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Vietnamese Students' Awareness of The Fourth Industrial Revolution: An Empirical Research

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Abstract

This research investigates Vietnamese students' awareness of the Fourth Industrial Revolution also called Industry 4.0. The study used a questionnaire survey and in-depth interviews. Research results from 443 Vietnamese students in Hanoi and Ho Chi Minh City show that students' awareness of the revolution and capabilities need to improve. Based on data analysis, recommendations are given to education and training institutions in order to create a skilled and qualified human resource. Key recommendations are about promoting students' awareness of Industry 4.0 through communication, improving students' IT skills, focusing on English training, improving teachers' capabilities and enhancing cooperation between training institutions and organizations.

Keywords: Awareness; industry 4.0; soft skills; the Fourth Industrial Revolution.

JEL code: O15.

1. Introduction

The Fourth Industrial Revolution (Industry 4.0) has been recently recognized with significant achievements in physical, digital and biological fields. The application of technologies in these fields has made the foundation of the revolution comprehensive, leading to significant and unpredictable changes in the daily lives of people. Since the pattern of consumption and production has changed, requirements for the knowledge and skills of workforces have also changed. Being aware of the revolution and prepared for its requirements is important for labourers, especially for those who are willing to participate in the labour market in the near future.

In the case of Vietnam, the impact of Industry 4.0 seems to have become obvious as several enterprises in Southern Vietnam have replaced humans with robots (Vuong Le, 2017). The need for information technology experts has increased over time (Huy Phong, 2017). Smart phones have been becoming familiar to people in their lives. The usage of the internet and the world wide web have been increasing day by day. The way people work in organizations is changing. Being aware of the revolution, thus becomes important for people, especially for students, who are going to apply for jobs in the near future. Given the fact that there has not been such a study in Vietnam, this research tries to explore Vietnamese students' awareness of the fourth industrial revolution and their preparation for facing the challenges of the revolution. Based on the analysis of the future of jobs and new requirements of the workforce in Vietnam, recommendations are given to education and training institutions in Vietnam in order to create skilled and qualified human resource.

2. Theoretical framework

2.1. Industry 4.0

Industry 4.0

The term Industry 4.0 was first introduced in 2011 at the Hanover Fair in Germany. After that it was officially included in the High-Tech Strategy which was adopted in 2012 by the German government. Germany was the first country to recognize Industry 4.0 and also the first to have a strategy to react to the revolution. The objectives of setting an Industry 4.0 strategy are to try to take opportunities as well as to limit negative impacts of the revolution. Industry 4.0 has become a common concern since January 2016 when the World Economic Forum (WEF) was held in Switzerland under the theme "Mastering the Fourth Industrial Revolution". At the conference, Klaus Schwab, founder and executive chairman of the World Economic Forum introduced his new book *The Fourth Industrial Revolution* (WEF, 2016).

Industry 4.0 was created on the base of the digital revolution, especially the use of the internet. The content of Industry 4.0 is development of the network between real and virtual worlds based on the internet of things (IoT) and the internet of systems (IoS). Artificial and decentralized intelligence helps to create a new aspect of manufacturing systems that is the interaction between the real and virtual worlds. Industry 4.0 refers to the technological evolution from embedded systems to cyber-physical systems. In other words, it represents the revolution on the way to an internet of things, data and services. With application of these technologies, industrial production machinery

no longer simply "processes" the product, but the product communicates with the machinery to tell it exactly what to do (German Trade and Invest, 2014). In the processes, the machinery operates based on intelligent communication and information technology and systems have the ability to independently communicate and solve problems.

Major Technologies of Industry 4.0

There are three major technological trends in Industry 4.0. They belong to the physical, digital and biological fields. In the physical field, there is an advanced technology well-known as 3D printing. The technology, also known as material additive manufacturing is an advanced development of printing technology which employs a rapid prototyping mode, without mold making. It helps people to produce complicated products by adding layer upon layer of material until the whole product is created. 3D printing technology can be applied in such fields as aerospace, architecture, automotive manufacturing, consumer products, dental, the medical and health care industry and training and education. Applying 3D printing technologies has become increasingly popular in the world.

In the digital field, the internet of things, Big data, artificial intelligence (AI) and Blockchain are major technologies. Firstly, the internet of things is an open and complicated system consisting of smart objects that can automatically organize, share information, data and resources and react to responses and changes in the environment. IoT is one such technology that can be applied to a lot of, or rather almost all, industries. Secondly, according to Mauro1 et al. (2015), Big data represents information assets characterized by such a high volume, velocity and variety as to require specific technology and analytical methods for its transformation into value. Big data can be applied in many industries. For example, popular applications are in banking and securities, in insurance, communications, media and entertainment, healthcare, education, manufacturing and natural resources, government, retail and wholesale trade, transportation, energy and utilities. Next, AI is a science which creates equipment that can understand people and have intelligent behaviour. In order to have equipment which is as intelligent as a person, AI is based on six fields – engineering, maths, computer science, biology, language and psychology. AI can be applied in many industries such as manufacturing, telecommunications, health care, agriculture and entertainment, and so on. Lastly, blockchain is a type of save data transmission technology in which information is assured not to be reversed and be incorrect (Aaron and Primavera, 2017). In the technological aspect, blockchain is a digitally engineered background which allows people to store the history of transactions among users. Applications for blockchain are cryptocurrency, smart contracts, digital identity, and digital elections.

In the biological field, there are two technological trends including gene and cell technologies. Regarding gene technology, gene modification allows people to repair and to eliminate some defective genes such as those that cause cancer or to choose children's genes. With regard to cell technology, original cells can be used to repair or replace harmed cells with healthy ones. In addition to that, based on the two technologies, asexual reproduction can be created. Applications of biological technol-

Table 1: Industry 4.0's requirements for labour

Knowledge/ skill	Explanation	Research
Good knowledge of information technology	Employees should be masters in working with the internet, using applications and/ or software. Employees also should be able to work with big data.	Schwab (2016), Tran and Do (2016), Kergroach (2017), Tran (2017), Beyza (2018)
Ability to work with cyber-physical systems	Ability to work with smart objects, to work at any place and at anytime	Schwab (2016), Tran and Do (2016), Kergroach (2017), Tran (2017), Beyza (2018)
Open mind-set and understanding of customer requirements	Employees are expected to have qualifications and ability to understand the products/ services and the environment.	Beyza (2018)
Ability to communicate in English	Employees are expected to read, speak, listen and write in English.	Tran and Do (2016), Nguyen et al. (2017)
Soft skills	Soft skills such as team work, commutation, strategic thinking and problem solving, managing change, creativity and innovation capability, judgement and decision making.	Schwab (2016), Tran and Do (2016), Nguyen et al. (2017)

Source: Summarized by the authors.

ogies can help people in growing cells to create organs to replace damaged ones.

