Labor Gap Analysis in Supporting Digital Economic Growth in Indonesia

Syukur Laoli, Annisa Ilmi Faried, Suhendi, Lia Nazliana Nasution

Abstract

The digital economy has become one of the main pillars of global economic growth, including in Indonesia. However, one of the main challenges faced is the workforce skills gap, which can hinder the potential of the digital economy to develop optimally. This study aims to analyze the influence of various economic variables, such as inflation (INF), gross domestic product (GDP), unemployment (PG), internet users (PGI), and labor (TK) on the growth of the digital economy in Indonesia. Using the Vector Autoregression (VAR) model and Impulse Response Function (IRF) analysis, this study evaluates the dynamic relationship between these variables in the short, medium, and long term. The results of the VAR test show that lag 2 is the most appropriate model to describe the relationship between variables, with a lower Akaike Information Criterion (AIC) value than lag 2, which is 25.81693 compared to 19.89891. The IRF results indicate that inflation and GDP provide positive responses in all periods, while unemployment shows a positive response in the short term but turns negative in the medium and long term. Internet users and workforce showed a consistent positive impact across all periods, underscoring the importance of digitalization and strengthening workforce skills in supporting the growth of the digital economy. To maximize the potential of the digital economy, Indonesia needs to focus on improving workforce skills, investing in technology education, and developing equitable digital infrastructure. With the right strategy, the digital economy can become a major driver of sustainable economic growth in Indonesia.

Keywords: Internet Users, Workforce, Unmployment, Inflation and GDP

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Introduction

In the current era of globalization, information and communication technology is developing very rapidly. Indonesia is one of the countries that is in the transition stage of the Industrial Revolution 4.0 where the use of technology is needed in various sectors. The development of information and communication technology has changed people's lives greatly, which has an impact on economic activities, so it is known as the digital economy. Indonesia is one of the countries that has great potential in the digital economy. According to data from the Central Statistics Agency (BPS), the proportion of individuals using the internet in Indonesia continues to increase, in 2019 47.69 percent of individuals used the internet (Firda, 2022).

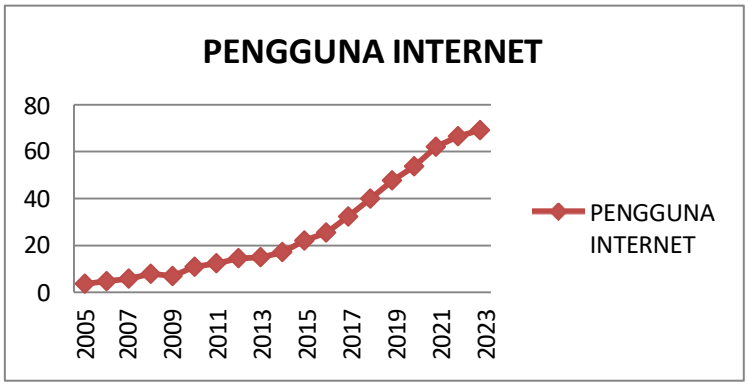

Figure 1. Internet User Data in Indonesia 2005-2023

The growth of the digital economy is seen as an opportunity for business actors to develop innovative business models that can help Indonesia advance as a developed country. This encourages stronger relationships between economic sectors and improves the structure of existing economic activities. The concept of the digital economy has developed along with advances in information and communication technology, and has contributed significantly to Indonesia's overall economic growth. The digital economy is expected to better address the challenges of economic instability by increasing the number of entrepreneurs who drive the economy and create new job opportunities. In addition, the adoption of digital technology is also expected to increase Indonesia's economic competitiveness on a global scale. One real sign of the development of the digital economy in Indonesia is the emergence of various digital applications for payment and financing systems that are increasingly used by the public. Other sectors, such as culture, tourism, and the creative economy, have also felt the benefits of the digital economy. Many local cultural and creative products are now traded on e-commerce platforms, allowing global access and use. (Devia, 2025).

Although the digital economy offers many opportunities, especially in terms of workforce readiness, there are several major issues that must be addressed. The limited skills of the workforce to meet the needs of the digital industry is one of the important issues that arise. To serve the digital transformation, employees are needed who not only have special technical skills, such as skills in information technology, big data, artificial intelligence (AI), and data analysis, but also have basic skills such as creativity, problem solving, and adaptability.

Unfortunately, there are still many Indonesian workers who are not ready to switch to this type of work, which causes a major loss of skills.

On the one hand, digital innovations such as artificial intelligence (AI), big data, the Internet of Things (IoT), and automation have increased efficiency and productivity. However, on the other hand, this transformation has also raised concerns about threats to traditional jobs, which have the potential to increase unemployment rates due to the replacement of human labor by machines and automated systems. The following is data on the workforce and unemployment in Indonesia from 2005 to 2024(Diena, 2025).

