Journal of Positive School Psychology http://journalppw.com
2022, Vol. 6, No. 11, 61-74

Guidelines To Improve Manpower Potential In The Manufacturing Industry In The Area Of The Eastern Economic Corridor: A Case Study Of The Rail Industry

Dr. Jutharat Pinthapataya*

****Assistant Professor, Faculty of Business and Industrial Development, Bachelor of Business Administration Program in Industrial Business and Human Resource Development, King Mongkut's University of Technology North Bangkok, Thailand.*
E-mail: Pinthapataya.J@gmail.com

Abstract

This study aimed to analyze the confirmatory factors of Guidelines to Improve Manpower Potential in the Manufacturing Industry in the Area of the Eastern Economic Corridor. Samples used in this study consisted of establishments in the rail industry and other related industries located in the area of the Eastern Economic Corridor registered with the Department of Indus-trial Works, divided into two groups, namely, the rail industry group and related industries group. There were 500 samples obtained from simple randomization. The statistics used to analyze the data were mean, standard deviation. The index value used to determine the coherence of the model with the empirical data is the confirmatory factor analysis.

The results of the confirmatory factor analysis by the second order confirmatory factor analysis showed that the guidelines to improve manpower potential in the manufacturing industry located in the area of the Eastern Economic Corridor: A Case Study of the Rail Industry had 3 main components and 32 sub-components. The 3 main components were knowledge with 13 sub-components, skills with 10 sub-components, and attributes with 9 sub-components. The Model had coherence with the empirical data. (χ^2 = 503.600, df = 461, p = 0.083, χ^2/df = 1.092, GFI = 0.940, RMSEA = 0.014).

Keywords: Eastern Economic Corridor, Manpower, Manufacturing Industry, Potential, Rail Industry.

Introduction

Thailand has a comparative advantage in biodiversity and culture when compared to many other countries. Under the current competitiveness of the global economy, the opportunities to take advantage of comparative advantages are limited. Therefore, it is imperative to transform such a comparative advantage into a competitive advantage by utilizing knowledge, technology, and creativity. In addition, there is a need to change the industrial sector under the economic model of Thailand 4.0 (Ministry of Industry, 2016; The National Reform Council, 2016) from being efficiency-driven to technology-driven. Innovation is the mechanism that drives the economy through the development of new target industries (S-Curve) to drive economic growth. There are 5 existing industries, which are called the First S-Curve, which are industries with a certain level of strength, but they need to be improved by research and development of technology and innovation in order to create value to be competitive in the world arena. There are 5 new industries, which are called New S-Curve, which are industries to improve the potential to compete in the future. The rail system is classified as S–Curve, namely, modern automotive industries, intelligent electronics industries, and industrial robots. The government focuses on promoting and supporting the manufacturing of rail system spare parts by using at least 40 percent of the domestic material (local content) by the year 2022, according to the "Thai First" policy. Therefore, it is imperative to improve the potential of manpower to have knowledge,

competence, and advanced skills in applying cutting-edge technology that is directly related to the rail industry, namely, the rail industry, locomotives, sky trains, suspension systems, drive and control systems, and other systems. The related industries are the manufacturing of electronic parts and equipment, parts and equipment used for electronic products, metal products industry, machinery, transportation equipment, robot assembly automatic equipment and industrial parts with machines with artificial intelligence (AI) functions or other types of businesses that are important to the development of the rail industry.

The goal is to shift from an economy that is largely dependent on external technology to one that focuses on developing its own technology at an appropriate level. One of the strategies under the industry under the economic model of Thailand 4.0 is to adjust the industrial structure and change the manpower to be in line with the Thailand 4.0 industry. Therefore, it is imperative to continue to develop manpower in today's manufacturing industry through reskilling, upskilling, and multiskilling as well as changing the mindset, skill set, and behavior set so as to be able to drive the industry under the Thailand 4.0 economic model that consists of truly wealthy, stable, and sustainable individuals. In addition, according to the framework of the 20-year national strategic plan, the goal of the country is to become a high-income country within the year 2027. The government is currently giving importance to the development of the country's infrastructure in terms of transportation and transportation networks, including investment in the Eastern Economic Corridor (EEC) Mega Projects, such as the high-speed train project, the electric train project in Bangkok Metropolis, which has caused more construction. Hence, there is a need to use workers with knowledge, skills, and attributes to keep up with modern technology, such as welding and joining technology for rail systems; computer aided analysis and design for rail systems; knowledge, understanding, and skills to control mannequins. Industrial and machine vision for railways, artificial intelligence (AI), railway industry management, etc., which requires cooperation between educational institutions and businesses in the improvement of manpower to have the potential in terms of knowledge, skills and attribute in modern operations to keep up with changes and experts, personnel, tools and equipment to be used a shared resources to drive the new target industry (S-Curve), which is an important driving mechanism for the economy in terms of innovation to raise the level of competitiveness to provide manpower with knowledge, skills and attributes are effective focus on the continuous development of knowledge, abilities and skills in the work, along with the appropriate welfare and benefits system which aims to raise the productivity of a knowledgeable manpower and advanced skills which will be an important component of raising the productivity of the country.

Due to the importance of manpower improvement in the railway industry, there is an interest in studying the improvement of manpower potential in the manufacturing industry in the area of the eastern economic corridor: a case study of the rail industry will lead to the drive economy and raise the competitiveness of the country further.

Hypothesis. Guidelines to Improve Manpower Potential in the Manufacturing Industry in the Area of the Eastern Economic Corridor: A Case Study of Rail Industry consisted of 3 main components, namely, Knowledge, Skills, and Attributes. All the main components fall under the same major component.

