

# The Impact of Digital Economy on the Characteristics of Employment in Indonesia 2018

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Digital technology has fundamentally changed how people and businesses work together. The changes also affect how workers do their job and make job shifting. Digital technology can give rise to new types of jobs or eliminate existing jobs. The mastery of Information and Communication Technologies (ICT) by labour force is fundamental to changing job characteristics in Indonesia. This paper aims to explain the characteristics of jobs in Indonesia, where workers use the internet to do their jobs. The variables studied to explain the characteristics of jobs are gender, disability, education, status (employee or entrepreneur), and length of work. The analytical method used in this study is quadrant and regression analysis. Indonesia labour force survey 2018 is applied to make the analysis. The data showed that the digital economy has an impact on the characteristics of employment are education and length of work.

**Key words:** *Digital technology, jobs shifting, jobs characteristics.*

## Introduction

Economic disruption is described as a change in the way people carry out economic activities that cause turmoil in the pre-existing economic sector. The disruption era is one of the stages for an exponential change in technology. (Diamendis, 2015) illustrates that there are six stages of exponential growth that are characterized by a rapid and fundamental shift. The first stage is the phase in which changes towards digitalization. The second stage is deception, the assumption that this startup will not shift the established business. The third stage is the disruption era: a shift in business that has five characteristics, namely cost savings, better quality, creation of new markets, more accessible, and more efficient. The fourth stage is demonetized, where the money is increasingly eliminated from the equation because technology becomes increasingly cheap. The fifth stage is dematerialization; separate

physical products are removed from the equation. Technology that was initially large or expensive like radio, cameras, GPS, video, maps - now everything is in a smartphone. The last stage is democratized. After something is digitized, more people can have access. Good technology is not only for governments, large organizations or the rich.

The disruption era has also changed the behaviour of economic agents. The use of Information and Communication Technologies (ICT) by labour force is fundamental in changing job characteristics in Indonesia. Utilization of digital technology has a positive impact in encouraging the growth of millennial generation to become leaders in e-commerce, startups and other digital economic development. In addition, in 2020, Indonesia will start a demographic bonus phase, where the number of productive age population (15-64 years) is greater than the non-productive age population, and the peak is expected to occur in 2030-2035 (Budiati et al., 2018).

Digital technology also created 3.7 million new jobs in the next 7 years, and the majority are in the service business sector. Preparation of skilled workers is the biggest challenge that must be faced and appropriately mitigated in facing the challenges of the digital economy. The industrial revolution 4.0 has driven technological innovations that have had a disruption or fundamental change in people's lives. The advancement of science and technology as a trigger for the industrial revolution is also followed by other implications such as unemployment, human versus machine competition, and increasingly high competency demands. The 4.0 industrial revolution in the next five years will erase 35% of the types of jobs, even in the next 10 years the types of jobs that will be lost increase to 75%. This is due to the work being played by humans step by step being replaced with program digitizing technology.

Digital technologies and online connectivity will be a driving force of growth and transformation of the Indonesia economy over the coming decades. The IT industry alone is expected to contribute 5.17% of the country's GDP in 2018. The Indonesia Government is playing an active role in accelerating the development of the digital economy through policies such as e-commerce Master Plan and the IT Master Plan. These have recently been bolstered by whole-of-government directives on transformation towards Industry 4.0.

According to (Bughin, Manyika, & Woetzel, 2017), 52.6 million jobs have the potential to be replaced by digital systems that are identified as conventional employment. One of the conventional roles that have the potential to be automated is the retail trade which has a very large potential reaching more than 50%. Based on data (Worldbank, 2019), the percentage of internet users from Indonesia's population shows a trend that is increasing rapidly from 1994 to 2017 in line with the increasing population each year. According to Tony Keusgen, Managing Director of Google Indonesia, in Google's research on Kompas.com, "Indonesia is



a country whose internet user population is growing very rapidly in the next 10 years, and it is predicted that the online market in Indonesia will increase massively in 10 years in the future reached 81 billion US dollars in 2025.

The development of digital technology in Indonesia has influenced workers in doing their jobs. Internet is considered to play the role of the use of digital technology (OECD, 2019). The digitalization of the economy has the potential to advance the Indonesian economy, but at the same time, it also demands that the worker make self-development in improving their ability to master digital technology. A major change in workers is how they adopt digital technology in doing their jobs (OECD, 2016). Nowadays, not only workers in ICT sector should master the use of digital technology, other sectors also required the same capability in order to make their work efficient. The use of the internet in business and industry also influence the occupation in employment. Many occupations required internet for their job (Hajkowicz & Dawson, 2018).

