A Strategic Plan for Capability Enhancement of Thai Manufacturing Industry with The Manufacturing Automation Systems Project

Executive Summary

The Office of Industrial Economics
Ministry of Industry

Executive summary

1. Introduction

The enhancement of production capability is considered to be a core of Thailand's industrial sectors. Due to rising competition nowadays, it is essential for industries to adjust their abilities in order to increase its production capability and competitiveness. Thai manufacturers need to pay attention to aspects of its production such as labor, production efficiency of machinery and work process. Manufacturing companies, especially for SMEs and labor-intensive businesses, should focus on improving production efficiency and labor productivity. For example, they should concentrate on increasing efficiency of manufacturing line system, improving production management, reducing logistics cost, and providing training and labor development regarding multi-skills development and capability to use advanced technology to support cutting-edge manufacturing system and machinery. Improving the efficiency of machinery and equipment towards manufacturing automation system is one of the options to increase competitiveness of Thai industries. This helps in the handling of a surge in cost of labor as well as adverse economic instability, both in the present and in the near future.

According to worldwide status and trend of robotics and automation system using, various countries have an increasing demand for the utilization of robotics and automation system. This trend is likely to continue in the near future. As for Thailand, the demand trend for robotics and automation in industrial sector is at a high level, especially when compared with other southeastern Asian countries. Main users are automobile industry, hard disk drive industry and electronics industry. In addition, there is an increasing possibility of usage in agricultural industry and food-processing industry, which are labor-intensive industries, in order to retain their competitiveness. The study of strategy to increase Thai industry's capability by using manufacturing automation system need to be set and provide guideline for development of automation system that is valuable and suitable for Thai context. In the meantime, government sector need to come up with actions to help Thai industries and to support them from losing their competitive positions, and to assist manufacturing industry in becoming more advanced.

2. Thai industry's status in world context

As Thailand previously focused on its strength using low cost labor (when compared with other countries), the expansion of industrial sectors was concentrated on labor intensive industries, for example, textile, footwear and clothing industry. As a result, Thai industrial sector's growth path has been opposed to Thailand's current structure of population growth. Domestic factors that reduce Thailand's competitiveness include insufficient labor, difficulty of labor recruitment, and large shortage of labor with educations. These problems of labor demand and labor supply are both quantitative and qualitative issues and are a result of various elements such as changes in population structure towards aging society. Moreover, Thai industries also face other challenges such as lack of knowledge and technology development, lack of investment to acquire more modern technologies. These factors are making Thailand losing its competitiveness.

Thailand's manufacturing competitiveness is not advancing enough when compared with other countries. This can be seen from several world indexes, which includes Global Competitiveness Index (GCI) prepared by World Economic Forum (WEF), World Competitiveness Scoreboard (WCS) prepared by International Institute for Management Development (IMD), and Global Innovation Index (GII) prepared by cooperation of many agencies such as INSEAD (European Institute of Business Administration) and WIPO (World Intellectual Property Organization). These indexes imply that Thai manufacturing cannot yet compete in the world context.

Table 1 Ranking of Thailand among GCI, WCS, and GII

Ranking of Thailand's competitiveness	2010	2011	2012	2013	2014
GCI Index (by WEF)	38	39	38	37	31
- Technological readiness index	68	84	84	78	65
- Innovation index	52	54	68	66	67
WCS Index (by IMD)	26	27	30	27	29
- Technology Infrastructure index	48	52	50	47	41
- Science Infrastructure index	40	40	40	40	46
GII Index (by INSEAD and WIPO)	60	48	57	57	48
- Innovation input sub-index	60	48	59	57	52
- Innovation output sub-index	71	46	56	61	49

From the aforementioned obstacles, Thai industries need to enhance its manufacturing efficiency. It is necessary for the country to develop technology and quality of human capital in order to boost its competitiveness by implementing manufacturing

automation system to its industries. Promotion of research and technological advancement within the country is crucial to obtain knowledge and technology that are suitable for major industries and its capital level, together with the development of proper infrastructure, such as related regulations and education system.

3. Automation system in Thailand's manufacturing industry

Automation system is the system that integrates mechanics, electronics, electrical systems and computers and operate as a whole. This system can self-operate and has procedures systematically. It also has automation objectives set, in which human involvement is only monitor after determination of work conditions and goals. Nowadays, large amount of manufacturers utilizes automation systems to increase production efficiency and reduce labor usage. However, in order to maximize the efficiency of organization's overall operation, these machinery and equipment are required to be systematically managed.