Table 1. Data on Labor and Unemployment in Indonesia 2005-2024

YEAR	LABOR	UNEMPLOYMENT
2005	66.57	7.95
2006	66.42	7.55
2007	68.40	8.06
2008	68.60	7.21
2009	68.25	6.11
2010	68.86	5.61
2011	69.39	5.15
2012	69.95	4.47
2013	69.27	4.34
2014	69.06	4.05
2015	69.00	4.51
2016	68.74	4.30
2017	69.05	3.78
2018	70.03	4.39
2019	70.57	3.59
2020	69.64	4.26
2021	68.18	3.83
2022	69.08	3.46
2023	69.07	3.31
2024	69.11	3.30

Data source: https://data.worldbank.org/indicator/SL.TLF.ACTI.ZS
https://data.worldbank.org/indicator/SL.UEM.TOTL.ZS

The development of the digital economy has a significant impact on employment, both in creating job opportunities and eliminating some types of jobs due to automation. Digitalization has driven the growth of the creative economy, startups, and e-commerce sectors, which are able to absorb a large number of workers, thus proving that digital transformation can be a major factor in creating new jobs. (Lokot, 2025). However, on the other hand, the digital economy also causes disruption in sectors that still rely on conventional labor. The application of artificial intelligence (AI) technology and automation in various industries has reduced the

need for humanlabor, especially in routine work, so that many workers have difficulty adapting to these changes. (Haris, 2022)

One of the main challenges in the digital economy era is the workforce skills gap. That many workers in Indonesia still have skills that do not match the needs of the digital industry. Therefore, training and education programs are needed that can help workers develop digital skills to remain competitive in an increasingly technology-based job market. In addition to these challenges, the digital economy also opens up opportunities for informal workers to develop. Digital platforms allow individuals to run independent businesses through marketplaces, social media, or freelance platforms, creating new, more flexible work models and giving more people the opportunity to participate in the digital economy. Thus, the digital economy has a complex impact on employment in Indonesia (Najicha Y. d., 2022). On the one hand, digitalization drives the growth of job opportunities, while on the other hand it demands the workforce to improve their skills to stay relevant in an increasingly technology-based world of work. With the right policies and investment in education and training, the digital economy has the potential to become a major driver of employment growth in Indonesia. (Masfiatun, 2023).

Advances in the digital economy have enabled the creation of new jobs, which have an impact on labor absorption. Labor absorption is a term that refers to the large number of jobs filled, which is reflected in the large number of the workforce population. Due to the high demand for labor, the working population is absorbed and spread across various economic sectors (Putri, 2021). The high unemployment rate shows that everyone must be creative in creating jobs that absorb labor and are able to keep up with technological developments and turn the wheels of an increasingly dynamic economy. Economic growth, along with the inflation rate, is a factor that has an influence on labor absorption. Economic growth is a mandatory requirement for reducing poverty rates, and the characteristics of economic growth are evenly distributed throughout the country. Economic growth can directly reduce poverty in areas where many poor people work. As one indicator of success in the development of a country, increasing economic growth shows success in the development of the country. Increasing economic growth shows a decrease in the poverty rate, which means that more jobs are available, so that more labor is absorbed. (Lia Nazliana, 2025).

This gap is also related to disparities in access to technology and digital infrastructure. In rural areas or areas with less developed technological infrastructure, access to digital training is still very limited, thus exacerbating the inequality of job opportunities. This condition can hamper the growth of the digital economy in Indonesia and widen the economic gap between urban and rural areas. Therefore, to ensure that the digital economy can function as the main driver of national economic growth, strategic efforts are needed to reduce the workforce skills gap. These steps include improving the quality of education, investing in digital skills training programs, and providing more equitable technology infrastructure. Thus, Indonesia can maximize its economic potential in the digital era while strengthening the competitiveness of its workforce on the global stage.

Literature Review

A. Internet Users

Internet users are showing changes in consumption behavior, such as preferring online shopping over in-person shopping, driven by convenience and product variety. Internet usage provides opportunities for small businesses to reach a wider market through digital platforms, although there are still challenges in terms of access and competition. (Santosa, 2022). Individuals who actively use the internet are more likely to have access to financial products such as bank accounts, loans, and investments. Internet use also contributes to increasing public awareness of financial products, through information available online. (Nugroho, 2023).

There are at least six internet roles that can be used in daily activities. Among them are:

a. The Internet acts as a communication tool with its ability as a fast means of communication, including its use to communicate via email, chat, or mailing lists.
b. Access to information allows individuals to find a variety of references, including research results and articles in various fields, without having to physically visit the library. The Internet is considered the largest library that can be accessed from anywhere.
c. The rapid growth of internet technology and its spread throughout the world has been utilized by various countries, institutions and experts for various purposes, including for learning purposes. (Khosiyono, 2022).

