HUMAN FACTORS OF THAILAND TOWARD INDUSTRY 4.0

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Abstract

Thai industry is moving toward Industry 4.0 era. Whilst technologies are today advanced and accessible, Organization and Management are often the obstacle to the development. Thus, the paper focuses on investigating the Human Resource and the Human Resource Management if they are aligned with the potential of the industry toward Industry 4.0. The paper selects indicators from the World Economic Forum's the Global Competitiveness Report in order to explore Thai industry's Organization and Management potential. The finding is suggestive that Human Resource and Human Resource Management of Thai industry are deficit. Whilst the Organization and Management Potential has been improving, the Human Resource and Human Resource Management are otherwise. The concerning issues are, for example, Quality of math and science education, Availability of scientists and engineers, Pay and productivity, and Capacity to retain and attract talent.

Keywords: Thailand, Industry 4.0, Organization and Management, Human Resource, Human Resource Management

1. INTRODUCTION

Thailand is world's 20th biggest economy with GDP of 406.9 US$ billion. As a newly industrialized country, the economy is highly dependent to industry and export. The industry is the main sectors in Thailand, accounting for 39.2% of GDP. Yearly, it is expected that Thailand has exported more than 230 US$ billion bywhich computers, electronic parts, car, automobile parts and food are among the top export. Thailand is ranked 32nd in Global Competitiveness Index (2017-2018 edition) by World Bank with outstanding Macroeconomic environment and market size (Schwab, 2017). The population of Thailand is reported as 69 million. 36.8 million are employed. Yet, only 13.8% of these workforces are skilled and knowledge-intensive (Martin et al., 2018). Thailand is among the lowest unemployment rate countries in the world. Thailand also ranks 26th in Ease of Doing Business 2018 by World Bank (World Bank, 2017). Moreover, Thailand has just recently joined the ASEAN Economic Community (AEC) which is an initiation between 10 South-East Asia countries, aiming at integrating 10

economies into a single market and a single production base (ASEAN & ASEAN Secretariat, 2008). This will allow free flow of goods, services, investment, capital and skilled labor among this region. The collaboration is now progressive and challenging (Das et al., 2013; Santiteerakul et al., 2018). This means the economy is expanding to the AEC's GDP of 2,553.4 US$ billion. The population of AEC is 635.9 million, 8.4% of the world. The AEC then springboards and includes Thailand to the strong economies such as Singapore (World's 3rd highest competitive country and 2nd in ease of Doing Business), Indonesia (World's 7th biggest economy) and Malaysia (World's 23rd highest competitive country and 24th in Ease of Doing Business) (Schwab, 2017).