Automation system has the main objective to increase efficiency and consistency of manufacturing quality, which assists in controlling and planning in production. Therefore, it can be said that automation system has advantages over labor-intensive manufacturing as follows

- Reduce production cost per unit
- Faster and enhance production capacity
- Lower production waste as automation system is designed to operate correctly and precisely according to production procedure. Thus, the chance of error in procedure and production is low
- Scale down accidents and dangers as well as loss from working over labor limitation, such as fatigue and stress
- Reduce health risk of employees due to working under toxic and extreme conditions
- Lessen impact of labor shortage as automation system can be used to replace workers

4. Analysis of Thai industrial sector's demand for automation system

The trend of importing parts, components related to automation system has increased in the past few years. Thailand is moving toward automation technology era in

order to enhance efficiency of manufacturing processes. It can reduce time and manufacturing processes. It would be the standard for all manufacturing sector in the future in order to conquer labor limitations. Moreover, developed automation technologies result in productivity improvement and more profit for the enterprises. Other considerations include decline population birth rate, aging society, and also declined in labor workforce. That will result in labor shortage.

In the past 10 years, the import value of automation machinery and components of all industries and 5 industrial sectors (Food, Fashion, Electric Appliance, Non-metal product and Wood & Furniture) tend to be higher from previous years in the rate of 10 percent per year. The factors that increasingly drive the automation demand are automation cost, automation performance, Capital-labor ration, Total Factor Productivity (TFP), Manufacturing Production index (MPI), Labor cost, Labor productivity, Gross Domestic Product (GDP)

5. Analysis of automation system in Thai manufacturing industries and needs

Automation process in industry can be divided into 4 work steps. Table 2 demonstrates the level of automation in industry. By considering work for each working step in the process, it can be divided into 4 working steps where each step means

1. Load working step is the step to load workpieces into machinery for processing or assembly procedures
2. Machine Cycle working step is the procedures to process or assemble workpieces according to product qualifications
3. Unload working step is the step to unload workpieces from their machinery positions through processing or assembly procedures
4. Part transfer working step is the step to transfer workpieces or raw materials to other procedures

Table 2 Level of automation

Level	*Load*	*Machine Cycle*	*Unload*	*Part transfer*
1	Manual	Manual	Manual	Manual
2a	Manual	Automation System	Manual	Manual
2b	Manual	Manual	Manual	Automation System
3a	Manual	Automation System	Automation System	Manual
3b	Manual	Automation System	Manual	Automation System
4	Automation System	Automation System	Automation System	Manual
5	Automation System	Automation System	Automation System	Automation System

(Source: From the analysis of consultant team)

Note Manual Automation System

As a result, manufacturing automation system can be separated into 5 level as shown in Table 2. Automation can explain each level as follows

1. Level 1 is the usage of labor in every steps
2. Level 2 is the usage of automation system in one step. For example, 2a is the usage of automated machine for processing procedure, and 2b is the usage of machine, such as conveyor belt, for automated part transfer
3. Level 3 is the usage of automation system in two steps. For example, 3a is the usage of automated machine for processing procedure and for automated unloading of workpieces from machine, or 3b is the usage of automated machine for processing procedure and conveyor belt for automated part transfer
4. Level 4 is the usage of automation system in three steps.
5. Level 5 is the usage of automation system in four steps and this system is called Fully Automation system, in which labor only have role to control and monitor the manufacturing operation.

From an analysis and evaluation of automation in manufacturing procedures, the majority of manufacturers in Thailand has an automation level of level 1 to 3. This is the

transition phase from usage of labor in production to automation system, or in other words, towards level 4-5 as shown in table 3.

Table 3 Automation Level of Thai manufacturers

Automation Level	Proportion of Manufacturers (Percent)
1	25
2	35
3	25
4	10
5	5

(Source: From the analysis of consultant team: 2015)

Automation Migration Strategy

Migration from traditional manufacturing system to manufacturing automation system can be done gradually without having to change the whole production system. In other words, it can alter some production processes before gradually shifting towards a full manufacturing automation system. Thus, these migrations can be seen and divided with respect to automation migration strategy into 3 phases

Phase I: Manufacturing that is labor-intensive in production and work transfer between processes (Manual work/Manual transfer). It is a manufacturing that mainly use labor, possibly with an aid of equipment or hand tools. However, it has characteristics that labor utilize equipment whereby work-in-process (WIP) transfer is done with labor mainly performing the handling.

Phase II: Manufacturing that integrates labor and automated machine (Machine work/Manual transfer or Manual work/Machine transfer). It is a manufacturing that has automated machines working separately in each process by having workpieces loaded to and unloaded from automated machine, and transferred to next procedures. These next procedures may be also automated machines, but they are still a manual transfer and the production of each procedure is separated. On the other hands, it can also be a manufacturing procedure that has automatic transfer with the use of machine, but the production processes still utilize labor or supporting equipment that are not automated processes.

Phase III: Automated and continuous manufacturing (Machine work/Machine transfer). It is an automated manufacturing that links between each production process. Automated machines work together with automated transfer of part and workpieces between processes. It can be performed as a work cell, which reduce labor utilization and increase production efficiency.

