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# Complements and Substitutes between Chatbots and Humans: Corporate Perspectives

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## ABSTRACT

The aim of this study is to determine the perceptions of business on the abilities of human labor and robots or Artificial Intelligence, where different types of labors, human and AI, suit different types of job duties. Chatbot is selected as a case because it has passed the introduction stage of its life cycle. It is now widely accepted and has become one of the major trends in business and corporate utilization among advanced countries such as Japan, China and USA. The study focuses on service sector in the position of customer service, call center, and lecturer. The results show that corporates perceive Chatbot as potential opportunity to work as receptionist, operator, call center, customer service staff and lecturer. The results imply that with only the factors of efficiency, productivity, cost of time, wage, and cost of production there are going to be difficulties for human labors to work in these duties. Government, therefore, should revamp the system and scheme of education in Thailand which is support in both worker skills and working skills with more complex, creative, critical, and service orientation in order to differentiate and maintain balances between the uses of advanced technologies and human jobs.

Keywords: Human worker; chatbot; corporate perspectives; complements; substitutes

## 1. Introduction

The potential and capability of the Internet-of-Things (IoT), Big Data analysis, and Artificial Intelligence (AI) which have been dramatically increasing. Within an interconnected economy with text and data mining based on Big Data analysis and decision-making process, AI disruptive is expected to bring about the greatest challenge to our societies. Consumers have been experiencing new ways of unlimited consumption of quality goods and services. Firms are capable to deliver better products and services to their customers, and will realize more intensified competition. These advanced technologies are key factors enhancing industrial and digital revolutions. However, some people view these technologies as opportunities while some view as

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threats to human labors. Therefore, the goal of this study is at uncovering corporate perspectives on complements and substitutes between humans and robots.

Although, using advanced technologies in the industries is the cause of increasing in unemployment because of human labor replacement and possible potential threat to human labor, they will increase in productivity and quantity also reduce time and increase in cost saving. Sometimes using the advanced technologies may increase the employment in some types of businesses. Some types of works may be better operated by human labors while some types are better operated advanced technologies.

In a business there are a lot of duties such as call centers, accounting manager, secretary, customer service, receptionists, drivers, bill collectors and operators and so on. So, the perception and the demand of labor of entrepreneurs are different depending on efficiency, productivity, cost of time, wage rate, and cost of production.

Among the advanced technologies, chatbot has passed the introduction stage of its life cycle. It is now widely accepted and has become one of the major trends in business and corporate utilization among advanced countries such as Japan, China and USA. The main aim of using chatbot is at communication between human and machine. There are embedded knowledge, text and data mining method in order to identify sentences, make decisions, respond to answer questions and make conversations. Chatbot gains popularity in taking the role of customer service, where the traditional of customer service used to be assigned to humans. It has also been adopted in financial services, education, and entertainment sectors.

The key focus of previous studies were at technological perspective making system improvement, utilizations and applications of chatbots. Very few empirical studies currently investigate their economic aspects, complements and substitutes between chatbots and humans. Specifically, it is still unclear whether corporate points of view in adopting chatbots are at replacing or supporting human roles. Typically, functions of human in a business which involve with interactive ability include accounting manager, secretary, customer service, call center, receptionist, bill collector, and operator and so on. For instance, Henn-na Hotel, a hotel in Japan where receptionists and in-room assistants were all robots. However, the hotel eventually laid off half its 243 robots because they created more problems in communications and decision making than they could solve. So, the perception of an entrepreneur and the demand for labor are different depending on corporate characteristics such as type of business, size, numbers of labor, wage rate, shortage of labor, and cost of production.

This study aims to investigate corporates intention to adopt chatbots and the expected roles of them in order to identify which duties chatbots can has higher potential than human and

which ones they should be used as to support human workers. The hypothesis is that chatbots will not substitute humans in all jobs but just some jobs that can respond to customers with standardized actions and answers. In many other jobs, chatbots can help the firms that face the shortage of labor to expand their businesses by adding chatbots to human workforces instead of finding humans to fill the vacancies. However, not all the jobs that chatbots can do well especially the jobs that need complicated and sensitive conversations. Therefore, the study will not try to find whether chatbots will be only substitutes or only complements to humans. Instead, it concerns that chatbots are both complements and substitutes to humans depending on different jobs. The analysis will also discover the relationship between corporate characteristics and expectation of chatbot implementations.

