Relationship Modeling between Digital Literacy, The Use of e-Resources and Reading Culture of Students at STMIK Sumedang using PLS-SEM

Reny Rian Marliana[1], Leni Nurhayati[2]
{renyrianmarliana@gmail.com[1], leninurhayati82@gmail.com[2] }

STMIK Sumedang[1,2]

Abstract. In this paper a relationship model between digital literacy, the use of e-resources and reading culture of students at STMIK Sumedang is studied. The goal of study is to determine influence of digital literacy on the use of e-resources and reading culture of students, and the influence of the use of e-resources on reading culture of students. The modeling used Partial Least Square-Structural Equation Modeling (PLS-SEM). Parameters of the model are estimated by Ordinary Least Square Method with PLS-SEM Algorithm. This study took data from 256 questionnaires of students at STMIK Sumedang. The results showed that digital literacy significantly influence the use of e-resources and reading culture of students with the total effects are 0.529 and 0.223. Meanwhile the use of e-resources does not significantly influence the reading culture of students with the total effect is 0.187.

Keywords: digital literacy, e-resources, reading culture, pls-sem.

1 Introduction

Internet is the most popular source of information among students. The internet offers easier, faster and almost unlimited access to information compared to the textbooks. The results of a survey conducted by the Indonesian Internet Service Providers Association in 2016 showed 7.8% of internet users in Indonesia were students [1] . The change in reading culture explains that interest in reading is not only about how many textbooks are read, but how many online sources of information that have been read, distributed, discussed, stored and downloaded [2].

Students at STMIK Sumedang are more often looking for answers using Google's search engine compared to looking for it in the recommended reference book or modules that have been provided by lecturers. For example, in academic essay assignments with a particular topic, students tend to look for it on the internet without reading, understanding, processing, just click, copy, paste, then become the paper. Those actions are lead to plagiarising.

The ease of access and almost unlimited sources of information in the internet have a negative impact on students. Students become less selective in choosing the source of information which is used for completing academic assignments. One of them is the use of information from unreliable sources such as blogs, wordpress and others which do not include clarity of information sources as a reference. While on the internet, there are digital information sources called electronic resources (e-resources) that are open access and consist

of various types of e-books, e-journals, full text databases, database indexing and abstracting, e-images, e-audio, videos and others [3].

To avoid the plagiarising and those negative impacts, a special ability is needed to use various information in a digital format called digital literacy. When the students are digital literate, students will able to process various information, understand messages and communicate effectively in various forms. Digital literacy is inseparable from the reading culture of the students themselves. If the digital literacy and the reading culture of students increase, it is expected that the use of e-resources will be higher than the use of unreliable sources. Thus, quality of academic assignments will increase and it will impact on improvement of the quality of the students themselves and the quality of graduates.

Some studies showed that there is a significant relationship between digital literacy and the use of e-resources. Study in [3] showed that digital literacy has a high correlation with the use of e-resources. In addition, studies in [4], [5], [6], [7] and [8] showed that low use of e-resources caused by low digital literacy. Another studies showed that the use of e-resources has a relationship with the reading culture. Studies in [6] and [9] indicate that the use of e-resources can improve the reading culture of students. The use of e-books increases the time and frequency of reading students [10]. According to UNESCO in 2011, the concept of digital literacy refers to literacy activities that it is inseparable from reading, writing and mathematics [11] [12]. While digital literacy is needed to be able to overcome changes in reading culture in the digital era [2]. One component of digital literacy is the basic ability of digital literacy which includes the ability to read, write, understand symbols in representing languages and calculate numbers [3]. Then it is clear that digital literacy has a reciprocal relationship with the reading culture.

Analysis of the relationship between digital literacy, the use of e-resources and reading culture is not yet use a simultaneous modeling. Relationship modeling between these three variables is separate. Relationship modeling between digital literacy and the use of e-resources in [3] only used pearson product moment correlations and the analysis in [4],[5],[6],[7] and [8] used descriptive statistics. Separately, the relationship modeling between the use of e-resources and reading culture in [6], [9] and [10] also used descriptive statistics. Identifying the relationship between digital literacy and reading culture studied based on the definition of literacy in [2],[3],[11] and [12]

A model that can analyze the relationship between digital literacy, the use of e-resources and the reading culture simultaneously is needed. The relationship modeling can be use to know the effect of digital literacy on the use of resources, the influence of digital literacy on the reading culture of students at STMIK Sumedang, the effect of using e-resources on the culture of reading students at STMIK Sumedang.