These migrations can help manufacturers to focus on specific process in a production that needs automation system. Moreover, it is the way to implement within a budget for automation system investment in a factory. Subsequently, the migration can be done gradually for other processes in the remaining of production line.

Table 4 State of Automation Migration Phase of Thai manufacturers

Automation Migration Phase	Proportion of manufacturers (Percent)
Phase I	25
Phase II	70
Phase III	5

(Source: From the analysis of consultant team: 2015)

Thai industry's status of automation system technology capability

Manufacturers who adopt automation system have differing technological capability. Capability of manufacturing automation technology of Thai Manufacturers can be divided into 5 levels, which are

1. No technological capability: They do not have capability in purchasing or procuring technology and still need to rely on external experts for the acquisition. Moreover, they need to depend on recommendation of sellers or sale representatives as well as external consultant for the adoption of these technologies. They also lack understanding in selecting machines for usage.

2. Acquisition and adoption capability: They are capable in acquiring and adopting technology for their usages. Moreover, they have an understanding in technology and have an ability to evaluate technology for adoption.

3. Maintenance capability: They capable in maintaining and repairing their existing technologies.

4. Modification capability: They capable in changing and modifying their existing technologies.

5. Development capability: They capable in developing or creating new technology and machines that respond to their manufacturing needs.

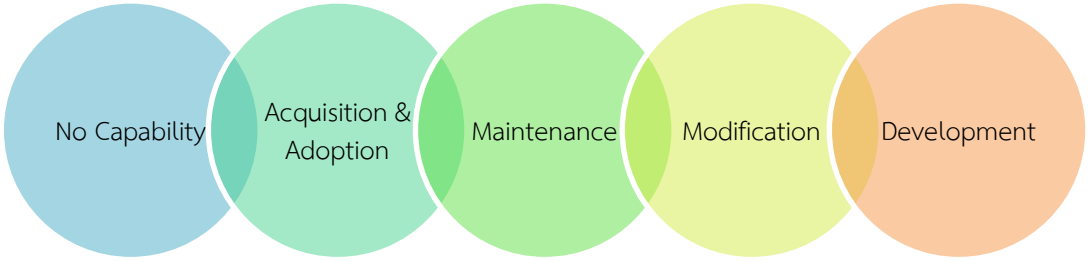

Figure 1 Capability of manufacturing automation technology of automation system's users

(Source: From the analysis of consultant team: 2015)

From the study, technological capability for automation system technology of the majority of Thai manufacturers is limited to acquisition and adoption capability. Some of the manufacturers have maintenance capability, but the majority lack modification and development capabilities.

The study result demonstrates that the majority of Thai manufacturers have technological capability of level 1-3. Few of medium to large enterprises has capability of level 4 and 5. For technological capability of level 5, it is limited to large factories that have dedicated engineers and personnel. From the analysis and survey, technological capability of Thai manufacturers can be summarized as shown in table 5.

Table 5 Manufacturer's Technological Capability for automation system technology

Technological Capability	Approximate proportion of Thai manufacturers (Percent)
None	20
Acquisition/Adoption	40
Maintenance	25
Modification	10
Development	5

(Source: From the analysis of consultant team: 2015)

Demand for automation system in industrial sector

The survey of 94 manufacturers from individual sectors (Food, Fashion, Electric Appliance, Non-metal product and wood & furniture) found that manufacturers have highest need is an automated system for part transfer with conveyor. This is because it is the technology that can be used in most industries. The second highest need is automated machines for specialized operation, which is not the ready-for-sale automation system as it is needed to be specifically designed to fit work procedure of enterprise or manufacturing procedure, for instance, automated machine to remove tamarind seed and machine to peel jackfruit. The third highest need is automated packing, as shown in figure 2, followed by need for robotic arms as enterprises consider this type of work as unskilled work. For example, the work to pick up and to place work piece into machines does not require skill; as a result, the adoption of robotic arms is possible. In addition, demand for automated inspection, continuous production system, and automated measurement are also high.

