Constructing of Decent Work Index of Regency/City in Indonesia and its Influencing Factors

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ABSTRACT – **Currently, there are still many workers in Indonesia who obtain low-quality or inappropriate jobs. This can be seen from inadequate wages, non-standard working hours, and low labour productivity. In fact, decent work is very important to reduce poverty and achieve sustainable development. Therefore, this study aims to develop a comprehensive measure of decent work, the Decent Work Index (DWI), for each regency/city in Indonesia. The DWI is compiled based on the ILO indicator framework using factor analysis method in accordance with the stages of index compilation by the OECD. In addition, this study also uses multiple linear regression to analyze the influence of education and the development of information and communication technology on decent work conditions. The results show that nine indicators are divided into three factors, namely full and productive work, rights at work, and equal opportunity and treatment in employment. Denpasar City is the city with the highest DWI, and Mamberamo Raya Regency is the regency with the lowest DWI. Meanwhile, the results of multiple linear regression shows that Mean Years of Schooling (MYS), the percentage of individuals using computers, and the percentage of individuals using e-commerce can increase the DWI.**

Keywords – **decent work, composite index, factor analysis, multiple linear regression**

I. INTRODUCTION

Decent work and livelihood are among the human rights of every person. The state must be present to guarantee the basic rights of workers as described in the 1945 Constitution of the Republic of Indonesia Article 27 paragraph (2). However, labour issues are still a challenge for many countries in the world, including Indonesia. According to the International Labour Organization (ILO), currently many workers receive low quality jobs both in terms of wages and ownership of job security and social protection. This condition indicates that the quality of work is still far from decent [1].

The concept of decent work was first defined by the ILO in 1999. The aim of this concept is to provide women and men with equal opportunities to obtain decent and productive work in conditions of freedom, equality, security, and human dignity [2]. Based on this objective, four pillars of decent work have been developed, consisting of workers rights, full employment, social protection, and social dialogue [3]. In this regard, decent work can be defined as work that ensures that every worker can be productive and that their basic human rights are fulfilled [4]. Thus, a person can be said to have decent work if their job fulfills the pillars of decent work. The more aspects of the job that align with these pillars, the higher the level of decent work.

Decent work is critical to reducing poverty and achieving sustainable development. The importance of realizing decent work is reflected in the eighth goal of the Sustainable Development Goals (SDGs), which is to "promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all" [5]. In addition, the realization of decent work is one of the efforts to achieve the first main goal of the 2025-2045 National Long-Term Development Plan (RPJPN), namely the attainment of a per capita income commensurate with that of developed countries. The creation of decent jobs will increase the number of middle-income people by around 80 percent.

People rely heavily on income from decent work opportunities that provide fair wages, job security, and social protection. According to the release of the ASEAN Statistical Yearbook 2023, Indonesia ranked first with the highest unemployment rate among ASEAN countries in 2022. This indicates that employment opportunities in Indonesia are still much lower than in other ASEAN countries. The lack of employment opportunities leads people who want to work to engage in informal activities, which tend to be more accessible [4]. In Indonesia, workers included in the informal economy are self-employed workers, workers supported by non-permanent/unpaid labour, casual workers, and family workers. Based on this definition, there were 59.31 percent informal workers in August 2022. The main problem for the well-being of these workers is the lack of social protection, legal basis for employment or decent wages. [4].

The World Bank notes that employment in Indonesia tends to be dominated by low-wage jobs that are unable to raise people's living standards [6]. Based on BPS data, the average monthly wage in Indonesia in 2022 is IDR 2.89 million. Based on 17 employment sectors, there are 7 sectors that are still below the national average wage, where the agriculture, forestry and fishery sector is one of the sectors with the lowest average wage of IDR 1.94 million per month. Meanwhile, this sector absorbs the highest labour force, which is about 26.8 percent of the national labour force. In addition, when looking at the average hourly wage of workers in Indonesia, there was a decline from IDR 18,089 per hour to IDR 17,542 per hour in 2022. The declining average hourly wage of workers indicates that there has been an excessive increase in working hours. Based on ILO conventions, BPS defines working hours exceeding 48 hours per week as excessive working

hours. In 2022, the proportion of workers with excessive working hours increased by 1.82 percent to 26.6 percent of the total labour force.

The phenomenon in the field of employment in Indonesia in terms of employment opportunities, job stability, income, and working hours shows a poor condition. This may contribute to the decline of labour productivity in general. Based on a publication released by ILOSTAT in 2022, Indonesia's labour productivity ranks 4th among the founding of ASEAN countries of Singapore, Malaysia, and Thailand. In addition, the lack of employment opportunities and the high number of workers in the informal sector indicate that the Indonesian workforce is dominated by workers on the verge of poverty. In the Statistical Update report 2018, Indonesia has 27.6 percent of poor workers, which is higher than several other ASEAN countries such as Singapore, Thailand, Malaysia, and Vietnam, which have less than 10 percent of poor workers [7]. This finding is also supported by BPS data, which indicates that the absolute number of poor people is still quite high at 26.36 million by September 2022, an increase of 1.58 million compared to before the pandemic in September 2019. In addition, income inequality in Indonesia as measured by the gini ratio shows a stagnant trend in the last 5 years with a value of 0.381 in September 2022. Therefore, efforts to reduce poverty and income inequality must also be accompanied by the creation of decent work.

In order to determine targeted decent work policies, the government needs to know about these conditions as a whole. Reference [2] is research on the first measurement of decent work by objectively measuring decent work through statistical indicators. Subsequently, the ILO developed a framework of decent work indicators at the 18th International Conference on Labour Statistics, which later became the basis for measuring decent work in various countries. In Indonesia, BPS has produced the Decent Work Indicator, which provides an overview of decent work conditions [4]. However, in these publications, the decent work conditions was measured separately for each indicator, so that no concrete conclusions could be drawn about the overall decent work situation.

One solution to the difficulty of describing decent work comprehensively is to measure it using a composite index. Composite indexes are now increasingly recognized as useful tools for policymaking because they can convey information that serves as a measure of performance [8]. Research on the measurement of decent work index has been carried out in several countries. In Indonesia, research by [9] measured decent work using a non-decent work index approach at the provincial level using sixteen indicators. Meanwhile, research by [10] has developed a decent work index with eight indicators, also at the provincial level in China. The research also analysed the factors affecting decent work in terms of politics, economics, and culture. In addition to these studies, there are a number of previous studies on the construction of a macro Decent Work Index (DWI) at the national to provincial level [11], [12]. However, no one has measured it to the regency/city level. The diverse demographic, social, and economic conditions of the Indonesian population are the reason why it is important to measure the index at the regency/city level.