1.1. Industry 4.0

Industry 4.0, referred to the 4th Industrial Revolution, is a concept that utilizes Cyber-Physical Systems (CPS), the Internet of Things (IoT) and the Internet of Services to leverage manufacturing to the new era. The technology enables industry to decentralize, integrate horizontally and vertically, be connected and analyse effectively (Gilchrist, 2016; Jazdi, 2014; Lasi et al., 2014). The factories and products become "smart" by accomplishing tasks based on information from physical and virtual synchronization. Smart Technology such as sensors, actors, and autonomous systems are equipped and therefore the factory can be autonomously controlled (Lucke, Constantinescu, & Westkämper, 2008). Whilst the concept has been more concreted, the implementation is yet challenging (Brettel et al., 2014; Lee, Bagheri & Kao, 2015; Wang et al., 2016). The scope of Industry 4.0 often encompasses the Smart Factory or Smart Manufacturing as well as Smart Logistics as the facilitators of these advancement (Kirch, Poenicke, & Richter, 2017; Resch & Blecker, 2012; Uckelmann, 2008). In addition, Organization and Management, highlighted as Strategy, Leadership, Governance, Culture and People, must also become smarter to cope with these advancements (Matt, Rauch, & Riedl, 2018; SME4.0, 2018). Figure 1 illustrates the relationship within Industry 4.0 scheme.
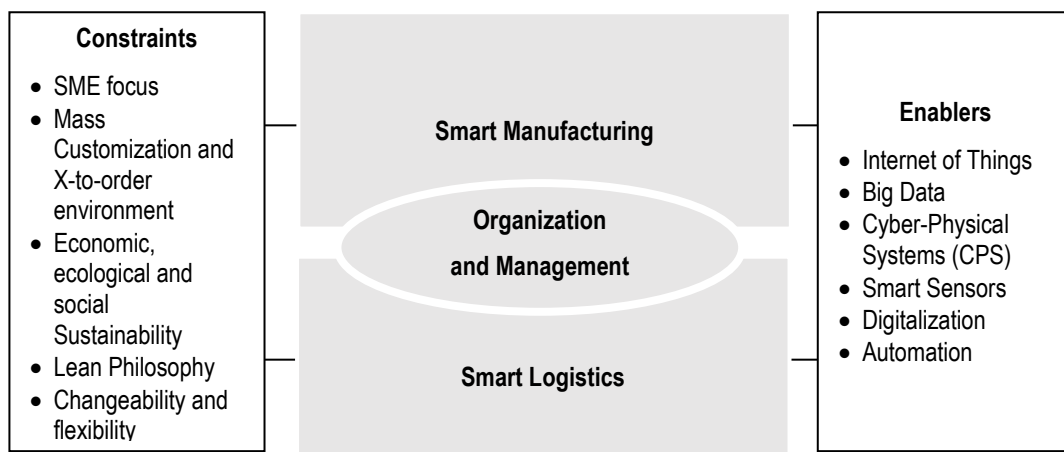

FIGURE 1 - INDUSTRY 4.0 HOLISTIC CONCEPT
Source: SME4.0 (2018)

1.2. Industry 4.0 in Thailand

Thailand is an industrialized Asian country with manufacturing value added in economy of 28.7% of GDP. 40.7% of the industries are medium hi-tech and hi-tech (Martin et al., 2018). Automotive, electronic, plastic, rubber and food industries are among the top product from these sectors.

Instead of focusing on industry alone, Thai government extends the Industry 4.0 concept to a national scheme of "Thailand 4.0". The agenda further focuses on developing sustainable economic model based on people with creativity and innovation as well as new technology and high-quality services (Jones & Pimdee, 2017; Puncreobutr, 2017).

1.3. Organization and Management

Technologies are today advanced and accessible to the world of manufacturing. Any company can become smarter and closer to Industry 4.0 league. However, Organization and Management (OM) are often the obstacle to this development (Hecklau et al., 2016; Shamim et al., 2016). Several Maturity Models are introduced to assess the maturity of the company toward Industry 4.0. Factors of interest are commonly Products, Customers, Operations and Technology. Enabling factors are, for example, Strategy, Leadership, Governance, Culture and People as of organizational aspect (Fanzarain & Errasti, 2016; Schumacher, Erol, & Sihn, 2016)

The paper aims at investigating Thailand's development, focusing on Human Resource and Human Resource Management as main success drivers to Industry 4.0, should they align with the Organization and Management potential.

2. METHODOLOGY

This paper focuses on people factor. As a key enabling driver to the Industry 4.0 era, Human Resource (HR) including labor availability, quality and quantity are of interest. Also, the Human Resource Management (HRM) of labor in terms of development, training, retention and remuneration are also of interest. Therefore, this paper focuses on 2 areas of OM toward Industry 4.0, i.e., HR and HRM.

The data used in this paper is based on the published indicators by World Economic Forum of the Global Competitiveness Report (GCR)[1]. Figure 2 illustrates the "Global Competitiveness" trend of Thailand since 2011.