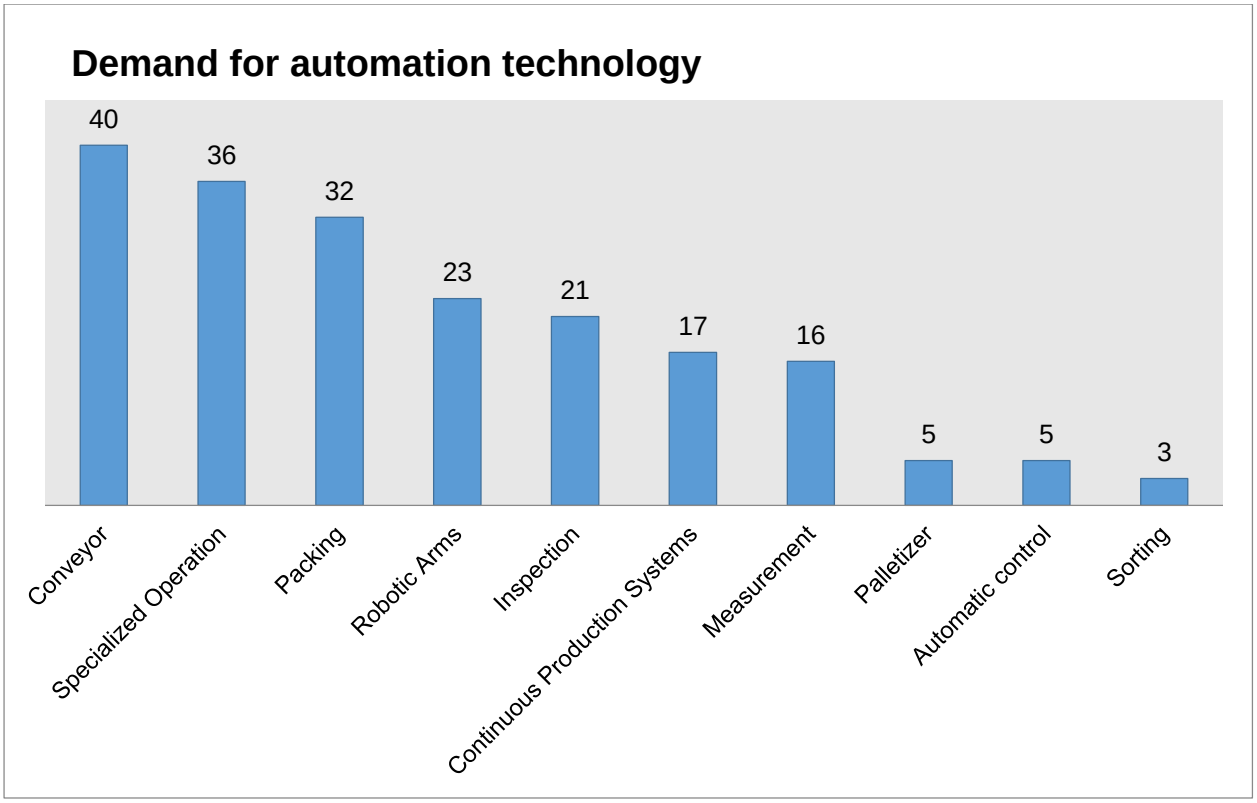

Figure 2 Type of demand for automation system of 94 representative samples
(Source: From the analysis of consultant team: 2015)

6. Analysis of automation system machinery industry

Thailand, nowadays, have developed and adopted manufacturing automation system for enterprises' usages in industry by using different formats and aspects. This ranges from turnkey import, to application and development within enterprise and development within country. Service providers for automation system are composed of both Thai and foreign enterprises. These providers include component manufacturers, component importers, automated machine developers (System Integrators), and researchers and developers of automation system both in private and education sectors. With regard to better comprehension of value chain for manufacturing automation system industry, it can be illustrated as follows

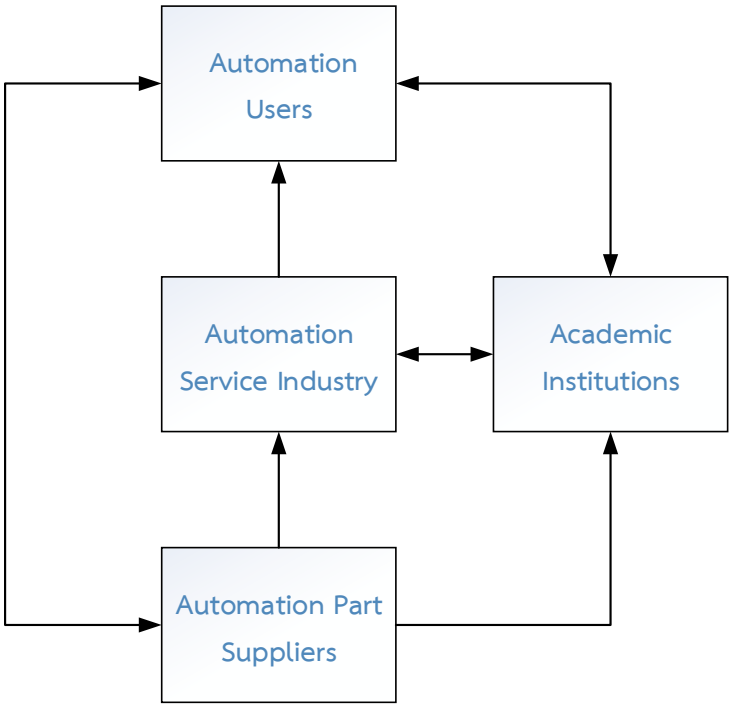

Figure 3 Structure of value chain for manufacturing automation system
(Source: From the analysis of consultant team)

Automation service providers

Automation service providers are entrepreneurs or experts who have expertise in designing and developing automation system and activity in providing services to client. They can also be called System Integrators. Technology capabilities in automation technology are concentrated mainly in these companies. They provide machine installation services or consultant services for designing automation systems.

