

Potential Structural Change of Labor Force from Corporate Perspectives

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Abstract

Advanced technologies are key factors enhancing industrial and digital revolution. According to the upcoming of Artificial Intelligence (AI) in Thailand, there are concerns on the future works and job reallocation. The aim of this study is to determine the perceptions of businesses on the abilities of human labor and robots or AI, where different types of labors, human and AI, suit different types of job duties. The data retrieved from 74 observations of firms collected from senior managers in various industries throughout Thailand during August 2018 through survey questionnaires. The corporate domain covers entrepreneurs who offer customer services, logistics, reception, call center, security, and advice functions. The results show that the entrepreneurs trust AI and robotics more than human in many tasks, leaving just the logistics, which interaction with customers is needed in the digital society, still be dominated by humans. The results imply that it is unavoidable for Thailand to move toward the digital transformation which human labor and advanced technologies will be combined to work together, and somehow advanced technologies may take over human jobs in many tasks. It is also the evidence implying that Thailand is fast enough, at least on the entrepreneurial side seen from their perspectives and perceptions, in moving toward the digital economy. This evidence is a significant warning to human labor to equip themselves with interaction skills for the works that cannot be replaced by AI.

Keywords: Labor Force, Artificial Intelligence, Corporate Perspectives, Structural Change, Labor Market

Introduction

The potentials and capabilities of the Internet-of-Things (IoT), Big Data analysis, and Artificial Intelligence (AI) have been dramatically increasing. With the capability of thinking, learning, and decision-making, enabled by text and data mining based on Big Data analysis, as opposed to simple software, AI disruption is expected to bring about great challenges to businesses, economies and societies (Manyika et al., 2017; Uzialko, 2019a). These advanced technologies are key factors enhancing revolutions across industries and economies (Hassan, 2020; Manyika et al., 2017). The transformation of digital technologies creates new collective experiences and ways of unlimited consumption of quality goods and services.

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In business, AI has diverse usage in different industries (Hassan, 2020; Uzialko, 2019a). The first generation of AIs dealt with automatic manual functions such as production and manufactures. Firms are also capable to deliver better and differentiated products and services to their customers (Curtis, 2019; Marr, 2020; Uzialko, 2019a). Moreover, they are realizing more complex and intensified competition. Moreover, AI jobs with the basis of deep learning algorithms are growing very fast, where deep learning is an artificial neural network running by modeling the structure of human brain (Curtis, 2019).

On the one hand, there was the case of a hotel in Japan, the Henn-na Hotel, where reception and in-room service were all executed by robots. The hotel eventually discharged half of its 243 robots because of more troubles in communications and decision making they created than parts they could solve (Social Tables, 2018). On the other hand, Marr (2020) believes that the reliability on human assistance could be changed if robots become more accurate and efficient at interpreting human's communications.

Gartner Inc. (2017) believes that AI will enhance the productivity of various jobs across industries. It is also expected that, in 2020, AI will create new 2.3 million jobs of high-skilled, while decrease 1.8 Million of middle and low-skilled jobs (Gartner Inc., 2017). That being said, some types of working tasks may be better conducted by human labors while some jobs are better performed by advanced technologies like robots or AIs. Also, some people view these advanced technologies as opportunities while some others view as threats to human labors (Uzialko, 2019a).

There is a growing body of literature emphasizing the interaction between AI and human labor. DeCanio (2016) applies cross-sectional data of U.S. productivity to show elasticity of substitution between human labor and robot. However, very few empirical studies investigate complements and substitutability of AIs and human labors from microeconomic perspective. Specifically, it is still unclear whether the aim of businesses in adopting AI are at replacing or supporting human roles (Curtis, 2019; Uzialko, 2019a).

Research Objectives

Gartner Inc. (2017) suggests that AI-enabled technologies investors should consider how these technologies will transform the way workers collaborate with each other. Also, what working position will be eliminated and what jobs will be newly created. Therefore, this study aims to uncover corporate perspectives on the potentials of humans and AIs in labor markets. Although advanced technologies utilization in industries will increase productivity and quantity, reduce time and increase in cost saving, they can be causes of increasing unemployment because of human labor replacement and possible threat to human labor (Gartner Inc., 2017; Lee, 2017; Uzialko, 2019b).

This study takes Thailand as a target because the country is at the stage of restructuring her workforce to cope with fast growing digital technologies. According to the upcoming of AI implementations in Thailand, there are some awareness on the reallocation of future works and jobs. It is unavoidable for Thailand to move toward the digital transformation which human labor and advanced technologies will be combined to work together, and somehow advanced technologies may take over human jobs in many tasks.