Materials and Methods

1. Population and sample group

1.1 Informants for in-depth interviews consisted of 7 executives in the rail industry and related industries in the Eastern Economic Corridor (ECC), which includes Chachoengsao Province, Chon Buri Province, and Rayong Province, and related government agencies from the public sector, private sector, and educational institutions obtained by purposive sampling.

1.2 Informants for quantitative data consisted of 2 groups of workers in the rail industry and related industries in the Eastern Economic Corridor (ECC), which includes Chachoengsao Province, Chon Buri Province, and Rayong Province as follows.

Group 1: Industrial factories related to rail systems which are factory code 07601 engaged in the business of building, modifying or repairing vehicles used in trains, electric trams or cable cars,

factory code 07602 engaged in the business of making special parts or equipment for vehicles used in trains, electric trams or cable cars and factory type code 30200 engaged in the business of manufacturing locomotives and carriages for railway and tram transportation

Group 2: Factories in related factories which are factory code 2410 engaged in the manufacturing of iron and basic steel, factory code 27101 engaged in the manufacturing of electric motors and generators, factory code 2732 engaged in the manufacturing of wires and other types of cables used in electronics and electricity, factory code 07701 engaged in the business related to building, assembling, modifying or changing the condition of automobiles or trailers and factory code 07702 engaged in the business related to making special parts or accessories for automobiles or trailers. Sample Random Sampling and the calculation method according to Taro Yamane's formula at a confidence level of 95% (Confirmatory Factor Analysis: CFA) were applied in this study. (Comrey and Lee, 1992) have suggested that a very good sample size is 500 samples. In this research, the researcher therefore set the sample size at 500 samples.

3. Focus Group Discussion to consider appropriateness and feasibility of guidelines to improve manpower potential in the rail system industry in the area of the Eastern Economic Corridor (ECC) consisted of 20 executives who are representatives of railway industry and related industries, representatives of the public sector, private sector, education sector and related people, obtained by Purposive Sampling.

2. Research Variables

2.1 Structural variables consisted of three main components, namely, Knowledge, Skills, and Attributes.

2.2 Measurable variables consisted of knowledge with 13 sub-components, skills with 10 sub-components, and attributes with 9 sub-components.

3. Research areas

This research is conducted to study and collect information from industrial factories in the railway system and related industries in the Eastern Economic Corridor (ECC) which includes Chachoengsao Province, Chon Buri Province and Rayong Province, Thailand.

4. Time Period

The period used in this research was carried out between 1 March 2021 and 31 August 2021.

5. Assessment of Research Tools

The research instrument was a questionnaire on guidelines to improve manpower potential in the rail system industry in the area of the Eastern Economic Corridor (ECC) which was developed as a Likert's 5-scale, namely (Likert, 1932), Highest, Hight, Moderate, Low and Lowest. The criterion for interpretation was as follows, the mean of 4.51 - 5.00 refers to Highest, 3.51 - 4.50 refers to High, 2.51 - 3.50 refers to Moderate, 1.51 - 2.50 refers to Low, and 1.00 - 1.50 refers to Lowest (Spooren et al., 2007; Srisa-ard, 2010; Silpcharu, 2017), divided into 3 areas, which are Knowledge, Skills and Attributes with the Index of Item Objective Congruence (IOC) of 0.80 - 1.00, Power of Discrimination from 0.23 to 80, and Reliability of the entire questionnaire of 0.98.

6. Data Collection

Proceed to data collection from representatives of the establishment holding the position of senior management, middle management, junior management, or operational staff. The researcher made a request for permission to collect data from establishments in the Eastern Economic Corridor (EEC), including Chachoengsao Province, Chon Buri Province, and Rayong Province, by sending registered mail and using an online questionnaire (Google form). Take the questionnaires obtained from the collection to verify the accuracy of the questionnaire responses, and then record the results of the questionnaires in a computer program as data for analysis and to conclude the research results.

7. Data analysis

7.1 Qualitative data were analyzed by taking the data collected from the in-depth interview for contents analysis and systematic classification of data.

7.2 Opinion on guidelines to improve manpower potential in the manufacturing industry in the area of the eastern economic corridor: a case study of the rail industry was analyzed by using basic

statistics, namely, number, percentage, mean, and standard deviation.

7.3 Data were analyzed by the structural equation model of the second-order confirmatory factor analysis (Comrey and Lee, 1992) model of guidelines to improve manpower potential in the manufacturing industry in the area of the eastern economic corridor: a case study of rail industry in order to study the order of importance of the 3 main elements, namely, knowledge, skills and attributes, which are statistical techniques in multivariate analysis.

8. Research process:

Process 1: Study related documents and research by studying the 20-year National Strategic Plan (2018 - 2037) (Office of the National Economics and Social Development Council, 2017), National Economic and Social Development Plan No. 12 (2017 - 2021), Thai Industrial Development Strategy 4.0 for 20-year period (2017 - 2036), future personnel capacity for 12 target industrial groups (2020 - 2024) of the National Higher Education, Science, Research and Innovation Policy Council Office, Ministry of Higher Education, Science, Research and Innovation and interview the experts in rail systems and related industries of government agencies, private sectors and educational institutions.

Process 2: Prepare a questionnaire on the opinion on guidelines to improve manpower potential in the rail system industry in the area of the Eastern Economic Corridor (ECC) which is divided into 2 parts: Part 1 General Information of Respondents, Part 2: The Need to Increase Manpower Potential in the Rail Industry, and Part 3 Additional comments and suggestions to be guidelines to improve manpower potential in the rail industry.

Process 3: Interview experts in the rail industry and related industries with in-depth interview techniques to find out about the improvement of manpower in the rail industry and use the information to organize a group discussion meeting.

Process 4: Organize a Focus Group Discussion with experts consisting of executives representing entrepreneurs in the new target industry group (S-Curve), representatives of the government, private sector, education sector, and related parties to consider the appropriateness and feasibility of guidelines to improve manpower potential in the rail system industry in the area of the Eastern Economic Corridor (ECC).