One of the statistical analysis that can be used is Structural Equation Modeling (SEM). This analysis can be used on variables that cannot be measured directly such as digital literacy, the use of e-resources and reading culture called latent variables. Stuctural Equation Modeling (SEM) is a second generation multvariat data analysis technique that can be used to testing the relationship between latent variables. There are two approaches in SEM, i.e. CB-SEM and PLS-SEM [13],[14] and [15]. Covariance Based-Structural Equation Modeling (CB-SEM) is used when the goal of study is to test a theory, confirm a theory and compare several alternative theories with large sample sizes and normally distributed data [13],[14] and [15]. Partial-Least Square Structural Equation Modeling (PLS-SEM) is a nonparametric method that does not need distribution assumptions from data. PLS-SEM can be used on data that is not normally distribute. The PLS algorithm transforms abnormal data through the central limit theorem [15]. In other words, PLS-SEM can be used on data with small sample sizes like the

data that collected in this study. PLS-SEM has a level of statistical power and shows higher convergence compared to CB-SEM [15].

2 Partial Least Squares-Structural Equation Modeling (PLS-SEM)

Analysis on PLS-SEM is not different from CB-SEM. The difference lies only in the parameter estimation method and the absence of goodness of fit (GOF) testing on PLS-SEM. PLS-SEM consist of model spesification, parameters estimation, structural model and measurement model assessment. Similar to CB-SEM, the specification model on PLS-SEM is done by making a path diagram that illustrates the relationship between exogenous and endogenous variables (structural model / inner model) and the relationship between exogenous and endogenous variables on each indicators (measurement model / outer model).

The parameter estimation is done by using Ordinary Least Square (OLS) method with the PLS-SEM algorithm. While the structural model (inner model) and measurement model (outer model) assessment are done through the bootstrapping and blindfolding. The step of PLS-SEM in this study are :

2.1. Model Specification

Structural model (inner model) and measurement model (outer model) in this study is formed based on the relationship modeling between digital literacy and the use of e-resources in [3],[4],[5],[6],[7] and [8], the relationship modeling between the use of e-resources and the reading culture in [6], [9] and [10] and the relationship between digital literacy and the reading culture in [2],[3],[11] and [12].