By combining the above technologies, the influence of Industry 4.0 is extremely strong in people's lives. According to the survey report by The World Economic Forum, Industry 4.0 has six megatrends that are shaping society (WEF, 2015).

- People and the internet: People connect with others through a combination of technologies especially with the wearable internet, connected homes, and implantable technology;

- Computing, communications and storage everywhere: Ubiquitous computing power is available. Everyone can access the internet through a supercomputer in their pocket, with nearly unlimited storage capacity;

- The Internet of Things: Sensors are being introduced everywhere. Everything can be connected;

- AI and Big data: Data about everything and everyone is created and stored. Software can address, learn and solve problems itself;

- The sharing economy and distributed trust: With the creation of networks, communication becomes easy among people. Assets can be shared, creating new efficiencies and new business models and opportunities for social self-organization. Blockchain technology will act as a third-party to provide trust for people to do things;

- The digitization of matter: 3D printing creates physical objects. This technology benefits manufacturing factories and medical organizations. It is also useful for people's health.

Industry 4.0's requirements to labour

Industry 4.0's requirements for labour have been examined by a number of researches. Since the revolution is based on digital technology, knowledge of information technology is very important for labour (Tran and Do, 2016). Changes in skill requirements have been

Table 2: Top ten skills employees needed by 2020

1	Complex problem solving	6	Emotional intelligence
2	Critical thinking	7	Judgement and decision making
3	Creativity	8	Service orientation
4	People management	9	Negotiation
5	Coordinating with others	10	Cognitive flexibility

Source: WEF (2015).

more demanded in computerizing occupations (Beyza, 2018). In various fields such as manufacturing, healthcare, entertainment, government, etc., employees need to have the ability to work with cyber-physical systems (Tran and Do, 2016; Beyza, 2018). Other knowledge and skills are also mentioned. They are listed in Table 1.

In order to thrive with the challenges of Industry 4.0, according to The World Economic Forum, employees are expected to have the 10 skills in Table 2.

In comparison with the skills that employees needed to have by 2015, two new skills are now required and these are emotional intelligence and cognitive flexibility. Quality control and active listening are no longer in the top ten needed skills. The change results in the need for labourers, especially for those students who will apply for a job in the near future, to prepare for enhancing those skills.

2.2. Awareness of Industry 4.0

According to the Oxford advanced learners' dictionary, awareness is knowledge or perception of a situation or fact. It is an understanding that something is happening or exists. In other words, it is the state or quality of being aware of something. To be aware means to know, to realize or be interested in knowing something or to know that something is important. When measuring awareness, it is important to measure what respondents know as well as what they do not know. It requires optimizing responses based on an individual's knowledge rather than by guessing (Ciochetto and Haley, 1995).

Awareness can be measured in three dimensions including the breadth and depth of the subjects and self-knowledge or degree to which one knows about himself or herself (Renesh, 2018). The breadth of awareness of Industry 4.0 can be explored through whether students know about the revolution. The depth can be measured through students' knowledge of major technologies and their applications. Finally, the self-knowledge can be assessed through students' thinking about the revolution's influences on their job in the future.

This research foundation relies on the theory of reasoned action and social cognitive theory. Reasoned action theory proposes that individuals consider the consequences or results of behaviour before performing the particular behaviour. Intention, thus, is an important factor in determining behaviour and behavioural change. Intentions develop from an individual's perception of behaviour as positive or negative together with the individual's impression of the way their society perceives the same behaviour (Ajzen and Fishbein, 1980). Thus, personal attitudes and social pressure shape in-

tention, which is essential to the performance of a behaviour and consequently behavioural change.

Social Learning Theory was proposed in the 1960s by Albert Bandura. It developed into Social Cognitive Theory in 1986 and stated that learning occurs in a social context with a dynamic and reciprocal interaction of the person, environment, and behaviour. People's behaviour change is affected by environmental influences, personal factors, and attributes of the behaviour itself. Personal factors include an individual's awareness, feelings, belief, and expectation whereas environment includes both the physical and social environment.

A central principle of social cognitive theory is self-efficacy. According to Bandura (1989), self-efficacy refers to an individual›s belief in his or her capacity to execute behaviours necessary to produce specific performance attainments. A person must believe in his or her capability to perform the behaviour and must perceive an incentive to do so.

As mentioned previously, there is evidence that applications of major technological trends in the physical, digital and biological fields cause significant changes in the daily lives of people. The six megatrends have been shaping society (WEF, 2015), leading to changes in production and consumption. Application of these major technologies leads to a reduction in the need for human labour, especially for unskilled workers (Do and Truong, 2017; Bonekamp and Sure, 2017), an increase in demand for new jobs, especially in the information technology (IT) field (Do and Truong, 2017; Bonekamp and Sure, 2017), and changes in the way people work (Do and Truong, 2017). As a result, new requirements are given for labour to meet in order to satisfy employers in the future (Flynn et al., 2017).

Taking into account the influence of Industry 4.0 on the future of jobs, based on the reasoned action theory, it is expected that if Vietnamese students are aware of Industry 4.0, they will prepare for meeting its requirements of the labour force. Particularly, if students have knowledge of the revolution (especially major technologies and their applications), and its expected influences on the future of jobs, leading to new skills required by labour, they will have the intention of acquiring the required knowledge and skills. Based on social cognitive theory, if Vietnamese students are aware of Industry 4.0, they know the knowledge and skill requirements that they have to meet, and it will certainly drive their belief, expectations, and feelings toward what they have to do to prepare for applying for jobs in the future.

