The Effect of Digitalization and Human Capital on Life Insurance Demand in Indonesia

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**Abstract.** The insurance industry has an important role in contributing to the rate of economic growth of a country which is directly related to the human resources and the implementation of industry revolution 4.0 through digital transformation. The aim of this study is to provide the evidence on the contribution of digitalization based on communication and information technology and human capital consisted of age dependency ratio, labor force, and life expectancy on life insurance demand in Indonesia. This study used the 16 years of annually data for the period from 2002-2017 and analyzed by using principal component regression for the research method. The result indicated that the digitalization and human capital have a significant effect on the demand of life insurance products at 5%. The findings shows that age dependency ratio has negative relationship with life insurance demand as hyphothesized. The labor force, life expectancy, individuals using internet and broadband subscription have positive impact on life insurance demand. Insurance industries are recommended to develop the human capital and their digital equipment to expand the bussiness.

**Keywords:** Digitalization, Human Capital, Life Insurance

**1 INTRODUCTION**

Life Insurance in Indonesia has become a necessity in the life of modern society today. In Indonesia, demand for life insurance continues to grow in line with increased income and public awareness of the importance of risk anticipation. To meet this demand, the number of life insurance companies is constantly increasing and so is the variety of products offered in the market. Thus, the life insurance industry began to contribute to the Indonesian economy even though it was still categorized as relatively low.

Digitalization is basically the result of technological developments that are currently developing very rapidly. Its main purpose is to provide convenience and efficiency both in all aspects, such as labor, costs, procedures and others. Digitalization is very synonymous with the use of electronics and computers. The presence of computer devices further simplifies and accelerates the growth of the digital world. Computerization is not only limited to computing devices. Now computerization can easily affect other devices, such as televisions and smartphones, have been computerized with the addition of operating systems like conventional computer devices. Salatin (2014) states the development of electronic sales make the insurance company becomes more toward product orientation compared with customer orientation. Previous research conducted in Kenya where Waita and Nairobi (2014) found a positive impact of technological developments on the growth of micro insurance period. Because Indonesia is a developing country where the last few years the development of technology whose usefulness is used in real life in everyday life, this is what makes the researchers stated that there is a significant influence on the existing insurance. Lin.HJ, Wen, MM, Lin , WT (2012) states that technology affects the cost efficient in the insurance industry that is only available in developed countries but not in developing countries.

Human capital is a combination of knowledge, skills, innovation, and a person's ability to carry out their duties so that they can create a value to achieve goals. The goals is related to the vision and target of the company. According to Campbell (1980), he said to optimal the purchase of insurance, it is really based on human capital uncertainty. Ostaszewski (2003) further stated that life insurance is a business of securing human capital that overcomes the uncertainty and lack of individual human capital.

The objective of this study is to investigate the impact of human capital and digitalization on the life insurance demand. In this study, human capital is measured by some variables namely life expectancy, labor force, age depedency as well as the digitalization is also measured by the number of individuals using internet and broadband subscription.

**2 Materials and Methods**

**2.1 Data**

The data used are secondary data that have dependent variables and independent variables. The dependent variable used is the number of life insurance requests calculated based on the many policies of life insurance (LI), that is, as the variable y. Various measures of life insurance demand have been used in empirical studies, such as premium spending, insurance density and insurance penetration (Beck and Webb, 2003). Dash (2018) investigated the life insurance demand by using the number of policy holder to see the demographic and socio-economic characteristics of life insurer. The independent variable used is human capital measured by 3 indicators, namely life expectancy (LE), labor force (LF), age dependency ratio (AD), and digitalization which are measured by 2 indicators namely the number of individuals using the internet (ID), and the number of broadband subscriptions (SB).

**2.2 Methodology**

The steps in data analysis are as follows:

1. Arrange the hypothesis in the form as follows.
2. H1: Life expectancy has a positive effect on demand for life insurance
3. H2: The number of workers has a positive influence on demand for life insurance
4. H3: Age dependency ratio has a negative influence on life insurance demand
5. H4: The number of individuals who use the internet has a positive influence on demand for life insurance
6. H5: The amount of broadband subscriptions has a positive influence on the demand for life insurance
7. Explore data with descriptive statistics.
8. See the relationship of each variable X with the variable Y using a scatter plot and see the value of correlation between independent variables.
9. Perform a regression analysis to determine the regression model with the least squares method
10. Check the non-multicollinearity assumption by looking at the VIF value, looking at the coefficient of determination (R2)
11. Handling multicollinearity problems if the assumptions of non-multicollinearity are not met with the Regression of the main components that are looking for eigenvalues ​​and eigenvectors,
12. Calculating the score of the main components, determine the number of main components to be used
13. Regressing between component scores obtained with the dependent variable
14. Returns the regression equation to the standard variable form
15. Calculate the standard error for each regression coefficient and test using the t test
16. Returns the regression equation to the original variable form
17. Interpret the main component regression model.