Human behavior and how they view technology are influenced by advances in information and communication technology. Along with various government programs aimed at making everyone in Indonesia internet literate, it is estimated that the number of internet users in the country will continue to increase. The large number of internet users in Indonesia has encouraged the government to try to change the old system with a digital system. It is hoped that the advancement of digital technology will allow Indonesia to compete with other countries that are starting to shift from a traditional lifestyle to the digital era. (Hanif, 2021).

B. Labor

The large number of workers in the workforce will increase the level of production, which indicates that the size of the domestic market tends to be large so that it can increase economic growth from the increase in output produced. Harrod Domar said that the production process has a constant coefficient (constant return scale), and the growth rate of the workforce is constant and the same as the population growth rate. (Dharmayanti, 2021).

Types of Labor

a. Educated workforce, namely workforce who have expertise or skills in certain fields through formal and informal schools or education.
b. Skilled labor, namely labor trained by workers with certain specialized knowledge through work experience. Mastery in the workplace is repeated practice to master a job. For example: pharmacists, surgeons, mechanics, etc.
c. Unskilled labor and unskilled labor are skilled and highly skilled labor that are trained based on their own strengths. For example: laborers, porters, waiters, etc. (Fatimah, 2003).

Labor absorption is the amount of labor used in a part of a particular business or in other words, labor absorption is the amount of labor working in a particular business unit. In this labor absorption, it is influenced by two external factors and internal factors. These external factors

include the level of economic growth, inflation rate, unemployment and interest rate. (Wulan, 2021).

C. Unemployment

The definition of unemployment is the working age population who are not working and are actively looking for work. Unemployment that occurs due to a mismatch between the characteristics of job seekers and the available job vacancies is called structural unemployment. Working is an activity to earn money, therefore wages are a central issue that determines whether someone is unemployed or a worker. In the context of the labor market, labor absorption only occurs if there is an agreement on wages (which is the price of labor services) between job seekers and employers. Unemployment can also occur because the wages offered by employers are lower than the wages expected by job seekers. This happens because every job seeker has an idea of the minimum wage level that is able to move him to accept a job. The wage level is known as the reservation wage. The existence of this reservation wage creates voluntary unemployment, namely people who are voluntarily unemployed because they consider the wages offered are not very good, and are waiting to get a job with better wages, at least the same as their reservation wage. (Ervin, 2021).

Unemployment is the working age population that is not working and is actively looking for work. The working age population is further divided into 2 groups, namely the labor force and not the labor force. The labor force is the workforce that is active in the labor market, and not the labor force is the workforce that is not active in the labor market. (Ervin, 2021).
Unemployment is a problem experienced by various countries, especially developing countries. The existence of unemployment can have an impact on the country. Not only negative impacts, it turns out that even a small unemployment rate is sometimes undesirable because it can affect the country's productivity. According to the definition of unemployment above, workers who are actively looking for work and/or preparing a business but have not yet obtained the desired position are considered unemployed. Unemployment can occur due to several factors. Factors that cause unemployment include:

a. The growth of the workforce continues to increase. The increase in labor force growth does not coincide with economic growth in the country.
b. Heterogeneous human resources. Job vacancies tend to look for qualified workers, or at least graduates of a certain degree. However, because of the 12-year compulsory education, people who have graduated from high school or equivalent feel that it is enough.
c. Lack of available jobs. Of the many Indonesian citizens and their developments at all times, the availability of jobs is felt to be very lacking. The lack of jobs is caused by many factors, but the dominant thing is the mindset of the nation's children who are fostered by their parents that success is working in a big company, not by opening a business and creating their own jobs.
d. The workforce is still blind to the world of work. The encouragement from the environment and idealistic principles in society make the workforce not yet know where their interests and passions are. So this results in the immature thinking of what field they want to work in. (Nurul, 2023).

D. Inflation

Inflation is a condition when economic value increases. Inflation can cause a country to experience an economic crisis in the long or short term defining inflation as a stage in the economy when wages and prices rise, demand for labor exceeds supply, and the money supply increases significantly. The amount of money compared to other countries is called the rupiah exchange rate. The decreasing role of the national economy or the increasing demand for foreign currency for use in international payments are two factors that cause the rupiah exchange rate to fall. Factors that cause inflation can be distinguished based on their origin, namely internal factors called domestic inflation and external factors also called imported inflation. Domestic inflation is inflation that is mostly caused by pressure from domestic macroeconomic variables, thus encouraging an increase in the prices of goods. While imported inflation is inflation caused by an increase in prices in other countries that have trade relations with the country being imported, so that imported goods become more expensive (Nurul, 2023).