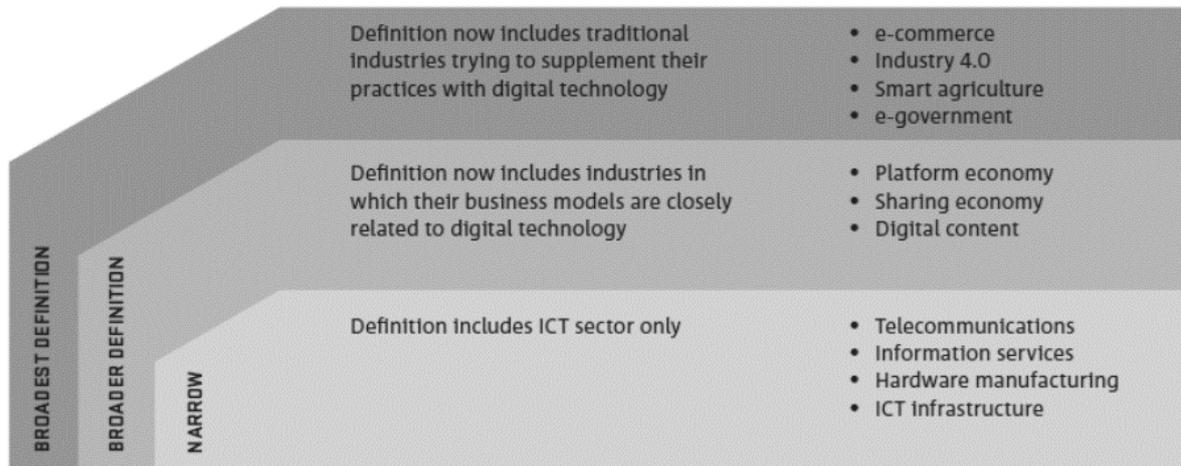
The impact of the digital economy is explained by revealing how workers do their job by using the internet as a proxy of digital technology. Basically, the digital economy has changed the characteristics of employment in Indonesia. This paper aims to explain the characteristics of jobs in Indonesia where workers use the internet to do their jobs.

## **Literature Review**

### ***Digital Economy***

The term of 'digital economy' is notoriously hard to define and measure, many institutions such as the Organisation for Economic Co-operation and Development (OECD), the G20 and Oxford Dictionary define it with variation in breadth and scope. This study will adopt a broad definition: "All businesses and services that have a business model based primarily on selling or servicing digital goods and services or their supporting equipment and infrastructure."

**Figure 1.** Definitions of Digital Economy



**Source:** Vietnam Today First report of Vietnam’s Future Digital Economy Project, March 2018

The digital economy includes emerging phenomena such as blockchain-based networks, digital platforms and social media, e-businesses (e.g. e-commerce, parts of traditional sectors which use digital-enabled technologies in Industry 4.0 or precision agriculture); businesses involved in the development of software, apps and other content and media creation, and associated training and services; and businesses engaged in creating and manufacturing ICT equipment. By this broad definition, digital is not just about IT infrastructure, nor focused narrowly on online/mobile presence, but an integrated set of opportunities leveraging technologies ranging from automation, the Internet of Things, and advanced analytics, through to agile methodologies and customer-centric product and experience design, (Long, 2002).

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### ***Labor Force***

The labour force concepts used in this paper are the same as those recommended by the International Labour Organization (ILO), which divides the population into two components: a working age group and a nonworking age group. The working-age population is in turn, classified into two major categories according to their current activities: those in the labour

force and those not in the labour force. Labour force is defined as persons of 15 years old and over who in the previous week were working, temporarily absent from work but having jobs, or those who did not have work and are looking for work or in the process of establishing a new business. Working: an activity done by a person who worked for pay or assisted others in obtaining pay or profit for the duration of at least one hour during the survey week. Including unpaid worker who helped conduct economic activities.

## **Methodology/Materials**

### ***Data Source***

The National Labor Force Survey (NLFS) or also known as Sakernas (Survey Angkatan Kerja Nasional) data is applied to this research as a data source. The NLFS data used in this research is collected in February 2018. The data coverage is in national level with a focus on workers who use the internet in doing their job. This research used data of worker by occupation for the inference analysis. For example the number of workers who work as a manager. The number of workers is classified into 446 types of occupation. We use the four digit Indonesia's Standard Classification of Occupation 2014, which is derived from ISIO (International Standard Classification of Occupation) 2008. It means we use 446 data to be analyzed for this research. The variables studied to explain the characteristics of jobs are gender, disability, education, status (employee or entrepreneur), and length of work. We also use a number of workers who work using the internet to do their job in the city. We tried to focus on the city because internet infrastructure in an urban area is better than that in a rural area.

## **Methodology**

We applied descriptive and inference analysis for this research. The descriptive analysis is presented by using graph and tables to explain the labour force. The descriptive analysis also uses quadrant analysis to classify the worker. The inference analysis is applied to see the relationship between the uses of the internet for work to the characteristic of a worker. The model proposed for this analysis is as follows:

$$\text{Log Worker} = \beta_0 + \beta_1 \text{ MALE} + \beta_2 \text{ DISABILITY} + \beta_3 \text{ EDUCATION} + \beta_4 \text{ EMPLOYEE} + \beta_5 \text{ INTERNET} + \beta_6 \text{ LENGTH} + \varepsilon_i$$

Where Log Worker is the number of people who work by occupation, MALE is the percentage of male workers, DISABILITY is the percentage of workers with a disability, EDUCATION is the percentage of workers with either high school education and above, EMPLOYEE is the percentage of workers as employees, INTERNET is the percentage of

worker using the internet to do their job, LENGTH is the percentage of workers who work more than a year. To know the impact of the digital economy to the characteristic of worker, we conduct partial analysis by using simple linear regression of a number of workers who work in the city and use the internet to characteristics variable gender, disability, education, and length of work. A statistical procedure is used as mention in (Gujarati, 2004)