**2.3 Principal Component Regression**

The common form of multiple linear regression model with independent variables are as in the following equation (Montgomery dan Peck, 1992).

$$Y\_{i}=β\_{0}+β\_{1}X\_{i1}+β\_{2}X\_{i2}+…+β\_{p-1}X\_{i,p-1}+ε\_{i}… \left(1\right)$$

With : $Y\_{i}$ is the independent variable for the $i$-th observation, for $i=1,2,…, n$ ;
$β\_{0},β\_{1},… β\_{p-1}$ is the parameters; $X\_{i1}$, $X\_{i2}, …, X\_{i,p-1}$ is the dependent variables ; $ε\_{i}$ is the residual (error) for the observed i-th which is assumed to be normally distributed independently and identical with the average 0 (zero) and variance $σ^{2}$.

The method used to estimate the model parameters
Linear multiple regression is the least squares method or often also called the ordinary least square method (OLS). This OLS method aims to minimize the sum of squares error, OLS estimators for $β$ are as follows (Montgomery dan Peck, 1992).

$$\hat{β}=\left(X^{T}X\right)^{-1}X^{T}Y… (2)$$

This study examines the effect of human capital and digitalization on demand for life insurance. The variable of human capital consists of life expectancy, many workers, age dependency ratio. While the digitalization variable consists of many individuals who use the internet and broadband subscriptions. To test the hypothesis using linear multiple regression with the analysis model used in this study is:

$$LI\_{t}=α+β\_{1}LE+β\_{2}FL+β\_{3}AD+β\_{4}ID+β\_{5}BS…(3)$$

Multicollinearity is the linear relationship between independent variables X in multiple regression models. High multicollinearity causes the probability of accepting the wrong hypothesis to increase and the value of R squared is high but none or the few coefficients are estimated to be statistically important. The correlation coefficient between the X variable and the large VIF (Variance Inflation Factors) value is a characteristic of multicollinearity problems.

The principal component regression forms the relationship between the dependent variable and the principal component selected from the independent variable (Ul-Saufie et al. 2011). The principal component regression can solve the multicollinearity problem (Montgomery dan Peck, 1992). The model for principal component regression is as follows.

$$Y=w\_{0}+w\_{1}K\_{1}+w\_{2}K\_{2}+…+w\_{p}K\_{p}+v… \left(4\right)$$

With $K\_{1}, K\_{2}, …,K\_{3}$ is principal component explanatory variables, $w\_{0} $is intercept or intersection point of the Y, $w\_{1},w\_{2},…, w\_{p}$ is principal component regression coefficient, $v$ is error factor.

**3 Result and Discussion**

Equations should be centred and should be numbered with the number on the right-hand side.

**Fig.1.** The Age Dependency Ratio and Life Expectancy 2002-2017 in Indonesia

From Figure 1. It can be seen that age dependency consistently decreases and life expectancy continues to increase every year. Life Expectancy (AHH) is an estimate of the average additional age of a person expected to continue to live. AHH can also be defined as the average number of years a person has lived after the person reached his xth birthday. A commonly used measure is the life expectancy at birth that reflects the health condition at the time. So generally when talking about AHH, what is meant is the average number of years that someone will have lived since the person was born. Dependency Ratio is the ratio between the population aged 0-14 years, plus the total population 65 years and over (both referred to as not the labor force) compared to the number of population aged 15-64 years (labor force).

Following below is figure 2 which shows the labor force rate from 2002 to 2017.

**Fig.2.** Labor Force 2002-2017 in Indonesia

The labour force participation rates is the number of persons who are employed and unemployed but looking for a job divided by the total working-age population. Labor Force Participation Rate in Indonesia averaged 84,3 percent from 2002 until 2017, reaching an all time high of 87.9 percent in 2012 and a record low of 78.8 percent in 2003.

**Fig.3.** Individuals using Internet and Fixed Broadband Subscription 2002-2017 in Indonesia

Broadband refers to an internet bandwidth connection. The term bandwidth is generally used to refer to data transfer speeds, in terms of computer networks and internet connections. Data transfers are usually measured in bits per second (bps). In broadband internet connections, transfer speeds are very high compared to dial-up internet connections. There are various types of broadband internet connections, depending on speed, cost and availability.

Fixed broadband subscription refers to a fixed subscription for high-speed access to public Internet (TCP / IP connection), at downstream speeds equal to, or greater than, 256 kbit / s. This includes cable modems, DSL, fiber-to-the-home / building, other fixed bandwidth (cable) subscriptions, satellite broadband and terrestrial fixed wireless broadband. This total is measured regardless of payment method. This includes residential subscriptions and subscriptions to organizations.

**Fig.3.** The Number of Life Insurance Policy Holder 2002-2017 in Indonesia

In this study, the number of life insurance demand is calculated based on the number of policies. The demand for life insurance is fluctuating every year. The average increase in the number of life insurance policies annually is 7.7%. In 2008 an increase in the number of policies amounted to 39.64% and a decrease in the number of life insurance policies by -39.25%. Likewise in 2015 there was an increase in the number of life insurance policies by 35%. Below is the table of descriptive statistics.