Inflation is the tendency of prices to rise continuously. Inflation can have positive and negative effects depending on the magnitude of inflation that occurs. Low inflation will have a positive impact so that it can boost the economy, increase national income and encourage investment. While if inflation is too high it can later weaken the economy, increase production costs, reduce investment and reduce the purchasing power of fixed income recipients such as civil servants, private employees or workers. Inflation can also benefit producers if the income earned is greater than the cost of increasing production. But if inflation affects the increasing cost of production, it will cause producers to lose money so that they will reduce their production to their workforce (Ihsanul F, 2023).

E. Economic growth

Economic growth can be defined as the development of economic activities that cause the price of goods and services produced in society to increase. The problem of economic growth can be viewed as a long-term macroeconomic problem. From one period to another, a country's ability to produce goods and services will increase. This increased ability is caused by the factors of production always experiencing an increase in quantity and quality. (Wulan, 2021).
Economic growth is a process of increasing productive capacity in an economy continuously or sustainably over time so as to produce increasingly greater levels of national income and output. Three components of economic growth that are important for every society are:

a. Capital accumulation, including all new investments in land, physical equipment and human resources through improvements in health, education and job skills.
b. Population growth which ultimately causes growth in the workforce
c. Technological advances are broadly defined as new ways of getting work done. (Dharmayanti, 2021).

Economic growth is an increase in aggregate output (all goods and services produced by economic activities) or “Gross Domestic Product” (GDP). GDP is defined as the total value of the final results obtained from an economic activity carried out by both local and foreign citizens residing in the country concerned. Thus, in general measurements to see the rate of economic growth is the percentage change in GDP on a national scale or the percentage change in GRDP on a provincial or district or city scale. (Suripto, 2020).

METHOD

The approach taken by quantitative researchers is based on secondary data from the period 2005-2023 through the Worldbank. The conceptual framework of the research is as follows:

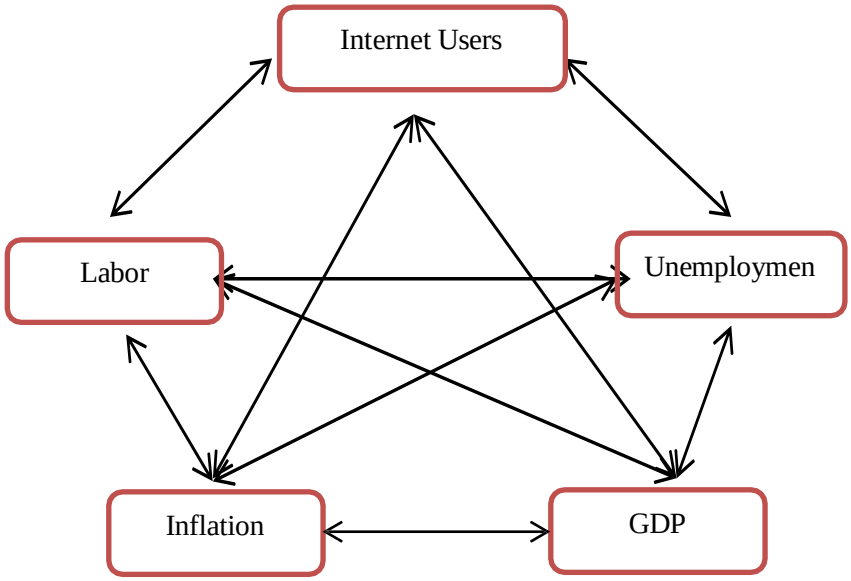

Figure 2. VAR Conceptual Framework

The conceptual framework image explains the model used is the Vector Autoregression (VAR) test to analyze monetary policy in strengthening economic fundamentals in Indonesia by looking at the formation of vectors that influence each other between variables. According to Manurung (2009) it is impossible to distinguish between endogenous and exogenous variables if simultaneity between several variables is true. Testing simultaneous relationships and degrees of integration between variables in the longterm using the VAR method is used because it is easier to use and to empirically prove the complex long-term reciprocal relationship of endogenous variables. The VAR analysis model consists of the following formula:

$$PDB_t = \beta_{10} PDB_{t-p} + \beta_{12} INF_{t-p} + \beta_{13} TK_{t-p} + \beta_{14} PG_{t-p} + \beta_{15} PGI_{t-p} + \beta + e_{t1}$$

$$INF_t = \beta_{10} PDB_{t-p} + \beta_{12} INF_{t-p} + \beta_{13} TK_{t-p} + \beta_{14} PG_{t-p} + \beta_{15} PGI_{t-p} + \beta + e_{t1}$$