Challenges in the labour market mean that investment in human capital is essential to increase decent work. Human capital theory emphasizes the importance of education and training as the basis for improving productivity and the global economy [13]. Increasing the level of education makes it possible to achieve full employment [14]. In addition, changes in work patterns due to the development of information and communication technologies have affected labour market conditions [15]. In particular, computer education is a source of competitive advantage as a means for the country to attract investors and create decent work for its citizens [16]. In addition, the development of ICT has also increased e-commerce activities. The implementation of e-commerce in business processes in developing countries can help workers who own small businesses to access a wider market [17]. Therefore, access to higher education, adaptable skills and inclusive labour market development can lead to quality jobs that provide decent work [1].

In this study, decent work is measured using a composite index consisting of indicators corresponding to the pillars and elements of the Decent Work Agenda, called the Decent Work Index (DWI). The DWI is constructed in accordance with the OECD guidelines for constructing composite indexes using the factor analysis method. Factor analysis was chosen as the multivariate method because it is the most efficient data reduction method and is able to identify deep latent structures [18]. Then, the constructed DWI will be analysed in terms of the general description of decent work conditions in regency/city in Indonesia. Furthermore, this study will also analyse the influence of education and the development of information and communication technology on decent work conditions in regency/city in Indonesia using multiple linear regression. The multiple linear regression method was chosen because it has simplicity in modelling and ease in interpretation, but still provides accurate and reliable analysis results when classical assumptions can be met [19].

II. LITERATURE REVIEW

A. Pillars and Elements of Decent Work

Decent work is important as it ensures everyone in the world has an equal opportunity to find work that meets all their needs [4]. As defined by the ILO, decent work consists of four interrelated pillars: rights at work, full and productive employment, social protection, and social dialogue. The ILO provides a framework of indicators that can be considered when measuring decent work [15]. The indicator framework aims to describe the economic and population characteristics that provide the context for determining the level, pattern and sustainability of decent work [2]. The framework includes ten main elements, namely: employment opportunities; adequate earnings and productive work; decent working time; combining work, family and personal life; work that should be abolished; stability and security of work; equal

opportunity and treatment in employment; safe work environment; social security; and social dialogue, employers' and workers' representation [15].

B. Exploratory Factor Analysis

Generally, there are two types of factor analysis, namely Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). In this research, the factor analysis method used is Exploratory Factor Analysis (EFA). EFA is typically employed when the objective is to summarize data, describe the correlation structure between variables, and generate hypotheses [20]. According to [18], a random vector as **X** with p components has a mean $\boldsymbol{\mu}$ and a covariance matrix $\boldsymbol{\Sigma}$. The factor model explains that **X** depends linearly on several unobservable random variables $F_1, F_2, \dots, F_m$ called common factors and p as the source of variables $\varepsilon_1, \varepsilon_2, \dots, \varepsilon_p$ called errors or also called specific factors. The model of factor analysis is as follows:

$$\begin{aligned} X_1 - \mu_1 &= \ell_{11}F_1 + \ell_{12}F_2 + \cdots + \ell_{1m}F_m + \varepsilon_1 \\ X_2 - \mu_2 &= \ell_{21}F_1 + \ell_{22}F_2 + \cdots + \ell_{2m}F_m + \varepsilon_2 \\ &\vdots \qquad\qquad\qquad\qquad \vdots \\ X_p - \mu_p &= \ell_{p1}F_1 + \ell_{p2}F_2 + \cdots + \ell_{pm}F_m + \varepsilon_p \end{aligned} \tag{1}$$

Where:

X_i = observed value of the ith variable
μ_i = mean of the ith variable
ℓ_{ic} = loading of ith variable on the cth factors
F_i = ith common factors
ε_i = ith specific factors
i = 1, 2, 3, …, p (number of variables)
c = 1, 2, 3, …, m (number of factors)

C. Multiple Linear Regression

Regression analysis is a statistical method of studying the dependence of a dependent variable on one or more independent variables with the goal of predicting the value of a parameter [19]. A regression model with more than two independent variables is called multiple linear regression. The general multiple linear regression model is as follows:

$$Y_j = \beta_0 + \beta_1 x_{j1} + \beta_2 x_{j2} + \cdots + \beta_{p-1} x_{j,p-1} + \varepsilon_j \tag{2}$$

Where:

Y_j = jth observation dependent variable
β_0 = intercept parameter
β_k = regression coefficient parameter of the kth independent variable
x_{jk} = kth independent variable jth observation
ε_j = jth observation error
j = 1, 2, …, n (number of observations)
k = 1, 2, …, p-1 (number of parameters)

III. METHODOLOGY

A. Research Variables

This study constructs a Decent Work Index (DWI) at the regency/city level covering 514 regency/city in Indonesia by 2022. In this study, there are fourteen indicators used to describe decent work based on the ILO Decent Work Indicator Framework. This study also analyses the influence of education and the development of information and communication technologies on decent work conditions. The variables used are Mean Years of Schooling (MYS), the percentage of individuals using computers, and the percentage of individuals using e-commerce. The framework is shown in Figure 1. In this study, the indicators used to construct the Decent Work Index (DWI) and the variables that influence the DWI are regional aggregates for each district/city in Indonesia. The operational definitions used are presented in Table 1.

