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ANALYSIS OF SOCIO-ECONOMIC IMPACTS OF THE COVID-19 PANDEMIC USING FACTOR ANALYSIS

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ABSTRACT

The purpose of this study is to identify the factors that influence the socio-economic impact of the COVID-19 pandemic. This study uses explanatory factor analysis which is an analysis that forms new random factors in which the later formed factors or constructs can be interpreted. The case study was conducted in Sawan Village, Sawan District, Buleleng Bali, with six variables explaining the economic impact and 16 variables explaining the social impact. The results of the study show that there are three factors that explain the economic impact due to COVID-19. They are the income factor, the purchase of quotas and gadgets, and the expenditure factor, with the total variance described being 82,178 percent. Meanwhile, the social impact of the COVID-19 pandemic is explained by three factors, namely the fear of interacting in public places, the fear factor of doing activities outside the home, and the fear of using public facilities with a total variance that can be explained is 73,609 percent.

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1. INTRODUCTION

The COVID-19 pandemic that broke out at the end of 2019 has plagued almost all over the world and brought changes to the world. The COVID-19 virus is an unknown and subsequent type of coronavirus. The virus (CoV) was identified by Chinese scientists on January 09, 2020 [1]. China first imposed restrictions on community activities starting January 13, 2020, to try to stop the spread of COVID-19. On the same day, the WHO reported a case in Thailand, which turned out to be the second country to have a positive patient after China. On January 17, 2020, the United States, Nepal, France, Australia, Malaysia, Taiwan, Singapore, and Vietnam confirmed their first cases of COVID-19 [2].

COVID-19 has become a world health problem, and WHO officially declared it a pandemic on 11 March 2020 [3]. Various efforts have been made to inhibit the spread of the COVID-19 virus in Indonesia, but these efforts have also hampered economic activities. The impact is a decrease in the level of social welfare in the community. After the Government has succeeded in showing the achievement of poverty reduction in recent years, the poverty rate has increased again after the COVID-19 pandemic. Without social assistance from the Government, the impact on the socio-economic situation of the pandemic could be much worse.

The COVID-19 pandemic has had a huge impact on various sectors, such as the travel industry [4], trade [5], tourism [6], [7], education [8], [9], [10] social and economic communities. The impact of COVID-19 has caused a decrease in health status to a very bad level. As shown in research [11], about 36% of the sampled Spanish population reported psychological impact as moderate to severe and stated the economic crisis had worst hit the well-being of the Spanish. Research results in India show the same thing based on the online survey study concluded that approximately one-third of the subjects had experienced substantial psychological distress [12]. The social impact caused by this pandemic creates new social behaviors in society, such as social distancing, avoiding public places, staying away from crowds, and maintaining an optimal distance of two meters from other people. The hope is that by keeping a distance from other people and avoiding crowds, the spread of this disease is expected to be reduced. The social impacts also lead to changes in voluntary travel behavior (VTBC) [13].

Bali, a major tourist destination where most of the population works in the tourism sector, experienced the most severe economic contraction compared to other provinces in Indonesia. The impact of Covid causes residents who work in the tourism sector to choose to return to their hometowns. Buleleng Regency is one of the regencies in which many residents migrate and work in the tourism sector. Once the pandemic hit Bali and brought down a major pillar of the island's economy, workers in the tourism sector flocked back to the villages. Since COVID-19 hit, workers in this sector have been forced to return home and switch professions as farmers, laborers, traders, and other jobs to survive. From previously earning at least five million rupiah per month, now there is no income at all. More than half of Bali's economy is directly dependent on tourism, while a quarter are involved in tourism-related activities, such as transporting tourists and supplying food to hotels and restaurants. Meanwhile, residents who do not work in the tourism sector also feel the socio-economic impact of the COVID-19 pandemic.

Research that discusses the impact of COVID-19 on the social economy of society includes research on the socio-economic impact of the COVID-19 pandemic on the ecotourism sector in the Savannah region of Ghana [7]. The method used is qualitative research, with research variables, namely the collapse of the community economy, business closures, and loss of livelihoods, as well as the decline in social activities. The results show that the main socio-economic impact of the pandemic is the loss of livelihoods, as this is closely related to tourism. Other research related to the impact of the COVID-19 pandemic refers to research on the socio-economic impact of COVID-19 on traders in the Klaten and Wonogiri markets [14]. The research variables are social banking policy and the decline in traders' income during the COVID-19 pandemic. The statistical method used is descriptive statistics, which shows that with the COVID-19 virus pandemic, there has been a decline in the economic sector, such as market traders experiencing a 50 percent decline in income. Based on the research above, researchers are interested in describing the characteristic variables that explain the impact of COVID-19 on the socio-economic community in Sawan Village, Bali, using the factor analysis method. So, the purpose of this research is to identify the factors that influence the socio-economic impact of the COVID-19 pandemic.

