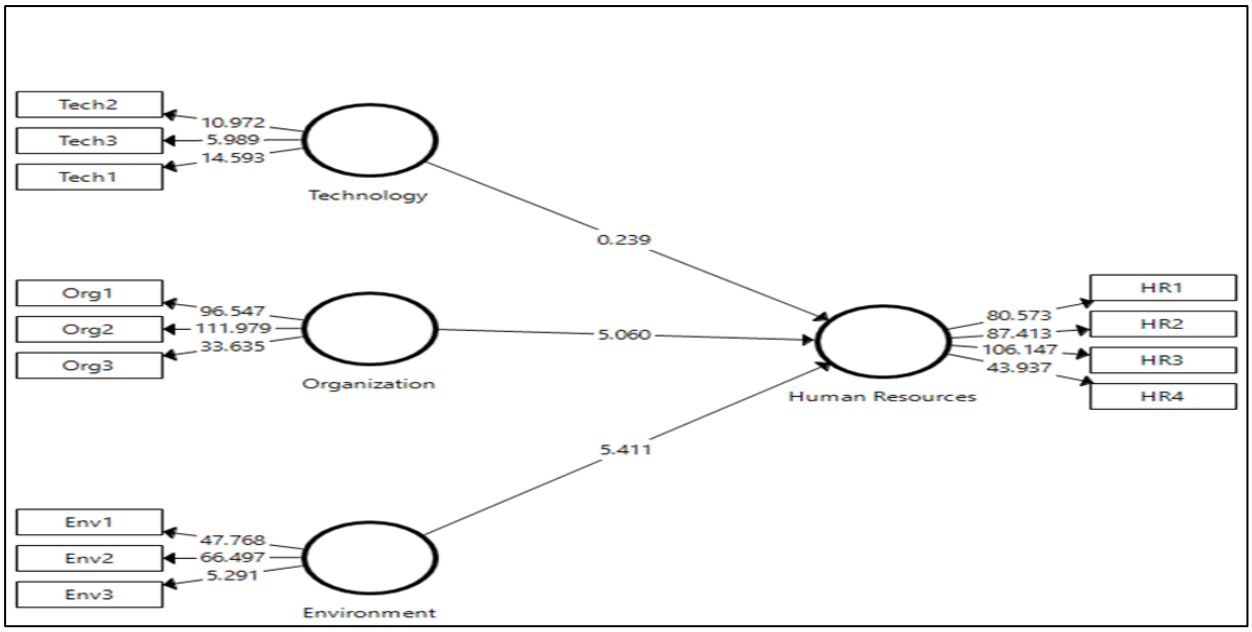

Figure 2: Hypothesised PLS Path Model

4.8 Importance-Performance Map Analysis (IPMA)

The model's total effects also function as feedback for the Importance-Performance Map Analysis (IPMA) and strengthen the PLS-SEM findings to report the path coefficient estimates by adding a dimension to the evaluation that includes the average values of the latent variable scores. (Hair et al., 2017). More specifically, the IPMA contrasts the structural model's cumulative results on a particular target construct with the overall latent variable scores of this construct's predecessors (Ringle & Sarstedt, 2016). There have two figures, and two tables which mean figure 3 show the Importance-Performance Map [Human Resources] (constructs, unstandardised effect) and table 7 shows the value of Importance-Performance Map [Human Resources] (constructs, unstandardised effect). Meanwhile, figure 4 and table 8 shows the Importance-Performance Map [Human Resources] (indicators, unstandardised effect). That means, the company should focus on figure 4 and table 8 it shows the Importance-Performance Map [Human Resources] (indicators, unstandardised effect).