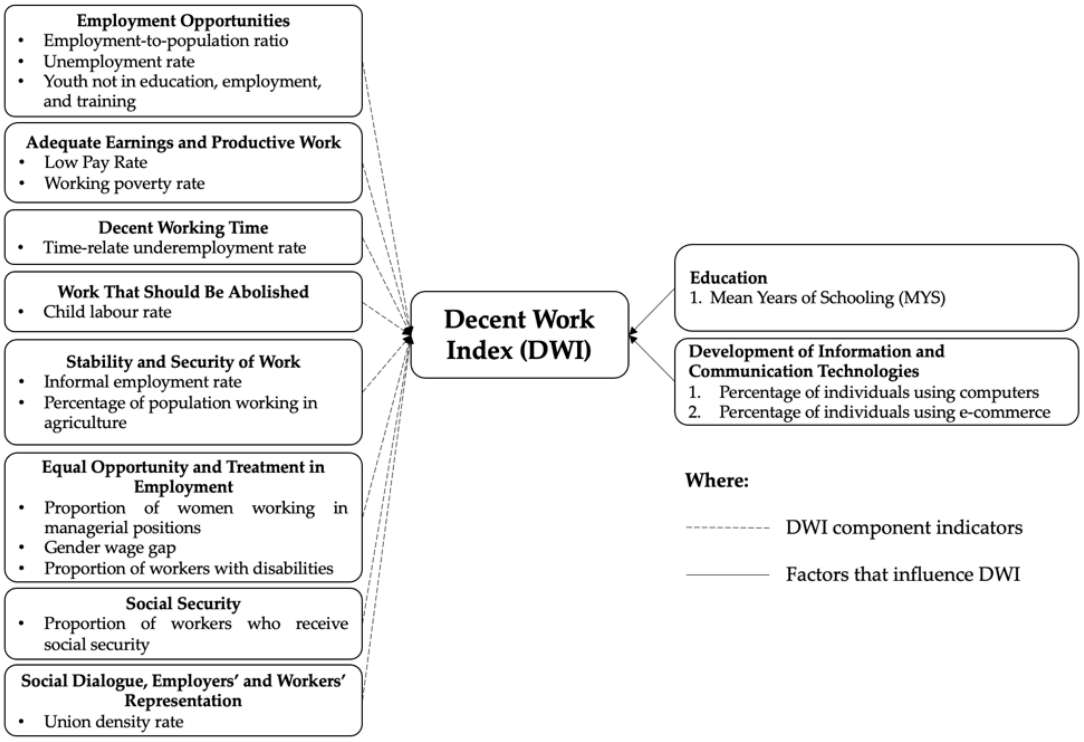

Figure 1 Research Framework

Table 1 Operational Definition

Symbols	Indicators	Operational Definition	Formula	Data Source
		DWI Component Indicators		
X_{1j}	Employment-to-population ratio	The percentage of employed persons in the working age population	$\frac{\text{Number of employed persons in the working age population}}{\text{Total number of persons in the working age population}} \times 100$	Sakernas of August 2022
X_{2j}	Unemployment rate	The percentage of unemployed persons in the labour force	$\frac{\text{Number of unemployed persons in the working age population}}{\text{Total number of persons in the labor force}} \times 100$	Sakernas of August 2022
X_{3j}	Youth not in employment, education, or training	The percentage of youth (15-24 years old) who are not in employment and not in education or training	$\frac{\text{Number of youth not in employment} + \text{Number of youth who are not in the labor force and are not in education or training}}{\text{Total number of youth}} \times 100$	Sakernas of August 2022
X_{4j}	Low pay rate	The percentage of employees whose earnings less than two-thirds of the median earnings of all employees	$\frac{\text{Number of employees paid less than 2/3 median earnings}}{\text{Total number of employees}} \times 100$	Sakernas of August 2022
X_{5j}	Working poverty rate	The percentage of the working population with incomes below a determined poverty line	$\frac{\text{Number of employed persons with incomes below a determinde poverty line}}{\text{Total number of employed persons}} \times 100$	Sakernas of August 2022
X_{6j}	Time-relate underemployment rate	The percentage of employed persons who worked less than the normal hours threshold (less than 35 hours in the past week)	$\frac{\text{Number of employed persons who worked less than 35 hours in the past week}}{\text{Total number of employed persons}} \times 100$	Sakernas of August 2022
X_{7j}	Child labour rate	The percentage of children in child labour aged 5 to 17, including those aged 5 to 12 regardless of hours worked, 13 to 14 years working over 15 hours per week, and 15 to 17 years working over 40 hours per week	$\frac{\text{Number of children aged } 5-12 \text{ years working} + \text{Number of children aged } 13-14 \text{ years working over 15 hours per week} + \text{Number of children aged } 15-17 \text{ years working over 40 hours per week}}{\text{Total number of children aged } 5-17} \times 100$	Sakernas of August 2022
X_{8j}	Informal employment rate	The percentage of persons in total employment who are in informal employment	$\frac{\text{Number of employed persons in informal employment}}{\text{Total number of employed persons}} \times 100$	Sakernas of August 2022

X_{9j}	Percentage of population working in agriculture	The percentage of employed persons working in agriculture	$\frac{Number\ of\ employed\ persons\ in\ informal\ employment}{Total\ number\ of\ employed\ persons} \times 100$	Sakernas of August 2022
X_{10j}	Proportion of women working in managerial positions	The percentage of women employed in managerial positions	$\frac{Number\ of\ women\ employed\ in\ managerial\ positions}{Total\ number\ of\ employed\ persons\ in\ managerial\ positions} \times 100$	Sakernas of August 2022
X_{11j}	Gender wage gap	The difference between the average earnings of male and female employees expressed as percentage of average earnings of male employees	$\frac{\left(Average\ earnings\ of\ male\ employees\right) - \left(Average\ earnings\ of\ female\ employees\right)}{Average\ earnings\ of\ male\ employees} \times 100$	Sakernas of August 2022
X_{12j}	Proportion of workers with disabilities	The percentage of workers with disabilities	$\frac{Number\ of\ employed\ persons\ with\ disabilities}{Total\ number\ of\ employed\ persons} \times 100$	Sakernas of August 2022
X_{13j}	Proportion of workers who receive social security	The percentage of employees who receive social security	$\frac{Number\ of\ employees\ who\ receive\ social\ security}{Total\ number\ of\ employees} \times 100$	Sakernas of August 2022
X_{14j}	Union density rate	The percentage of employees who are trade union members	$\frac{Number\ of\ employees\ who\ are\ trade\ union\ members}{Total\ number\ of\ employees} \times 100$	Sakernas of August 2022
		Factors that influence DWI		
MYS_j	Mean Years of Schooling	Number of years the population spent in formal education	-	BPS
$Computer_j$	Percentage of individuals using computers	The percentage of individuals who use a computer, including desktop computers, laptops, or tablets	-	Publication Welfare Statistics 2022
$E\text{-}Commerce_j$	Percentage of individuals using e-commerce	The percentage of e-commerce users	-	Publication Welfare Statistics 2022

B. Data Source

The data used are secondary data obtained from the raw data of the National Labour Force Survey (Sakernas) of August 2022, the publication Welfare Statistics 2022, and statistical tables available on the official website of the BPS.