$$PGI_t = \beta_{10} PDB_{t-p} + \beta_{12} INF_{t-p} + \beta_{13} TK_{t-p} + \beta_{14} PG_{t-p} + \beta_{15} PGI_{t-p} + \beta + e_{t1}$$

$$TK_t = \beta_{10} PDB_{t-p} + \beta_{12} INF_{t-p} + \beta_{13} TK_{t-p} + \beta_{14} PG_{t-p} + \beta_{15} PGI_{t-p} + \beta + e_{t1}$$

$$PG_t = \beta_{10} PDB_{t-p} + \beta_{12} INF_{t-p} + \beta_{13} TK_{t-p} + \beta_{14} PG_{t-p} + \beta_{15} PGI_{t-p} + \beta + e_{t1}$$

Where:
GDP = Economic Growth
INF = Inflation
PGI = Internet Users
Kindergarten = Labor

PG = Unemployment
p = Length Lag

Next is the analysis of the Impulse Response Function (IRF) model, conducted to understand how each variable affects the standard deviation of innovation. Ariefianto (2012) explains that IRF conducts a search related to the impact of shocks or shocks on a variable in the system within a certain period of time. The purpose of the IRF analysis is to determine whether each transmission variable is cointegrated in both the short and long term. Manurung (2005) states that IRF is an indicator of changes in the direction of movement of transmission variables as a result of changes in other transmission variables. To find out how important various shocks are to the variable itself and other variables, the Forecast Error Variance Decomposition (FEVD) is used. Manurung (2005) states that the purpose of the FEVD analysis is to determine the contribution or influence between transmission variables.

Further analysis is carried out with the Assumption test consisting of the Data Stationarity Test (Unit Roots Test) and the Johansen Cointegration Test. Data stationarity can be obtained from data that is initially non-stationary through testing the degree of integration or stationarity at the level of data differentiation. This process involves testing the availability of data stationarity at one level and then repeating the test at the differentiation level until it reaches a stationary condition. Dickey-Fuller recommends applying certain regression models to determine the presence of unit roots in the data, as follows:

$\Delta Yt = \theta Yt\text{-}1 + et$ (1)

$\Delta Yt = \beta 1 + \theta Yt\text{-}1 + et$ (2)

$\Delta Yt = \beta 1 + \beta 2t + \theta Yt\text{-}1 + et$ (3)

In equation (1), the variable that shows the difference in time trend is denoted as t, and there are two additional regressors that include constant and time trend variables. Each model has two hypotheses considered: the null hypothesis $\Theta = 0$, which indicates the non-stationarity of the data, and the alternative hypothesis $\Theta < 0$, which indicates that the data is stationary. The DF statistic, represented by the t value of the coefficient $\Theta Yt\text{-}1$, is compared with its critical value; the rejection of the null hypothesis occurs if the absolute value of the DF statistic exceeds the critical value, indicating that the observed data is stationary. Conversely, if the value of the DF statistic is smaller than the critical value of the t distribution, then the data is considered non-stationary. The residuals et and the autocorrelation elements are often related and interrelated according to the assumptions in equations (1) and (2). Dickey Fuller then included the autocorrelation elements into his model, known as the Augmented Dickey-Fuller (ADF) to develop the unit root test. This ADF test is commonly used to assess the stationarity of data. The formulation of the ADF test can be explained as follows:

$\Delta Yt = \theta Yt\text{-}1 + et$ (1)

$\Delta Yt = \beta 1 + \theta Yt\text{-}1 + et$ (2)

$\Delta Yt = \beta 1 + \beta 2t + \theta Yt\text{-}1 + et$ (3)

Where: Y = Research variable Yt = Yt – Yt-1 T = Time trend N = lag value. The process of assessing whether the data is stationary or not involves comparing the ADF statistic value with the Mackinnon critical distribution value. The t statistic value of the coefficient γYt-1 is given in equations (4 to 6). If the absolute value of the ADF statistic exceeds its critical value, then the observed data shows a stationary nature. Conversely, if the absolute value of the ADF statistic is smaller than its critical value, then the data is considered non-stationary. It is also important to determine the length of the lag in the ADF test, and the Aikake Information Criterion (AIC) or Schwarz Information Criterion (SIC) can be used for this purpose. The model with the lowest AIC and SIC values is considered the most appropriate model. After knowing that the Export and Import data are stationary, the next step will determine whether there is a long-run equilibrium relationship between the two. There is one direction of Granger causality that is most uncertain if the two variables are integrated to degree one, I (1) and cointegrated. Based on the representation theorem, it is said that if a vector n/ (1) of time series data Xt is cointegrated with the cointegration vector, then there is an error correction representation, which can be mathematically represented by: A (L).Xt = -yaXt-1 + β(L) εt (7) Where: A(L) is a polynomial matrix in the lag operator with A(0) = I; Y is a (nx1) constant vector that is not equal to zero; β(L) is a polynomial scalar in L; and εt is a vector of error variables that are white noise. In the short term, any deviation from long-term equilibrium (a'X=0) will affect the change in Xt and will adjust back towards equilibrium. The cointegration test that will be used here uses a test procedure.