2.3. Previous research about Industry 4.0 and awareness of Industry 4.0

The term Industry 4.0 is relatively new to people as it was first mentioned in the world seven years ago. However, because of its importance and urgency, some governments immediately had a strategy to deal with its impact, e.g. the "Industrial value chain idea" of the Japanese government, "Industrial Innovation 3.0" of Korean government, "Made in China 2025" of the Chinese government, "Productivity 4.0" of the Taiwanese government, and so on. Industry 4.0 has become the common concern of researchers and organizations. Researches have been conducted with respect to many aspects of Industry 4.0. Among them, significant consideration is paid to the impacts of Industry 4.0 on

production and employment.

The roles and relationships between people and machines are examined since it is believed in the future that humans will have less influence on machines or machines will become more intelligent (The Boston Consulting Group - BCG, 2015b). Industry 4.0 is expected to have significant impacts on enterprises' productivity (BCG, 2015a). The way to navigate digitalization in the manufacturing sector is mentioned (McKinsey and Company, 2015). Industry 4.0 was reviewed in its complex aspects (Roblek et al., 2016) and it was found that the revolution and Internet-connected technologies are important and do have influence on the creation of value added for organizations and society. Besides these researches, some authors also examined influences of the revolution within their countries, e.g. such as research and innovation proposals dealing with changes caused by Industry 4.0 in the manufacturing sector in Japan (Nagasato and Yoshima, 2016), the operation of stores in Japan under the impact of Industry 4.0 (Takakuwa, 2016), influences of Industry 4.0 on the manufacturing sector in Germany (German Trade and Invest, 2014), or the potential impact of Industry 4.0 on employment demographics in the United Kingdom (UK) (Flynn et al., 2017). Engineers' skills in the future under the influences of Industry 4.0 are also examined through a questionnaire survey in Italy. The survey highlighted some interesting aspects concerning the Italian students' digital behaviour and their consideration of the Industry 4.0 framework (Motyla, 2017). In addition to that, the fourth industrial revolution's effects on education and vocational training are predicted and analysed (Institute of Technology Assessment, 2015). It is revealed that new capabilities and qualifications of human resources will be given preference, especially the information technology capacity. The preparation for the workforce in general is mentioned (WEF, 2016), or in a particular country, such as in China (Andrea, 2016).

Recently, there have been some researches on Industry 4.0 in Vietnam. In 2016, there was a research investigating characteristics of Industry 4.0 and proposed implications to change the education and training policy in Vietnam (Tran and Do, 2016). The research focused on the emergence of Industry 4.0 and how education and training policies in Vietnam should be changed to react to the revolution. In 2017, the revolution's expected influences on the future of jobs in Vietnam was examined (Do and Truong, 2017). Another research on students' awareness and preparation for meeting the requirements of Industry 4.0 was conducted in 2017 by a group of students in the National Economics University. Respondents were 228 students in the economic and business management field. The research revealed that more than 40% of 228 surveyed students knew the term Industry 4.0 and about 30% of them understood about the revolution (Nguyen et al., 2017). The research came up with some recommendations for education and training institutions and students in Vietnam in order to improve their operation and qualification.

Although the above researches focused on different aspects of Industry 4.0, authors all agreed that Industry 4.0 will have significant impacts on the future of jobs. Education and training institutions and learners need to identify the revolution's requirements of the labour

Table 3: Distribution of observation

Field of study	Number of observations
Natural Science	154
Social Science	240
Others	49
Total	443

Source: Result of the survey.

force in the future so as to create a qualified human resource. In the case of Vietnam, although there has been a study precisely examining students' awareness of Industry 4.0, the research took into account students in the economic and business management field only. Given the fact that Industry 4.0 influences are in various fields, it is necessary to conduct such research in various fields. For that reason, this paper examines Vietnamese students' awareness of Industry 4.0 and then gives some recommendations for education and training institutions and students in order to create a qualified human resource.

3. Research methodology

3.1. Data collection

The overall objective of the study was to examine Vietnamese students' awareness of Industry 4.0. The findings of the research were completed by applying secondary data research, a questionnaire survey and in-depth interviews.

Firstly, a secondary data research was conducted to summarize the technological trends and the characteristics of Industry 4.0 as well as to find if there had been any similar research. A short list of relevant researches was compiled. Recognizing the research gap, the study came up with two objectives as follows:

- To examine Vietnamese students' awareness of Industry 4.0.

- To draw conclusions and make some recommendations for higher education and training institutions in order to react to Industry 4.0.

Secondly, a set of semi-structured questionnaires for experts was conducted. The objective of the questionnaires was to explore how to measure students' awareness of Industry 4.0. Three experts in the fields of information technology and biology were invited to be interviewed in March 2017. After analyzing these data, key questions for assessing students' awareness were listed.

Thirdly, based on the characteristics and requirements of the revolution, questionnaires were designed to ask students whether they had heard of the revolution, what they understood about it and how they would assess their capability with respect to meeting new requirements set by the revolution. A pilot survey with 55 students in Hanoi was conducted in March 2017. Respondents were students who had studied in a university for at least 2 years. The reasons for choosing respondents was to know how students' self-studies were after spending a period of time in university.

Finally, the official survey was conducted in September to November 2017, with 443 students in Hanoi and Ho Chi Minh city. The two

locations were chosen as they are the two largest cities where the largest numbers of universities are located in Vietnam. The distribution of observations in terms of students' field of study is shown in Table 3.

Students were enrolled in eight large universities in Vietnam. Six of the universities were in Hanoi and the other two in Ho Chi Minh city. In-depth interviews were implemented with 20 students, 15 in Hanoi and 5 in Ho Chi Minh City. The objective of the interviews was to find the reasons the respondents chose the answers they did.

As said previously, the objective of the research was to measure Vietnamese students' awareness of Industry 4.0. The questionnaire was divided into 4 parts. The first included questions to collect general information about the respondents. The second measured students' awareness and expectation of the impacts of Industry 4.0. The next part was for students' self-assessment of their capability with respect to meeting requirements set by the revolution. Some last questions were included to gather students' opinions about how they expected their institutions to help them in improving their capabilities. Questionnaires for the interview were to learn the reasons for answers given by the students.