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[1] Global Competitiveness Report, reported by World Economic Forums, has been assessing economies in the world since 2004 in 12 productivity and long-term prosperity pillars, i.e., institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labor market efficiency, financial market development, technological readiness, market size, business sophistication, and innovation. There are all together 114 indicators, used to reflect the competitiveness of economies. In 2017-2108 report, the database comprises of 137 economies, including Thailand.
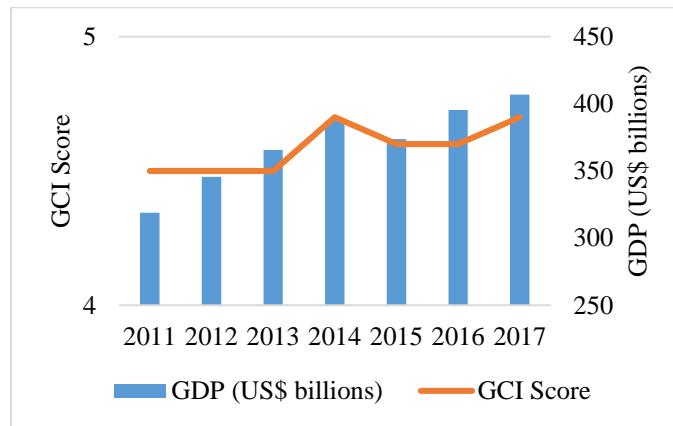
FIGURE 2 - GDP AND GCI SCORE OF THAILAND – 2011-2017
Source: Schwab (2011, 2012, 2013, 2014, 2015, 2016, 2017)

At first, it can be seen that Thailand has been developing in both economic strengths and Global Competitive Index (GCI) score. Gross Domestic Product (GDP) of Thailand has been increased by 27% since 2011. However, GCI score has increased by only 4%, from 4.5 to 4.7. This is questionable if the competitiveness of Thailand has been developed adequately. However, it shall be noted that GCI score are greatly composite in many economic and social perspectives. Therefore, the paper will select only indicators that are related to HR and HRM of interest. In addition, the paper will select indicators that are reflective to Industry 4.0 OM Potential to challenge the quest. Figure 3 illustrates the conceptual relationship between HR, HRM and Industry 4.0 OM Potential.
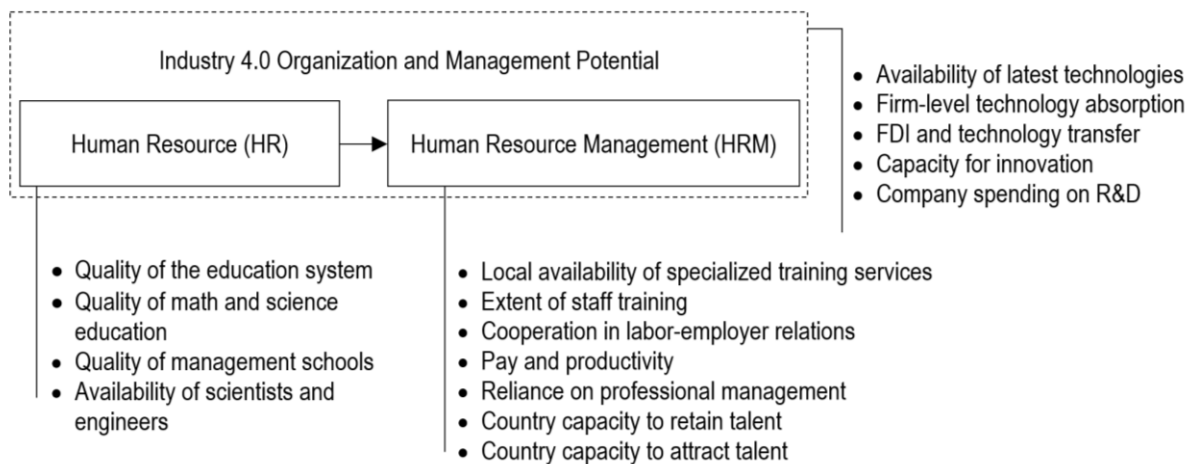

FIGURE 3 - RELATIONSHIP BETWEEN HUMAN RESOURCE, HUMAN RESOURCE AND INDUSTRY 4.0 ORGANIZATION AND MANAGEMENT POTENTIAL

3. RESULT PRESENTATION

The investigation divided into 3 areas, i.e., Human Resource, Human Resource and Industry 4.0 Organization and Management Potential.