Results and Discussion

The results of Vector Autoregression (VAR) show that with a lag of 1, the vector autoregression analysis shows the contribution of each variable to the variable itself and other variables, which is more clearly described in the following table:

Table 2. Vector Autoregression Results

Lag 1	Lag 2
Vector Autoregression Estimates Date: 05/18/25 Time: 22:47 Sample (adjusted):2 18 Included observations: 17 after adjustments Standard errors in()&t-statistics in[] Determinant resident covatiance (dofadj.) 28990.38 Determinant residual covariance 3288.309 Log likelihood -189.4439 Akaike informationcriterion 25.81693 Black criterion 27.28730 Number of coefficients 30	Vector Autoregression Estimates Date: 05/18/25 Time: 22:49 Sample (adjusted):3 18 Included observations: 16 after adjustments Standard errors in()&t-statistics in[] Determinant resident covatiance (dofadj.) 104.6140 Determinant residual covariance 0.311774 Log likelihood -104.1913 Akaike informationcriterion 19.89891 Black criterion 22.55468 Number of coefficients 55

In Table 1. above, the VAR results show the Lag 1 AIC value.25.81693< Lag 2 AIC value19.89891also shows that the past variable (t-1) contributes to the current variable, both to the variable itself and to other variables. The results of the analysis show that there is a reciprocal relationship between the variables. Next is the Impulse Response Function (IRF)

analysis with the results described as follows:

Table 3. Summary of Impulse Response Function (IRF) results

Response of INF:					
Period	INF	GDP	PG	PGI	Kindergarten
1	2.264952	0.000000	0.000000	0.000000	0.000000
5	0.278996	2.502697	0.077420	0.303974	-0.302596
10	1.016040	2.336331	-0.430661	-0.321164	-0.286298
Response of PDB:					
Period	INF	GDP	PG	PGI	Kindergarten
1	0.386137	1.718007	0.000000	0.000000	0.000000
5	0.640301	1.101958	-0.095339	-0.082923	0.102936
10	1.369407	2.951930	0.439515	-0.250454	0.013586
Response from PG:					
Period	INF	GDP	PG	PGI	Kindergarten
1	-0.053781	-0.364674	0.391591	0.000000	0.000000
5	-0.145212	0.075420	-0.066339	0.085698	-0.049063
10	0.107672	0.377672	-0.000221	-0.057433	0.031897
Response from PGI:					
Period	INF	GDP	PG	PGI	Kindergarten
1	1.093429	-0.011556	-1.421055	0.558843	0.000000
5	0.953914	-0.272965	-3.284291	0.772839	-0.082686
10	3.325728	1.845780	-5.412609	1.123273	0.199403
Response from TK:					
Period	INF	GDP	PG	PGI	Kindergarten
1	18.73049	28.68502	1.106951	-10.09742	12.01127
5	-0.661266	1.800245	-21.07857	7.333583	4.012241
10	74.30579	183.4736	-37.12910	11.20384	11.65928
Cholesky Ordering: INF PDB PG PGI TK					

Source: Author's Processed Data, 2025

Based on Table 2, the results show that the inflation variable provides a positive response in both the short, medium, and long term, reflecting its influence provides a positive response in both the short, medium, and long term. Furthermore, the Gross Domestic Product (GDP) variable also provides a positive response in the third period, indicating its stable contribution to the economy. Meanwhile, the unemployment variable shows a different pattern, where in the short term it gives a positive response, but returns to negative in the medium and long term. The internet user variable consistently gives a positive response in the short, medium, and long term. Finally, the workforce variable also shows a positive response continuously in all periods.