Factor analysis is a multivariate analysis technique that aims to analyze the structure of the relationship (correlation) among a large number of variables by defining the set of interrelated variables, known as factors or components [15]. This can be explained as follows. Suppose all variables in a group have a high correlation

among members of that group but have a low correlation with variables in other groups. So, it is conceivable that each group of variables represents one basic construct, or factor, which is responsible for the observed correlation [16].

2. RESEARCH METHODS

This research was conducted in Sawan Village, Sawan District, Buleleng Regency. It is assumed that the village has a population that is almost similar to other areas in terms of being affected negatively by the COVID-19 pandemic. The data in this study are quantitative and qualitative data obtained from primary sources, which are taken directly by researchers using questionnaires.

The population in this study was all heads of families in Sawan Village. The sampling method in this study was carried out by purposive sampling, in which the sample selection is carried out with certain subjective considerations based on several characteristics possessed by the sample and are considered to be closely related to the characteristics of the population that have been known previously [17]. The considerations used in selecting respondents in this study were residents willing to be interviewed. They provided the information requested by the researcher. The sample size was 120 respondents from 763 families in Sawan Village.

In this study, the impact of the COVID-19 pandemic is divided into two dimensions, namely the economic impact and the social impact. The economic impacts are explained by 6 indicators, and social impacts are explained by 16 indicators. The following are the steps of data analysis:

1. Test the feasibility of the questionnaire using validity and reliability tests.
2. Analyze the factors [15] with the following steps:

   a. Calculate the value of Bartlett's test

      Bartlett's test of sphericity is a test on the correlation between variables. This test will provide statistical significance, which shows the correlation matrix has a minimal significant correlation in several variables. Bartlett's test to test the hypothesis is as follows:

$$\chi^2 = -\left[(N-1) - \frac{(2p+5)}{6}\right] \ln|R| \qquad (1)$$

      where N is the number of observations, p is the number of variables, and $|R|$ is the determinant of the correlation matrix provided that the significance value obtained must be less than 0.05.

   b. Calculate the value of Kaiser-Meyer-Olkin (KMO)

      Kaiser-Meyer-Olkin is an index to compare the magnitude of the observed correlation coefficient with the partial correlation coefficient. The test is used to determine the adequacy of the sample for factor analysis. The formula used for this KMO test is as follows:

$$KMO = \frac{\sum\sum r_{ij}^2}{\sum\sum r_{ij}^2 + \sum\sum a_{ij}^2} \qquad (2)$$

      where:
      r_{ij} : correlation coefficient between variable *i* and variable *j*,
      a_{ij} : partial correlation coefficient between variable *i* and variable *j*,
      and provided that the KMO value must be greater than 0.5.

   c. Looking at the value *Measure of Sampling Adequacy* (MSA)

      The MSA value is very reasonable to include indicators in factor analysis by looking at measuring the level of interrelationship between variables. MSA value can use the following formula:

$$MSA_i = \frac{\sum_j r_{ij}^2}{\sum_j r_{ij}^2 + \sum_j a_{ij}{}^2}, for\ i \neq j \qquad (3)$$

      where:
      i : 1,2,3, … , p many variables,
      r_{ij} : correlation coefficient between variable *i* and variable *j*,
      $Research_{ij}$: Coefficient of partial correlation between variable *i* and variable *j*.

If the MSA value is more than 0.5, it indicates that the variable can be used and analyzed further, but if the MSA value is less than 0.5, then these variables cannot be analyzed further or must be discarded.

d. Perform factor extraction to generate a number of factors from existing data using principal component analysis.

e. Perform varimax factor rotation to simplify the structure by transforming the factors and then getting the factor pattern so that it is easy to interpret.

f. Interpretation of Factors

3. RESULTS AND DISCUSSION

3.1 Questionnaire Validity and Reliability Test

The first step before carrying out statistical analysis is to test the validity and reliability of the questionnaire. The validity test was carried out on the first 40 sample data by looking at the Pearson correlation value, while the reliability value was measured using Cronbach's Alpha value. The results of the validity test showed that all question items regarding the negative socio-economic impact of the COVID-19 pandemic were valid. This means that all question items accurately represent the dimensions of the negative socio-economic impact due to the COVID-19 pandemic.