Process 5: Analyze, conclude, and prepare a policy recommendation on the improvement of manpower potential in the rail system industry in the area of the Eastern Economic Corridor (ECC) to benefit the government, private sector, and educational institutions by using information as guidelines to improve manpower potential in the rail system industry in the area of the Eastern Economic Corridor (ECC) and guidelines for the improvement of manpower potential in related industries.

Results

1. Analysis of opinions about the needs of the establishment to improve manpower in the rail industry as a whole and by different aspects.

The establishment had a need to improve manpower in the rail industry as a whole (mean score of 4.41) at a high level. When each aspect was considered, it was found that all aspects were at a high level. When sorting the need to develop manpower in In the rail system industry from ascending to descending, it was found that the Attributes had a mean score of 4.38, followed by Skills, which had mean score of 4.41 and Knowledge, which had mean score of 4.39 respectively, as details shown in Table 1.

Table 1. Mean, standard deviation and level of opinion about the average value, standard deviation and level of opinion about the need to improve manpower potential in the manufacturing industry in the area of the eastern economic corridor: a case study of rail industry, as a whole and by each aspect.

Evaluation list	$\bar{X}$	S.D.	Opinion Level
Knowledge	4.39	0.69	High
Skills	4.41	0.60	High
Attributes	4.44	0.69	High
Overall	**4.41**	**0.66**	**High**

2. Analysis of structural equation models of the second order confirmatory factor analysis of guidelines to improve manpower potential in the manufacturing industry located in the area of the

Eastern Economic Corridor: A Case Study of the Rail Industry

Results of the analysis of structural equation models of the second order confirmatory factor analysis of guidelines to improve manpower potential in the manufacturing industry located in the area of the Eastern Economic Corridor: A Case Study of Rail Industry consisting of Knowledge, Skills, and Attributes. The model had the coherence with the empirical data with all statistical values in the reasonable range with Chi-Square Probability Level – p of 0.083 which was higher than 0.05, Relative Chi-Square (CMIN\DF) of 1.092 which was lower than 3, Comparative Fit Index (CFI) of 0.940 which was higher 0.90 and Root Mean Square Error of Approximation (RMSEA) of 0.014 which was higher than 0.08. When considering the factor loading in the standardized mode, it was found that all positive values ranged from 0.50 to 0.95 and were statistically significantly different from zero at the 0.001 level. When factor loading of each component was considered, followings are found.

1. Variable that was the most important in the area of Knowledge was Industrial Robotics and Machine Vision for Rail Systems (know8) with the standardized factor loading of 0.95 and covariance with the Knowledge of 0.91%, followed by Welding & Joining Technology for Rail Systems (know15) with the standardized factor loading of 0.94 and covariance with the Knowledge of 0.89%, Design and Manufacturing Standards of Spare Parts for Rail Systems (know10) with the standardized factor loading of 0.93 and covariance with the Knowledge of 0.87%, Hydraulic and Pneumatic Systems for Rail Systems (know7) with the standardized factor loading of 0.92 and covariance with the Knowledge of 0.84%, Programmable Logic Controller for Rail System (know 18) with the standardized factor loading of 0.92 and covariance with the Knowledge of 0.84%, Railway Structure Design (Civil Works and Railway) (know11) with the standardized factor loading of 0.88 and covariance with the Knowledge of 0.78%, Mandate Signal System for Rail System (know21) with the standardized factor loading of 0.87 and covariance with the Knowledge of 0.76%, Using CAD and CAM Programs (know20) with the standardized factor loading of 0.85 and covariance with the Knowledge of 0.73%. Technology for Elementary Railway System (know3) with the standardized factor loading of 0.82 and covariance with the Knowledge of 0.68%, Microcontroller for Rail System (know9) with the standardized factor loading of 0.82 and covariance with the Knowledge of 0.67%, Controls and Electronics for Rail Systems (know13) with the standardized factor loading of 0.82 and covariance with the Knowledge of 0.67%, Electrical System and Power Supply System (know16) with the standardized factor loading of 0.75 and covariance with the Knowledge of 0.56%, and Railway Industry Management (know26) with the standardized factor loading of 0.64 and covariance with the Knowledge of 0.41%, respectively.

2. Variable that was the most important in the area of Skills was Welding & Joining Work for Rail Systems (skill3) with the standardized factor loading of 0.85 and covariance with the Skills of 0.72%, followed by Industrial Robotics and Machine Vision for Rail Systems (skill9) with the standardized factor loading of 0.85 and covariance with the Skills of 0.72%, Vehicle Drive Work for Rail Systems (skill4)) with the standardized factor loading of 0.85 and covariance with the Skills of 0.55%. Analytical Thinking and Problem Solving at Work (skill26) with the standardized factor loading of 0.74 and covariance with the Skills of 0.54%, Work Related to the Use of Hydraulic and Pneumatic Systems for Rail Systems (skill8) with the standardized factor loading of 0.70 and covariance with the Skills of 0.49%, Programmable Logic Controller for Rail System (skill11) with the standardized factor loading of 0.68 and covariance with the Skills of 0.46%, Maintenance Planning for Rail Systems (skill17) with the standardized factor loading of 0.66 and covariance with the Skills of 0.43%, Railway Structure Design (Civil Works and Railway) (skill20) with the standardized factor loading of 0.66 and covariance with the Skills of 0.43%. Computer Aided Analysis and Design for Rail Systems (Skill13) with the standardized factor loading of 0.60 and covariance with the Skills of 0.36%, and Ability to Use English (skill27) with the standardized factor loading of 0.50 and covariance with the Skills of 0.25%, respectively.