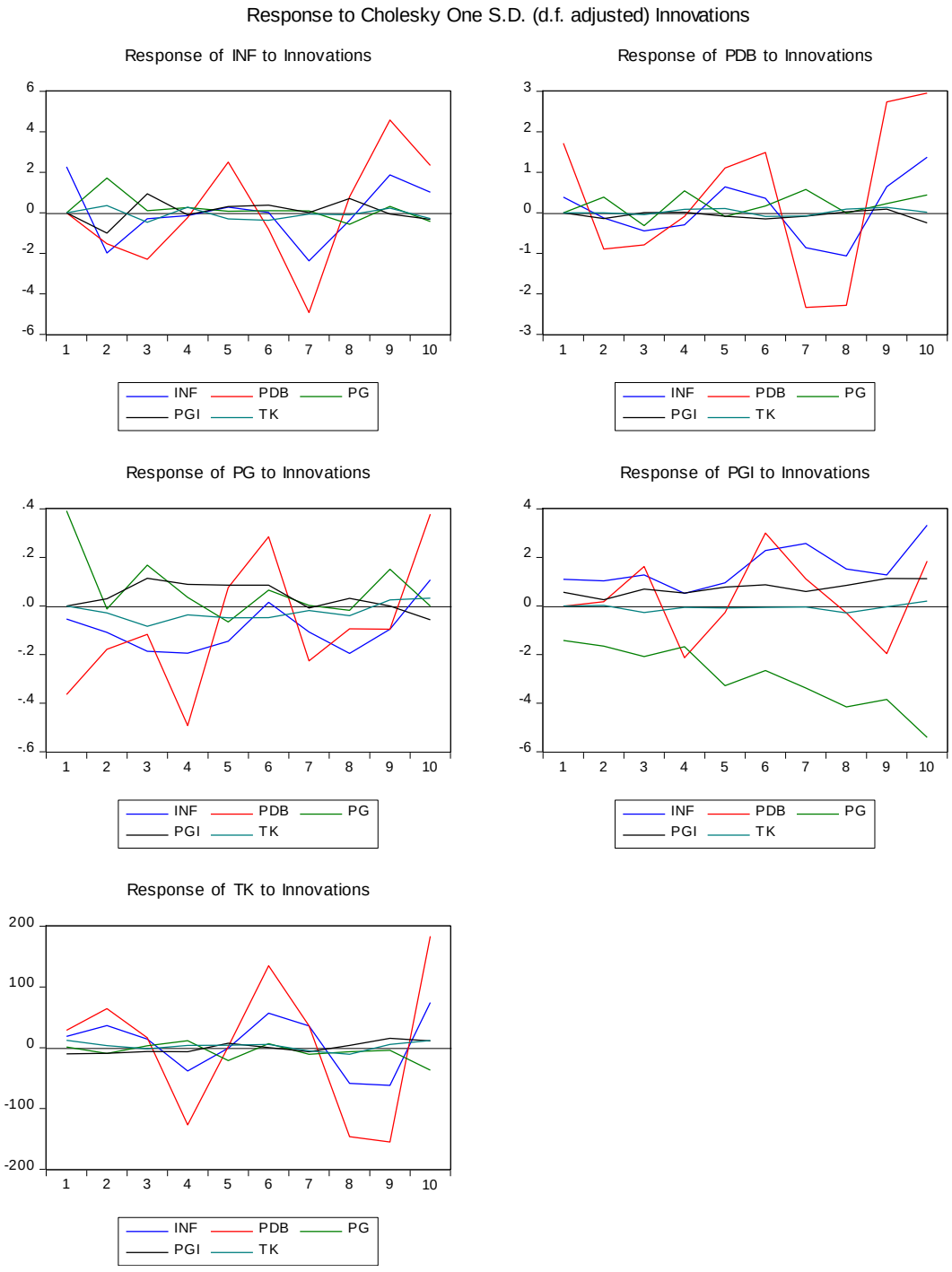

Figure 3. Impulse Response Function (IRF) graph

The figure above displays the analysis of the results of the impulse response function (IRF) on Cholesky One SD innovation (df customized) for several economic variables, including inflation (INF), gross domestic product (GDP), unemployment (PGI), internet users (PGI), and labor force (TK). In the first panel, it can be seen that inflation (INF) shows a fairly large performance in responding to innovation on other variables, with a pattern that tends to be unstable in the first few periods before returning to approach the equilibrium line. The second panel shows the response of GDP to innovation, with a pattern that is initially positive but experiences several declines before finally increasing significantly in the final period, reflecting a strong economic response to external changes. Meanwhile, in the third panel, Unemployment shows a fairly fluctuating pattern, with a dominant negative response in the early period before experiencing several positive and negative movements, indicating sensitivity to changes in other variables. Internet users (PGI) in the fourth panel are seen to provide a more consistent response, with a tendency to increase in the last few periods. Finally, labor (TK) in the fifth panel shows a relatively stable response pattern, with a slight efficiency before finally returning to a positive trend in the final period, indicating the important role of labor in maintaining economic stability.