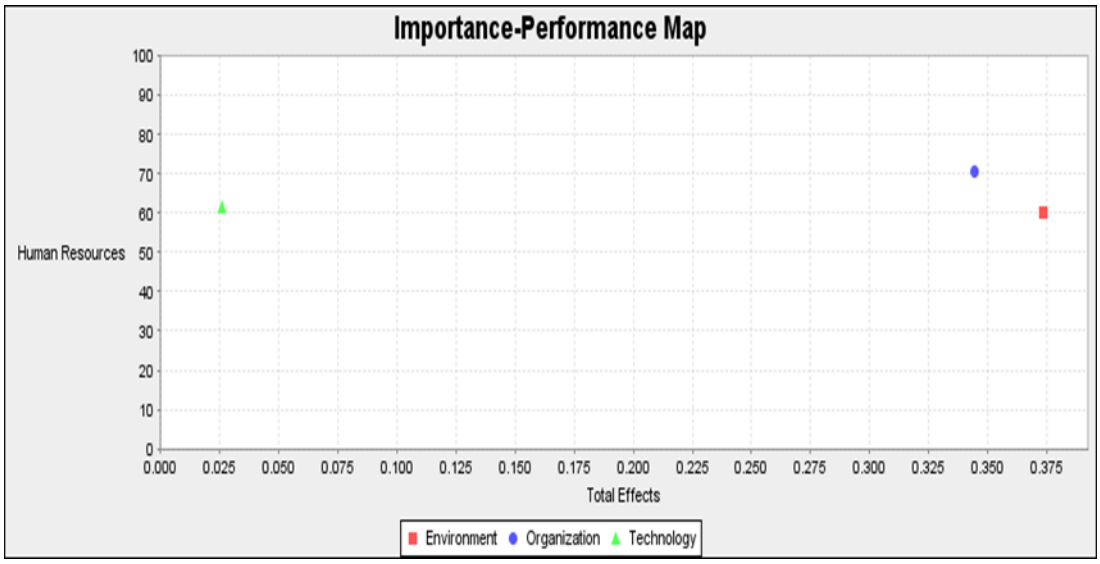

Figure 3: Importance-Performance Map [Human Resources] (constructs, unstandardized effect)

Table 7: Importance-Performance Map [Human Resources] (constructs, unstandardized effect)

	Human Resources
Environment	0.373
Organisation	0.345
Technology	0.026

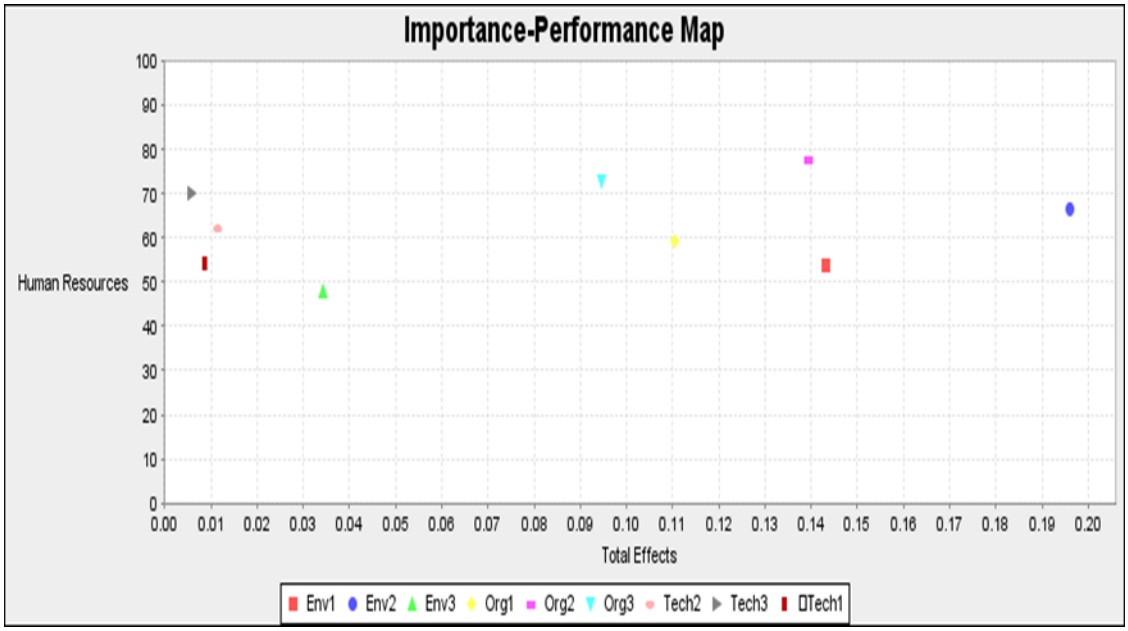

Figure 4: Importance-Performance Map [Human Resources] (indicators, unstandardized effect)