3. Variable that was the most important in the area of Attributes was Honesty at Work (att21)) with the standardized factor loading of 0.88 and covariance with the Attributes of 0.77%, followed by

Discipline and Compliance with Organization Rules (att4) with the standardized factor loading of 0.85 and covariance with the Attributes of 0.72%, Responsible for Assignments Well (att1) with the standardized factor loading of 0.83 and covariance with the Attributes of 0.68%, Ability to Communicate and Coordinate with Other Departments (att16) with the standardized factor loading of 0.83 and covariance with the Attributes of 0.68%, Being patient to Work (att9) with the standardized factor loading of 0.81 and covariance with the Attributes of 0.66%, Human Relations and Being Able to Get Along Well with Colleagues (att15) with the standardized factor loading of 0.81 and covariance with the Attributes of 0.65%, Good Leadership (att11) with the standardized factor loading of 0.81 and covariance with the Attributes of 0.66%, Having Awareness of Safety (att26) with the standardized factor loading of 0.72 and covariance with the Attributes of 0.52%, and Adaptability and Flexibility to Situations (att10) with the standardized factor loading of 0.69 and covariance with the Attributes of 0.48%, respectively.

From the hypothesis, it was found that all 3 components were under the same major component with the factor loading between 0.97 and 1.00. When the factor loading is sorted from ascending to descending, it was found that Skills, Attributes, and Knowledge with to factor loading of 1.00, 0.99 and 0.97 respectively.

Details as shown in Table 2 and Figure 1.

Table 2. Statistics obtained from the analysis of structural equation models of the second order confirmatory factor analysis of guidelines to improve manpower potential in the manufacturing industry located in the area of the Eastern Economic Corridor: A Case Study of Rail Industry after model adjustment.

Variable	Estimate		Variances	R^2	C.R.	P
	Unstandardized	standardized				
Outcome variable						
Guidelines to Improve Manpower Potential in the Manufacturing Industry in the Area of the Eastern Economic Corridor: A Case Study of Rail Industry						
Variable						
Knowledge	1.00	1.00	0.99	0.00		
Skills	0.99	1.04	0.97	0.01	22.964	***
Attributes	0.97	0.98	0.94	0.02	21.658	***
Knowledge						
1. Technology for Elementary Railway System (know3)	0.82	1.00	0.68	0.17		
2. Hydraulic and Pneumatic Systems for Rail Systems (know7)	0.92	1.11	0.84	0.08	27.213	***
3. Industrial Robotics and Machine Vision for Rail Systems (know8)	0.95	1.18	0.91	0.05	29.084	
4. Microcontroller for Rail System (know9)	0.82	1.00	0.67	0.17	22.556	***
5. Welding & Joining Technology for Rail Systems (know10)	0.93	1.12	0.87	0.07	27.854	***
6. Programmable Logic Controller for Rail System (know11)	0.88	1.10	0.78	0.12	25.521	***
7. Controls and Electronics for Rail Systems (know13)	0.82	1.00	0.67	0.18	22.413	***
8. Welding & Joining Technology for Rail Systems (know15)	0.94	1.17	0.89	0.06	28.501	***
9. Electrical System and Power Supply System (know16)	0.75	0.92	0.56	0.23	19.767	***

10. Programmable Logic Controller for Rail System (know18)	0.92	1.09	0.84	0.08	27.165	***
11. Using CAD and CAM Programs (know20)	0.85	1.04	0.73	0.14	24.067	***
12. Mandate Signal System for Rail System (know21)	0.87	1.06	0.76	0.13	24.805	***

Variable	Estimate		Variances	R^2	C.R.	P
	Unstandardized	standardized				
13. Railway Industry Management (know26)	0.64	0.78	0.41	0.31	16.102	***
Skills						
1. Welding & Joining Work for Rail Systems (skill3)	0.85	1.00	0.72	0.15		
2. Vehicle Drive Work for Rail Systems (skill4).	0.74	0.86	0.55	0.24	19.927	***
3. Work Related to The Use of Hydraulic and Pneumatic Systems for Rail Systems (skill8)	0.70	0.83	0.49	0.28	18.437	***
4. Industrial Robotics and Machine Vision for Rail Systems (skill9)	0.85	0.99	0.72	0.15	24.77	***
5. Programmable Logic Controller for Rail System (skill11)	0.68	0.80	0.46	0.29	17.409	***
6. Welding & Joining Work for Rail Systems (skill13)	0.60	0.70	0.36	0.34	14.868	***
7. Maintenance Planning for Rail Systems (skill17)	0.66	0.76	0.43	0.30	16.833	***
8. Railway Structure Design (Civil Works and Railway) (skill20)	0.66	0.80	0.43	0.33	16.718	***
9. Analytical Thinking and Problem Solving at Work (skill26)	0.74	0.98	0.54	0.32	19.737	***
10. Ability to Use English (skill27)	0.50	0.59	0.25	0.40	11.885	***
Attributes						
1. Responsible for Assignments Well (att1)	0.83	1.00	0.68	0.17		
2. Discipline and Compliance with Organization Rules (att4)	0.85	1.04	0.72	0.15	23.667	***
3. Being patient to Work (att9)	0.81	1.05	0.66	0.20	22.074	***
4. Adaptability and Flexibility to Situations (att10)	0.69	0.96	0.48	0.37	17.486	***
5. Good Leadership (att11)	0.81	1.01	0.66	0.19	22.179	***
6. Human Relations and Being Able to Get Along Well with Colleagues (att15)	0.81	0.96	0.65	0.18	21.835	***
7. Ability to Communicate and Coordinate with Other Departments (att16)	0.83	1.04	0.68	0.18	22.658	***

8. Honesty at Work (att21)	0.88	1.07	0.77	0.13	24.878	***
9. Having Awareness of Safety (att26)	0.72	0.88	0.52	0.26	18.561	***