C. Data Analysis Steps

The Decent Work Index (DWI) was constructed by following the steps for constructing a composite index by the OECD using exploratory factor analysis [21]. The following are the stages in the construction of the DWI.

1. Develop a theoretical framework and select indicators
2. Perform data normalization to adjust the indicator scale to have the same or standardized range. This research uses the min-max normalization method, which produces a range of values between 0 and 1. The formula used to calculate the min-max normalization is as follows:

$$X'_{ij} = \frac{X_{ij} - min(X_i)}{max(X_i) - min(X_i)} \quad (3)$$

where:

$\boldsymbol{X'_{ij}}$ = the value of the ith indicator of the jth regency/city as a result of min-max normalization
$\boldsymbol{X_{ij}}$ = the value of the ith indicator of the jth regency/city
$\boldsymbol{min\ (X_i)}$ = minimum value of ith indicator
$\boldsymbol{max\ (X_i)}$ = maximum value of ith indicator

3. Carry out a multivariate analysis with factor analysis. The purpose of this analysis is to examine the structure of the data and the appropriateness of the indicators used. The following are the stages of factor analysis according to what was done by [20].
   a. Testing the assumptions of factor analysis
      - Bartlett's Test of Sphericity shows that the indicators are significantly correlated, so factor analysis can be done.
      - The Kaiser-Meyer-Olkin (KMO) value must be at least 0.7 to meet the sample adequacy requirements [22].
      - The feasibility of each indicator is measured by a Measure of Sample Adequacy (MSA) value greater than 0.5 and communalities greater than 0.4 [23].

b. Determine the factor extraction method used, Principal Component Analysis (PCA) or Maximum Likelihood Estimation (MLE). To select the correct method, it is necessary to test for normality. If the data are not multivariate normally distributed, the PCA method is used for factor extraction. In this study, the normality test used is the Henze-Zirkler test. The Henze-Zirkler test is an alternative method for assessing normality in high-dimensional data [24]. This test is specifically designed for multivariate data by evaluating the joint distribution of variables, unlike univariate normality tests that assess each variable individually. One of the advantages of this test is its strong performance, especially on large samples (n > 100) [25].
c. Determine the number of factors based on the criteria of eigenvalue greater than one and percentage of cumulative variance greater than or equal to 60 percent [20].
d. Perform factor rotation using the varimax procedure.
e. Interpret the factors formed.

4. Perform weighting and aggregation on the formed indicators and factors. In this research, the weighting methods used are equal weighting and unequal weighting.
The equal weighting formula:

$$b_i = \frac{1}{p^*} \tag{4}$$

$$B_c = \frac{1}{c} \tag{5}$$

The unequal weighting formula:

$$b_i = \frac{LF_{ic}}{\sum_{i=1}^{p^*} LF_{ic}} \tag{6}$$

$$B_c = \frac{\%\ variance\ explained_c}{\%\ cumulative\ variance} \tag{7}$$

where:

b_i = weight of ith indicator
B_c = weight of cth factor
LF_{ic} = factor loading of the ith indicator of the cth factor
$\%\ variance\ explained_c$ = percentage of variance explained for the cth factor
$\%\ cumulative\ variance$ = percentage of cumulative variance
p^* = number of indicators in one factor
c = number of factors
i = 1,2, …, 14 (number of indicators)

After obtaining the weights for each indicator and factor, linear aggregation is performed on each factor and indicator as follows:

$$DWI_j = \sum_{k=1}^{n} B_c F_{jc} \tag{8}$$

with:

$$F_{jc} = \sum_{k=1}^{p^*} b_i X'_{ij} \tag{9}$$

where:

DWI_j = Decent Work Index (DWI) of the jth regency/city
F_{jc} = the cth factor score of the jth regency/city
X'_{ij} = the value of the ith indicator of the jth regency/city as a result of min-max normalization
j = 1, 2, …, 514 (number of regency/city)

5. Perform an uncertainty analysis to measure the robustness of the index. According to [26], an uncertainty analysis can be performed by finding the highest Spearman correlation between scenarios and the lowest average rank difference between scenarios. The scenarios in this study focus only on the differences in weighting, as follows:
a. Scenario 1: unequal weighting of indicators and factors.
b. Scenario 2: unequal weighting of indicators and equal weighting of factors.
c. Scenario 3: equal weighting of indicators and unequal weighting of factors.
d. Scenario 4: equal weighting of indicators and factors.
6. Validation by looking at the relationship between DWI and HDI as a measure that is considered valid and has been used worldwide [27]. The method to be used is the Pearson correlation.
7. Data visualization with tables and thematic maps. In addition, to facilitate the interpretation of the results, classification is performed using the Jenks Natural Break method.

The analytical method used to analyse the influence of education and the development of information and communication technology on decent work conditions in Indonesia in 2022 is multiple linear regression. The following are the stages of multiple linear regression analysis conducted [19], [28].

1. Perform model building. The dependent variable used is the DWI, which represents the condition of decent work. Meanwhile, there are three independent variables used, namely Mean Years of Schooling (MYS), the percentage of

individuals using computers, and the percentage of individuals using e-commerce. In this study, the multiple linear regression model formed is as follows.

$$\boldsymbol{DWI_j = \beta_0 + \beta_1\, RLS_j + \beta_2\, Computer_j + \beta_3\, E\text{-}commerce_j + \varepsilon_j} \quad (10)$$

where:

$\boldsymbol{DWI_j}$ = Decent Work Index (DWI) of the jth regency/city
$\boldsymbol{\beta_0}$ = intercept parameter
$\boldsymbol{\beta_k}$ = regression coefficient parameter of the kth independent variable
$\boldsymbol{MYS_j}$ = Mean Years of Schooling (MYS) of the jth regency/city
$\boldsymbol{Computer_j}$ = percentage of individuals using computers of the jth regency/city
$\boldsymbol{E\text{-}commerce_j}$ = percentage of individuals using e-commerce of the jth regency/city
$\boldsymbol{\varepsilon_j}$ = error of the jth regency/city
$\boldsymbol{j}$ = 1, 2, …, 514 (number of regency/city)
$\boldsymbol{k}$ = 1, 2, 3 (number of parameters)