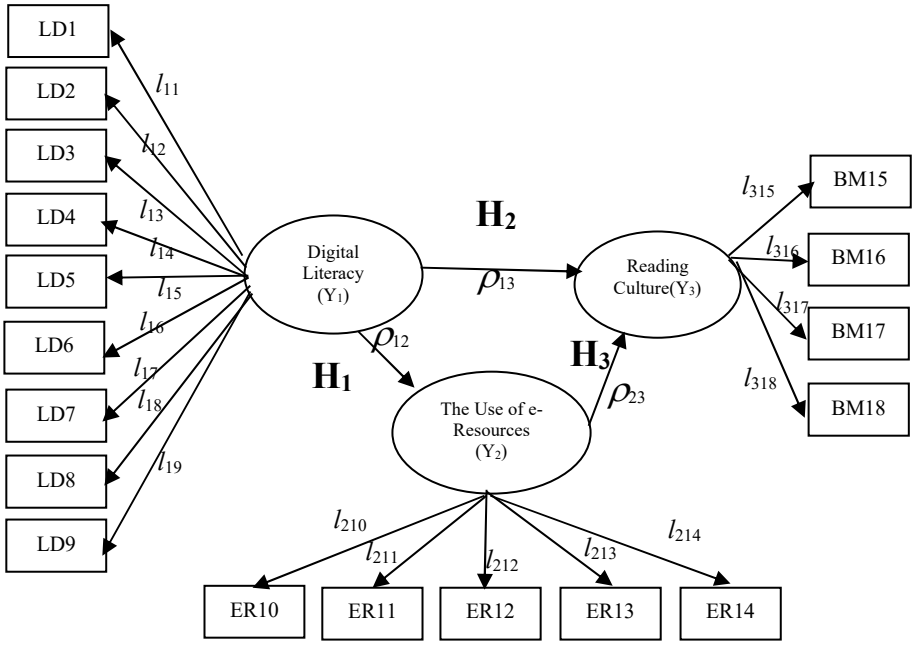

Figure.1. Model Specification and Hypothesis Research

2.2. Parameters Estimation

The parameters estimation of the model in Figureure 1 is carried out using the PLS-SEM algorithm based on the Ordinary Least Square (OLS) method [14]. The PLS-SEM algorithm is done using a partial regression model which is done iteratively in two stages. The first stage is the assessment of construct scores. The second one is estimating outter loadings (l), path coefficients (ρ) and R^2 values from endogenous latent variables. Outter loadings (l), estimated by simple regression on each indicator for each construct. While the path coefficients (ρ) and R^2 are estimated through regression analysis between endogenous variables. The PLS-SEM algorithm is stopped when convergence has been reached or the maximum value of the iteration number is reached.

2.3. Measurement Model (Outer Model) Assessment

Assessment of the measurement model in PLS-SEM built a non-parametric evaluation criteria and used bootstapping and blindfolding procedures. The assessment is to evaluate the validity and reliability of the measurement construct or indicator. In the reflective measurement model in this study, evaluation of the measurement model was carried out using internal consistency (composite reliability), reliability indicators, convergent validity (average variance extracted) and discriminant validity.

Internal consistency measurements are carried out using composite reliability statistics (ρ_c) which are calculated through:

$$\rho_c = \frac{\left(\sum_i l_i\right)^2}{\left(\sum_i l_i\right)^2 + \sum_i \mathrm{var}\left(e_i\right)} \tag{2}$$

with l_i is the standardized outer loading of the-i variable indicator in a particular construct, e_i is the measurement error of the-i and var(e_i) is the variance of the error measurement indicator of the-i indicator. Composite reliability values are in the range *0* to 1, the higher the value indicates the higher level of reliability. To say an indicator variable has sufficient internal consistency, the composite reliability value is must greater than 0.708 [14].

The higher value of outer loading in a construct indicates that the indicators in the construct have many similarities. These characteristics are referred to a reliability indicators. The value of outer loading on all indicators is must statistically significant with a minimum value of 0.708. When the value of the outer loading obtained is in the interval 0.4-0.7, it has to considered to be excluded from the model. With a note, if the removal of the indicator from the model can increase the composite reliability value and the value of average variance extracted (AVE).

Convergent validity can be measured using the AVE value and the value is must greater than 0.5. When the AVE value is greater than 0.5 then the construct average explains more than half (50%) of the variance of each indicator. But, if the AVE value is smaller than 0.5 then on average there are more errors compared to the variance explained by the construct.

The discriminat measurement validity can be done by using the indicator variable cross loadings value. The value of the outer loadings of an indicator variable is must greater than all the values of the outer loadings of the indicator variable compared to the other constructs.

2.4. Structural Model (Inner Model)Assessment

The structural model (inner model) assessment is carried out in several stages, collinearity testing, the significance tests of the relationship in the structural model and measuring the value of R^2. Collinearity testing is done by using VIF statistics which is must greater than 0.2 but smaller than 5. If the value is smaller than 0.2 or greater than 5, the construct has to considered to be eliminated from the structural model or combined in one other construct**.**

The significance tests of the relationship in the structural model are carried out using *t* statistics which are obtained after the path coefficients are estimated. The PLS-SEM algorithm produces a standardized path coefficient (ρ) value with a range of -1 to +1. The path coefficient value that approaches +1 indicates a strong positive relationship and if the value is close to -1, it shows a strong negative relationship [15]. The statistic *t* for the path coefficient (ρ_{ij}) between endogenous *i*-th and *j*-th latent variables with the standard se_{ij}* is obtained through the boostrap method:

$$t = \frac{\rho_{ij}}{se^*_{ij}} \tag{3}$$

The critical value when the sample size is greater than 30, two-tailed hypothesis and the significance level (α) 10%, 5% and 1% are 1.65, 1.96 and 2.57. When the value of *t* statistic that is obtained using the equation (3) is greater than the critical value, the path coefficient is significant.