Note ***. p = < 0.001

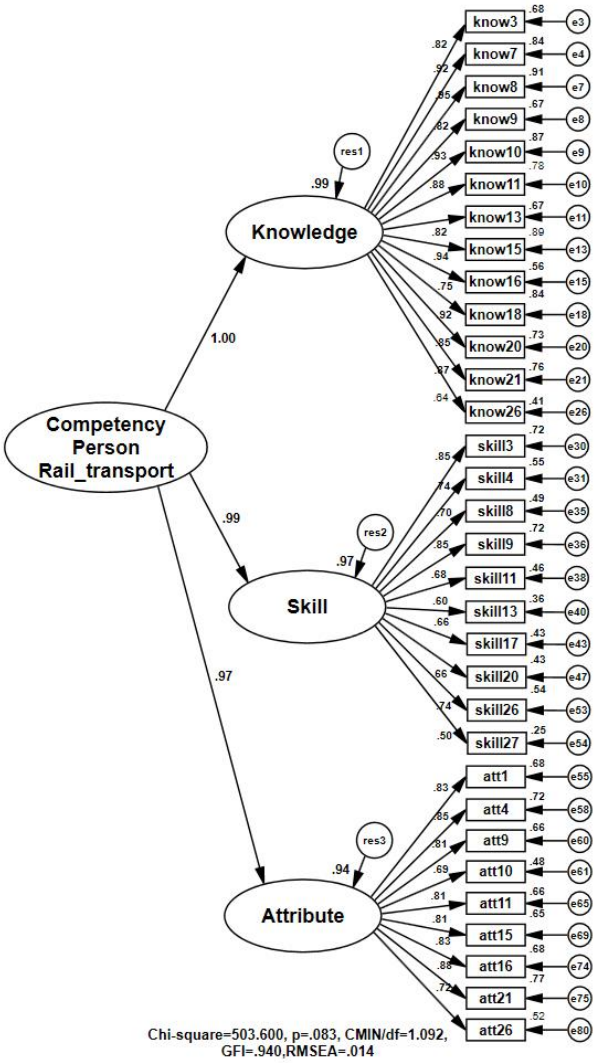

Figure 1. Structural equation models of guidelines to improve manpower potential in the manufacturing industry located in the area of the Eastern Economic Corridor: A Case Study of Rail Industry in Standardized Estimate mode.

Conclusion and Discussion

1. The results of the study on the improve manpower potential in the rail system industry in the area of the Eastern Economic Corridor (ECC) concluded that the establishment has a need to improve manpower in the rail industry as a whole and by different aspects, namely, Knowledge, Skills and Attributes at a high level. When each aspect was considered, it was found that there is a need to improve the manpower potential in term of knowledge at a high level as a whole. When the top three items were considered, it was found that the need to improve the knowledge on Industrial Robotics and Machine Vision for Rail Systems was the most, followed by Welding & Joining Technology for Rail Systems, and Design and Manufacturing Standards of Spare Parts for Rail Systems. Regarding the need to improve the manpower potential in term of skills at a high level

as a whole. When the top three items were considered, it was found that the need to improve the skills in Welding & Joining Work for Rail Systems was the most, followed by Industrial Robotics and Machine Vision for Rail Systems, and Vehicle Drive Work for Rail Systems. The need to improve the manpower potential in term of attributes at a high level as a whole. When the top three items were considered, it was found that the need to improve the Honesty at Work was the most, followed by Discipline and Compliance with Organization Rules and Ability to Communicate and Coordinate with Other Departments. The fact that the research results are like this may be because in order to make the Thai rail system becomes sustainable, Thai industry must be strengthened by focusing on creating people, knowledge, innovation using science and technology to meet the Country's challenges. Applying knowledge will help supporting work in the Thai rail industry to be even stronger because in the past the technology in the rail system depended on the import of technology from abroad. Therefore, the application of the knowledge on science, technology and innovation to help strengthen the strength of the rail industry in Thailand will be an important mechanism of manpower to support the rail industry successfully in line with the 20 year National Strategic Plan which is the main master plan for the development of Thailand to be stable, prosperous and sustainable where the goals of Thailand in 20 years as well the strategic issues and the main guidelines that will move towards the country's long-term goals with the economic development plan and National Society No. 12 (B.E. 2017 - 2021) has been set as an important tool or mechanism that transfers the 20-year national strategy (2017 - 2036) to practice. The 12th Development Plan has clearly defined the goals to be achieved in the first 5 years in term of the economic, social and environmental dimensions, therefore it has defined a development strategy, especially the 3rd strategy which is to build economic strength and sustainably compete, with infrastructure development to connect Thailand to the world and moving towards becoming the economic center of ASEAN and an important hub of the Asian region. Infrastructure covers the physical infrastructure in the field of transportation networks by connecting the regional transportation network from East Asia to South Asia seamlessly with Thailand as the main hub of transportation to become the economic corridor of Asia to be the center of transportation, delivery, distribution, trade, investment, and tourism and focusing on water transportation and rail system. This is in line with McClelland's performance theory (1973), mentioning that the improvement of manpower potential must be in three areas: knowledge, skills and attributes, which the person expresses as a way of thinking and behavior in Work that will affect the performance of each individual. In addition, continuous personal development that will result in the achievement of standards or higher than the standards set by the organization.