2. Estimating regression coefficient parameters. This research uses Ordinary Least Squares (OLS) to estimate multiple linear regression coefficient parameters. The OLS method is a method that produces a least squares estimator. In addition, the OLS method also produces a BLUE (Best Linear Unbiased Estimator) estimator when the classical assumptions are met.
3. Testing classical assumptions includes checking normality, homoscedasticity, and non-multicollinearity. Normality testing is used to determine whether or not the distribution of errors is normally distributed. In this study, Kolmogorov-Smirnov is used as the normality test. Meanwhile, homoskedasticity test is used to see whether the error variance is constant or not. In this study, the homoscedasticity assumption test used is Breusch-Pagan. Then, the non-multicollinearity assumption is checked using the VIF value, which aims to see whether there is a linear relationship between independent variables.
4. Testing parameter significance and model goodness. The estimated regression coefficient parameters are then tested for parameter significance. The purpose of this stage is to statistically test the relationship between the independent variable and the dependent variable. Two tests are performed, namely simultaneous test and partial test. The simultaneous test uses the F-test, which aims to test the effect of independent variables simultaneously on the dependent variable. Meanwhile, the partial test uses the t-test, which aims to test the effect of the independent variables partially on the dependent variable. Finally, the goodness of the model is tested with the adjusted coefficient of determination (Adjusted R^2).
5. Interpretation of test results.

IV. RESULTS AND DISCUSSIONS

A. Constructing of The Decent Work Index of Regency/City in Indonesia in 2022

The Decent Work Index (DWI) is made up of fourteen indicators representing eight elements of decent work compiled by ILO. In addition, the data preparation stage includes determining the direction of the indicators and normalizing the data using the min-max method. The next step was to conduct a multivariate analysis using factor analysis. The first step of this analysis is to test the correlation that occurs in the indicators with Bartlett's test of sphericity, test the sampling adequacy with Kaiser-Meyer-Olkin (KMO), and test the data feasibility with Measure of Sampling Adequacy (MSA) and communalities. This test is performed using a process of adding and eliminating indicators until they meet the predetermined requirements. This process produces a value of Bartlett's Test of Sphericity with a p-value of 0.000, which means that there is a significant correlation between the indicators, so that the factor analysis can continue. Furthermore, the KMO value of 0.78 was obtained, which is on the criteria of sufficient data for factor analysis [22]. Meanwhile, the calculation of the MSA and the communities was carried out on each of the indicators that make up the DWI.

Table 2 MSA and Communalities Values of The Indicators

Indicators	MSA	Communalities
Employment-to-population ratio	0.82	0.76
Unemployment rate	0.87	0.70
Working poverty rate	0.61	0.65
Time-relate underemployment rate	0.85	0.55
Child labour rate	0.79	0.44

Indicators	MSA	Communalities
Informal employment rate	0.75	0.76
Percentage of population working in agriculture	0.73	0.78
Proportion of women working in managerial positions	0.63	0.59
Proportion of workers with disabilities	0.79	0.65
Youth not in employment, education, or training	0.46	0.76
Low pay rate	0.42	0.58
Gender wage gap	0.35	0.53
Proportion of workers who receive social security	0.47	0.83
Union density rate	0.81	0.32

Table 2 shows the MSA and community values of all the indicators that make up the DWI. According to [23], the eligibility of indicators is measured by the criteria of MSA values greater than 0.5 and communalities greater than 0.4. Based on these criteria, there are five indicators that do not meet the requirements, namely youth not in employment, education, or training, low pay rate, gender wage gap, proportion of workers who receive social security, and union density rate. Thus, testing the assumptions of the factor analysis led to the development of the next DWI with nine indicators representing the six elements of decent work.

The next step was to perform a factor analysis. First, the assumption of multivariate normality was tested using the Henze-Zirkler test. The processing results showed a p-value of 0.000, which means that the data did not follow a normal multivariate distribution. Therefore, Principal Component Analysis (PCA) was used as the factor extraction method. Furthermore, the determination of the number of factors is based on an eigenvalue greater than one and a cumulative variance percentage of at least 60 percent [20]. Based on these criteria, the number of factors formed is three factors with a cumulative variance percentage of 65.23 percent. However, the factors obtained are still difficult to interpret. Therefore, in order for each indicator to be appropriately included in the factor, rotation of the obtained loading matrix is performed. In this study, the factor rotation method used is the varimax method.

Table 3 Summary of DWI Factor Analysis Results

Numbers	Factors	Indicators	Loading Factor	% Variance Explained
1	Full and productive work	Employment-to-population ratio	0.87	36.32%
		Percentage of population working in agriculture	0.84	
		Unemployment rate	0.83	
		Informal employment rate	0.81	
		Child labour rate	0.62	
2	Rights at work	Working poverty rate	0.80	17.26%
		Time-relate underemployment rate	0.64	
3	Equal opportunity and treatment in employment	Proportion of women working in managerial positions	0.73	11.65%
		Proportion of workers with disabilities	0.58	

The next step is to interpret the factors formed by identifying the indicators that make up each factor. Based on Table 3, the loading value of each indicator is more than 0.5, which means that the indicator has a strong enough correlation value with its respective factor. Based on the percentage of variance explained, the full and productive work factor has a contribution of 36.32 percent, the rights at work factor is 17.26 percent, and the equal opportunity and treatment in employment factor is 11.65 percent. The first factor is called full and productive work because it consists of indicators

that represent the elements of employment opportunities, stability and security of work, and work that should be abolished, which are included in the full and productive employment pillar. This factor consists of five indicators, namely the employment-to-population ratio, the percentage of population working in agriculture, unemployment rate, the informal employment rate, and the child labour rate. Meanwhile, the second factor is called rights at work because it consists of indicators that represent the elements of adequate earnings and productive work and decent working time included in the pillar of rights at work. The second factor consists of two indicators, namely the working poverty rate and the time-relate underemployment rate. Furthermore, the third factor is called equal opportunity and treatment in employment because it consists of indicators that represent the elements of equal opportunity and treatment in employment. The factor consists of two indicators, namely the proportion of women working in managerial positions and the proportion of workers with disabilities.