The R^2, coefficient of determination is a measure of the accuracy of the prediction model which is calculated as a correlation value squared between the actual value and the predicted value of the construct of a particular endogenous variable. This coefficient shows the combined effect of exogenous latent variables on endogenous latent variables. The value is in the range of *0* to 1 with the criteria 0.75 high, 0.5 medium and 0.25 low [14].

3 Result and Discussion

This study took data from 256 questionaires of students at STMIK Sumedang. PLS-SEM analysis was carried out using SmartPLS 3 [16]. The parameter estimator that is obtained using SmartPLS 3 can be seen at Figure. 2.

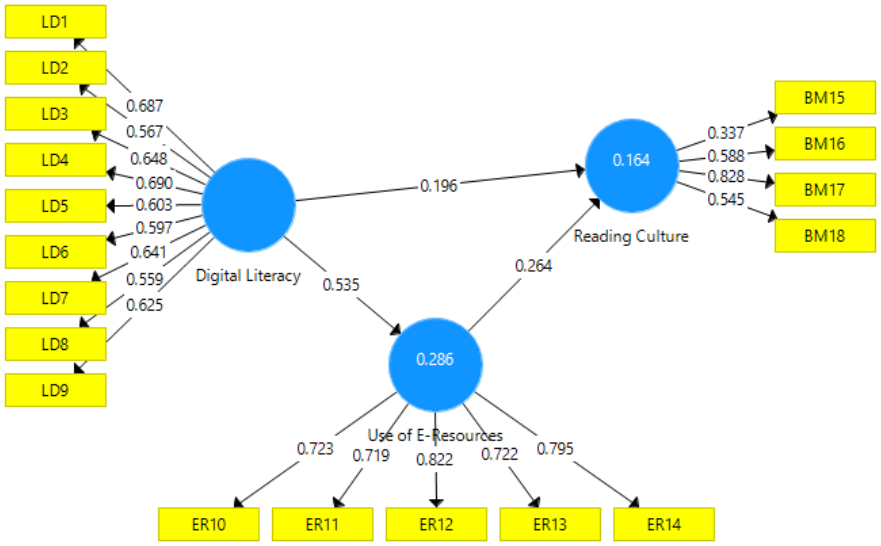

Figure.2. Parameters Model Estimator

The composite reliability for reading culture (Table 1) is less than 0.708. In adition, we get that there are indicators that have outer loadings between 0.40 and 0.70 (Table 2). These indicators should be considered to be removed from the model if and only if the removal leads to an increase in composite reliability and AVE. From this, we get an adjusted model (Figure.3) with removal of indicator BM15 and BM18 for Reading Culture, LD2 and LD8 for digital literacy. The removal of these indicators is increasing the composite reliability and AVE (Table 3 and Table 4).

Table 1. Construct Reliability and Validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Digital Literacy	0.805	0.806	0.852	0.392
Reading Culture	0.380	0.442	0.673	0.360
Use of E-Resources	0.814	0.819	0.870	0.574

Tabel 2. Outer Loadings

	Digital Literacy	**Reading Culture**	**Use of E-Resources**
BM15		0.337	
BM16		0.588	
BM17		0.828	
BM18		0.545	
ER10			0.723

ER11		0.719
ER12		0.822
ER13		0.722
ER14		0.795
LD1	0.687	
LD2	0.567	
LD3	0.648	
LD4	0.690	
LD5	0.603	
LD6	0.597	
LD7	0.641	
LD8	0.559	
LD9	0.625	

Table 3. Comparison of Composite Reliability

	Model Spesification (Figure.1)	Adjusted Model (Figure.3)
Digital Literacy	0.852	0.842
Reading Culture	0.673	0.790
Use of E-Resources	0.870	0.870

Table 4. Comparison of Average Variance Extracted (AVE)

	Model Spesification (Figure.1)	Adjusted Model (Figure.3)
Digital Literacy	0.392	0.433
Reading Culture	0.360	0.653
Use of E-Resources	0.574	0.573