In a business, there are a lot of working duties. A set of field survey data were collected from various industries throughout Thailand those offer customer service, reception, call center, security and lecture/advise services.

Depending on corporate characteristics such as type of business, size, numbers of labor, wage rate, shortage of labor, and cost of production, the perceptions of entrepreneurs and the demand for labor are different. The corporate decision in labor segregation and synchronization between human and AI will affect the structure of labor market in the country. Policy implication

from this study will shed lights to the Thai government and policy makers in creating policies which would stimulate employment system and education reforms of future skills for human workers.

Literature Review

The use of AI in production

Many firms prefer using new technologies to make their industry better than others and more comfortable for their businesses (Soonsarthorn, 2018). Across many industries, top leading companies are investing for AIs' power. The utilizations are vary from frauds detection by banks to the adoption of chatbots by customer services and call centers to get better customer interactions. The capability of AI is at monitoring, managing, and controlling the automation of production and also service delivery (Curtis, 2019). In medicine, AI can diagnose patient's risk. It will improve patients' safety and efficient care to prevent disease (Hassan, 2020). AI can also predict failures in manufacturing before happening while it could manage routes for drivers by real-time analytics on traffic jams based on their location data in the transportation industry (Curtis, 2019).

Among the advanced technologies, chatbot is now widely accepted and has passed the introduction stage of its life cycle. It has become one of the major trends in business and corporate utilization among advanced countries such as USA, Japan and China. The main aim of using chatbot is at the communication function between human and business through machines. There are embedded information and knowledge, text and data mining methods to make conversations, identify sentences, make decisions, and respond to answer questions. Chatbot gains popularity in taking the role of customer service, where the traditional customer service used to be assigned to human workers (Curtis, 2019).

Nowadays, many firms are considering the uses of AI in 4 types (Soonsarthorn, 2018);

1. Computer vision can make AI more efficient by Automated Issue Identification Process.
2. Generative design which is the process of testing what should be and how things are different.
3. Digital twin is a digital replica of potential and actual physical assets, processes, people, places, systems and devices that can be used for various purposes.
4. Predictive maintenance can alarm and solve the problems before they occur.

Related literatures

The impact of robotics on employment and employee motivation gains higher attention from social-science researchers (see Acemoglu & Restrepo, 2020; Anderson & Smith, 2014; Benzell et al., 2015; Bessen, 2017; Chui, Manyika & Miremadi 2016; Fortunati, Esposito & Lugano, 2015; West, 2015). The research question started from how technological progress affects the equilibrium number of jobs. Mortensen & Pissarides (1998) aim at considering situations where firms adopt the new technology through creative destruction and renovation coexist. Then, the literature found that faster technological progress leads to greater and wider job reallocation either across firms or across sectors. However, the work could not find clear-cut associations between unemployment in aggregate data and productivity growth. Also, it concludes without implying lower equilibrium number of jobs.

Later, in the study by Qureshi & Syed (2014), there are important keys to be concerned whether robots have advantages or disadvantages. The research aims at finding out all possible benefits and limitations associated with robotics involving the concept of Impact of Robotics on Employment and Employee Motivation in Health Care. The result shows that robots have either advantages or disadvantages. Although robots can do some jobs better, cheaper, and faster than humans, firms should focus on training and development of employees.

Most of recent pieces of literature aim to study sets of counterfactual scenarios leading to the understanding of how ICTs have transformed labor markets. The study by Atalay et al. (2018) uses advertisement texts on newspaper measuring job tasks and the adoption of individual information and communication technologies (ICTs) in the U.S. labor market. The results show that technology adoption connects with an increase in non-routine analytic tasks and—in conjunction with high income workers’ comparative advantage in occupations rich in these types of tasks—an increase in the inequality of earnings.

Nam (2019) investigates citizen attitudes on job replacement caused by robotics and automations. Through survey questionnaires, the work measures people’s enthusiasm and worry about job replacement taken by robots. Regarding to the possibility that computers and robots could do most of the work currently done by humans, the survey asks two perceptions: How enthusiastic are you? and How worried are you? If at all, about this possibility for society as a whole? The results cluster the respondents into four types based on bi-dimensional view which are optimistic (high enthusiasm and low worry), pessimistic (low enthusiasm and high worry), skeptical (low enthusiasm and low worry), and hybrid (high enthusiasm and high worry). Regression analysis was applied to predict attitudinal category of an individual 1) according to the degree of which he or she supports specific policy options (guaranteed income, robot quotas, extra pay for human interaction, and a national program for displaced workers) and 2) according to his or her awareness, perceived likelihood, and expectation of positive outcomes of job replacement. The result of the analysis shows that attitudes differ considerably based on ideology and partisanship.