The decision of corporates of utilizing chatbot to replace or support human labor will affect labor market and education policies in the country. Policy implication from this study will shed lights for the Thai government in creating policies those would be stimulating employment and also education reforms of future skills for human workers.

## 2. Literature review

The impact of robotics on employment and employee motivation gains higher attentions from social sciences researchers. The question of research was started from how does technological progress affect the equilibrium number of jobs? Mortensen & Pissarides (1998) aim to consider situations where firms that adopt the new technology through creative destruction and firms that adopt it through renovation coexist. Then, they found that faster technological progress leads to grosser job reallocation either across firms or across sectors. However, the work could not find clear-cut associations between productivity growth and unemployment in aggregate data and conclude without implying lower equilibrium number of jobs.

As mentioned by Qureshi & Syed (2014), there are important keys to be concerned, that is, robots have either advantages or disadvantages. Although robots can do some jobs better, cheaper, and faster than humans, but we should be viable focus on training and development of employees. The research aims to find out all the possible benefits and limitations associated with robotics applying theories of Impact of Robotics on Employment and Employee Motivation, Impact of Robotics 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, but we should be viable focus on training and development of employees.

Most of recent research aim to explore a set of counterfactual scenarios making an understanding how ICTs have transformed labor market. The study by Atalay, Phongthientham,

Sotelo, & Tannenbaum (2018) uses newspaper ad text 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 is associated 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 earnings inequality. However, there are important exceptions: office software tends to substitute for non-routine analytic tasks, and leads to an attenuation of the male-female earnings gap.

### 3. Methodology

The analytical part of this study examines the factors that influence on firm’s decision on labor segregation between advanced technologies and human applying quantitative approach. The study focuses on size of business, types of business, number of labor, wage, shortage of labor, cost of production and some characteristics such as diligence, enthusiasm, responsibility and honesty. The authors concerns firms’ decision making on labor segregation that which jobs should belong to advanced technologies such as robots, Artificial Intelligence, smartphone, machines and which jobs should belong mainly to human labor. Primary data of this study retrieves through survey questionnaires from 40 Thai entrepreneurs those offer customer service, reception, call center, and lecture functions.

The questionnaire mainly ask the decisions and perceptions of the entrepreneurs on the following explanatory factors;

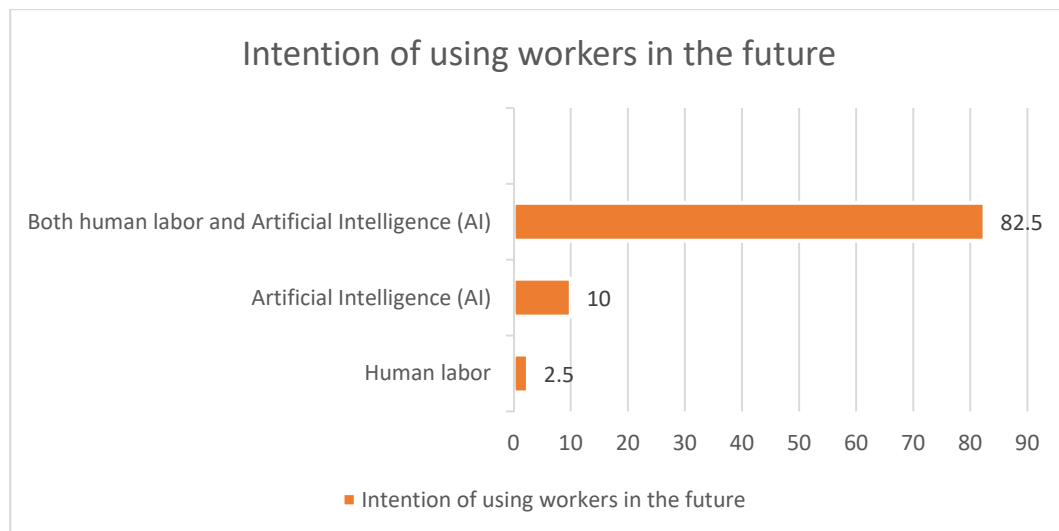
- 1) Efficiency; - workers have to consider that the efficiency on advanced technologies and human labor which one convenient for each tasks.
- 2) Productivity; - all workers have to concern about which one has productivity between advanced technologies and human labor.
- 3) Cost of time; - workers have to worry about cost of time that workers have to spend in each tasks which one between advanced technologies and human labor use less of time.
- 4) Wage of labor; - workers have to trade of between using human labor and advanced technologies.
- 5) Cost of production; - the important factor that entrepreneurs should consider because the cost of production is the basic essential for beginning the business different cost of production will influence different firm’s decision to choose human labor or technologies.