3.2. Data processing

There are two sets of data. The first is quantitative data, including all information about the 443 students in Vietnam. The statistical package for the social sciences (SPSS) was used to analyze the collected data. Descriptive statistics were calculated for all variables to have a general screening on the real data set in terms of frequency, means, variances, etc. The second data set includes qualitative data derived from the in-depth interviews. This data was used to supplement the quantitative data.

4. Results and discussion

4.1. Characteristics of the sample

Approximately 55% of the students were female and nearly 69% of the students were in their 7th and 8th term of study. The percentage of students in their 5th and 6th term was 31.8%. Among the 20 interviewees, 11 students were female and 12 were in their 7th and 8th term of study, 5 were in their 9th and 10th term, the rest were in their 5th and 6th term.

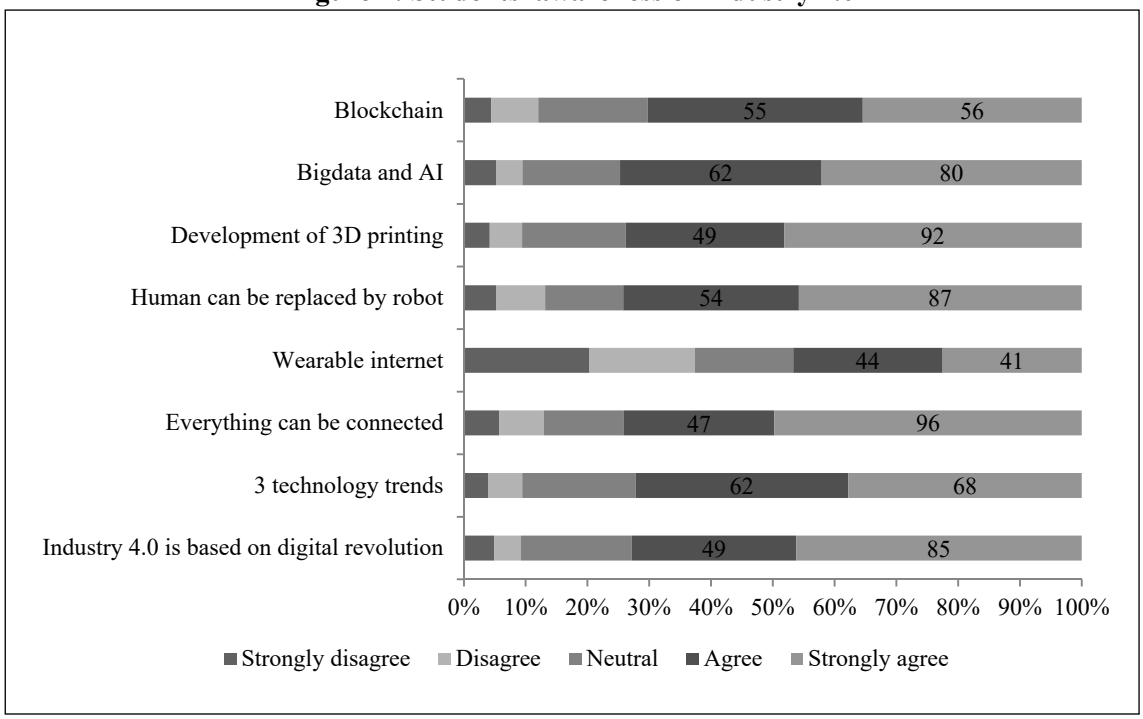
Altogether, nearly 35% of the students were studying economics business management. Students studying natural sciences accounted for 29.1% of the total number and others who were studying in such fields as foreign languages, information technology and tourism accounted for the rest of 11.1%. Among the 20 interviewees, 10 students were studying economics and business management and 5 were studying natural science. In the three fields of engineering, pedagogy and press, there were five interviewees.

The grade point average (GPA) of about 60% of the students in the previous term ranged from 6.5 to 8.0. About 20% of the surveyed students had a GPA from 8.0 to 8.5. Especially, 7% of the respondents had excellent study results as their GPAs were higher than 8.5. However, there were 50 students having GPAs ranging from 5.0 to 6.5. The GPA of the rest was lower than 5.0.

4.2. Students' awareness of Industry 4.0

Among the 443 respondents, 199 of the students had heard the term "Industry 4.0" (45%)

Figure 1: Students' awareness of Industry 4.0



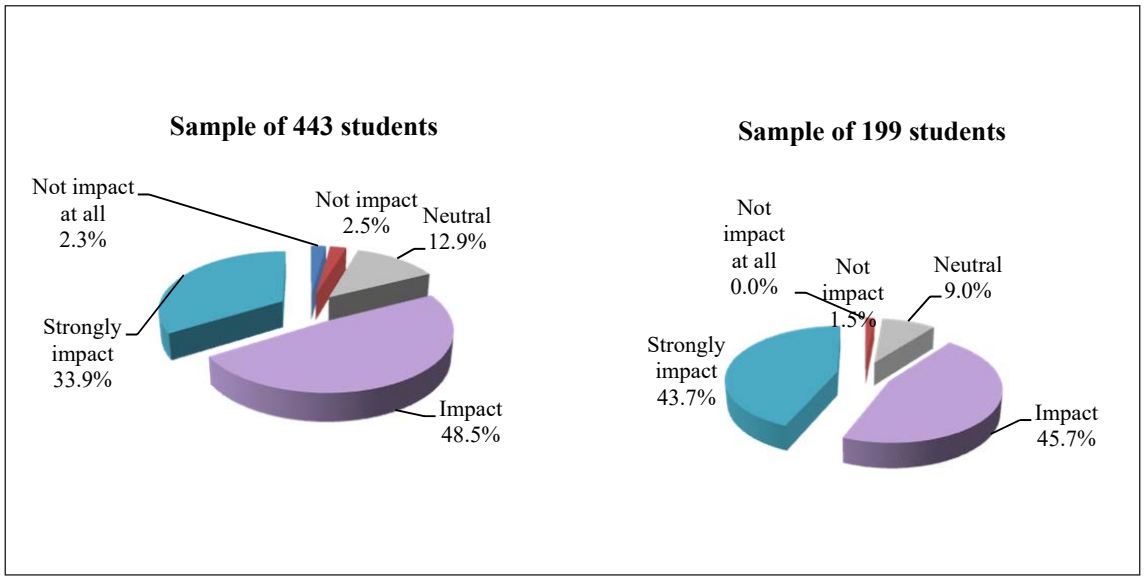
Source: Result of the survey.

while 23.3% were not sure whether they had heard the term. A large number of students, accounting for 31.8% had never heard the term.