Framework design and the survey

This study takes Thailand as a target because the country is at the stage of restructuring her workforce to cope with fast growing digital technologies. A set of field survey data was primarily collected from various industries throughout Thailand those offer customer service, reception, call center, and lecture/advise services.

The authors concern firms’ decision making on labor segregation and combination to figure out which jobs should be belonged to advanced technologies such as automation machines with decision-making ability, robots, AI, chatbot and which jobs should mainly be belonged to human labor.

Primary data of this study were collected during August 2018 through survey questionnaires from senior manager and above positions of Thai entrepreneurs those offer customer service, reception, call center, security and lecture/advise functions.

The survey provides brief explanations of AI, Machine Learning, and Deep Learning before asking several key questions on the perception of Thai entrepreneurs of performances of advanced technologies or AI and human labor.

The questionnaire consists of general information, their perception of performances of labors; advanced technologies and human labor in industries, and the intention of using advanced technologies and AI in the future.

The general information consists of gender, age, education background, occupation and the advanced technologies or AI that the companies are using nowadays. The questionnaire also covers the understanding of advanced technologies and AI which are chatbot, autonomous vehicle, machine learning, deep learning and cognitive learning.

The concerns of productivity and efficiency between employee and AI mentioned by Uzialko (2019a) and Curtis (2019) lead to the next part of the questionnaire. The decisions and perceptions of the entrepreneurs mainly consist of the following explanatory factors; efficiency, productivity, cost of time, wage rate of labor, and cost of production.

1. Efficiency: the consideration whether advanced technologies or human labors are more efficient for each task.

2. Productivity: the consideration whether advanced technologies or human labors are more productive for each task.

3. Cost of time: the consideration whether advanced technologies or human labors use less time to perform each task.

4. Wage of labor: the consideration to trade-off between the wage of labors and cost of advanced technologies.

5. Cost of production: the consideration to trade-off between the cost of production when using intensive labors and intensive advanced technologies which leads to further decisions in other dimensions of production and the ways of doing business.

Finally, the questionnaire asks the intention to adopt advanced technologies and AI in the future. This decision will determine the direction of labor segregation, the utilization of AI and robotics, and the trend of the combination of labors and advanced technologies in the near future.

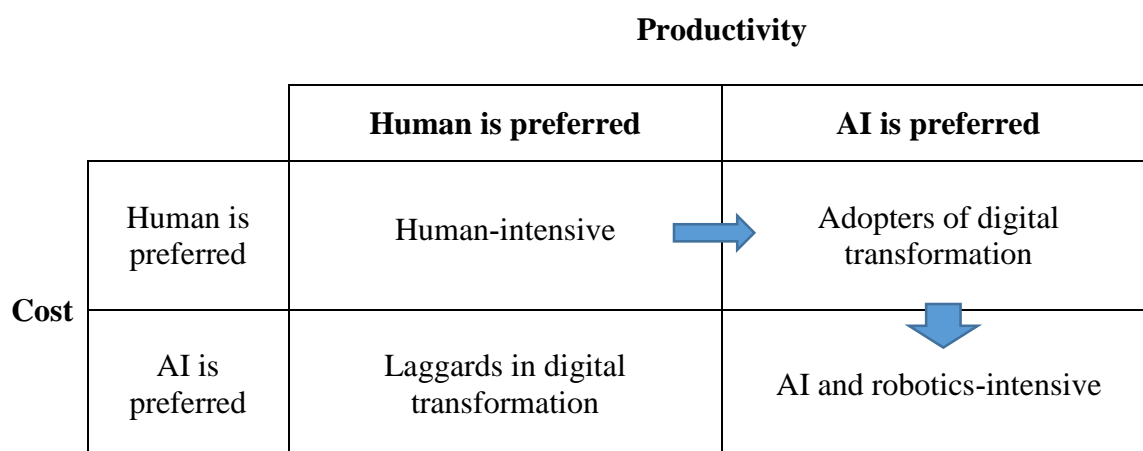


Figure 3 The digital transformation path from human labors to AIs and robotics

The potential of the structural change of labor market affected by disruptive technologies is to uncover how technologies are related to human workers. This study asked about the perceptions of entrepreneurs toward cost vs. productivity created by human labor and AI/robotics. Respondents were asked whether human labor or AI/robotics would benefit them more in terms of cost and productivity. Figure 3 shows the digital transformation path from human labor to AI and robotics. The job position or working task that an entrepreneur views that human labor is better in both cost and productivity is defined as *human-intensive*. When AI/robotics advance their capabilities, the *human-intensive* will then be transformed to *adopters of digital transformation*. Later, when AI/robotic become lower in their costs, the job position will move toward the *AI and robotics-intensive* position and the production will probably be fully automated. The *laggards in digital transformation* refers to the jobs which companies perceive that human labors provide better productivity at lower costs.