## Hypothesis

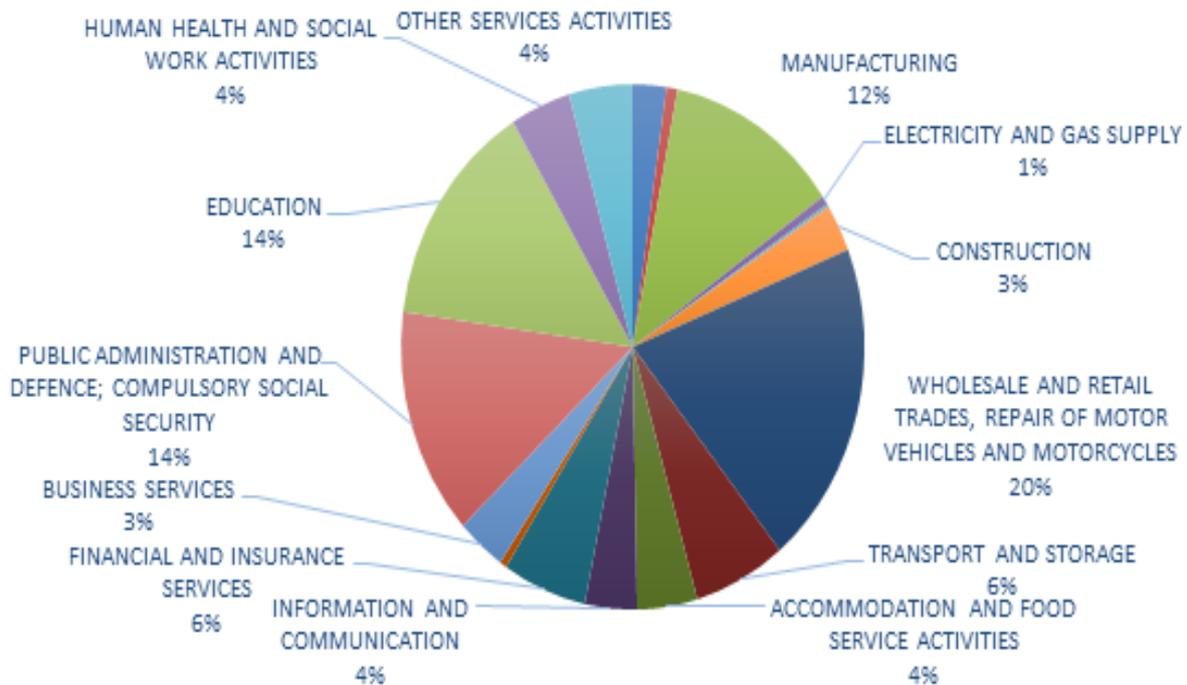
Hypothesis for this research is conducted in two different ways—the hypothesis to be tested used two different equation and measure two different things. The first hypothesis is all characteristics of worker is significant to employment, especially worker who use the internet to do their job. This hypothesis means to search what is the dominant characteristic in the digital economy. Using the second hypothesis is there is positive impact of the worker who use the internet on the characteristics of the worker.

## Results and Findings

The share of the ICT sector in Indonesia reached 5.17% of the country's GDP in 2018 (BPS, 2018). It showed how the digital technology contributes to the Indonesian economy. But the digital economy is not only showed by its ICT sector contribution to GDP. It can be shown by how many workers use the internet to do their jobs. The idea of knowing how many workers use the internet to do their jobs is to make an approach to the digital economy.

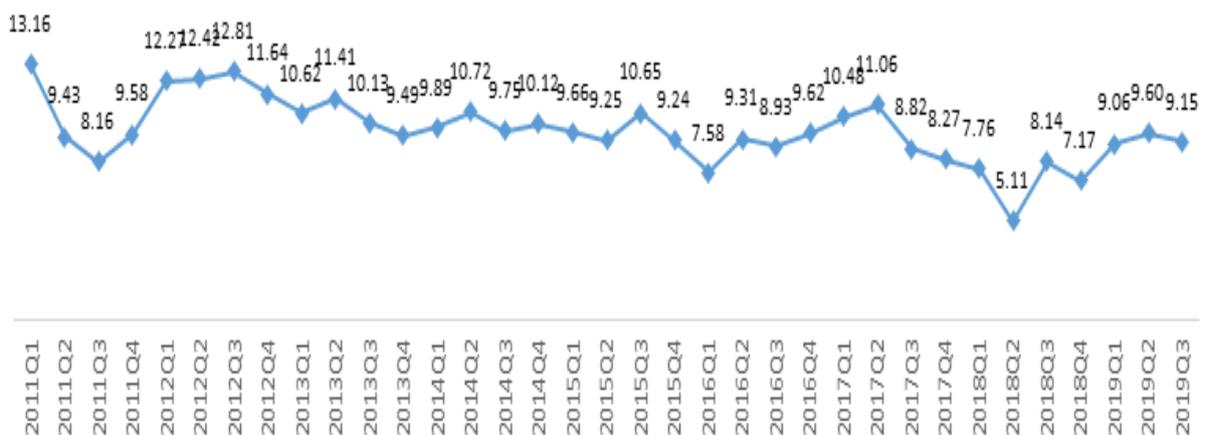
The total population of Indonesia in February 2018 based on the projected population of 2010–2035 estimated at 263.97 million people, with the working-age population amounted to 193.54 million people. The number of the economically active population in February 2018 reached 133.94 million people. The total number of working people in February 2018 was 127.07 million people. Taken from the number of working people, 15.2 per cent Indonesian worker use the internet to do their job. Workers who use the internet for their job mainly work in Wholesale and retail trades, repair of motor vehicles and motorcycles sector. Figure 1 showed the percentage of workers who use the internet by sector, and it is showed the top three sectors where workers use the internet to do their job: Wholesale and retail trades, repair of motor vehicles and motorcycles sector, Education, and Public administration and defence; compulsory social security. The percentage of workers who use the internet in ICT sector only 4 per cent. This is an interesting finding since the ICT sector is considered to lead the use of the internet.