In order to examine how much those students who had heard the term "Industry 4.0" understood the revolution, respondents were asked to show their agreement on 8 statements of major technological trends of Industry 4.0. The statements were about 3D printing, Big data and AI, IoT, and blockchain and they are exactly true. The answers are presented in Figure 1. According to the figure, students seemed not to be sure about the wearable internet. Less than 50% of those surveyed thought there will be wearable internet. For other technological achievements, about 30% of the respondents were not sure about whether there will be such technologies. Thus, even though there were 199 students hearing the term Industry 4.0, about 30% of them did not fully understand about the revolution.

The result of the interviews revealed that some students seemed to be surprised when asked about technological trends of Industry 4.0. Among 20 interviewees, 14 said they had heard the term Industry 4.0 on television, radio or through the internet. However, they were not familiar with these trends. Among 14 students, half thought Industry 4.0 was about the information technology revolution and almost all about the internet; three thought the revolution may be about social networks like Facebook and Twitter. After listening to the explanation of Industry 4.0, students seemed to be surprised

Figure 2: Students' assessment of Industry 4.0's impact on their future of job



Source: Result of the survey.

about the revolution. The finding is somewhat similar to the previous research conducted by Nguyen et al. (2017) . According to them, about 40% of 228 surveyed students had never heard the term Industry 4.0 and only 30% of them seemed to understand about the revolution.

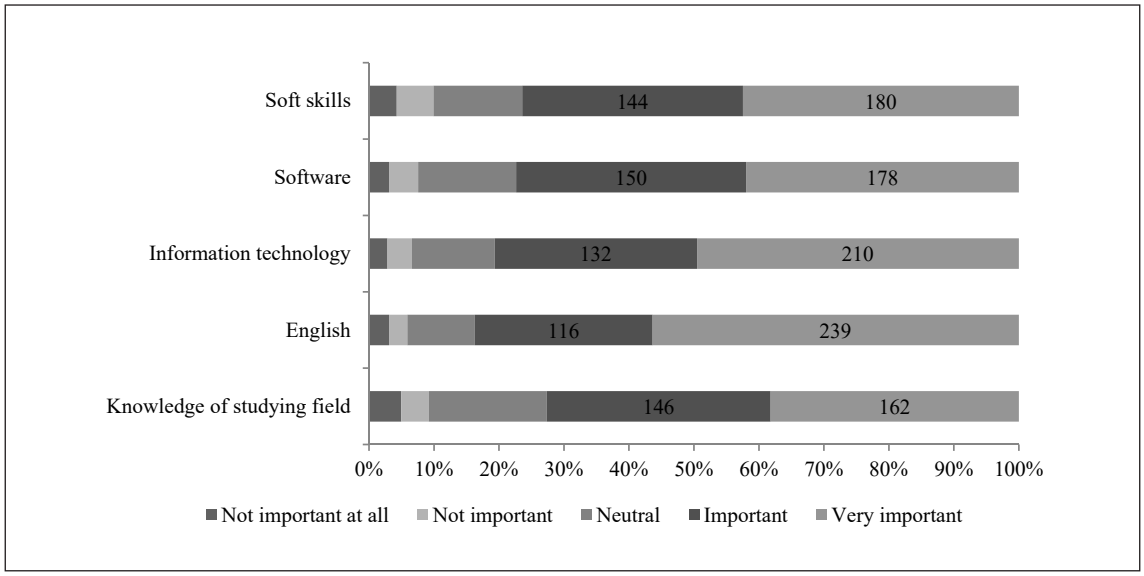
4.3. Students' assessment of the revolution's impact on their future job

Both questionnaires in the direct survey and for interview had a short explanation about the characteristics and technological trends of Industry 4.0. After understanding the revolution, students were asked about their expectations of the impact of Industry 4.0 on their future job. Table 2 shows students' assessment of the revolution's impacts. There are two samples, the first is 443 observations, the total sample of the study and the second consists of 199 students – those had heard the term Industry 4.0.

Approximately 82% of the 443 students believed the revolution would have an impact or even a strong impact on their future job while 89.4% had heard the term before. Especially, no one who had heard the term Industry 4.0 thought the revolution would not impact their future job at all. There is a slight difference in the two samples (Figure 2).

The result of the interviews revealed that among the 20 interviewees, 14 students believed their job in the future would be affected by the revolution. When being asked about how the revolution would affect their job, these students thought the way they work would change, especially the way they contact with others and exchange information during work time. Three even believed that they could mainly work at home. Four interviewees, those who were studying economics and business management said they were interested in starting up a business in the future and they thought the busi-

Figure 3: Students' assessment of importance of qualification and skills (sample of 443 students)