| | | Efficiency | |
|------|--------------------|---|--|
| | | Human is preferred | AI is preferred |
| Wage | Human is preferred | Human provide more productivity/efficiency & Human are cheaper. | AI provides more productivity/efficiency But human are cheaper |
| | AI is preferred | Human provide more productivity/efficiency But AI is cheaper | AI provides more productivity/efficiency & AI is cheaper |

Figure 4 Potential of job replacement by AI and robotics

Considering the potential of job replacement by AI and robotics, the displacement path starts from the *AI/robotics-intensive* where AI and robotics are technically feasible at high rate of utilization. The *adopters of digital transformation* working position has high potential to be replaced by AI/robotics when the cost of the advanced technologies become relatively lower than wage rate. The replacement path spans from higher level of *AI/robotics-intensive* to *human-intensive*, as shown in Figure 4. The *laggards in digital transformation* type is viewed as potentially secured jobs, at least for this decade. There are challenges and some rooms for human workers to improve their skills needed for more competitive and productive capabilities in order to move toward *human-intensive* job position. Although automations consume less cost, no one would pay for new technologies with lower productivity. This is the expectation that new technologies must be invented to be more efficient than human labor considering at the same cost.

Results and Discussion

Totally, 74 observations of firms were collected from senior managers in various industries throughout Thailand who offer customer service, reception, call center, and lecture/advise functions. The results are shown in Figure 5 and 6 as follows:

(a) Total number of human vs. AI preference with specification of tasks

| | | Productivity | |
|------|--------------------|----------------------------------|--|
| | | Human is preferred | AI is preferred |
| Cost | Human is preferred | Logistics, *Financial advisor | Call center, Reception, Health technician, *Financial advisor |
| | AI is preferred | None | Financial security, Banking, Security guard |

(b) Tasks of work

| | | Productivity | |
|------|--------------------|--------------------|-----------------|
| | | Human is preferred | AI is preferred |
| Cost | Human is preferred | 96 selections | 146 selections |
| | AI is preferred | 62 selections | 140 selections |

Figure 5 Preference in terms of cost of production vs Productivity between human labor and AI

Note: *Equal portion in more than one category

In the digital transformation pathway and in terms of productivity compared to the cost, it can be seen that most of the selection (146 selections in Figure 5a) are on the transformation. These tasks are call center, reception, health technician, and financial advisor. While the cost of human labor is still lower than AI in these tasks, entrepreneurs prefer to rely their productivity on AI.

In the Figure 5b, tasks that are still reserved to human labor are logistics and financial sector (partly located in this category and the other equal part is belonged to the digital transformation). However, advanced tasks that employ the productivity of AI faster than other sectors are financial security, banking and security guard regardless of the cost of AI.

(a) Total number of human or AI preference with specification of tasks

| | | Efficiency | |
|-------------|--------------------|---------------------------|------------------------|
| | | Human is preferred | AI is preferred |
| Wage | Human is preferred | 72 selections | 112 selections |
| | AI is preferred | 111 selections | 149 selections |

(b) Tasks of work

| | | Efficiency | |
|-------------|--------------------|---------------------------|--|
| | | Human is preferred | AI is preferred |
| Wage | Human is preferred | None | Health technician, *Security guard |
| | AI is preferred | Logistics | Call center, Reception Financial security, Bank, Financial advisor, *Security guard |

Figure 6 Preference in terms of wage vs. efficiency between human labor and AI

Note: * Equal portion in more than one category

In another dimension on the digital transformation pathway and in terms of efficiency and wage, there are only small amounts of entrepreneurs that rely their businesses on only human labor (72 selections in figure 6a). The largest portion of this dimension is located at the usage of AI as main workers (149 selections in figure 6a) while the combination of AI and human labor are quite equal in both entrepreneurs who are adopters of advanced technologies (112 selections in figure 6a) and the laggards (111 selections in figure 6a).