**Figure 2.** Percentage of workers who use internet by sector



The growth of ICT sector fluctuates over time. Since 2011, the growth of ICT sector (yoy) is relatively high and gradually stable in 9 per cent. Figure 3 showed the ICT sector growth over time.

**Figure 3.** ICT Growth in Indonesia (yoy)



The growth of ICT sector actually started with high growth in 2011 due to the penetration of the internet in Indonesia. Infrastructure for ICT was built massively at that time. The number of people using the internet also increased exponentially. Started with the growth of 13.16 per cent in 2011Q1, the growth of the ICT sector is corrected in the next quarter until the end of

2011. The following year it started to increase its growth to 12.27 in 2012 Q1 and maintain its growth during the year 2012. During 2013-2015 the growth maintains its pace above 9 per cent. There was a correction in its growth in 2016 Q1, but the growth looked stable until 2018. In 2018Q2 there was a slowdown of the growth from 7.76 per cent in 2018Q1 to 5.11 in 2018Q2. The growth also performed not stable in 2018Q4 that it only grew 7.17 per cent. The year 2018 is known as the year of preparation for the 2019 presidential election; people tend to wait and see what will happen before they make a move. It could be one of the reasons why there is a slowdown in 2018Q2 for ICT sector growth.

We updated our data by using current data in economic growth that was just released, so we can show how the performance of the ICT sector's growth in 2019. It looks like we have a promising growth in 2019 since all the growth in the three quarters are stable in 9 per cent. Actually, the growth of 9 per cent for the ICT sector is above the growth of total economy. Moreover, the important thing by knowing the growth of ICT sector is that the economy is shown that digital economy is really happening in Indonesia, The steady growth also let us know that Indonesia government put necessary attention in developing ICT sector by making friendly regulation and investment environment. It also let us know how the ICT sector is making improvement in the economy.

### *Worker Who Use the Internet to do Their Job*

According to the occupation of workers who use the internet to do their job, 22.66 per cent worker has occupation as executive officers, administrative and staff—22.66 per cent, followed by professionals, technicians and other personnel 22.1 per cent. Operational production equipment and transport equipment, rough worker, become the third occupation with the highest internet use.

**Table 1:** Percentage of worker who use internet by sector and occupation

Sector	Occupation								Total
	Professionals, Technicians and Other Personnel	Leadership and Management	Executive Officers, Administrative and Staff	Sales Worker	Service Worker	Farmers, Gardeners, Breeder, Fisherman, Forestry worker and animal hunter	Operational Production Equipment and Transport Equipment Rough Workers	Others	
A Agriculture, Forestry and Fishery	2.11%	1.22%	7.94%	1.45%	0.72%	80.04%	4.11%	2.41%	100.00%
B Mining and Quarrying	13.22%	3.85%	23.35%	3.22%	0.59%	0.00%	49.23%	6.54%	100.00%
C Manufacturing	6.98%	5.38%	12.76%	4.86%	1.35%	0.30%	66.62%	1.75%	100.00%

D	Electricity and Gas Supply	25.14%	2.38%	32.90%	0.00%	2.14%	0.00%	36.70%	0.74%	100.00%
E	Water Supply, Sewerage, Waste Management and Remediation Activities	27.52%	17.60%	28.80%	4.52%	0.00%	0.00%	21.56%	0.00%	100.00%
F	Construction	16.09%	30.04%	16.46%	0.77%	1.96%	0.00%	33.91%	0.77%	100.00%
G	Wholesale and Retail Trades, Repair Of Motor Vehicles and Motorcycles	1.39%	0.53%	10.32%	76.47%	1.31%	0.00%	9.60%	0.38%	100.00%
H	Transport and Storage	4.90%	2.43%	14.38%	1.20%	2.48%	0.00%	<b>73.77%</b>	0.85%	100.00%
I	Accommodation and Food Service Activities	1.73%	0.25%	16.71%	17.42%	29.17%	0.00%	32.68%	2.05%	100.00%
J	Information and Communication	27.41%	0.45%	28.38%	29.72%	5.83%	0.00%	8.05%	0.16%	100.00%
K	Financial and Insurance Services	18.31%	6.07%	49.83%	13.40%	7.00%	0.00%	1.66%	3.74%	100.00%
L	Real Estate Activities	5.67%	7.26%	13.97%	41.87%	18.32%	0.00%	3.09%	9.83%	100.00%
M	Business Services	26.38%	9.60%	25.78%	4.67%	11.02%	0.78%	17.69%	4.09%	100.00%
N	Public Administration and Defense; Compulsory Social Security	12.20%	8.31%	<b>58.80%</b>	0.06%	3.00%	0.26%	2.61%	14.76%	100.00%
O	Education	<b>80.98%</b>	4.48%	12.13%	0.09%	0.62%	0.00%	0.83%	0.88%	100.00%
P	Human Health and Social Work Activities	64.27%	0.82%	23.29%	0.47%	6.04%	0.00%	4.79%	0.32%	100.00%
Q	Other Services Activities	20.59%	2.65%	10.78%	2.70%	35.92%	0.36%	26.02%	0.99%	100.00%
R	Total	22.17%	4.60%	22.68%	19.26%	5.35%	1.98%	20.73%	3.23%	100.00%