3.1. Human Resource

The area of HR is scoped mainly to the quality and availability of the skilled workforce entering the industry. Therefore, selected GCR indicators are Quality of the (Higher) education system, Quality of math and science education, Quality of management schools and Availability of scientists and engineers.
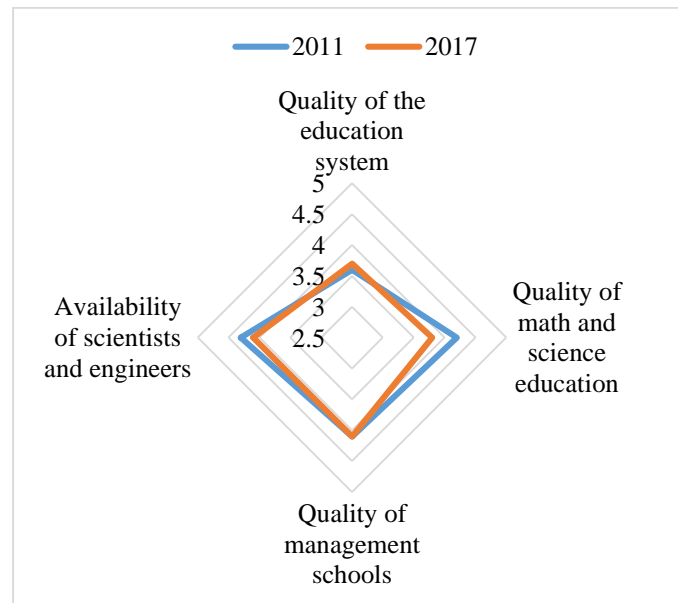

FIGURE 4 - HUMAN RESOURCE SCORES OF THAILAND TOWARD INDUSTRY 4.0

Figure 4 illustrates scores (year 2011 and 2017) of each indicator in HR area of Thailand taken from GCR. The score ranges from 1 to 7. The higher the score is, the better.

Here, it is suggestive that HR of Thailand has been declined. The score of Quality of math and science education is dropped from 4.2 in 2011 to 3.8 in 2017. The score of Availability of scientists and engineers has also dropped from 4.3 in 2011 to 4.1 in 2017. The score of Quality of management schools has not been improved since 2011. Only the score of Quality of education system has been increased slightly from 3.6 in 2011 to 3.7 in 2017. These figures reflect the undesirable trend of HR in Thailand.

3.2. Human Resource Management

The area of HRM mainly focuses on labor management including training, retaining, performance and pay management and retention. This is the management of the HR once they are inputted. Selected GCR indicators are Local availability of specialized training services, Extent of staff training, Cooperation in labor-employer relations, Pay and productivity, Reliance on professional management, Country capacity to retain talent and Country capacity to attract talent.
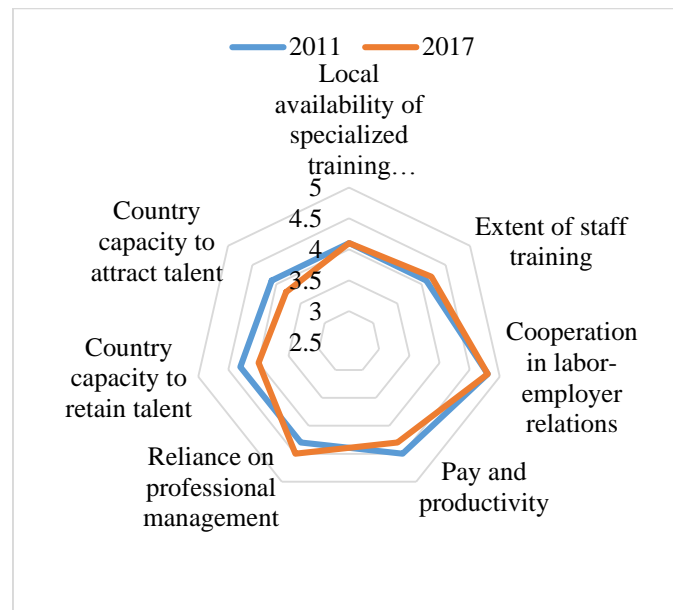
FIGURE 5 - HUMAN RESOURCE MANAGEMENT SCORES OF THAILAND TOWARD INDUSTRY 4.0