To be specific on the tasks of work, logistics may be the laggards because of the need to have human labor for packing, driving and delivery that cannot be replaced even though the wage of AI will be dropped sufficiently. Moreover, entrepreneurs view that human drivers are better than fully automated car. Health technician and security guard receive more confidence to replace human when the wage of human labor is still lower than AI. Surprisingly, the move toward the digital transformation in terms of efficiency is faster in terms of productivity when many tasks prefer AI when the wage of AI is still high. These tasks are call center (82.43 per cent of entrepreneur prefer chatbot to human), reception, financial security, banking, financial advisor and security guard (sharing equal portion with the digital transformation category).

For the last resort for human labor, the replacement of labor will take place from the bottom right position of figure 5 and 6. It will be harder for humans to find jobs in these tasks. However, logistics are the one which can absorb human labor. For example, nowadays the growing business of Grab, Line Delivery, Kerry and other delivery services of passengers, parcels and foods need more and more human drivers for the delivery tasks.

Another last resort for human labor may be the financial advisor. A part of this task is under digital transformation but remain half of the portion in the human-intensive category. Trust is the key of the financial advisor. AI may provide information but humans can provide trust. Whenever the trust is not broken by human advisor, humans can still do this job. Besides,

whenever trust can be gained sufficiently by AI and robots, humans may lose this job. For some evidences, AI takes over some parts of the mutual fund management. Some of their returns on investment are higher than human-managed fund so that financial institutions dare to offer AI-managed fund to be an alternative product to their customers.

Many people are in fear of the deployment of AI at workplace. In lining with Hassan (2020), however, the results of this study show that AI is expected to help improving productivity and efficiency with the repetitive working tasks. In addition, as suggested by Wolla (2018), technology, in its status quo, consists of two different features: *physical capital* and *technology*. *Physical capital* is defined as all tangible tools used to produce goods and services, which is many times used as substitute for human labor. *Technology* is referred to as all intangible functions embedded in the physical capital, which is used as complement for human labor, in terms of knowledge, processes, and techniques in goods and services production. While the structure of labor market has been changing over time, human labors can maintain their employment by equipping themselves with the necessary skills to be ready for non-routine tasks.

Conclusion

AI refers to machines that are capable of thinking, learning, managing, and decision-making abilities like humans do. According to the forthcoming implementation of AI in Thailand, there are some awareness and concerns on the future works and jobs reallocation. Some scholars believe that almost all jobs can be transformed with automations to a greater or lesser degree, depending on the types of works. However, only small percentage will be fully replaced by technologies. Sometimes using the advanced technologies, such as AIs and robotics, may drive employment rates in some types of businesses. That being said, some tasks of works may be better operated by human workers while some jobs are better operated by advanced technologies.

This study provides an empirical evidence from corporate perceptions on the potentials of humans and robots in labor markets. The data retrieves from senior manager and above position. The corporate domain covers entrepreneurs who offer customer services, logistics, reception, call center, and advice functions.

The results show that entrepreneurs trust AI and robotics more than human in many tasks, leaving just the logistics, which interaction skill with customers is needed, is dominated by humans. Financial advisor, bank clerk, health technician, reception, and call center are in their digital transformation. In other words, AI and robotics are currently complementary in these job positions. From corporate points of view, it is the threat to security guard for being replaced by the first wave of AI and robotics.

The structure of labor market has been changing over time. Policy implication from this study is that the government should play a very important role to cope with human skills for the working with AI and emphasize the working that cannot be replaced by AI. Implication for human labors is to equip themselves with necessary skills to be ready for non-routine tasks in order to maintain their employment amid the incredible progress of AI and automation. Also, the results of this study is an evidence indicating significant warning to education system that is needed to reform immediately.

From technological acceptance point of view, this study is the evidence implying that Thailand is fast enough, at least on the entrepreneurial side seen from their perspectives and perceptions, in moving toward the digital economy. According to Gartner Inc. (2017), evidences from the past suggest that innovations engaged with temporary job elimination during the transition period before the recovery. Therefore, it is believed that digital transformation by AI will follow the same pathway. The results of this present study imply that it is unavoidable for

Thailand to move toward the digital transformation which human labor and advanced technologies will be combined to work together, and somehow advanced technologies may take over human jobs in many tasks. Moreover, since all economies around the world could be collision with the implementation of AI and automation (Manyika et al., 2017). Therefore, the framework of this present study can be generalized to reveal structural changes of labor markets across countries.

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