In addition, it is important to strengthening the economic sectors in both agriculture, industry, and services as the original source of income and expanding new production and service sectors for the future by strengthening and developing the competitiveness of manufacturing and service sectors. The development of the industrial sector aims to enable Thailand to move towards a high-income country, so there is a need to determine the target industry (S-Curve) with current potential to be the driving force of Thailand's economy as well as determine future industries that can take advantage of the opportunity of new context changes in the world, such as technological progress, adapting to the industrial age under the Thailand 4.0 economic model driven by using digital technology and innovation to raise the level of development. The country's economy must give priority to the creation of high-quality manpower to support the needs of the industrial sector and adjust the manpower to be in line with Industry 4.0 by creating quality and moral people as well as having skills and the ability in the future. Therefore, it is very necessary to carry out Reskilling, Upskilling and Multiskilling in the current manpower by focusing on developing skills to support Non-Routine/ Non-Repetitive / Task Specific / Project-Based Jobs more. This is in line with Thailand 4.0 economic model which is driven by digital technology and innovation to raise the level of the country's economic development by enhancing the skills of Thai people 1.0 - 4.0 such as the project to change the potential of leadership and management of commercial skills and digital behavior, which is necessary to accelerate the production of rail system parts in the country or local

content to achieve results, where the joint work of the relevant agencies from the whole sector, namely, government, education sector, private sector is required (Research Institute of Science and Technology of Thailand, 2021)

2. Followings are the result of confirmatory factory analysis of the guidelines to improve manpower potential in the rail system industry in the area of the Eastern Economic Corridor (ECC) which consisted of 3 main components and 32 sub-components, namely, Knowledge with 13 sub-components, Skills with 10 sub-component and Attributes with 9 sub-components.

1. Knowledge consisted of 13 sub-components, namely, (1) Industrial Robotics and Machine Vision for Rail Systems, (2) Welding & Joining Technology for Rail Systems, (3) Design and Manufacturing Standards of Spare Parts for Rail Systems, (4) Hydraulic and Pneumatic Systems for Rail Systems, (5) Programmable Logic Controller for Rail System, (6) Railway Structure Design (Civil Works and Railway), (7) Mandate Signal System for Rail System, (8) Using CAD and CAM Programs, (9) Technology for Elementary Railway System, (10) Microcontroller for Rail System, (11) Controls and Electronics for Rail Systems, (12) Electrical System and Power Supply System and (13) Railway Industry Management. This is consistent with Thongprasit (2022) revealed that executives of establishments in the new target industry (S-Curve) in in the Eastern Economic Corridor (ECC) of the industrial zone in Rayong Province had opinion on the development of manpower potential in terms of knowledge, sorting from ascending to descending, (1) Computer Programming with A Programmable Logic Controller (PLC) for Industrial Robots, followed by (2) Artificial intelligence, software development to provide services and links to manage Big Data, Data Analytics, Predictive, management systems, (3) Electronic systems (4) Computer drafting with CAD, CAM, CNC programs (5) Sensors and actuators, electrical systems, hydraulic systems (6) Welding (welders and welding robot controls) and (7) pneumatic systems.

2. Skills consisted of 10 sub-components, namely, (1) Welding & Joining Work for Rail Systems, (2) Industrial Robotics and Machine Vision for Rail Systems, (3) Vehicle Drive Work for Rail Systems, (4) Analytical Thinking and Problem Solving at Work, (5) Work Related to The Use of Hydraulic and Pneumatic Systems for Rail Systems, (6) Programmable Logic Controller for Rail System, (7) Maintenance Planning for Rail Systems, (8) Railway Structure Design (Civil Works and Railway), (9) Computer Aided Analysis and Design for Rail Systems, and (10) Ability to Use English. This is consistent with Thongprasit (2022) revealed that executives of establishments had opinion on the development of manpower potential in the manufacturing and service in terms of skills, sorting from ascending to descending, (1) Specific operational skills of the target industry, followed by (2) Advanced thinking skills, (3) Digital skills, (4) Foreign language communication skills, (5) Operational coordination skills, (6) Organizational communication skills, and (7) Adaptability skills and flexible to the situation. This is consistent with Magrane, Diane et al. (2018) who has conducted research on Competencies and Practices in Academic Engineering Leadership Development: Lessons from a National Survey. revealed that The list of skills reflects academic leadership skills reported by leadership practitioners and by scholars from a variety of disciplines (Rich et al. 2008; Magrane and Morahan 2016; Wilkes et al. 2015; Gmelch et al. 2017). Our respondents gave high ratings for both importance and self-confidence to skills of transactional management: Interpreting budgets and managing resources, communication skills in messaging, and engaging other administrators in project development. This finding is not surprising given that these are skills that transition well from the management of academic grants and research projects. According to a recent study of engineering leaders, these skills define technical mastery and collaborative optimization (Rottmann et al. 2015). The lower ratings for self-confidence regarding these skills are similar to ratings reported in a large national survey of department chairs (Gmelch et al. 2017), which was a follow-up study to Gmelch's survey of chairs more than two decades ago (Gmelch and Miskin 1993)

3. Attributes consisted of 9 sub-components, namely, (1) Honesty at Work (2) Discipline and Compliance with Organization Rules, (3) Ability to Communicate and Coordinate with Other Departments, (4) Responsible for Assignments Well, (5) Human Relations and Being Able to Get Along