Table 8: Importance-Performance Map [Human Resources] (indicators, unstandardised effect)

	Human Resources
Env1	0.143
Env2	0.196
Env3	0.034
Org1	0.11
Org2	0.14
Org3	0.095
Tech2	0.011
Tech3	0.006
Tech1	0.009

DISCUSSION AND CONCLUSION

5.1 Discussion

The section has three parts: first, the relationship between technological drivers with human resource 4.0. Second is the relationship between organisational drivers with human resource 4.0 and the relationship between environmental drivers with human resource 4.0. For the first part, the hypotheses testing proved one element of technology on human resources 4.0 are not supported. This is because Malaysia cannot embrace the Industrial Revolution 4.0 technologies for human resources and not ready yet for Industrial Revolution 4.0. Except for top management and environment like a composer, both of them have adopted Industrial Revolution 4.0. That is why the Government has a crucial role in driving the implementation of Industry 4.0 in Malaysia. For the second part, that result hypothesis for the organisation on human resources 4.0 is supported. It is because Malaysia adapts the Industrial Revolution (IR) 4.0 for the organisation on human resources. Since the company's scale and the firm's top management support Industrial Revolution (IR) 4.0. Lastly, for part three, also those result hypotheses for environmental on human resources 4.0 is supported. Both these environmental in the manufacturing climate have a significant effect on employees' role in the industry, especially human resources (Kazancoglu, 2018).

5.2 Limitations and conclusion

In my research as a researcher, I found that respondents are limited. There are two types of limited respondents namely respondents in the pandemic of covid transmission 19 and lack of adequate funding sources. We look at the first respondent which is on the epidemic of covid transmission 19. When this epidemic strikes the country it makes the respondent limited due to workers having difficulty going to work in a state of outbreak of covid transmission 19 which has not yet recovered. The second respondent is the lack of adequate sources of funds; due to the spread of the covid 19 epidemic so many companies reduce employees to control the cost and this became one of the company's losses during the outbreak of the covid 19 outbreak.

For the conclusion, while I4.0 awareness is understandable in Malaysia and among respondents, the implementation of technology related to I4.0 is still limited. Thus, the result of Hypothesis 1 is rejected since it is related to technology adoption. Companies should dare to invest in order for fulfill their plan and thus to get closer to industry 4.0 especially for technology in company. Investments in skills advancement of workforces around the company must be made in order to understand how to deal with the consequences of Industry 4.0 and how importance the industry 4.0 at human resource and company to archive the goals for the future. That why the Government has a crucial role in driving the implementation of Industry 4.0 in Malaysia like Government launched Industry4WRD: National Policy on Industry 4.0 to accelerate digital transformation in different sectors in Malaysia, one of which is the development of Information Analysis for Science and Technology Excellence (KRSTE.my) and the formation of an Industry Digitalization Transformation Fund to authorize businesses to use it.

5.3 Future Study

Some recommendations should be made in a future study. First, further study can determine the element of technology that Industrial Revolution 4.0 goes toward for human resources by studying from a different perspective. In the future, many studies will be found. This condition will make it easier for a potential researcher to carry out new research. Second, for future research, the reading of journals and papers should be expanded. The future researcher should understand the research purpose and the general knowledge about the Industrial Revolution 4.0. Lastly, the future study can be done to determine the Industrial Revolution 4.0 on Human Resources by focusing on one problem. To unravel the network linking human resource management with IR 4.0 knowledge, it is recommended that future research to focus on social network theory (Shaharudin et al., 2019).

REFERENCES

Ahmad, S., & Schroeder, R. G. (2003). The impact of human resource management practices on operational performance: recognising country and industry differences. Journal of operations Management, 21(1), 19-43.