Automation Part and Component Suppliers

Automation part suppliers are composed of local manufacturers and suppliers as well as importers of automation system from foreign countries. It can be seen that the majority of mechanical workpieces and parts of manufacturing automation system's structure can be acquired or produced within the country. On the contrary, most of electronics devices or sensors used for controlling manufacturing system are still needed to be imported from foreign countries.

Automation system integrators in Thailand are entrepreneurs that can design and develop automation manufacturing machines as well as the entire production line in manufacturing system. The capability of automation system providers can be divided into 3 levels, which are design and integration, replication, and repairing as shown in figure 4

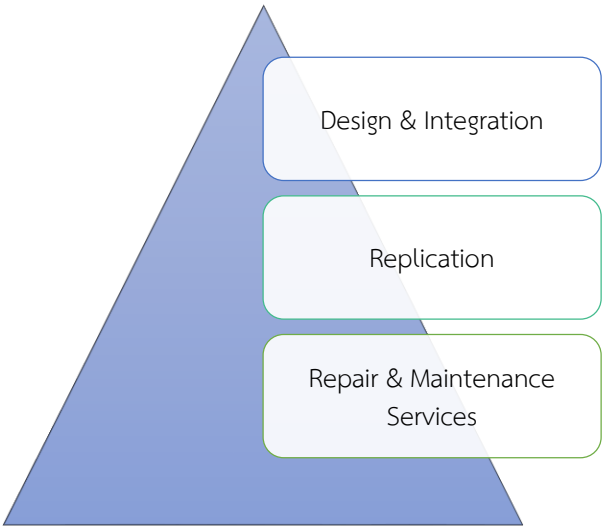

Figure 4 Capability level of providers of machine and manufacturing automation system

(Source: From the analysis of consultant team)

Characteristics of service capability have descriptions as follows

1. Design and System Integrating is the system design to suit requirement; in other words, Design and Build. This level requires capability in the areas of knowledge and understanding of machine design, electrical system, control system, as well as natures and regulations of various industries.

2. Replication is the production of manufacturing automation system, or Build-to-Print. Entrepreneurs have to have capability to support large orders from clients, and have trading partners who are able to deliver components promptly.

3. Repair and Maintenance is the reparation of damaged components, maintenance, and modification of system, together with other forms of service rendered.

Academic institutions and research institutes relating to automation system technology

Academic institutions and research institutes are the source of knowledge for automation technology development as they create human resource for industries. They also are the source of new technology and manufacturing innovation. These institutes and agencies should recognize industry' situations and their needs in order to use their knowledge to develop new technology and move the industry forward.

Academic personnel are considered one of the important mechanisms for student development to have knowledge and skills required for work in different industries. Thai industrial sector's demand for personnel and technology in robotics and automation technology has an upward trend. This stems from an increasing competition within business sectors, which leads to technological gap and production capacity gap. Thus, there is a necessity for simultaneous personnel development.

Table 6 Capability gap of automation industry's value chain

	Obstacles and Challenges	Needs
Automation Service Providers	▪ Cost of production compare with foreign competitors ▪ Establishment of reliability with clients ▪ Clients' lack of understanding for hidden cost of prototype development ▪ Cost of design and development ▪ Tax burden on clients for certain parts import ▪ SMEs entrepreneurs have limited capital ▪ Lack of automation experts	▪ Procurement of parts with competitive price ▪ Obtainment of trust from targeted clients ▪ Understanding about prototype development before real working machine ▪ Investment and financial support ▪ Support regarding tax on parts import
Automation Part Suppliers	▪ Limited trading partners for machine development ▪ Most of users that are SMEs lack machine development capability ▪ Tax burden on clients for certain imports	▪ Availability of various machine developers ▪ Development of maintenance capability of users ▪ Support regarding tax on parts import
Automation Academic Institutions	▪ Development of automation technology does not meet industry's needs ▪ Personnel development is insufficient ▪ Lack of mechanism for technology and knowledge transfer to industry	▪ Direct obtainment of demand from industry ▪ Achievement of set goals for personnel development ▪ Development of mechanism for transfer as well as exchange and cooperation activity with industry

(Source: From the analysis of consultant team)

7. Case study of successful manufacturing automation system in foreign countries

The mechanisms and guidelines in enhancing competitiveness of industry by implementing manufacturing automation system have been studied. There are successful case studies in 4 foreign countries, which are Japan, South Korea, Taiwan, and Germany; it can be summarized as follows