Table 1. Cronbach's Aplha Test Results for the Negative Socio-Economic Impacts of the COVID-19

Reliability Statistics		
Dimension	**Cronbach's Alpha**	**N of Items**
Economic	0.751	6
Social	0.964	16

The results of the reliability test for the negative economic impact get the Cronbach's alpha test value of 0.751 and the social impact of 0.964. This value is greater than the minimum allowable value of 0.5. Therefore, it can be concluded that the question item to see the negative socio-economic impact due to the COVID-19 pandemic is reliable. The results of the validity and reliability tests on the tested questionnaires have been fulfilled, so this questionnaire can be distributed to the Sawan Village community.

3.2 Descriptive Characteristics of Respondents

Descriptively, it can be explained in **Table 2** below, namely, there are 120 respondents taken from three banjars (sub-community) in Sawan Village, with the average age of respondents being 38.5 years, the oldest respondent being 69 years old and the youngest 21 years. Judging from the income of respondents before the COVID-19 pandemic, the average was 4.46 million, with the highest income of 42 million and the lowest of 700 thousand. It can also be seen that the standard deviation for respondents' income before the pandemic was very large because some respondents had incomes that were much larger than others. This respondent previously worked on a cruise ship, which before the pandemic, earned a very high income. As a result of the pandemic, his job was turned into a laborer with an income of no more than 2 million a month.

Table 2. Summary of Data on the Characteristics of Sawan Community Based on Quantitative

	Data Summary of			
Statistics	**Income after Before Covid (Rp)**	**Income after Covid (Rp)**	**Dependents**	**Age**
N	120.0	120.0	120.0	120.0
Mean	4458000.0	1494833.0	3.2	38.5
Maximum	42000000.0	9000000.0	9.0	69.0
Minimum	700000.0	0.0	0.0	21.0
Std. Deviation	5198143.9	1418554.1	1.6	11.6

Based on respondents' income during the pandemic Covid, it obtained an average income of 1.5 million, a decrease of almost 3 million compared to the income before the pandemic. The respondent's highest income during Covid was 9 million. The lowest was without income. There are respondents who are unemployed due to the Covid pandemic, leaving them without any income. Meanwhile, judging from the number of dependents, the most have 9 dependents, and the least are without dependents.

3.3 Results of Factor

Table 3. Bartlett's and KMO Test Results Socio-Economic Impact of the COVID-19 Pandemic

KMO and Bartlett's			
		Economic	**Social**
KMO Test		0.696	0.944
Bartlett's Test of Sphericity	**Approx. Chi-Square**	270.191	1585.514
	Df	15.000	120.000
	Sig.	0.000	0.000

Factor analysis begins with testing assumptions, including the Bartlett, KMO, and MSA tests. This test is used to ensure that the data matrix obtained must have sufficient correlation in order to use factor analysis. The hypothesis for the Bartlett test is:
H_0: The correlation matrix is an identity matrix
H_1: The correlation matrix is not an identity matrix.

Table 3 shows the value of the Bartlett Test and KMO socio-economic impact. In Bartlett's test, both have a p-value of 0, which is less than 0.05, so the hypothesis H0 is rejected, and the correlation matrix formed is not an identity matrix, meaning that the variables have sufficient correlation to continue to factor analysis. For the KMO value of the economic impact (0.696) and the social impact (0.944), the value is greater than 0.5 so that the data has met the sample adequacy requirements and is feasible to proceed to factor analysis.

The next assumption test is to look at the MSA value, as summarized in **Table 4** and **Table 5** below. The MSA value for each indicator is greater than 0.5 so that each indicator has a strong enough relationship between indicators so that it can be continued to factor analysis.