Al-Qirim, N. (2006). The role of the government and e-commerce adoption in small businesses in New Zealand. International Journal of Internet and Enterprise Management, 4, 293–313.

Awa, H. O., Ukoha, O., & Emecheta, B. C. (2016). Using TOE theoretical framework to study the adoption of ERP solution. Cogent Business & Management, 3(1), 1196571.

Azmi, A. N., Kamin, Y., Noordin, M. K., & Nasir, A. N. M. (2018). Towards industrial revolution 4.0: employers' expectations on fresh engineering graduates. International Journal of Engineering & Technology, 7(4.28), 267-272.

Azmi, A. N., Kamin, Y., Noordin, M. K., & Nasir, A. N. M. (2018). Towards industrial revolution 4.0: employers' expectations on fresh engineering graduates. International Journal of Engineering & Technology, 7(4.28), 267-272.

Bag, S., Gupta, S., & Kumar, S. (2020). Industry 4.0 adoption and 10R advance manufacturing capabilities for sustainable development. International Journal of Production Economics, 231, 107844.

Ghobakhloo, M. (2020). Industry 4.0, digitisation, and opportunities for sustainability. Journal of Cleaner Production, 252, 119869.

Gui, A., Fernando, Y., Shaharudin, M. S., Mokhtar, M., & Karmawan, I. G. M. (2021). Drivers of Cloud Computing Adoption in Small Medium Enterprises of Indonesia Creative Industry. JOIV: International Journal on Informatics Visualization, 5(1), 69-75.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. European Business Review.

Jabbour, C. J. C., Fiorini, P. D. C., Wong, C. W., Jugend, D., Jabbour, A. B. L. D. S., Seles, B. M. R. P., ... & da Silva, H. M. R. (2020). First-mover firms in the transition towards the sharing economy in metallic natural resource-intensive industries: Implications for the circular economy and emerging industry 4.0 technologies. Resources Policy, 66, 101596.

Kazancoglu, Y., & Ozkan-Ozen, Y. D. (2018). Analysing Workforce 4.0 in the Fourth Industrial Revolution and proposing a road map from operations management perspective with fuzzy DEMATEL. Journal of Enterprise Information Management.

Kumar, R., Singh, R. K., & Dwivedi, Y. K. (2020). Application of industry 4.0 technologies in SMEs for ethical and sustainable operations: Analysis of challenges. Journal of cleaner production, 275, 124063.

Li, G., Hou, Y., & Wu, A. (2017). Fourth Industrial Revolution: technological drivers, impacts and coping methods. Chinese Geographical Science, 27(4), 626-637.

Margherita, E. G., & Braccini, A. M. (2020). Organisational Impacts on Sustainability of I ndustry 4.0: A Systematic Literature Review from Empirical Case Studies. Digital Business Transformation, 173-186.

Morrar, R., Arman, H., & Mousa, S. (2017). The fourth industrial revolution (Industry 4.0): A social innovation perspective. Technology Innovation Management Review, 7(11), 12-20.

Neumann, W. P., Winkelhaus, S., Grosse, E. H., & Glock, C. H. (2020). Industry 4.0 and the human factor–A systems framework and analysis methodology for successful development. International Journal of Production Economics, 107992.

Parham, S., & Tamminga, H. J. (2018). The adaptation of the logistic industry to the fourth industrial revolution: The role of human resource management. Journal of Business Management & Social Science Research, 7(9), 179-191.

Potoczek, N. R. (2020). Improving business processes and process organisation from the Industry 4.0 perspective.

Pudjianto, B., Zo, H., Ciganek, A. P., & Rho, J. J. (2011). Determinants of e- government assimilation in Indonesia: An empirical investigation using a TOE framework. Asia Pacific Journal of Information Systems, 21(1), 49-80.

Pudjianto, B., Zo, H., Ciganek, A. P., & Rho, J. J. (2011). Determinants of e- government assimilation in Indonesia: An empirical investigation using a TOE framework. Asia Pacific Journal of Information Systems, 21(1), 49-80.