1. Japan has started to use manufacturing automation system to increase productivity of industrial factories by setting up a specific association. This association brings together researchers, university professors, construction companies, and machine manufacturers to study, design, and develop to incorporate computer system for control of prototype manufacturing system. Subsequently, there are developments of robotics industry that corresponds to market demands for the usage of robots, for entertainment, for companion, and for service-rendered as Japan has entered aging society. Strength of Japan's manufacturing automation system is the development of robotics and manufacturing automation system that can support diverse industries, such as service, child care and elder care, and nursing industries. Other strengths include automation system support for SMEs and establishment of common standards for system to help reducing maintenance cost.

2. South Korea has started using manufacturing automation system during industrial era that is labor-intensive. It has 4 strategies to support robotics and automation system industry, which are research and development of robotics and manufacturing automation system, development of robotics and system to support all industries, development of environmental-friendly robots, and procurement of network for robotics and automation system development, which focus on service industry. South Korea's strengths of manufacturing automation system are clear determination of industrial policy for robotics and automation system development, explicit goals, technological application to support industry that is suitable and corresponds to country's industry, and objectives to support every industries, concentrating on environmental friendly aspect.

3. Taiwan has promoted manufacturing automation system industry by releasing various strategies to support manufacturing automation system. These strategies include tax measure, measure for source of capital, measure for technological development and measure for education. Moreover, it has initiative to reduce cost of production of robotics and manufacturing automation system by developing and using domestic parts and by establishing common standard for automation system,

focusing on manufacturing and service industries. Taiwan's strengths of manufacturing automation system include government support through various initiatives, establishment of common standard for system, concentration of automation system on increasing production efficiency of industrial factories, and personnel development for the entire system.

4. Germany has utilized robotics and automation in productions to replace labor and to increase production efficiency. Its objectives include the usage of robots to relieve human's duty in daily life, robotics service system for elder care, and robots that can learn to work cooperatively and to communicate. Germany has adopted digital technology and internet to use in manufacturing process by using smart manufacturing system, or in other names, the fourth industrial revolution. This is done by integrating companies, researchers, professors and related parties, both in public and private sectors to develop strategies and development plan for embedded system industry for "Smart Factory" usage. Germany's strengths of manufacturing automation system include the development of robotics and automation system by taking into consideration various targeted groups, such as elderly, general public, and industrial factories.

Therefore, it can be seen that each country has the same objective, which is the utilization of technology and innovation in daily life, both for manufacturing and for every day's life to improve well-being. Remarkable observations include

1. Technological development in the areas of robotics and automation system in various countries is the unification to exchange knowledge and to develop and transfer technology among parties, leading to faster technological advancement than individual development.

2. Government places important on industry and determine policy to move industry forward. This is done by giving supports for various resources, such as capital and expert knowledge through technological transfer mechanism.

3. Policy maker's clear foresight of demands that has vision on the important of differing issues in the future, such as aging society and lack of workforce. This brings about realization of markets, in which automation system technology and robotics can have impact and role in daily life.

4. Decipherment of various obstacles in supporting the creation of users and providers, and in establishing standard for manufacturing and parts lead to an acceptance of

technology using the same standard. This facilitates knowledge transfer, mutual learning, and system maintenance that users can understand well.

8. Industrial strategic plan for Thai industries by using manufacturing automation system

The direction for supporting enterprises with manufacturing automation system

1. Migration towards an automation system

The direction for improvement should support industry to have better manufacturing planning and management to have continuous production and to have efficiency before changing toward manufacturing automation system, for example, transporting materials used in assembly, and management of conveyor belt to enhance production efficiency.

Furthermore, there should be a support in propagating the adoption of manufacturing automation system by SMEs by publicizing annually case studies of the usage of automation system in factory, and by gathering best practices from those systems after some period of experiments in order to provide examples to other interested industries, to guide those industries who wish to conduct production planning, and to plan the development of automation system in each phase, corresponding to periodic investment of the automation system.

2. Development of technological capability of businesses

Therefore, direction for the capability development of Thailand's manufacturing industry should focus on increasing the potential or technological capacity of businesses, so that they will be able to attain maintenance and modification capabilities to correspond to their productions. In terms of automation system development capability, Thailand should create new automation service entrepreneurs and support existing entrepreneurs who have related capabilities in order to have sufficient number of entrepreneurs and to have new industrial group for these areas. Moreover, there should be an increase support in the investment of technology and innovation developed within the country as well as the encouragement for entrepreneurs and employees to have knowledge and capability in adaptation of these technologies for their own usages.