Table 4. Workforce Interaction in Supporting Digital Economic Growth

Variables	Workforce in Supporting Digital Economic Growth					Period
	INF	GDP	PG	PGI	Kindergarten	
Inflation	100.00%	0.00%	0.00%	0.00%	0.00%	Short-term
	32.19%	48.53%	10.55%	6.93%	1.78%	Medium term
	21.12%	71.11%	3.94%	2.95%	0.86%	Long-term
GDP	4.80%	95.19%	0.00%	0.00%	0.00%	Short-term
	12.25%	79.21%	7.85%	0.38%	0.28%	Medium term
	12.55%	84.17%	2.81%	0.31%	0.14%	Long-term
Unemployment	1.00%	45.98%	53.01%	0.00%	0.00%	Short-term
	14.24%	55.90%	24.54%	3.79%	1.51%	Medium term
	15.31%	61.39%	18.32%	3.46%	1.49%	Long-term
Users Internet	33.89%	0.00%	57.24%	8.85%	0.00%	Short-term
	23.72%	29.77%	62.59%	4.68%	0.23%	Medium term
	19.22%	15.02%	61.93%	3.67%	0.13%	Long-term
Power Work	24.68%	57.90%	0.08%	7.17%	10.15%	Short-term
	12.92%	82.48%	2.63%	1.23%	0.72%	Medium term
	14.33%	83.20%	1.58%	0.51%	0.36%	Long-term

Source: Author's processed data, 2025

: Largest 1

: Largest 2

Table 4 shows the interaction of labor in supporting the growth of the digital economy based on several variables, namely inflation (INF), gross domestic product (GDP), storms (PG), internet users (PGI), and labor (TK) in three time periods: short term, medium term, and long term. In the short term, inflation is fully (100%) influenced by itself without the influence of

other variables, but over time this influence decreases. In the medium term, inflation is more influenced by GDP by 48.53%, followed by a decrease in influence of 10.55%, internet users 6.93%, and labor 1.78%. In the long term, the influence of GDP is increasingly dominant reaching 71.11%, while the influence of poverty, internet users, and labor decreases to 3.94%, 2.95%, and 0.86%, respectively. For GDP, in the short term, its contribution to itself is very dominant, reaching 95.19%, while other variables such as inflation only contribute 4.80%. In the medium term, the influence of GDP on itself slightly decreases to 79.21%, with an increase in the contribution of inflation to 12.25%. In the long term, GDP remains dominant with a contribution of 84.17%, while other influencing variables remain relatively small. Unemployment, in the short term, is more influenced by itself with a contribution of 53.01%, but GDP also has a significant influence of 45.98%. In the medium term, the influence of GDP increases to 55.90%, while the influence of the decline on itself decreases to 24.54%. In the longterm, GDP remains the main influence with a contribution of 61.39%, while the influence of poverty decreases by itself to 18.32%. Internet users, in the short term, are most influenced by poverty at 57.24%, followed by inflation at 33.89%. However, in the medium term, the influence of poverty remains dominant at 62.59%, with the influence of GDP increasing to 29.77%. In the long term, a similar pattern is seen with the inflation rate remaining high at 61.93%, while the influence of inflation decreases to 19.22%. For labor, in the short term, the largest influence comes from GDP at 57.90%, followed by inflation at 24.68%, while the influence of labor itself is only 10.15%. In the medium term, the influence of GDP becomes more dominant at 82.48%, while the contribution of inflation decreases to 12.92%. In the long term, the influence of GDP remains strong at 83.20%, with the contribution of labor to itself only 0.36%.

Conclusion

This study shows that the digital economy has great potential to drive Indonesia's economic growth, but the workforce skills gap remains a major challenge. Based on the results of the Vector Autoregression (VAR) test with lag 1 which has a lower Akaike Information Criterion (AIC) value (25.81693) compared to lag 2 (19.89891), it can be seen that the model with lag 2 is more appropriate in describing the relationship between the economic variables studied, including inflation (INF), gross domestic product (GDP), tourism (PG), internet users (PGI), and workforce (TK).The results of the Impulse Response Function (IRF) analysis show that inflation provides a positive response in the short, medium, and long term, reflecting its consistent influence on the digital economy. GDP also provides a stable positive response in all periods, confirming it as the main driver of the economy. However, the decline shows a different pattern, where in the short term it provides a positive response, but turns negative in the medium and long term, reflecting the impact of automation and digital transformation on the decline of traditional jobs. Meanwhile, internet usage and labor provide a consistent positive influence in all periods, indicating the importance of digitalization in expanding employment and increasing economic productivity. The results of the Forecast Error Variance Decomposition (FEVD) test confirm this finding, where inflation in the short term is fully influenced by itself (100%), but

its contribution decreases over time, replaced by the dominant influence of GDP. GDP itself remains the most dominant variable in influencing the growth of the digital economy throughout the period, including in influencing the workforce. Unemployment, although initially having a significant influence on itself, gradually experiences a decrease in influence in the long term, as the contribution of GDP and the digitalization of the economy increases.

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