Rahman, M., Kamal, M. M., Aydin, E., & Haque, A. U. (2020). Impact of Industry 4.0 drivers on the performance of the service sector: comparative study of cargo logistic firms in developed and developing regions. Production Planning & Control, 1-16.

Raj, A., Dwivedi, G., Sharma, A., de Sousa Jabbour, A. B. L., & Rajak, S. (2020). Barriers to the adoption of industry 4.0 technologies in the manufacturing sector: An inter-country comparative perspective. International Journal of Production Economics, 224, 107546.

Shaharudin, M. S., Fernando, Y., Jabbour, C. J. C., Sroufe, R., & Jasmi, M. F. A. (2019). Past, present, and future low carbon supply chain management: A content review using social network analysis. Journal of cleaner production, 218, 629-643.

Sharotry, A. (2020). A digital twin framework of a material handling operator in industry 4.0 environments.

Sima, V., Gheorghe, I. G., Subić, J., & Nancu, D. (2020). Influences of the Industry 4.0 Revolution on the Human Capital Development and Consumer Behavior: A Systematic Review. Sustainability, 12(10), 4035.

Sorooshian, S., & Panigrahi, S. (2020). Impacts of the 4th Industrial Revolution on Industries. Walailak Journal of Science and Technology (WJST), 17(8), 903-915.

Szymczyk, K. (2020). Industry 4.0 From the Point of View of Human Resources Management. Zeszyty Naukowe. Organizacja i Zarządzanie/Politechnika Śląska, (149), 695- 703.

Tortorella, G. L., Vergara, A. M. C., Garza-Reyes, J. A., & Sawhney, R. (2020). Organizational learning paths based upon industry 4.0 adoption: An empirical study with Brazilian manufacturers. International Journal of Production Economics, 219, 284-294.

Zia, N. U., & Owusu, V. K. (2020, June). A Viewpoint on Management Practices for Cybersecurity in Industry 4.0 Environment. In ECCWS 2020 20th European Conference on Cyber Warfare and Security (p. 435). Academic Conferences and publishing limited.

Ziaei Nafchi, M., & Mohelská, H. (2020). Organizational Culture as an Indication of Readiness to Implement Industry 4.0. Information, 11(3), 174.

APPENDIX

Table 10: Drivers of Human Resources 4.0: Technology, Organization and Environment (Independent Variable)

Variable	Items	Source adapted from
Drivers of Human Resources 4.0: Technology, Organisation and Environment	**Technology:** 1. Our company have good infrastructure in applying the Industrial Revolution (IR) 4.0 technology. 2. Our company provides knowledgeable personnel or expertise and training employees to handle the Industrial Revolution (IR) 4.0 technology. 3. Our company shares the Industrial Revolution (IR) 4.0 infrastructure's database for various applications. **Organisation:** 1. Our company's top management has a vision of using the Industrial Revolution (IR) 4.0 technology. 2. Our company's top management formulate a strategy for adopting the Industrial Revolution (IR) 4.0 technology. 3. Our company's top management use the Industrial Revolution (IR) 4.0 technology to monitor the company's goals and objectives **Environment:** 1. The initiative and implementation of the industrial revolution (IR) 4.0 technology in our company are supported by government laws and regulation. 2. The government have provided an incentive to pursue the use of the Industrial Revolution (IR) 4.0 technology in our company. 3. Using the Industrial Revolution (IR) 4.0 technology, our company' organisation needs can quickly require.	Pudjianto et al. (2011)

Table 11: Human Resources 4.0 (Dependent Variable)

Variable	Questions	Source adapted from
Human Resources 4.0	1. Our company has technology 4.0 to facilitate idea exchange among employees. 2. Our company has technology 4.0 to determine a fair rewarding system. 3. Our company has technology 4.0 to improve employee's development and training. 4. Our company has technology 4.0 to show employee's productivity information.	Ahmad et al. (2003).

CONFLICT OF INTEREST

The author(s), as noted, certify that they have NO affiliations with or involvement in any organisation or agency with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, jobs, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, expertise or beliefs) in the subject matter or materials addressed in this manuscript.

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