Table 4. MSA and Communality Values for Economic Impact

Indicators	MSA	Communalities
1. Work impact of COVID-19	0.717	0.802
2 Food consumed daily	0.861	0.882
3. Impact on total income	0.637	0.876
4. Total daily	0.742	0.693
5. Internet quota	0.694	0.826
6. Spending on gadgets (mobile phones, laptop)	0.619	0.851

Table 5. MSA and Communality Values for Social Impact

Indicators	MSA	Communalities
1. Fear of communicating with others	0.922	0.736
2. Fear of shaking hands	0.919	0.792
3. Fear of praying in temples	0.906	0.849
4. Fear of children participating in face-to-face	0.957	0.631
5. Fear of participating in traditional activities	0.957	0.724
6. Fear of shopping at the market	0.948	0.781
7. Fear of eating at food stalls	0.939	0.747
8. Fear of traveling	0.969	0.774
9. Fear of working	0.959	0.588
10. Fear of letting children play outside the House	0.946	0.771
11. Fear of exercising (gymnastics, football, futsal, fitness)	0.646	0.736
12. Fear of recreation	0.925	0.697
13. Fear of going to treatment to hospital	0.942	0.842
14. Fear of using public transportation	0.956	0.735

Indicators	MSA	Communalities
15. Fear of going to public places, such as banks, government offices, etc.	0.943	0.669
16. Fear of visiting family or friends	0.952	0.706

The important value used to see the variance of each indicator is a communality value. The communality value shows the ability of each indicator to explain the formed factors. Communities that are less than 0.5 cannot be used in the analysis because they do not have sufficient variance to explain these variables [15]. The communality value for all indicators can be seen in Table 4 and Table 5. The communality value for each indicator is more than 0.5, which means that each indicator has a sufficient variance to proceed to factor analysis so that factor analysis can be continued to the next stage, namely factor extraction.

The purpose of factor extraction is to obtain new factors, which in this study are referred to as factors that affect the socio-economic impact of the COVID-19 pandemic. The factor extraction used is the component analysis by looking for the eigenvalues of each indicator in the dimensions. The indicator that has an eigenvalue greater than 0.7 is considered significant as a factor.

Table 6. Eigen Values of Socio-Economic Impact

Dimension	*Component*	Total	*% of Variance*	*% of Cummulative*
Economic	**1**	**3.060**	**50.997**	**50.997**
	2	**1.101**	**18.351**	**69.348**
	3	**0.770**	**12.829**	**82.178**
	4	0.507	8.449	90.626
	5	0.350	5.838	96.464
	6	0.212	3.536	100.000
Social	**1**	**10.042**	**62.764**	**62.764**
	2	**0.951**	**5.943**	**68.706**
	3	**0.784**	**4.903**	**73.609**
	⋮	⋮	⋮	⋮
	16	0.126	0.786	100.000

In each dimension resulting from factor extraction as shown in Table 6, which are factors with eigenvalues greater than 0.7. The three factors on the economic impact produce a cumulative variance percentage of 82.178 percent, and the three factors on the social impact produce a cumulative variance percentage of 73.609 percent. This means that the three factors in these two dimensions are able to explain the factors that influence the socio-economic impact due to the COVID-19 pandemic.

Indicators that explain each factor are described in the factor component. Efforts to obtain a simpler factor result then do a factor rotation. The result of factor rotation describes which indicators will be in the formed factor. In this study, orthogonal rotation using the Varimax method is deployed.

Table 7. Rotation Results using Varimax Method for Economic Impact

Indicators	Factors		
	1	**2**	**3**
1	**0.858**	0.243	0.082
2	0.131	0.170	**0.914**
3	**0.897**	0.099	0.249
4	0.551	0.165	**0.602**
5	0.253	**0.868**	0.095
6	0.089	**0.897**	0.197

Based on Table 7 and Table 8, the economic dimension shows that the largest loading is in indicator 2, while in the social dimension, the largest loading factor is in indicator 3. The first factor in the economic dimension will be filled by indicator 3 and indicator 1, in factor two will be explained by indicators 6 and 5, and indicators 2 and 4 in the third factor. Furthermore, on the social dimension, factor 1, in order from the

largest loading, is explained by indicators 1, 2, 4, 6, 7, 8, 10, and 15; factor 2 has indicators 3, 5, 11, and 16, and the third factor is explained by indicators 9, 13, and 14. The loading value is the value of the strength of the relationship between each variable and the construct that is formed. *Factor loading* has a significant value based on the number of samples used in the study, and the minimum significant loading factor is not less than 0.5.