From figure 5, the trend of HRM is again concerning. The scores of Country capacity to attract and retain talent both have dropped by 0.3 points. The score of Pay and productivity has dropped by 0.2 points. The score of Local availability of specialized training services and Cooperation in labor-employer relations have not been improved. The only good signs are the score of Reliance on professional management that has been increased from 4.3 in 2011 to 4.5 in 2017 and the score of Extent of staff training has been increased by 0.1 points, from 4.1 in 2011 to 4.2 in 2017.

3.3. Industry 4.0 Organization and Management Potential

Toward Industry 4.0, the technology availability, transferability and absorption as well as R&D and innovation capacity are critical. Therefore, the paper selects 5 GCR indicators to reflect the Industry 4.0 OM potential of Thai industry. The indicators are Availability of latest technologies, Firm-level technology absorption, FDI and technology transfer, Capacity for innovation and Company spending on R&D.

From Figure 6, it can be seen that Thai industry OM potential toward Industry 4.0 has been improved. The score of Capacity for innovation has been increased from 3.2 in 2011 to 4.1 in 2017. The score of Company spending on R&D has been increased from 3.0 in 2011 to 3.6 in 2017. Yet, the improvement in Availability of latest technology and Firm-level technology absorption and the decreased score in FDI and technology transfer are only marginal.
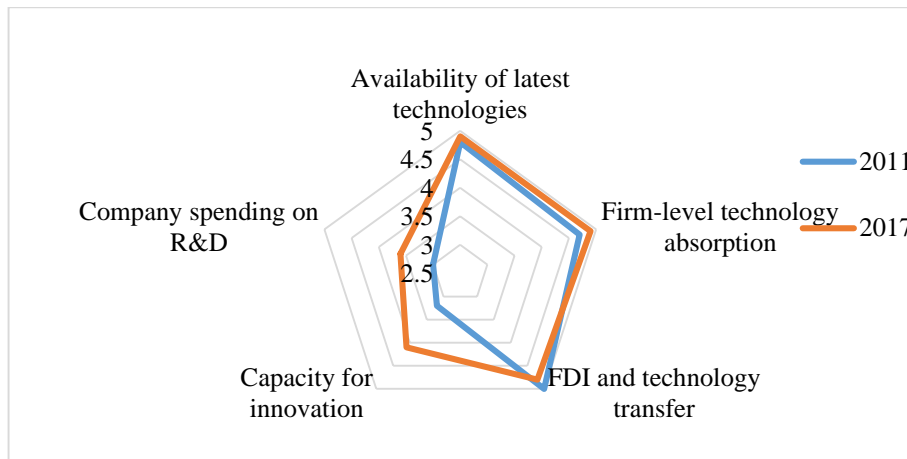
FIGURE 6 - SCORES OF INDUSTRY 4.0 ORGANIZATION AND MANAGEMENT POTENTIAL OF THAILAND TOWARD INDUSTRY 4.0