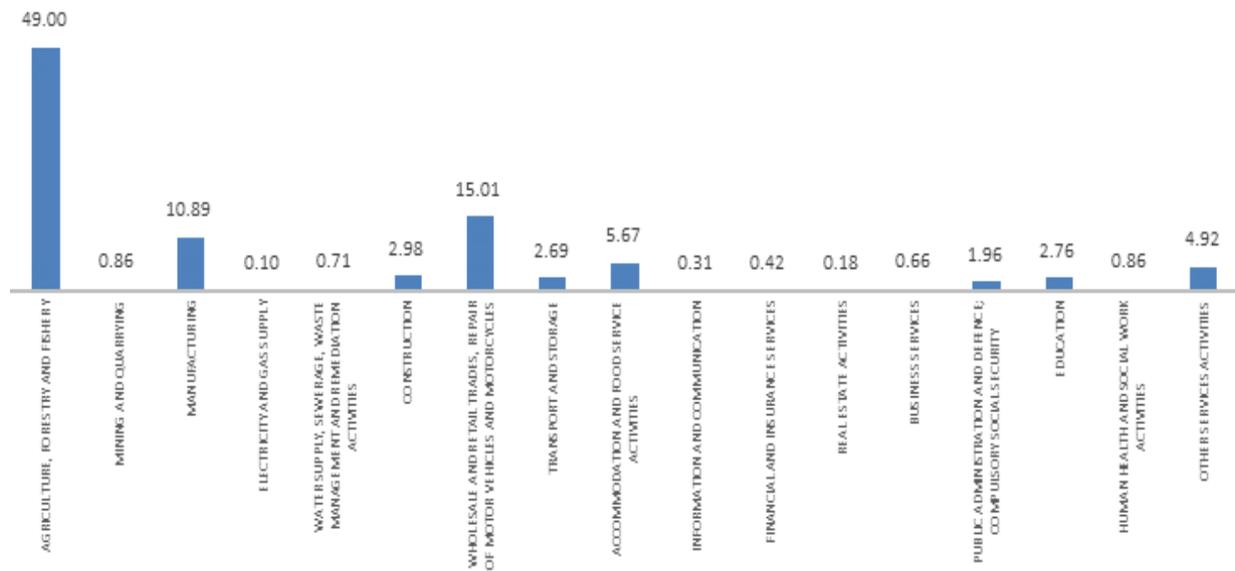
Source: National Labor Force Survey, February 2018. Processed data.

Executive officers, administrative and staff who use the internet to do their job mainly working in public administration and defence; and the compulsory social security sector. Table 1 showed that 58.80 per cent of workers who use the internet to do their job in this sector are either executive officers, administrative and staff professionals, technicians and other personnel who use the internet to do their job mainly working in the education sector. We can say 80.98 per cent of workers who use the internet to do their job is working as

Professionals, Technicians and Other Personnel. Operational production equipment and transport equipment, rough workers who use the internet to do their job mainly working in the transport and storage sector. The table showed that 73.77 per cent of workers who use the internet to do their job is a rough worker. The sector with the highest internet used by the worker reflects how the digital economy influences the employment in sector and occupation.