The next step is weighting and aggregation. In this study, the weighting methods used are equal and unequal weighting as in Equations (4), (5), (6) and (7). Meanwhile, for aggregation, linear aggregation is used as in Equations (8) and (9). To determine the most stable combination of index construction, an uncertainty analysis is required. Based on the research [26], several combination scenarios were formed, such as data normalization, weighting, and aggregation methods. These scenarios were then tested by comparing the Spearman correlation and the average ranking difference between scenarios.

Table 4 Spearman Correlation Matrix Between DWI Scenarios

Scenarios	1	2	3	4	Average
1	1	0.937	0.991	0.954	0.970
2	0.937	1	0.900	0.990	0.957
3	0.991	0.900	1	0.932	0.956
4	0.954	0.990	0.932	1	0.969

Table 5 Average Ranking Difference Between DWI Scenarios

Scenarios	1	2	3	4	Average
1	0	40.210	14.323	33.202	21.934
2	40.210	0	50.339	15.891	26.610
3	14.323	50.339	0	40.856	26.379
4	33.202	15.891	40.856	0	22.487

According to [26], a stable and reliable scenario is one that maximizes the Spearman correlation coefficient and minimizes the average ranking difference between scenarios. Based on Table 4, it can be seen that all scenarios provide a correlation coefficient above 0.9 and the scenario that has the highest average correlation coefficient is Scenario 1. Furthermore, based on Table 5, it can be seen that the scenario that provides the lowest average ranking difference between scenarios is Scenario 1. Therefore, it can be concluded that Scenario 1 is the most stable and reliable scenario. Thus, the DWI is constructed using unequal weighting of indicators and factors to give weight according to their contribution, and linear aggregation to combine indicators and factors into index values. The following is the model of the Decent Work Index (DWI) that has been constructed:

$$DWI_j = 0.557F_{1j} + 0.265F_{2j} + 0.178F_{3j} \tag{11}$$

with:

$$F_{1j} = 0.219X_{1j} + 0.212X_{9j} + 0.209X_{2j} + 0.204X_{8j} + 0.157X_{7j} \tag{12}$$

$$F_{2j} = 0.556X_{5j} + 0.444X_{6j} \tag{13}$$

$$F_{3j} = 0.556X_{10j} + 0.444X_{12j} \tag{14}$$

where:

DWI_j = Decent Work Index (DWI) of the jth regency/city

F_{1j} = full and productive work factor score of the jth regency/city

F_{2j} = rights at work factor score of the jth regency/city

F_{3j} = equal opportunity and treatment in employment factor score of the jth regency/city

Theoretically, the concept of decent work has a close relationship with human development. Human development is an extension of the material freedom that people have [29]. In the context of employment, this freedom is related to an individual's ability to obtain a job. Therefore, to ensure that the resulting index is good, the DWI is correlated with the Human Development Index (HDI) as a measure of the success of human development in a region [27]. The result of the correlation analysis using Pearson correlation between DWI and HDI is 0.774. This value shows a positive relationship in the category of high relationship [30]. Thus, there is a relationship between DWI and HDI, which means that the higher the level of human development in a region, the higher the level of decent work produced.

B. Decent Work Conditions Based on the Decent Work Index (DWI) by Regency / City in Indonesia in 2022

The Decent Work Index (DWI) has a range of values between 0 and 100, with the interpretation that the higher the DWI value, the better the decent work conditions in the region. The DWI by regency/city is classified using the national average as a boundary to visualize the data distribution. This aims to highlight areas that still have the DWI below the average and those with the DWI above the average.

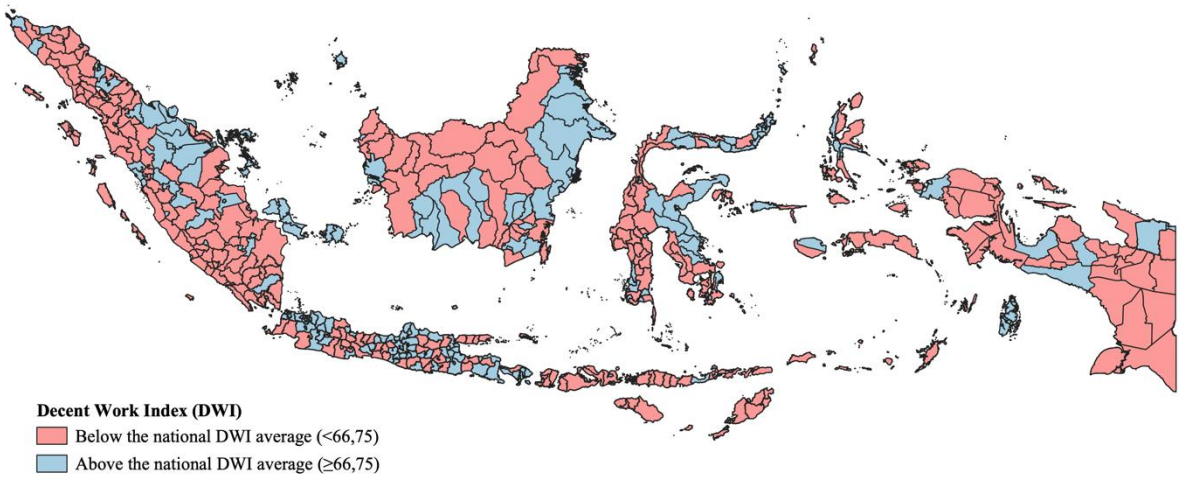

Figure 2 Classification map of regency/city in Indonesia based on DWI in 2022

Figure 2 shows a map of the distribution of regency/city based on the DWI classification in 2022. Based on these results, 276 regency/city are classified below the national DWI average and 238 regency/city are classified above the national DWI average. Based on the data distribution, regency/city in Java Islands dominates the regions with DWI above the national average. Meanwhile, regency/city in Nusa Tenggara Islands, Maluku Islands, and Papua Islands are dominated by regency/city with DWI below the average. However, regency/city in Sumatra Islands, Kalimantan Islands, and Sulawesi Islands have a more diverse DWI distribution, with a combination of areas both above and below the national average. By province, the regency/city in DKI Jakarta is already in the high DWI classification.