Well with Colleagues, (6) Good Leadership, (7) Being patient to Work, (8) Having Awareness of Safety and (9) Adaptability and Flexibility to Situations. This is in line with Bunyasophon and Chalemchirarat (2013) have presented the attributes of a good leader who will be successful in the work, consisting of 1) A Sense of Mission: : Having confidence in oneself that he/she can be a leader and love for the duties of a leader as well as being honest to colleagues and to duties, 2) Self-Denial: Be ready to sacrifice or abandon his/her own opinion when found to be incorrect, as well as be willing to devote brain power to solving problems in the work as well, 3) High Character: Being ready to deal with problems and difficult events firmly and steadfastly, having the courage to listen to the criticism of one's shortcomings from others, as well as being honest and trustworthy to people, 4) Job Competence: There is a lot of discussion whether good executives need technical skills or not, but it turns out that successful executives have expertise in the technical field before. This is because a part of leadership is the worker's belief in the leader that he can lead them academically, 5) Good Judgement: with Common Sense, Tact, and the wisdom to see the problem to clearly and plan the work in advance. These combine to form a good judgment that helps strengthen a person to be a good leader, 6) Energetic: The higher the executive level, the less time he has for himself, meaning that he will have to sleep late and wake up early with all sorts of problems on his mind all the time. Only a person with good mental state can live in the above way. This is consistent with Thongprasit (2022) revealed that executives of establishments had opinion on the development of manpower potential in terms of attributes, sorting from ascending to descending, (1) Honesty and ethics, followed by (2) Continuous learning and pursuit (3) Leadership and (4) Working to achieve the goals. This is in line with Phlaipet (2020) who has presented the model of human resource development in the automotive parts industry in the future, which revealed that the improvement of human potential of human resources management personnel consists of 1) analysis in solving problems, 2) ethics and integrity, and 3) planning and managing problems with new methods. This is in line with with the research results of Noo Ngam (2019) on management strategies for excellence in the industrial business sector in a sustainable manner which revealed that management strategies for excellence in the sustainable industrial business sector with the highest average value in term of leader was behaving ethically and promoting the law compliance, in term of customer focus was strictly adhering to the commitment given to customers, in term of planning was having a strategic plan that aligns with the goals of the organization that focuses on excellence, in term of digital technology was having a process to prevent, detect, and recover information systems from attacks, and in term of manpower was stimulating employees to have a positive attitude towards the organization by encouraging, giving loyalty to the organization, cultivating a sense of participation and ownership. This is consistent with Pinthapataya (2016) who has conducted research on Potential Model Development for Chief Crew Flight Attendants of Thailand's Aviation Business, revealed that As results, the components of potential model development for chief crew flight attendants consist of 5 essential components with 19 sub-components as follows: (1) Knowledge Management, embracing 4 constituents: knowledge development, knowledge acquisition, knowledge transfer, and knowledge retention; (2) Operations Management, containing 3 constituents: duty planning, job performance organizing, and job evaluation; (3) Organizational Development, comprising 2 sub-components: human resources, and operational systems development; (4) Self Development, containing 4 sub-factors: cognitive skill development, self-improvement, self-control, and solving in-flight critical problems; (5) Human Relationship covering 6 sub-components: leadership, in-flight communication, work cooperation, teamwork abilities, flexible in working, and company royalty. This is consistent with Mahasiriapirak (2017) who has conducted research on the potential development model of production leaders for creating innovation in automotive parts industrials, revealed that there are two component main findings: organization behaviour and attributes and roles of supervisors. For the first component, there are two sub-factors: communication, presentation, and dedication to organization. For the second component, there are six attributes and roles: leadership, there are three sub-factors: code of conduct and ethics and integrity, leadership skills,

being role model of colleagues, creativity, there are two sub-factors: creativity and constant work development, analytic thinking and problem solving, planning, there are two sub-factors: systematical thinking and analytical thinking, planning and management, coaching, there are two sub-factors: focusing on efficient work development, instruction, guidance and consultancy, communication, there are two sub-factors: teambuilding and collaboration, good human relations, motivation Furthermore, there are two sub-factors: energy and good attitude to oneself and organization and management, and competency in continuing changes. This is consistent with principles and theories of human potential development of Smith and Hulin (1969) mentioning that personnel development leads to better quality or potential of individuals, more productivity and satisfaction with workers, managers and other people in the organization that can be measured and must be appropriate and be in line with the vision, values and goals of the organization or in other words, it is a personality hidden within a person that can drive that person to create a good performance or according to the criteria set in the job (McClelland, 1973). It is consistent with Agrawal, et al.. (2020) mentioning that having good interpersonal communication skills in the organization is important and necessary for leaders to drive organizational change and push the work of personnel in all areas. It is also consistent with Phlaipet (2020) revealed that the development of human potential of human resources management personnel consists of 1) analysis in solving problems, 2) ethics and integrity, and 3) planning and managing problems with new methods. This is consistent with principles and theories of human potential development of Smith and Hulin (1969) mentioning that personnel development leads to better quality or potential of individuals, more productivity and satisfaction with workers, managers and other people in the organization focusing on the development of individual human resources using an integrated method combines various human roles related to personal development, professional development and organizational development so that members of the organization can work according to the goals of the organization, focusing on system development (life-organization-society) to be better. In addition to having knowledge, skills and attributes, the person must be able to apply knowledge, skills and attitudes that are appropriate and necessary in the job effectively, which may be expressed in ways of thinking (Raksri, 2016)

Recommendations

1. Suggestions for applying the research results

1.1 The Office of the Permanent Secretary of the Ministry of Higher Education, Science, Research and Innovation, the Ministry of Higher Education, Science, Research and Innovation should apply the results of this research to formulate policies and plans for the promotion of personnel in the rail industry as well as use them to improve development courses in education and training of manpower related to the rail industry and related industries.

1.2 The Office of the Vocational Education Commission, the Ministry of Education should apply the research results obtained from this research in terms of knowledge, skills, and attributes in the development of the courses to meet the labor needs of the establishment and to develop manpower potential in the rail industry to be in line with the country's industrial development direction.

1.3 The Office of the Basic Education Commission, the Ministry of Education should apply the research results obtained from this research in terms of knowledge, skills and attributes in the development curriculum focusing on developing basic science and technology with students at all levels to be in line with the context of changing the country's industrial structure in the digital age.

1.4 Government and private sector agencies should apply the research results obtained from this research as a guide in formulating policies and manpower development plans to raise the level of competitiveness of the rail industry.

2. Suggestion for the Future Research

Educational institutions that are autonomous universities and universities affiliated with the state with cooperative education are able to apply the findings of this research as a guideline in conjunction with the development of learners' learning outcomes, and then evaluate the results of learners in various components in order to utilize the results in developing cooperative education to be more effective in the future.