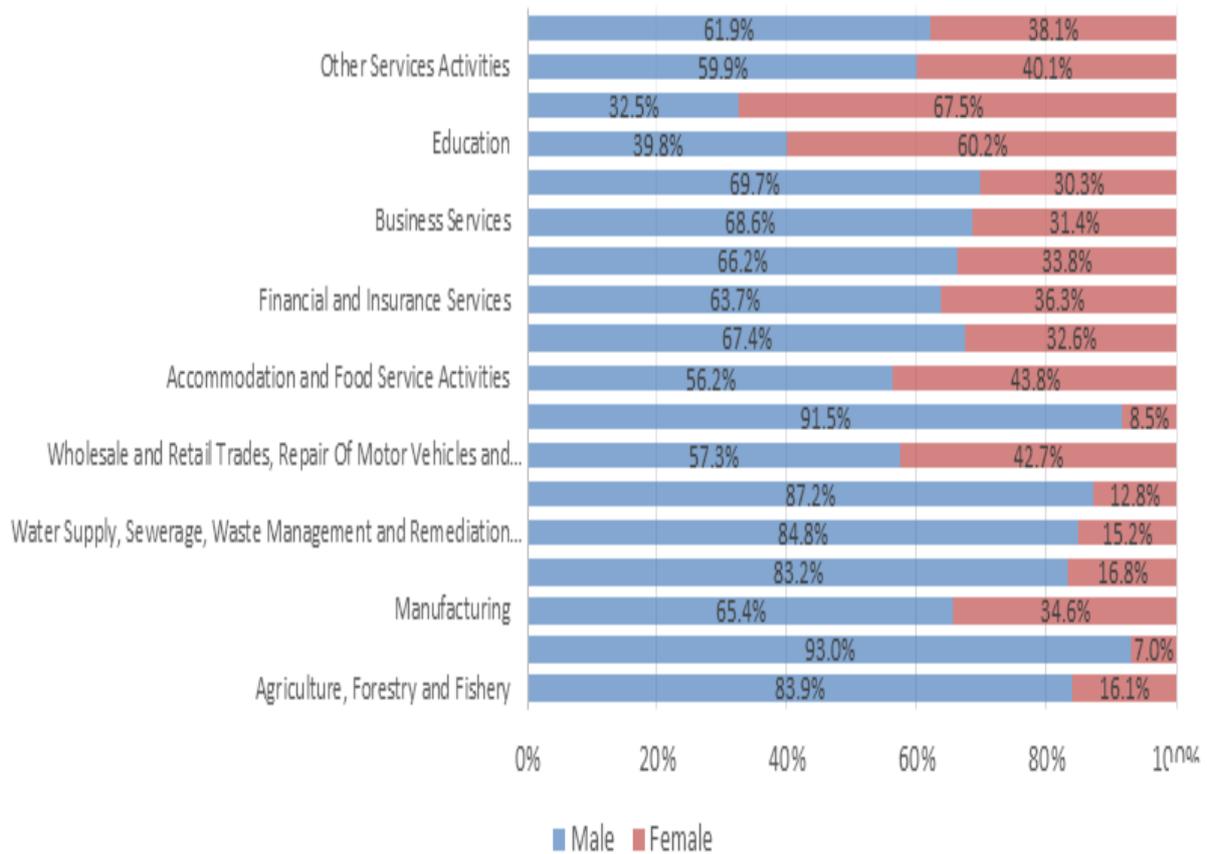
Occupation with the lowest internet use by the worker is farmers, gardeners, breeder, fisherman, forestry worker and animal hunter. Interestingly, although only 1.98 per cent farmers, gardeners, breeder, fisherman, forestry worker and animal hunter use the internet to do their job, in agriculture, forestry and fishery sector - which is associated with the occupation – the farmers, gardeners, breeder, fisherman, forestry worker and animal hunters had the highest number of workers who use the internet to do their job, not professional or operational occupation. It means farmers, gardeners, breeder, fisherman, forestry worker and animal hunter know how to utilize the internet in doing their job.

**Figure 4.** Worker With Disability Who Use Internet To Do Their Job By Sector.



Workers who use the internet to do their job is assumed to be a person who has no obstacle in do their activity. Sometimes workers with a disability can not use the internet to do their job. Considering worker with a disability, 7 per cent of worker with a disability use the internet to do their job. Workers with a disability who use the internet to do their job mainly working in agriculture, forestry and fishery sector. At least 49 per cent of the workers with a disability who use the internet to do their job work in this sector. Real estate sector becomes the sector with the least worker with a disability who use the internet to do their job. Only 0.18 percent worker with disability who use internet to do their job work in this sector. Figure 4 above showed worker with a disability who use the internet to do their job by sector.

**Figure 5.** Proportion of Worker Who Use Internet by Sex and Sector



Internet use by worker to do their job is not spreading evenly by gender. Only 38.1 per cent of workers who use the internet to do their job is female, the other 61.9 per cent is male. This male domination occurred in Transport and storage sector. 91.5 per cent male worker in this sector use the internet to do their job, and only 8.5 per cent female. The domination by female worker occurred in human health and social work activities sector. 67.5 per cent female worker use the internet to do their job in this sector. Figure 5 showed the distribution worker who use the internet to do their job by gender and sector.

***The Relationship between the Characteristics of Workers and Labor***

To analyze the relationship between the characteristics of workers and labour, we use multiple linear regression. The idea to know the relationship between the characteristics of workers and labour are if the characteristics are significant to the labour, it means the characteristics of workers are determinant to the labour. The dependent variable in this model is labor as we use the log number of workers as a proxy variable. The characteristics are derived from the demographic dimension such as sex, disability, education, status as an employee, using the internet and how long the worker works at time reference. The

independent variables are the characteristics of worker as we mentioned in methodology. The result is quite surprising, because only education and internet statistically significant to the labour. Table 2 showed the result from the model.

**Table 2:** Model Result

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	13.772	.520		26.462	.000
Percentage of male worker	1.130	.266	-.177	-4.254	.000
Percentage of disability worker	1.375	1.281	.047	1.074	.284
<b>Percentage of worker with high school education and above</b>	1.635	.363	-.291	-4.501	.000
Percentage of worker as employee	.013	.285	-.002	-.047	.962
<b>Percentage of worker using internet to do their job</b>	1.190	.343	-.207	-3.467	.001
Percentage of worker who work more than a year	.690	.517	-.056	-1.336	.182

Dependent Variable: (Log Worker)

From the model, it can be said that the change of one per cent in the worker with higher education increase 1.635 per cent of labour. Also one per cent the change in workers who use the internet to do their job will increase by 1.19 per cent of labour. The characteristics which determined labour are education and internet use. There is no specific reason why other characteristics are not significant to the labour. Model summary as shown in table 3 tell us that the adjusted R squared is only 25.2 per cent. It means labour can be explained by independent variables using in this model, only 25.2 per cent. The adjusted R-squared is a modified version of R-squared that has been adjusted for the number of predictors (independent variables) in the model. According to Minitab manual, the adjusted R-squared increases only if the new term improves the model more than would be expected by chance. It decreases when a predictor improves the model by less than expected by chance. It can be used to know how well a dependent variable is explained by independent variables used in the model.