Direction for human resource development

The development of human resource at all level, from newly graduated students, technicians, industrial employees to top manufacturing directors, requires production planning and continuous supplying of knowledge. Moreover, there is a need for consistency with manufacturing industry improvement on both existing and emerging manufacturing technology. By collecting in-depth information, the result shows that most manufacturers do not have sufficient employees with knowledge and capability on automation manufacturing system. Thus, the human resource development is needed. The roles of academic institutions, besides providing high-quality knowledge and experience about automation technology, are to explore new teaching methods that can arouse interests, and to create learning experience from real practices. Students can immediately apply their knowledge and capabilities learned from class to real work practice. There should be the development of researchers and personnel in enterprises, together with the creation of research based on industry's needs as these practices offer opportunities for professors and researchers to closely work with enterprises.

Direction for technological development

Consequently, there should be the development of automation system technology within the country by taking into account basic factors and capabilities of industry in developing these technologies. There should be instigation for the collaboration between public and private sectors in creating group of researchers, developers and system owners to conduct research and development of appropriate robotics and automation manufacturing technology, together with support in terms of capital, information sources, researchers and responsible alliances or organizations.

There should be an establishment of common standard for equipment used in manufacturing automation system. Technicians and engineers can develop automation system without violating intellectual property right, and can develop equipment that is suitable for each industrial sector. That equipment is easily repairable, and is not expensive. Having a common standard can facilitate the development of human resource in industrial sector to be easier and more extensive. In addition, the manufacturing automation system is the foundation of smart factory as it has flexibility. The system has the ability to connect digitally through internet network, and is able to fully respond to the definition of SMART FACTORY. As a result, SMEs can adopt principle of SMART FACTORY to add value to their supply chains, and entrepreneurs can offer individualized products and service in order to increase their competitiveness against large enterprises and industrial groups. Thus, in the

case that there is the development of manufacturing technology and modification, enterprises and research institutions need to consider SMART FACTORY system and its principle. In order to continuously support automation technology development and avoid challenges and obstacles.

Direction for encouragement of manufacturers to have understanding and access to automation technology

Direction for encouragement of entrepreneurs to have an interest and a desire to change towards automation system should have methods to create understandings and knowledge for entrepreneur. There should be activities that offer facilitations, including a provision of consultation or information regarding technology or developers, a promotion of collaboration between machinery developers, and academic institutions and users. Moreover, there should be knowledge and technology transferring so that the creation of personnel and knowledge within enterprises is possible. This will lead to better knowledge and driving force for that enterprise as it helps reducing gaps of the enterprise.

The development of expert database, where industry members can have access to information, is essential, as well as the establishment of research centers in different sectors that are the result of various universities' collaborations.

There should be a measure to reduce income tax burdens of companies in the case where they make donations or provide financial support for academic institutions' research. There should be incentives to private sector for helping educational institutions. Moreover, a measure to lower import duties of raw materials and inputs, such as sensors, used in the assembly of robotics and automation system is needed.

With all of the above reasons, Thailand's manufacturing industry needs to have measures, policies, and strategies for the development of industry in order to enhance the capability, as well as an action plan that can push forward the operation.

Vision and objective

The enhancement of manufacturing industry's competitiveness requires planning of overall systematic operation, which considers all elements in an integration format throughout the value chain of manufacturing technology. In its supply chain, raw materials suppliers, machinery designer sector, machinery development sector also need a systematic approach. By creating strategy to enhance competitiveness of Thai industry with

manufacturing automation system, important framework, various development dimensions, and vision are specified as follows

Vision to enhance competitiveness in Thai industries by adopting manufacturing automation system:

"Create technological capability, transfer capability to enhance and improve, and move toward continuous change"

Objectives:

1. To enhance total factor productivity and labor productivity of manufacturing industry by using science and technology relating to manufacturing automation system, and to increase manufacturing competitiveness in the region

2. To enhance manufacturing technology capability of personnel and to have knowledge, understanding and ability in improving efficiency in manufacturing process and create more adoption

3. To mitigate labor shortage of Thai industry and a rising production cost

4. To set up framework and guideline for a manufacturing automation system research development.

5. To reduce gap and solve problems regarding the inability of Thai entrepreneurs in accessing and adopting manufacturing automation system

Strategies to enhance potential of Thai industry by using manufacturing automation system

The government has released the national policy for economics and social development that focus on increasing productivity in order to create value with knowledge and technology. They also need to set direction for industrial development, both for the overall and sectorial development, as well as an adaptation of Thai core competency to respond to world-class demand in order to improve competitiveness of industrial sector. Due to rising demand and readiness of Thailand, direction for development of Thai industry using manufacturing automation system has set 4 main strategies, which are

Strategy 1: Direction is to implement manufacturing automation system in enterprises through mechanism of technology transfer that both transfer to enterprises and their human capital. By using expert, technology transfer helps to develop manufacturing system that is

in automated format. This allows industry to increase productivity that leads to a cycle of transformation in manufacturing format towards continuous manufacturing automation.