Table 6 Ten Regency/City in Indonesia with The Highest DWI in 2022

Rank	Regency/City	Score	Rank	Regency/City	Score
1	Denpasar City	77.15	6	Pekalongan City	75.43
2	Surakarta City	77.09	7	Batam City	75.26
3	Madiun City	75.89	8	Tangerang Regency	75.20
4	Semarang City	75.74	9	North Jakarta City	75.16
5	South Jakarta City	75.55	10	South Tangerang City	75.06

Table 6 shows the ten regency/city in Indonesia with the highest DWI in 2022. The regency/city with the highest DWI is Denpasar City, Bali Province, with a DWI of 77.15. When viewed based on the factors that make up the DWI, Denpasar City has the highest full and productive work factor score among other regency/city. This indicates that Denpasar City, as the main tourist city in Bali Province, provides employment opportunities for its residents. In addition, the low number of informal workers also reflects good job stability and security.

Table 7 Ten Regency/City in Indonesia with The Lowest DWI in 2022

Rank	Regency/City	Score	Rank	Regency/City	Score
514	Mamberamo Raya Regency	53.66	509	Empat Lawang Regency	56.32
513	Intan Jaya Regency	54.39	508	East Manggarai Regency	56.75
512	Mappi Regency	54.61	507	East Seram Regency	56.85
511	Deiyai Regency	54.90	506	Central Mamberamo Regency	56.88
510	Tolikara Regency	56.30	505	Mamasa Regency	57.29

Table 7 shows the ten regency/city in Indonesia with the lowest DWI in 2022. The regency/city with the lowest DWI is Mamberamo Raya Regency, Papua Province, with a DWI score of 53.66. Mamberamo Raya Regency is known as an area crossed by the largest river in Papua, the Mamberamo River. Therefore, Mamberamo Raya Regency has a high potential of natural resources such as fisheries and mining. However, its utilization for the absorption of decent employment opportunities has not been optimal. Based on the factors that make up the ILO, the score of the labour rights factor in Mamberamo Raya Regency is one of the lowest. This indicates that wages are not sufficient and working hours are not in line with standards.

C. The Influence of Education and The Development of Information and Communication Technology on Decent Work in Indonesia in 2022

In this study, the influence of education and the development of information and communication technology on decent work is analysed using multiple linear regression. The previously constructed DWI is used as the dependent variable representing decent work conditions. The variable representing education is Mean Years of Schooling (MYS). Meanwhile, the development of information and communication technology consists of the variables of the percentage of individuals using computers and the percentage of individuals using e-commerce.

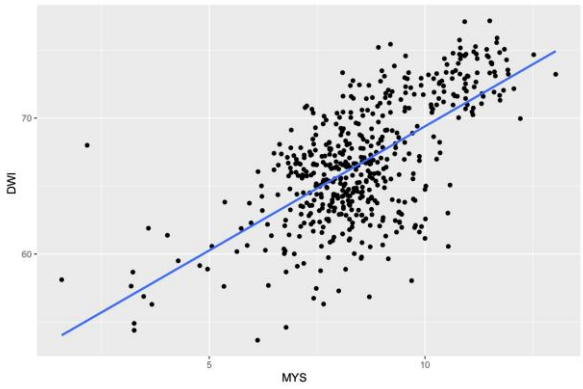

Figure 3 Scatter plot of Mean Years of Schooling (MYS) and DWI

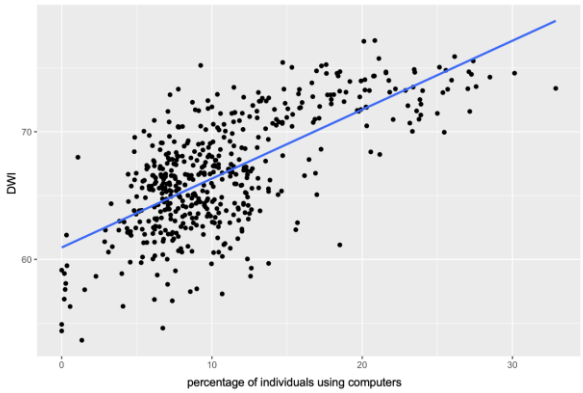

Figure 4 Scatter plot of percentage of individuals using computers and DWI

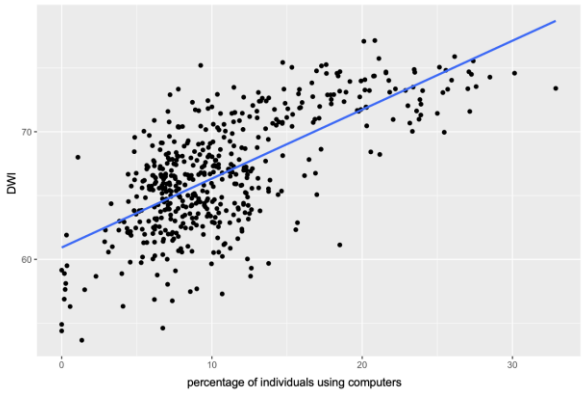

Figure 5 Scatter plot of percentage of individuals using e-commerce and DWI

Mean Years of Schooling (MYS) in a regency/city reflects the educational level of the population in that area. Increasing years of schooling is associated with better job quality and higher wages [31]. Figure 3 shows the relationship between Mean Years of Schooling (MYS) and DWI, which has a general upward trend, reflecting that an increase in MYS tends to be accompanied by an increase in DWI. This suggests that higher MYS tends to provide access to more decent jobs. The percentage of individuals using computers in a regency/city represents the access and infrastructure of information and communication technology development in the region. Figure 4 shows a positive relationship between the percentage of individuals using computers and DWI. This result is consistent with a report by OECD, which states that individuals with higher information and communication technology skills tend to have better jobs [32]. Thus, there is evidence that increasing the number of individuals using computers can expand their access to decent work. The percentage of individuals using e-commerce in a regency/city represents the usage aspect of the region's information and communication technology development. Figure 5 shows the trend that an increase in the percentage of individuals using e-commerce tends to be accompanied by an increase in DWI. This finding is consistent with research [33] that found a relationship between participation in e-commerce and an increase in the labour force. This suggests that an increase in e-commerce individuals may lead to greater employment opportunities.