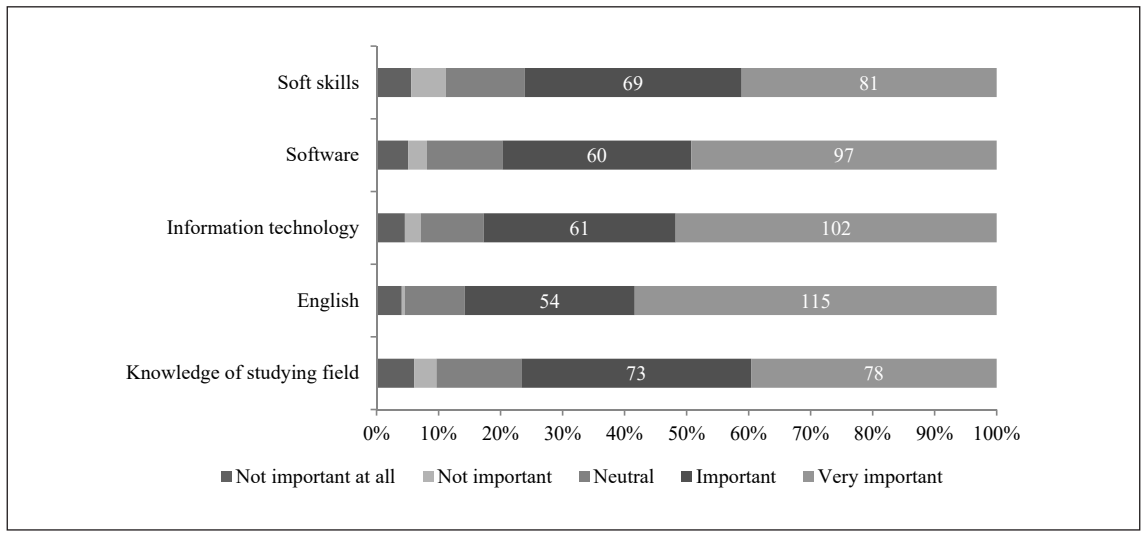


Source: Result of the survey.

ness they would choose to start-up and the way they would run that business may change. Six students were not sure whether the revolution would have an impact on their job in the future.

Figure 3 and 4 show how students evaluated the level of importance of qualifications and skills. Qualifications and four skills including English, information technology, using soft-

Figure 4: Students' assessment of importance of qualification and skills (sample of 199 students)



Source: Result of the survey.

ware, and ten soft skills were mentioned. There was not much difference between the students' assessment in the two samples mentioned previously.

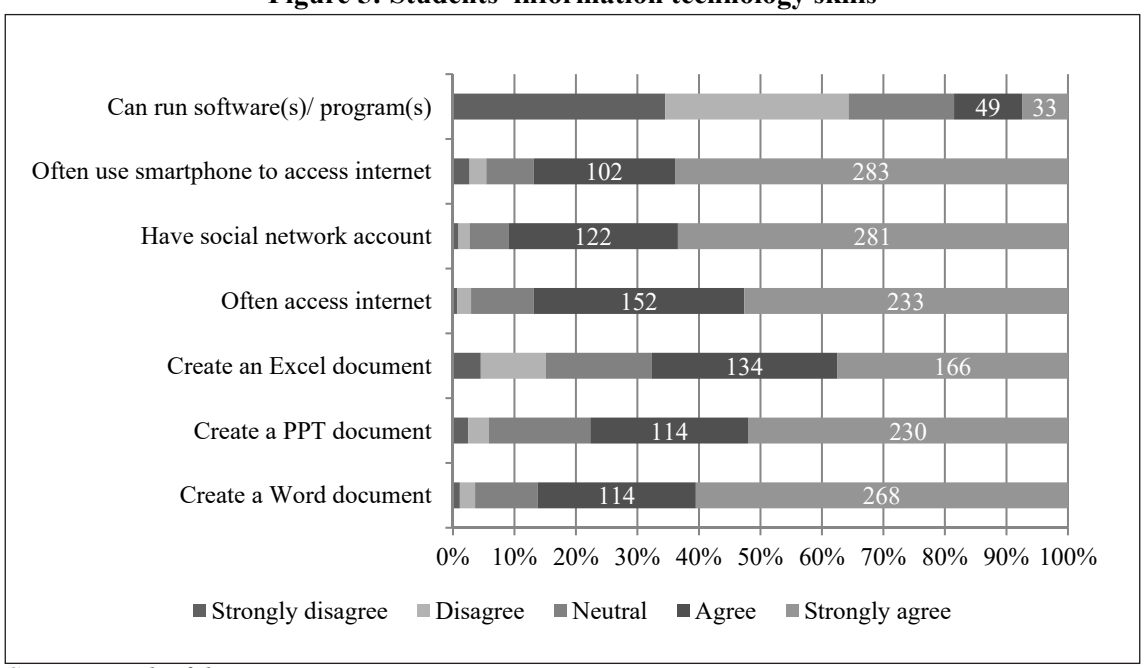
More than 70% of the students in the two samples thought that knowledge of their studying field would be important for their job in the future, under the revolution's impact. Conversely, about 10% thought it would not be important for them. For students' attitude toward the 10 soft skills, English, using software and information technology skills seemed not to be different. About 80% thought these skills were important for their job in the future, especially English. Approximately 85% of the students believed English was important and only 5% thought it was not important for their job in the future.

4.4. Students' self-assessment

Students' currents capabilities were evaluated in three aspects of information technology skill, English and 10 soft skills. Regarding evaluation of the information technology skill, students were asked about their level of agreement on 7 statements. Through their level of agreement on the statements, their current IT skills were examined. The result of the survey is presented in Figure 5.

Regarding Figure 5, a small proportion (3.6%) of surveyed students revealed that they were not familiar with working with Microsoft Word as they could not create and edit a Word file. Approximately 84% of them said they could create a Word file. Regarding PowerPoint and Excel software, about 77.6% and 67.7% of respondents could create and manage

Figure 5: Students' information technology skills



Source: Result of the survey.

a PowerPoint file and Excel file, respectively. Through interviews, students said that because they have to complete a lot of assignments they were familiar with working with some Microsoft Office software such as Microsoft Word, Microsoft PowerPoint and Microsoft Excel. Among these, Microsoft Word is used the most to write essays. Microsoft PowerPoint is often used for presentations. Students said that they hardly ever use Microsoft Excel for assignments as it is not necessary.

The majority of surveyed students often accessed the internet for updating news and searching data. 385 students revealed that they often accessed the internet, accounting for 86.9%. Less than 3% of students did not often access the internet. The number of students who often use a smart phone to access the internet was also 385. It may be that most of the students who often access the internet use a smart phone for connecting. 19 interviewees said they often accessed the internet, among them, 15 used a smartphone whereas the rest use personal computers.