Table 8. Rotation Results using Varimax Method for Social Impact

Indicators	Factors			Indicators	Factors		
	1	2	3		1	2	3
1	**0.816**	0.248	0.092	**9**	0.450	0.372	**0.500**
2	**0.844**	0.195	0.203	**10**	**0.649**	0.262	0.530
3	0.168	**0.886**	0.190	**11**	0.273	**0.650**	0.489
4	**0.543**	0.240	0.528	**12**	**0.712**	0.274	0.340
5	0.463	**0.692**	0.174	**13**	0.144	0.199	**0.884**
6	**0.656**	0.479	0.348	**14**	0.519	0.369	**0.574**
7	**0.596**	0.339	0.526	**15**	**0.574**	0.483	0.327
8	**0.707**	0.309	0.422	**16**	0.512	**0.522**	0.413

Table 9 is the result of factor analysis based on eigenvalues greater than 0.7, which have been sorted based on the largest loading value. The new components formed from the rotation of the factor are then named based on the indicators that compose them. The first factor with a cumulative variance percentage of 50.997 is named the income factor, which is composed of two indicators, namely the impact on income and the impact on employment. This shows that 50.997 percent of the diversity of the economic impact due to the COVID-19 pandemic can be explained by the income factor. This is in line with research **[18]**, which shows that, on average, the impact of COVID-19 is negative on the income side, thus increasing costs and having a negative impact on profits.

Table 9. Results of Factor Analysis for Economic Impact

Indicators	Factors	Eigen Values	Loading Factors	Names of Factor
3 (Impact on income)	1	3.060	0.897	Income
1 (Impact on employment)			0.858	
6 (Impact on internet quota)	2	1.101	0.897	Purchases internet quota and gadgets
5 (Impact on spending on gadgets (mobile phones, laptops))			0.868	
2 (Impact on food consumed daily)	3	82.178	0.914	Expenditure
4 (Impact on total expenditure)			0.602	

The second factor is composed of indicators of the impact on the purchase of internet quota and the impact on spending on gadgets (mobile phones, laptops) called the purchase of internet quota and gadgets factor. This factor can describe the total diversity of 18.351 percent. The last factor is also compiled by two indicators, namely the impact on food consumed daily and the impact on total expenditure, and is named the expenditure factor with the percentage of variance explained as 12.829 percent. Furthermore, the results of the factor analysis for the social impact of the COVID-19 pandemic are summarized in **Table 10**.

There are 16 indicators that explain the social impact of the COVID-19 pandemic. When viewed from the loading factor value, there is no value less than 0.5, with three factors formed, and the total percentage of diversity that can be explained is 73.609 percent. The first factor is explained by nine indicators, named the fear of interacting in public places, with the fear of shaking hands as the indicator that has the largest factor loading. The total diversity that can be explained by this first factor is 62.764 percent. The second factor is called fear of doing activities outside the home, explained by four indicators, and the third factor, described by three indicators, is named fear of using public facilities. The results of the same research were also obtained

[19] that the negative social impacts due to COVID-19 were that many events and activities were delayed and even canceled, reduced communication between communities, strained public relations, sick people became ostracized because of fear of contracting COVID-19, activity in the market has become quiet, places of worship and several other public facilities have been closed, acts of violence during COVID-19 have increased.

Table 10. Result of Factor Analysis for Social Impact

Indicators	Factors	Eigen Values	Loading Factors	Names of Factor
2 (Fear of shaking hands)	1	10.042	0.844	Fear of interacting in public places
1 (Fear of communicating with others)			0.816	
12 (Fear of recreation)			0.712	
8 (Fear of traveling)			0.707	
6 (Fear of shopping at the market)			0.656	
10 (Fear of children playing outside the house)			0.649	
7 (Fear of eating in food stalls)			0.596	
15 (Fear of going to places general)			0.574	
4 (Fear of children learning face to face)			0.543	
3 (Fear of praying in temples)	2	5.943	0.886	Fear of doing activities outside the home
5 (Fear of participating in traditional activities)			0.692	
11 (Fear of exercising in outside the home)			0.650	
16 (Fear of visiting family or friends)			0.522	
13 (Fear of going to the hospital)	3	0.784	0.884	Fear of using public facilities
14 (Fear of using public transportation)			0.574	
9 (Fear of working)			0.500	

4. CONCLUSIONS

The conclusions obtained based on the discussion above are the factors that affect the economic impact of the COVID-19 pandemic are the income factor, the quota and gadget purchase factor, and the expenditure factor, with the total variance described being 82.178 percent. The social impact of the COVID-19 pandemic is explained by the fear factor of interacting in public places, the fear factor of doing activities outside the home, and the fear of using public facilities, with a total variance that can be explained as 7.609 percent.

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