**Table 3:** Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,512 <sup>a</sup>	,262	,252	1,56113

### *The Impact of Digital Economy on the Characteristics of Employment*

The digital economy is notoriously difficult to measure. In this research, we use worker who use the internet to do their job as the impact of the digital economy. The problem arises when we want to map the workers who use the internet to do their job. Internet infrastructure is not good in rural areas (OECD, 2018), so we made an adjustment by using workers in rural areas who use the internet to do their job as the impact of the digital economy. We called the variable as city workers. Simple Linear Regressions are applied to know the impact of the digital economy on the characteristics of employment. The characteristics we measured as dependent variables are sex, disability, education, length of work and employment. Each dependent variables is regressed to city workers as independent variables.

**Table 4:** Partial Analysis Using Simple Linear Regression

Dependent Variable	Independent Variable	Coefficient	t	Sig.	Adjusted R Square
Percentage of male worker	City worker	-0.088	-1.379	0.169	0.033
Percentage of disability worker	City worker	0.023	1.476	0.141	0.007
<b>Percentage of worker with high school education and above</b>	City worker	0.367	6.987	0	0.11
<b>Percentage of worker who work more than a year</b>	City worker	0.103	2.391	0.017	0.012
Log worker	City worker	0.113	1.65	0.1	0.003

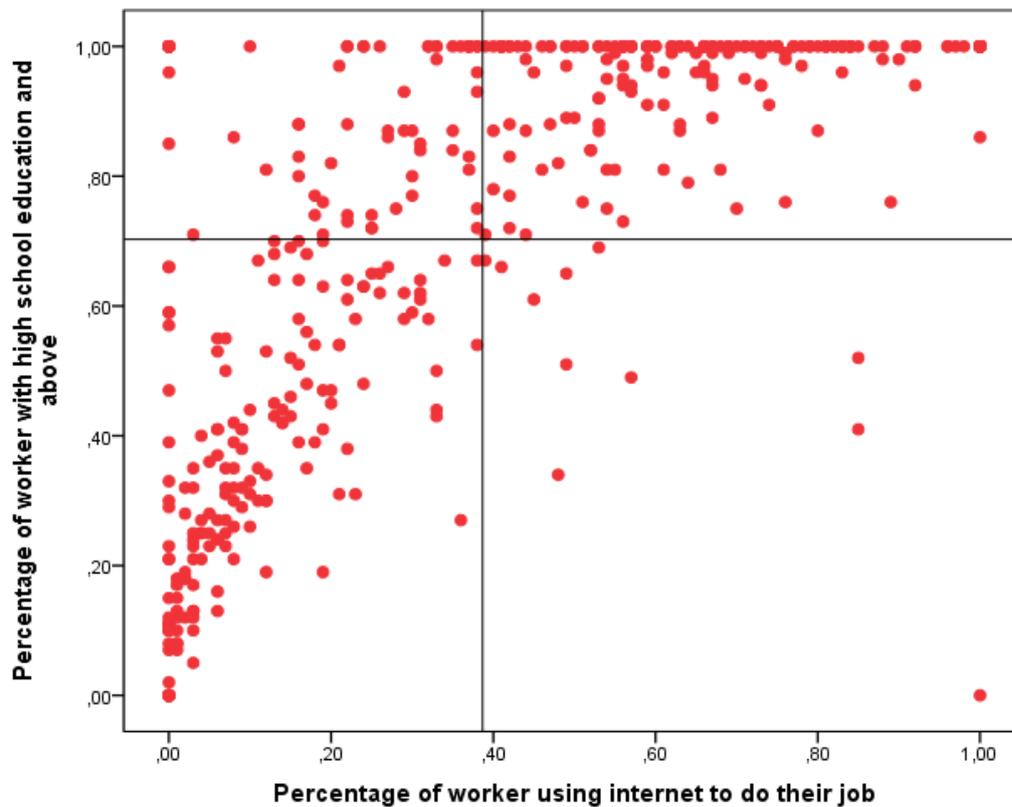
The reason we use the same independent variable is we want to know whether the digital economy has an impact on each characteristic of worker or not. From table 4 we know that workers who live in the city and use the internet have an impact on workers with high education and workers who work more than a year. It means that the digital economy affected these two characteristic of worker on how they do their work. Interestingly, the city workers who use the internet is not influenced by the number of workers (employment).

The model only uses one variable independent, and it is all the same for all model, the difference is in the dependent variable. Since we use only simple linear regression with one independent variable, the model fitness is not good enough to explain the dependent variable. It was shown in table 4 where all the adjusted R squared are very low, less than 5 per cent.