**Table 1. Descriptive Statistics**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | Mean | Deviation Standard | Minimum | Maximum | Median |
| Age depedency | 51,36 | 1,88 | 48,53 | 54,13 | 51,26 |
| Labor Force | 84,28 | 2,92 | 78,84 | 87,92 | 85,33 |
| Life Expectancy | 69,26 | 1,45 | 66,60 | 71,06 | 69,51 |
| Internet | 11,60 | 9,00 | 2,13 | 32,29 | 9,42 |
| Broadband | 0,85 | 0,78 | 0,02 | 2,36 | 0,86 |
| Life Insurance Demand | 14,10 | 4,04 | 7,86 | 21,04 | 14,81 |

From the results of multiple linear regression analysis obtained an R squared value of 80,1%, indicating that the relationship between life insurance demand with the independent variable was 80,1% while the remaining 18,9% was caused by other factors. Henceforth it is necessary to do simultaneous tests and individual tests to see the effects simultaneously and individually between the independent variable and the dependent variable. From the analysis results obtained the calculated F value 8,07 with P-value 0,003 it can be said that the independent variables simultaneously affect the dependent variable. Table 3 shows the variance inflation factors (VIF) which indicated the multicollinearity problem.

**Table 2. Variance Inflation Factors among Variables**

|  |  |  |
| --- | --- | --- |
| No. | Variable | VIF |
| 1 | Age Depedency | 101,45 |
| 2 | Labor Force | 1,39 |
| 3 | Life Expectancy | 41,55 |
| 4 | Individuals use internet | 26,19 |
| 5 | Broadband Subscription | 55,45 |

According to Table 2. time series regression model produced a very large value of vif, which is more than 1. Multicollinearity also can be detected by calculating the correlation coefficient as Table 3 shown below.

**Table 3.** The Correlation Coefficient among Variables

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variables | Labor Force | Life Expectancy | Individuals use Internet | Broadband Subscription | Life Insurace Demand |
| Age Depedency | -0,45 | -0,98\* | -0,94\* | -0,97\* | -0,80\* |
| Labor Force |  | 0,48 | 0,43 | 0,41 | 0,31 |
| Life Expectancy |  |  | 0,88\* | 0,92\* | 0,77\* |
| Individuals use Internet |  |  |  | 0,98\* | 0,71\* |
| Broadband Subscription |  |  |  |  | 0,70\* |

From Table 3, almost all correlation coefficients between the 2 variables are greater than 0.5. This also proves that there are multicollinearity problems.

The next step is to perform a principal component regression analysis. In this analysis the initial step taken is to transform the independent variable $X$ into a variable Z by using the correlation matrix because it is assumed that the units used in the independent variable are not the same. In order to obtain new data with the variable Z. After getting the eigenvalue and the score of the principal component then determine which principal component meets the criteria of having eigen values greater than 1 ($λ>1$). PC1 is the principal components selected. Below is the scree plot related to determine the eigen value.



**Fig.4.** The Scree Plot of Eigen Value and the Component Number

The next step is to regress the dependent variable Y with the PC1, obtained a regression equation as follows.

$$Y=14,10+1,50PC1…(5)$$

The regression equation obtained from the standard variable is returned to the original variable form (with the X variable) so that the main component regression model is obtained as follows.

$$Y=46,11-19,95X\_{1}+11,89X\_{2}+34,28X\_{3}+5,73X\_{4}+0,07X\_{5}…(6)$$

The estimated regression coefficients of the variables in Model 6 are reported in Table 4 below.

 **Table 4.** The Coefficient and Calculated t test of Principal Components

|  |  |  |  |
| --- | --- | --- | --- |
| Variable Z | Coefficient | Deviation Standard $s\left(y\_{i}\right)$ | Calculated t |
| Z1 | -0,73 | 0,043 | -17,1721\* |
| Z2 | 0,41 | 0,021 | 17,1721\* |
| Z3 | 0,76 | 0,042 | 17,1721\* |
| Z4 | 0,71 | 0,042 | 17,1721\* |
| Z5 | 0,72 | 0,042 | 17,1721\* |

For the life insurance demand function, the test statistics indicate that most of the variables are statistically significant with the expected sign. It suggests that in the model 6, an increase of 1 percent of age depedency is associated with an decrease of about 19 percent in life insurance consumption. An increase of 1 percent of force labor is associated with an increase of about 11,9 percent in life insurance consumption. The coefficients of the number of broadband subscription, labor force, life expectancy and individual using internet have positive signs and in each case are highly statistically significant as expected. The coefficient of age dependency have negative impact and statistically significant on life insurance demands as hypothesized.

**Conclusion and Recommendation**

The growing demand of life insurance is inseparable from the influence of the increasing development on digital technology and human capital. Age dependency ratio, labor force, life expectancy, broadband subscriptions and individual using internet services are the variables which statistically affect the life insurance demand. It could be a consideration for the policy makers of insurance industry to start developing the online premium policy or the online claim system and their human capital index.

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