The author measures the understanding of respondents by sets the criteria for ranking respondents' understanding in Artificial Intelligence (AI), Chatbot, machine learning, deep learning and cognitive computing. The authors consider the following the criteria;

- 1) Least; - the respondents have the lowest information and understanding about Artificial Intelligence (AI), Chatbot, smart car, machine learning, deep learning and cognitive computing.
- 2) Pretty bad; - the respondents have less information and understanding about Artificial Intelligence (AI), Chatbot, smart car, machine learning, deep learning and cognitive computing but cannot define characteristics of each Artificial Intelligence (AI).
- 3) Average; - the respondents have medium information and understanding about Artificial Intelligence (AI), Chatbot, smart car, machine learning, deep learning and cognitive computing and can explain basic characteristics of each types of Artificial Intelligence (AI).
- 4) Pretty well; - the respondents have good information and understanding about Artificial Intelligence (AI), Chatbot, smart car, machine learning, deep learning and cognitive computing. Respondents can define each types of Artificial Intelligence (AI) as good.
- 5) Well; - the respondents have the best information and understanding about Artificial Intelligence (AI), Chatbot, smart car, machine learning, deep learning and cognitive computing. Respondents can define each types of Artificial Intelligence (AI) very well.

#### 4. Results and interpretations

The results of this study show that most of respondents intend to hire both human labor or Artificial Intelligent (AI), which is accounted for 82.5 percent of respondents. For other respondents willing to appoint only one type of work, only human labor or Artificial Intelligence (AI), which accounted for 2.5 percent and 10 percent respectively.



Source: survey, 2019

Table 1. Perceptions of respondents in using Chatbot versus human labor toward explanatory factors

Explanatory factor	Number of human	Number of Chatbot	Percentage of human	Percentage of Chatbot
Efficiency	22	18	55	45
Productivity	19	21	47.5	52.5
Cost of time	8	32	20	80
Wage	16	24	40	60
Cost of production	17	23	42.5	57.5
Total	82	118	41	59

Source: survey, 2019

From the survey, most of respondents are intended to use Chatbot at 59 percent while the demand for human labor is at 41 percent.

## 5. Discussion and conclusion

According to the upcoming of Artificial Intelligence (AI) in Thailand, there are concerns on the future works and job reallocation. Therefore, the author find out the perception of workers in many aspects of work. The authors mainly concern Chatbot machine learning, deep learning and cognitive computing following by five factors including in efficiency, productivity, cost of time, wage and cost of production.

From the result, more than half of workers aim to use both human labor and advanced technologies in many approaches of work such as self-employment, government officials, professional skills and state-owned enterprise staffs. Nonetheless, there are a few entrepreneurs

intend to use only human labor and only Artificial Intelligence (AI). Workers perceives to use Chatbot, which has potential to work as receptionist, operator, call center, customer service staff and lecturer.

The results imply that with only the factors of efficiency, productivity, cost of time, wage, and cost of production there are going to be difficulties for human labors to work as receptionist, operator, call center, customer service staff and lecturer. Government should revamp the system and scheme of education in Thailand which is support in both worker skills and working skills with more complex, creative, critical, and service orientation in order to differentiate and maintain balances between the uses of advanced technologies and human jobs.

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