The majority of surveyed students had a digital presence on the internet. Among the 443 respondents, approximately 91% of the respondents had a social network account like Facebook, Twitter, LinkedIn, Google+, YouTube, or Instagram. The result of interviews showed that 17 interviewees participated in social media network. Among them, 4 even had three accounts on Facebook, Instagram and Twitter and 3 had two accounts on Facebook and Instagram. Facebook seems to be the most popular social network for students. Interviewees said they read Facebook every day. They even use Facebook for discussion when complet-

Figure 6: Students' English skill

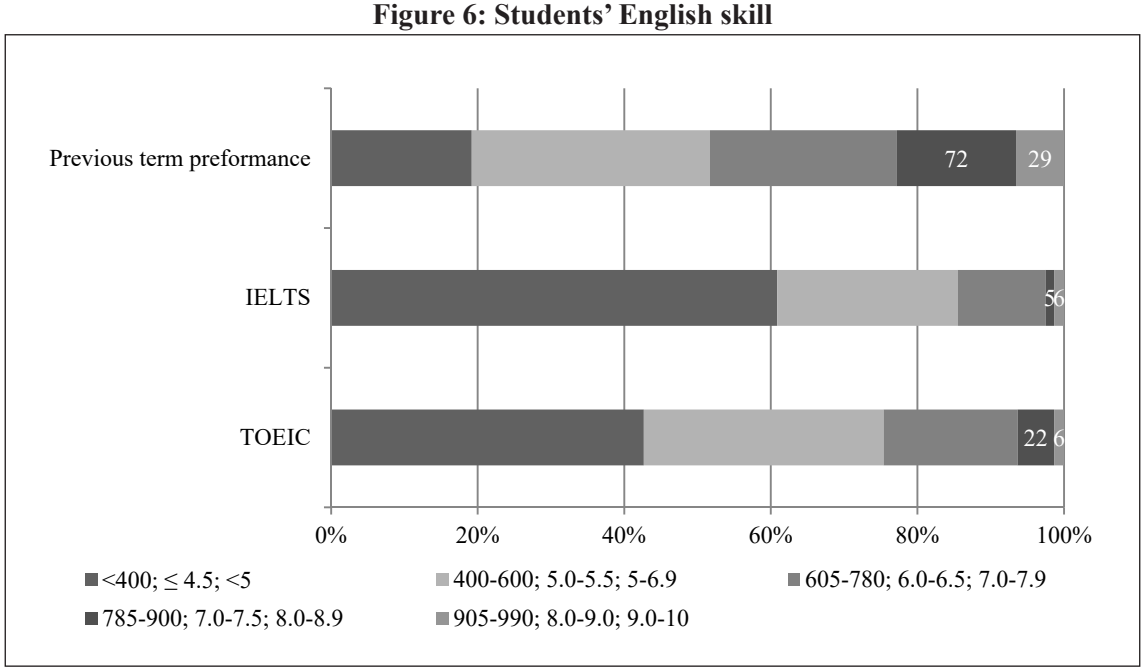
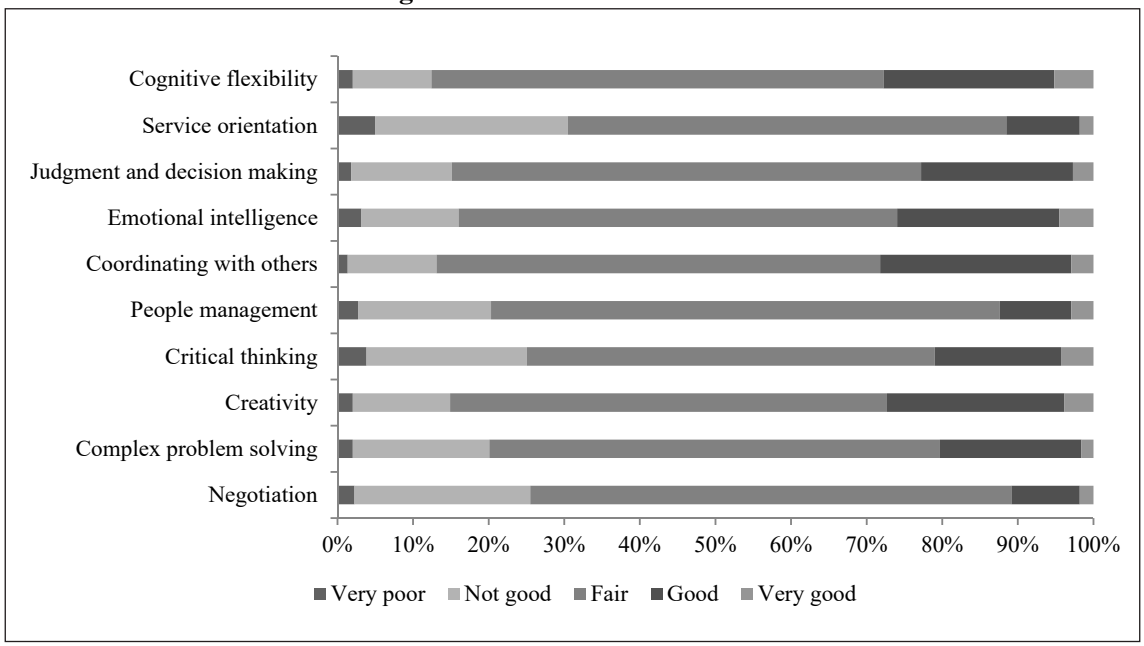


Figure 7: Students' 10 soft skills



Source: Result of the survey.

ing assignments. One student even said that it was not easy to give up using Facebook as her classmates often post class announcements on a Facebook page. Even though the percentage of students having a digital presence was high, the majority of them did not pay attention to understanding and using software such as ERP, FAST, etc. Nearly two thirds of the surveyed students revealed that they could not use any software such as ERP, FAST, MISA, etc.

Among the 443 surveyed students, 102 had bought a product and or service online. They bought such products or service as hotel booking, reserving a table in a restaurant, buying movie tickets, buying online courses, booking Uber or Grab car, paying communication fee by applications such as Momo, buying entertainment games via the internet, etc. Interviewees said it was easy and convenient for them to make transactions via the internet.