Strategy 2: Direction for development is to enhance technological capability of personnel. Therefore, the development of personnel is needed to support the new manufacturing automation technology. As enterprises have a tendency to change and adopt manufacturing automation system, an enhancement of industrial personnel's competency and technological capability is essential. In the long run, there is a need to build a strong foundation in university for future students who will enter workforce in the industry.

Strategy 3: Direction for development is to build a foundation for the country's manufacturing automation technology. Therefore, Thailand should build its own foundation in knowledge and manufacturing technology. The development of a prototype for industry within an industry group will help in raising manufacturing capability of industry.

Strategy 4: Direction is to focus on supporting and creating incentives for industry to change toward automation system through facilitation and support in various factors used to improve manufacturing system, assessment and planning, modification or change towards automation system, and to make entrepreneur understand and be able to decide which parts and areas of manufacturing system that needed modification.

9. Guideline for promotion of manufacturing automation system in industry

Therefore, from purposed strategic industrial plan, recommendations and guidelines for the development of Thai industry through manufacturing automation system can be summarized as follows

1. It should organize activity to transfer automation system technology to interested users. It is an adoption of manufacturing automation system in enterprises through technological transfer mechanism from experts and technology owners. This is done to improve and enhance manufacturing system towards manufacturing automation.

2. Public sector has to support and drive academic institutions to take part in personnel development. This development is for personnel in both industrial sector and in academic sector relating to fundamental of automation system and robotics.

3. It should set up an agency that is responsible for transferring automation system technology. It should also promote research and development by supporting network of academic sector that cooperate in the development of automation system.

4. It should compile and establish knowledge and information to encourage the shift towards automation system. This is done by concentrating on promoting and creating incentives for industry to use manufacturing automation system. For example, it can facilitate and support in terms of various factors required for enhancement of manufacturing system.

5. Policy makers should assure measures that drives the demand for automation system. For example, tax rebate measure that automation system purchasers can be eligible when purchase the system from Thai enterprises. These kinds of measures can stimulate increasing demand for automation system. This includes measure to exempt import tax on automation system parts used in prototype development by specifying that buyers can use expenses to demand for tax rebate. These measures lead to an emerging of automatic machine development industry in Thailand. Moreover, system buyers can also acquire machinery with suitable and competitive price.

Guidelines for promotion of individual target industry

Electrical and electronics industry

Electrical appliances and electronics industry have promotional guidelines that SMEs need to adjust. These include productivity both in production process and management of supply chain in aggregation and in industrial factories, improvement of manufacturing process towards semi-automation, and the adoption of manufacturing automation system in each work procedure.

Ceramic industry

Thailand's ceramic industry has guideline and direction for development, which is the adoption of cutting-edge manufacturing technology or automation technology to support skilled workers to add value to and increase quality of products. This will help in solving problems of labor shortage, outdated machinery, and machinery efficiency issue that have an impact on inconsistency of manufacturing quality.

Wood and furniture industry

Wood and furniture industry set plan so that work can be done continuously and without production break to wait for subsequent procedures. The adoption of vision system to measure the size of wood can assure quality and reduce repetition of work process. Moreover, the usage of robotics arms or robots for spray-painting can ensure the plainness

and consistency of coloration. Conveyor system is also utilized for transferring workpieces and parts.

Food industry

Food industry has guidelines and directions for development, which is the development of automation system to control production process that is precise and take into consideration food quality. It also uses robotics arms or robots in manufacturing system that requires repetitive and unnecessary work, for example, to load cans into box, to pick up boxes into palette, and to lift boxed in warehouse process. This help reduce workload of labor as well as their fatigues.

Fashion industry

Fashion industry has guidelines and directions for development, which is the development of automation system to count workpieces and to inspect. Moreover, it can also apply vision system in factories as well as system that can check and reject workpieces automatically or to use as aiding tools. These help to enhance manufacturing quality and increase productivity. Manufacturing automation system in information can also assist in production planning, in notifying when raw materials and parts are adequate for production order, and in knowing the status of current manufacturing process.

To enhance manufacturing industry with automation technology, it should have direction for development of the entire system that requires simultaneous implementation. However, challenges still remain for the adoption of automation system, including manufacturers' lack of knowledge and understanding of manufacturing automation technology. With a rising competition, related organizations, both in public and private sectors, need to be well-informed and to cooperate in order to enhance manufacturing industry. Moreover, establishment of database relating to technology and tendency of demand for manufacturing automation system is essential. Development of manufacturing automation system should conform to direction on industrial development and industrial labor market. All of these are indispensable in reducing labor shortage problems of Thai industry, and cost of production issues due to gradual augmentation of minimum wages. This also helps in sustainably increasing productivity for industrial entrepreneurs.

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