3.4. Trend of Human Resource and Human Resource Management in Industry 4.0 Organization and Management Potential in Thailand
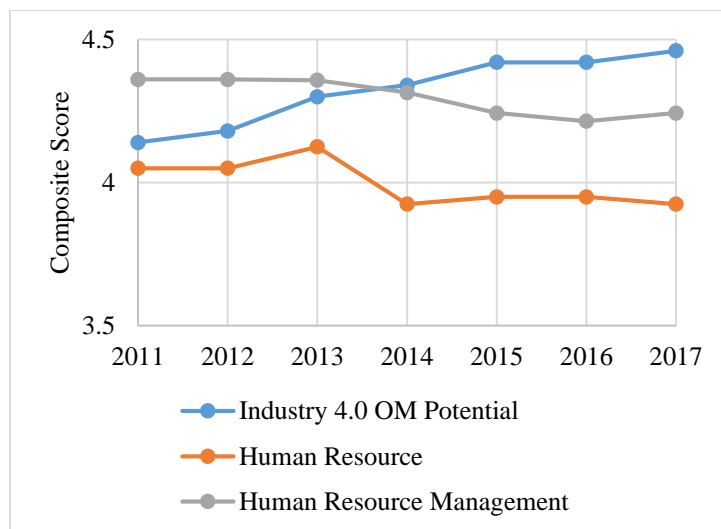

FIGURE 7 - COMPOSITE SCORES IN HUMAN RESOURCE, HUMAN RESOURCE MANAGEMENT AND INDUSTRY 4.0 ORGANIZATION AND MANAGEMENT POTENTIAL OF THAILAND – 2011-2017

Figure 7 summarizes composite score in HR, HRM and Industry 4.0 OM Potential of Thailand. The scores are taken from average of the indicators represent each area of interest discussed above. The figure is indicative that OM Potential of Thailand toward Industry 4.0 has been improving continuously as discussed above. The biggest improvement is from the Capacity of innovation and Company spending on R&D. However, HR and HRM are otherwise. The aggregated scores of HR and HRM have been both decreased. In area of HR, Quality of math and science education and Availability of scientists and engineers are among the weakest. In area of HRM, Pay and productivity and Capacity to retain and attract talent are among the least desirable aspects.

Therefore, the figure is suggestive that HR and HRM of Thailand is not aligned with the Thailand's Industry 4.0 Organization and Management Potential.

4. DISCUSSIONS

This section further investigates if the findings are concreted and if it is normal and acceptable. Therefore, the paper selects 4 economies, closely related to Thailand, as the benchmarks. Selected economies are Singapore, Malaysia, Indonesia and Vietnam. These countries are working closely together with Thailand in the initiatives of AEC single market and production base.

Table 1, firstly, compares these economies in terms of GDP, GDP per capita, GCI rank and GCI score. It can be seen that Singapore is the exceptional as ranked 3rd in the Global Competitiveness. The country is small but highly significant to Thailand economy as 3.5% of total Thai exports go to Singapore. Malaysia, Indonesia and Vietnam, on the other hand, are more economically or demographically similar to Thailand. They are industrialized and developing countries. Malaysia is bordering South of Thailand. It accounts 4.4% of total Thai exports. Indonesia and Vietnam are further out. However, they are among top 10 trading partners of Thailand (3.7% and 4.9% of total Thai export, respectively) (The Bank of Thailand, 2018).