Figure 6 shows the English ability of the surveyed students. In general, their English was not good. More than 60% of the respondents thought their English was at a level of an IELTS score of less than 4.0. 85.3% thought their English was at the level of an IELTS score less than 6.0. Approximately 2.5% thought they had at least a 7.0 score. With regard to students' previous term performance, 22.8% had results equal to or higher than an 8.0 score.

Results of the interviews revealed that students said they focused a lot on English writing and reading but not on conversational English. As a result, they could write but found it difficult to speak English. Although in a university where there are some English clubs, only three interviewees said they participated in such

a club for practicing English. Others went to class outside university for learning. Some students expressed that they did not find enough motivation to learn English in their university.

Students were required to evaluate their soft skills. According to the World Economic Forum, by 2020, Industry 4.0 will have brought people some remarkable technological advancements such as advanced robotics and autonomous transport, artificial intelligence and machine learning, advanced materials, biotechnology and genomics and this advancement will change the way we live and the way we work. The top ten necessary skills will change. Figure 7 shows students' self- assessment of the 10 skills.

Regarding Figure 7, students seemed to be neutral when assessing their soft skills. The majority of surveyed students thought their soft skills were fair. Among the 10 skills, they seemed not to be good in service orientation, negotiation and people management. Less than 11% of the sample thought they were good in service orientation whereas more than 30% thought they were not good in this skill. Likewise, about 11% and 13% of the surveyed students supposed they were good in negotiation and in people management, respectively. The percentage of respondents who thought they were not good in negotiation and people management, in turn, was 25.5% and 20.3%. Students' thoughts of their other skills seemed more positive. For example, more than 28% thought they were good whereas about 13% assumed they were not good in coordinating with others.

However, the result seems not to have very much reliability since results of interviews revealed that students did not understand clearly about these skills. For example, even though approximately 26% of the students believed they were good in emotional intelligence, 12 out of 20 interviewees could not explain the meaning of emotional intelligence. Likewise, about 28% of the surveyed students supposed they were good in cognitive flexibility but 13 out of the 20 interviewees did not understand this skill. Five interviewees pointed out that some of the skills like cognitive flexibility, service orientation, emotional intelligence, critical thinking, and creativity seem difficult to understand for them.

Finally, students expressed how they expected education and training institutions to help them in improving their capabilities. There were 330 ideas about that. Regarding knowledge, 67 students pointed out that training quality should be improved by enhancing the quality of teachers and materials, applying a learner centered teaching approach and updating training programs to be more practical, etc. Students particularly focused on promoting internship and inviting guest speakers to class. Relating to English, 90 students mentioned the quality of English teachers should be improved, English native speakers should be invited to class, more specialized courses or even conferences in English should be opened and requirements of graduates in terms of English should be increased, etc. With regard to IT skills, 74 students expected that they could develop their IT skills if the institutions opened more courses, conferences and even competitions on IT, upgraded IT infrastructure such as computer networks or imported simulation software or games. IT should be applied more

in conducting courses, for example, students should be given assignment like writing blogs or Facebook or take exams on computers. In addition, requirements of graduate in terms of IT skill should also be increased. In regard to soft skills, students expected universities to open courses on soft skills for them or embed soft skills in specialized courses.

5. Conclusions and Implications

As mentioned previously, if students have knowledge of Industry 4.0 (especially major technologies and their applications), and its expected influences on the future of jobs, leading to new skills required by labour, they will have the intention of acquiring the required knowledge and skills. Effort should be made to improve students' awareness and capabilities in terms of professional knowledge, IT skill, English and soft skills.

Although it is supposed that people should be aware of the Fourth Industrial Revolution's impacts on their occupation in order to prepare for reacting to it, about 45% of the surveyed students had heard the term *Industry 4.0*. Among them, approximately 30% did not clearly understand the revolution. Some students were surprised at the technological trends of Industry 4.0. They thought the revolution was about information technology and almost only about the internet.

Students seem familiar with virtual life as more than 90% of respondents had a digital presence on internet and 102 of them had used online services. Nearly 100% of the students who frequently accessed the internet used a mobile phone for accessing network. 18.5% of the respondents revealed they could run (some) software and/ or programs.

Students' English and soft skills seem not good. Although they believed English was important to their future job, more than 60% of surveyed students supposed their English was at a level of less than 4.0 IELTS points. Students seemed not good in service orientation, negotiation and people management skills.

In order to create a skilled and qualified labor force, higher education and training institutions should pay attention to the points below:

- Promote students' awareness of Industry 4.0 through communication. As mentioned previously, the proportion of students who had heard the term *Industry 4.0* seem to be more proactive in preparing for meeting requirements of jobs in the future than the rest. If we increase students' awareness, hopefully, there will be an improvement of students' competencies.

- Improve students' IT skills. More information technology courses should be added to training programs. Students should be required to take some online courses. Institutions should also assure there is sufficient equipment for IT learning. They should promote the use of information and communication technologies (ICT) tools in teaching and learning processes e.g. More courses should be opened online. Reward and recognition should be provided to recognize teachers and students with good knowledge and skills in ICT. It might be done through competition or movement.

- Focus on English. Specialized courses should be conducted in English. The quality of English teachers should be improved. More English clubs should be opened. English native speakers should be invited to classes so that students can have more opportunities to prac-

tise English.

- Improve teachers' capability. Not only IT and English teachers should be paid attention but also teachers of professional subjects. All of them should be trained on pedagogy, subject mastery, management skills and the use of various teaching tools, especially ICT tools. Periodic training should be provided for teachers so they can update and master the subject.

- Enhance cooperation between training institutions and organizations. Higher education and training institutions should try to cooperate with organizations that recruit graduates in order to better understand about human resource demand, so that they can conduct training programs not to alienate the workers.

In addition to the above, students themselves also have to be proactive in improving their knowledge and skills for thriving in the future. Students should have good knowledge about their field, professional English and good IT and soft skills.

This research has two limitations. At first, since the number of Vietnamese students all over Vietnam is large, the sample size of 443 students is small. Secondly, Vietnamese students' awareness of Industry 4.0 was assessed through descriptive data. If the relationship, if any, between their awareness and preparation to react to Industry 4.0 was identified, the result would be better.

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