The first step in multiple linear regression analysis is model building, as shown in Equation (10). Next, the regression coefficient parameters are estimated using the Ordinary Least Square (OLS) method. Table 8 summarizes the obtained estimation results. The use of multiple linear regression coefficient estimation results requires several assumptions to be met, namely normality, homoscedasticity, and non-multicollinearity. The purpose of this test is to determine the accuracy of the regression model in estimating the parameters. A regression model that satisfies the classical assumption test can be said to be the correct model and is the Best Linear Unbiased Estimator (BLUE). The normality test used in this study is Kolmogorov-Smirnov. The test produces a p-value of 0.6344, which is greater than 0.05. This means that at a 5 percent significance level, the error follows a normal distribution. Another classic assumption that must be met is homoscedasticity. This study uses the Breusch-Pagan test to test the homoscedasticity assumption. The result obtained a p-value of 0.0695, which is greater than 0.05. This means that at a 5 percent significance level, the variance of the error generated by the regression model is constant or the homoscedasticity assumption is met. Finally, the assumption of non-multicollinearity is checked to ensure that there is no correlation between the independent variables in the regression model. In this study, the multicollinearity test uses the Variance Inflation Factor (VIF) value with a VIF criterion greater than 10. MYS has a VIF value of 2.511, percentage of individuals using computers of 3.017, and percentage of individuals using e-commerce of 1.505. Based on the analysis results, all independent variables have a VIF value of less than 10. Therefore, the assumption of non-multicollinearity is met.

Table 8 Summary of Multiple Linear Regression Coefficient Estimation Results

Variable	Coefficient	Standard Error	t-Statistic	p-value
Intercept	53.849	0.851	63.254	0.000
MYS	0.899	0.127	7.076	0.000
Computer	0.206	0.040	5.174	0.000
E-commerce	0.272	0.033	8.338	0.000
Adjusted R-squared		0.5678		
F-statistics		225.7		

The next step is to test the significance of the parameters. There are two types of significance tests for parameters, namely simultaneous tests and partial tests. In this study, a 5 percent level of significance was used. The results of the simultaneous test with the F-test resulted in an F-statistic value of 225.7 with a p-value of 0.000. This means that at least one of the three independent variables has a significant effect on DWI. After the simultaneous test, the next step is the partial test using the t-test. Based on Table 8, it is found that the variables that significantly affect DWI are Mean Years of Schooling (MYS), the percentage of individuals using computers, and the percentage of individuals using e-commerce. The next step is to test the goodness of the model using the coefficient of determination with adjusted R^2. The estimation results in Table 8 show the adjusted R^2 value of 0.5678, which means that 56.78 percent of the total diversity of the dependent variable, namely DWI, can be explained by the independent variables, namely MYS, percentage of individuals using computers, and percentage of individuals using e-commerce. Based on research [34] , in social research, adjusted R^2 values between 0.50 and 0.99 are considered acceptable, especially when most of the independent variables are statistically significant. Based on the stages of multiple linear regression analysis that have been carried out, the following regression equation is formed:

$$\widehat{DWI}_j = 53.849^* + 0.899\, MYS_j^* + 0.206\, Computer_j^* + 0.272\, E\text{-}commerce_j^* \quad (15)$$

where:

$\widehat{DWI}_j$ = Decent Work Index (DWI) of the jth regency/city
MYS_j = Mean Years of Schooling (MYS) of the jth regency/city
$Computer_j$ = Percentage of individuals using computers of the jth regency/city
$E\text{-}commerce_j$ = Percentage of individuals using e-commerce of the jth regency/city

*) Significant at 5% level of significance

In this study, the level of education is represented by the Mean Years of Schooling (MYS) variable. The regression coefficient value of the MYS variable is 0.899, which means that a one-year increase in the average length of schooling increases the value of DWI by 0.899 units, holding other variables constant. This finding is consistent with research [35] that found a significant positive relationship between educational attainment and decent work. People with higher levels of education tend to find it easier to get the job they want [36]. The development of information and communication technology is represented by the variable percentage of individuals using computers and the percentage of individuals using e-commerce. The value of the regression coefficient of the variable percentage of individuals using computers is 0.206, which means that a one percent increase in the number of individuals using computers will increase the value of DWI by 0.206 units, assuming that other variables are constant. Thus, an increase in the number of individuals who own computers, which represents the state of information and communication technology infrastructure, can improve decent work conditions. This finding is consistent with research [37] that found that increased computer use can support the digital transformation process, which has a positive relationship with decent work. Meanwhile, the regression coefficient value of the variable percentage of individuals using e-commerce is 0.272, which means that a one percent increase in individual e-commerce users will increase the value of DWI by 0.272 units, assuming other variables are constant. These results are consistent with the research conducted [38], which states that the use of increasingly easy Internet access can be used by microenterprise actors to increase income by selling/buying online. This can increase people's access to wider employment opportunities.

V. CONCLUSIONS AND SUGGESTIONS

The results of the factor analysis show that the Decent Work Index (DWI) is composed of nine indicators grouped into three factors. The three factors are full and productive employment, rights at work, and equal opportunity and treatment in employment. Based on the uncertainty analysis, unequal weighting of indicators and factors provides the most stable results. In addition, DWI and HDI have a significant positive correlation, so the validity of the constructed index is fulfilled. Based on the distribution, it was found that DWI in regency/city in Nusa Tenggara Islands, Maluku Island and Papua Island were dominated by regency/city with low performance. In order, Denpasar City, Bali Province, is the city with the highest DWI and Mamberamo Raya District, Papua Province, is the district with the lowest DWI. Based on the results of multiple linear regression, an increase in Mean Years School (MYS), percentage of individuals using computers, and percentage of individuals using e-commerce provides a positive and significant increase in decent work conditions.

The government needs to further improve education programs, especially the implementation and monitoring of the 12-year compulsory education policy, and ensure the implementation of the Indonesia Smart Card (KIP) and Cash Transfers for Poor Students (BSM) programs. These policies can be prioritized in areas with low DWI performance such as regency/city in Nusa Tenggara Islands, Maluku Island and Papua Island. Policies related to the development of information and communication technology, such as the expansion of Base Transceiver Station (BTS) infrastructure and free ICT training and certification programs, also need to be improved. In addition, the use of the Internet, especially for e-commerce, needs to be protected through the strict application of the Consumer Protection Law and the Electronic Information and Transactions Law (UU ITE). For the BPS as a data collection institution, it is recommended to complete the collection of indicators related to decent work, so that for future research, indicators related to decent work that were not covered in this study can be added.

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