References

[1] Agrawal, et al.. (2020). To emerge stronger from the COVID -19 crisis, companies should start reskilling their workforces now. McKinsey & Company.

[2] Arbuckle, J.L. (2011). IBM®SPSS®AmosTM 20 User's Guide; IBM: New York, NY, USA, pp. 597–617.

[3] Bunyasophon, T. and Chalemchirarat, W. (2013). Basic Industrial Management. Bangkok: King Mongkut University of Technology Phra Nakhon Nuea.

[4] Comrey, A.; Lee, (1992). H. A First Course in Factor Analysis; Lawrence Erlbaum Associates Inc.: Mahwah, NJ, USA; pp. 326–350.

[5] Gmelch, Walter H., and Val D. Miskin. (1993). Leadership Skills for Department Chairs. Bolton: Anker, pp. 88–89. ISBN 0962704261.

[6] Gmelch, Walter H., Drew Roberts, Kelly Ward, and Sally Hirsch. (2017). A retrospective view of department chairs: Lessons learned. The Department Chair 28: 1–4.

[7] Likert, R. (1932). A Technique for the Measurement of Attitudes. Arch. Psychol, 22, 5–54.

[8] Magrane, Diane, and Page S. Morahan. (2016). Fortifying the pipeline to leadership: The International Center for Executive Leadership in Academics at Drexel. In FORWARD to Professorship in STEM: Inclusive Faculty Development Strategies That Work. Edited by Rachelle Heller, Catherine Mavriplis and Paul Sabila. London, San Diego,Waltham and Oxford: Academic Press, pp. 319–36. ISBN 9780128008553.

[9] Magrane, Diane, Morahan, Page S., Ambrose, Susan, Dannels, Sharon A. (2018). Competencies and Practices in Academic Engineering Leadership Development: Lessons from a National Survey. Social Sciences. 7: 171. https://doi.org/10.3390/socsci7100171

[10] Mahasiriapirak, T. (2017). The Potential Development Model of Production Leaders for Creating Innovation in Automotive Parts Industrials. Dissertation in Industrial Business Administration, Department of Industrial Business Administration, Graduate School, King Mongkut University of Technology, Phra Nakhon Nuea.

[11] McClelland, D.C. (1973). Testing for Competence Rather Than for Intelligence. American Psychologists, 17, pp 1-14.

[12] Ministry of Industry. (2016), "The 20-year industrial development strategic plan of Industry 4.0 (2017 - 2036)", available at: http://www.oie.go.th. (accessed 7 May 2021)

[13] Noo Ngam, V. (2019). Management Strategy for Excellence In Sustainable Industrial Business Sector. Dissertation in Industrial Business Administration, Department of Industrial Business Administration, Graduate School, King Mongkut University of Technology, Phra Nakhon Nuea.

[14] Office of the National Economics and Social Development Council. (2017), The 20-Year National Strategy (2017 - 2036). Bangkok: Office of the Prime Minister.

[15] Phlaipet, R. (2020). The Development Model of Human Resource Management Potential In the Automotive Parts Manufacturing Industry in the Future. Industrial Education Journal of King Mongkut Phra Nakhon Nuea. 1, 129-139.

[16] Pinthapataya, J. (2016). Potential Model Development for Chief Crew Flight Attendants of Thailand's Aviation Business. Doctoral Dissertation in Business Administration, Industrial Business and Human Resource Development Program, Graduate School, King Mongkut's University of Technology North Bangkok.

[17] Raksri, T. (2016). A Study of the Development Guidelines of Thai Graduates In The 21St Century And The Attributes of Graduates of the Faculty of Industrial Education and Technology, King Mongkut University of Technology, Thonburi. Master's Thesis in Industrial and Technology. Technology And Mass Communication Department. Bangkok: Graduate School. King Mongkut University of Technology Thonburi.

[18] Research Institute of Science and Technology of Thailand. (2021). Rail system partners. Pathum Thani. Ministry of Higher Education, Science, Research and Innovation, printed image.

[19] Rich, Eugene C., Diane Magrane, and Darrell G. Kirch. (2008). Qualities of the medical

school dean: Insights from the literature. Academic Medicine 83: 483–87.

[20] Rottmann, Cindy, Robin Sacks, and Douglas Reeve. (2015). Engineering leadership: Grounding leadership theory in engineers' professional identities. Leadership 11: 351–73.

[21] Silpcharu, T. (2017). Statistical Data Analysis and Research by SPSS and AMOS, 15th ed.; Business R&D Ordinary Partnership: Bangkok, Thailand, 2017; pp. 95–96.

[22] Smith, L. M. Kendall and Hulin, C. L. (1969). The Measurement of Job Satisfaction in Work and Retirement. Chicago: Rand McNally Strauss.

[23] Spooren, P., Mortelmans, D., & Denekens, J. (2007). Student evaluation of teaching quality in higher education. Development of an instrument based on 10 Likert scales. Assessment and Evaluation in Higher Education, 32, 667–679. https://doi.org/10.1080/02602930601117191

[24] Srisa-ard, B. (2010). Research Principles (8th ed.). Bangkok: Suweeriyasarn.

[25] The National Reform Council. (2016). Blue print and action plan for the drive of Thailand 4.0. Model drive of Thailand towards stability, wealth and sustainable. Printed material.

[26] Thongprasit, K. (2022). Approaches for competency development of workforces in the manufacturing and service industry sector, eastern economic corridor (EEC): A case study of industrial land in Rayong province in Thailand. Journal of Management Information and Decision Sciences, 25, 1-18.

[27] Wilkes, Lesley M., Wendy Cross, Debra Jackson, and John Daly. (2015). A repertoire of leadership attributes: An international study of deans of nursing. Journal of Nursing Management 23: 279–86.