### Quadrant Analysis

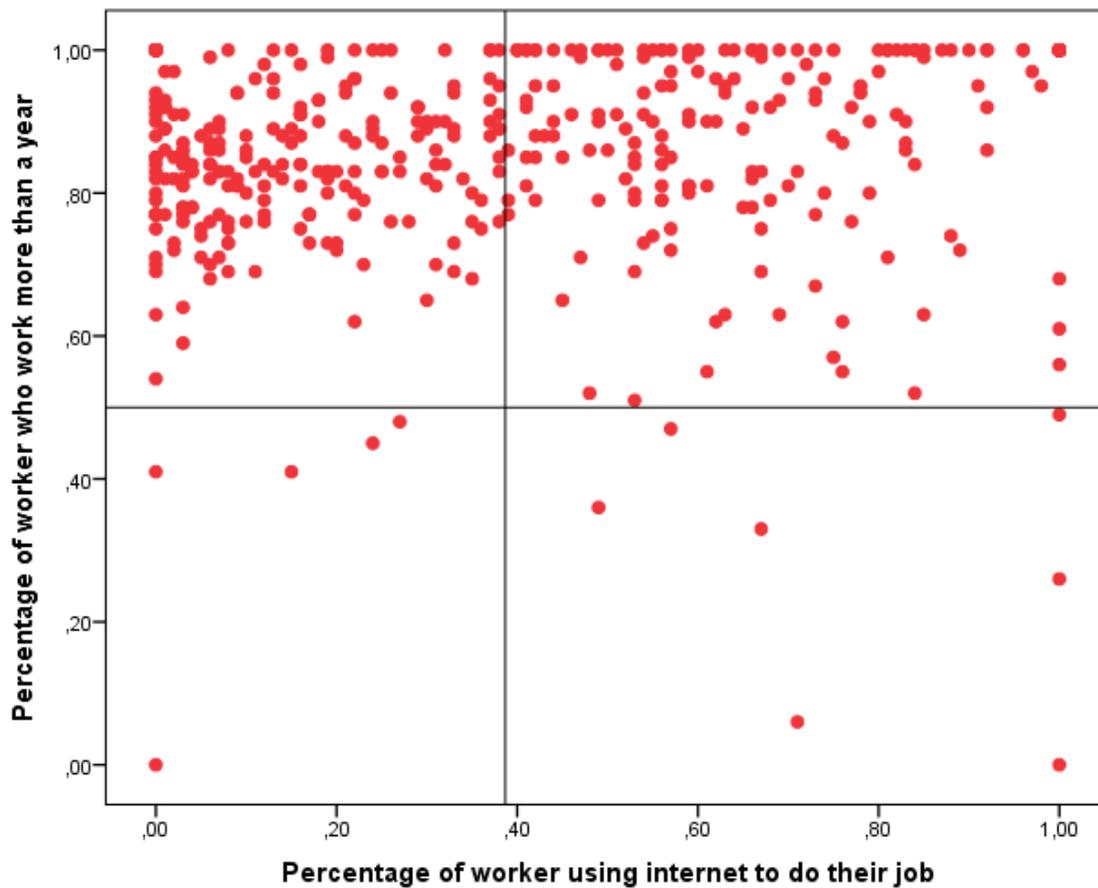
From the inference analysis above, we know that workers with high education levels and worker with the length of the work more than a year play an important role in the digital economy. We use a scatter plot to make a quadrant analysis for this matter. Figure 5 showed the relationship of workers who use the internet to do their job and worker with high education. The vertical line showed the mean of workers who use the internet to do their job. The horizontal line also the mean of worker with high education. The number of dots above is the mean of workers who use the internet to do their job and worker with high education is considered as the influence of digital economy on workers with high education levels. 69.25 per cent worker who use the internet to do their job is above the average. In opposite, the number of dots below the mean of workers who use the internet to do their job and worker with high education is considered that the influence of digital economy to workers with a high education level is not strong enough to show. Figure 6 not only showed the density of the dots in each quadrant but also show the correlation between a worker who use the internet to do their job and worker with high education. It showed positive correlation since the dots are placed upward.

**Figure 6.** Quadrant analysis of worker using internet to do their job and education



Workers with the length of the work and use the internet to do their job also play an important role in showing the characteristics of employment as the impact of the digital economy. Figure 7 showed that the number of workers who work more than a year in their current job dominate the data. It can be seen that the percentage of workers who use the internet to do their job and have worked more than a year above the average is bigger than any other quadrant.

**Figure 7.** Quadrant analysis of worker using internet to do their job and length of the work



The quadrant analysis tells us that there is a relationship between workers who use the internet to do their job and the length of the worker. The more they use the internet the period they work in their current jobs (their occupation) is longer or more than a year. That means the internet keep their interest in their occupation longer compared than a worker who does not use the internet to do their job.



## **Conclusion**

In 2018 ICT sectors contributed 5.17 per cent to GDP. The digital economy can be shown by the percentage of workers who use the internet to do their job. 15.2 per cent worker use the internet to do their job in Indonesia. They mainly work in wholesale and retail trades, repair of motor vehicles and motorcycles sector, Education, and Public administration and defence; compulsory social security the digital economy worker can be measured by using the number of worker who use internet to do their job. To have a better understanding on how digital economy influence the characteristics of employment, the data was classified by Indonesia Standard Classification of Occupation 2014 to make it easier to analyze. Using this data, we can conclude that worker who use the internet to do their job influence employment. The digital economy also has a strong impact on two characteristics of a worker on how they do their work, namely high education and worker who works more than a year. High education refers to that the worker has education high school and above. A worker who works more than a year showed how long the worker works in their current job.

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