TABLE 1 - BASIC INFORMATION OF THAILAND, SINGAPORE, MALAYSIA, INDONESIA AND VIETNAM

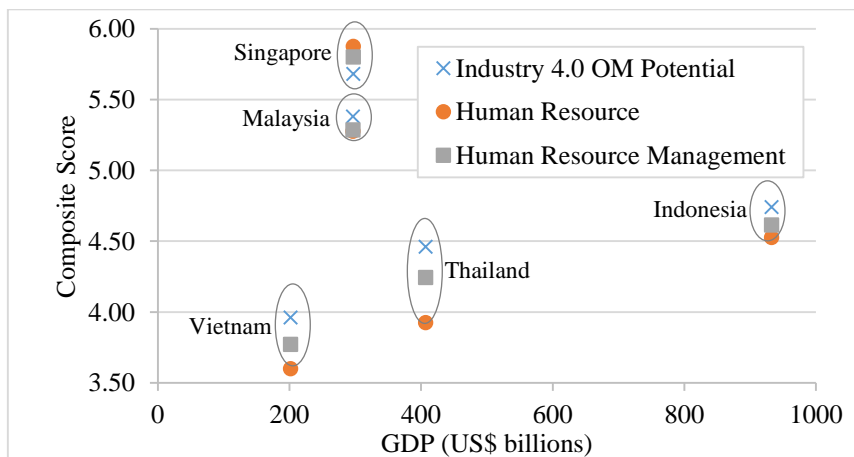|	Thailand	Singapore	Malaysia	Indonesia	Vietnam
Population (millions)	69.0	5.6	31.7	258.7	96.2
GDP (US$ billions)	406.9	297	296.4	932.4	201.3
GDP per capita (US$)	5899.4	52960.0	9360.5	3604.3	2173.3
GCI Rank	32	3	23	36	55
GCI Score	4.7	5.7	5.2	4.7	4.4

Source: Schwab (2017)

FIGURE 8 - COMPOSITE SCORE IN HUMAN RESOURCE, HUMAN RESOURCE MANAGEMENT AND INDUSTRY 4.0 ORGANIZATION AND MANAGEMENT POTENTIAL OF THAILAND, SINGAPORE, MALAYSIA, INDONESIA AND VIETNAM – 2017

Figure 8 illustrate composite score in HR, HRM and Industry 4.0 OM Potential of Thailand, Singapore, Malaysia, Indonesia and Vietnam, based on 2017-2018 GCR. Here, it can be seen that Singapore outleagues other economies as expected. Singapore's HR and HRM even score higher than Industry 4.0 OM potential score. This is suggestive that HR and HRM in Singapore are progressive beyond the technological advancement, required for Industry 4.0. In fact, Singapore is world top 5 in more than half of the inspected indicators. Malaysia is also positioned well toward the issues. With average score of above 5, the country is strong in all areas. Moreover, the score of HR and HRM are close to the score of Industry 4.0 OM Potential. This is suggestive if the development of HR and HRM are coordinated with the country OM potential toward Industry 4.0.

On the other hand, Indonesia's Global Competitiveness is ranked lower than Thailand. Its GCI scores is equal to Thailand at 4.7. However, Indonesia has higher scores in HR, HRM and Industry 4.0 OM Potential than Thailand. Quality of the education system, Quality of math and science education, Quality of management schools and Availability of scientists and engineers are among the betterment in Indonesia's HR and HRM. Capacity for innovation and Company spending on R&D are among the Indonesia OM Potential advancements toward Industry 4.0. In contrast, Vietnam is behind Thailand in the issue. However, gaps between aggregate score of the Industry 4.0 OM Potential and scores of HR and HRM of Vietnam are both lesser than those of Thailand. This means Vietnam's HR and HRM are more aligned to the OM Potential toward Industry 4.0. Thailand has a big room of improvement both HR and HRM to cope with these Industry 4.0 quest.

5. CONCLUSIONS

The paper investigates the alignment of Human Resource and Human Resource Management of Thai industry toward Organization and Management Potential toward Industry 4.0. The paper uses selected indicators reported by World Economic Forum's Global Competitiveness Report, dated 2011-2017 of Thailand and 4 benchmarking countries. The finding is suggestive that Thai Human Resource and Human Resource Management are deficit and not aligned with Industry 4.0 Organization and Management Potential. Whilst the Organization and Management Potential of Thailand is improving, e.g., Capacity for innovation and Company spending on R&D, Human Resource and Human Resource Management of Thailand are otherwise. The gap is widened, and it is not a good sign. The issue of concerns are the Quality of math and science education, Availability of scientists and engineers, Pay and productivity, and Capacity to retain and attract talent.

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