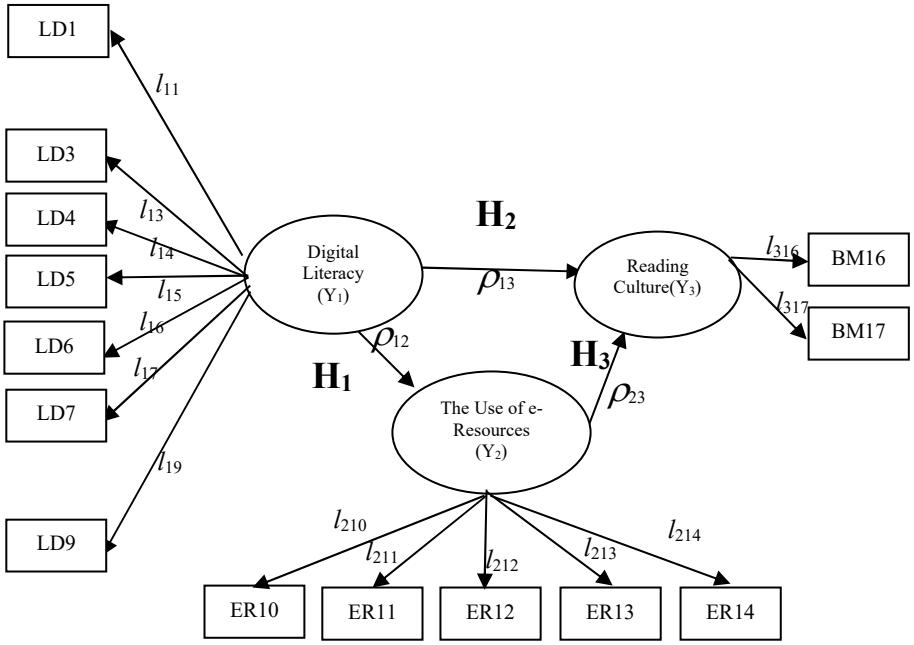

Figure.3. Adjusted Model Specification and Hypothesis Research

For the structural model assessment, the values of AVE for digital literacy, reading culture and use of e-Resources (Table 5) are greater than 0.2 but smaller than 5. It means that there are not colliniearity between these three latent variable.

Table 5. Inner VIF

	Digital Literacy	Reading Culture	Use of E-Resources
Digital Literacy		1.388	1.000
Reading Culture			
Use of E-Resources		1.388	

The significance tests of the relationship variables in the structural model (Figure.3) are carried out using *t-values.* With the critical value 1.96 we get that H_1 and H_2 at Figure.3 are accepted (Table 6). In other words, digital literacy significantly influence the use of e-resources and reading culture of students at STMIK Sumedang, with the total effect (Table 7) are 0.529 and 0.223. These significant relationships show a same outcome with the analysis of relationship of digital literacy and the use of reasources in [3],[4],[5],[6],[7] and [8], and the analysis the relationship between digital literacy and the reading culture in [2],[3],[11] and [12]. The amount of variance of the use of e-Resources and reading culture of students at STMIK Sumedang that are influenced by digital literacy are 27,9% and 12,9%. Meanwhile the

use of e-resources does not significantly influence the reading culture of students at STMIK Sumedang with the total effect (Table 7) is 0.187. This result give a different output with the analysis of relationship between the use of e-resources and the reading culture in [6], [9] and [10].

There for, we get the relationship modeling between digital literacy, the use of e-Resources and reading culture of students at STMIK at the Figure.4.

Table 6. The Significance Tests of The Relationship in The Structural Model

Hypothesis	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Digital Literacy -> Reading Culture	0.223	0.230	0.101	2.207	0.027
Digital Literacy -> Use of E-Resources	0.529	0.537	0.047	11.257	0.000
Use of E-Resources -> Reading Culture	0.187	0.183	0.114	1.642	0.101

Table 7. Total Effect

	Reading Culture	Use of E-Resources
Digital Literacy	0.322	0.529
Use of E-Resources	0.187	

Table 8. Coefficients of Determination (R^2)

	R Square	R Square Adjusted
Reading Culture	0,129	0,122
Use of E-Resources	0,279	0,276

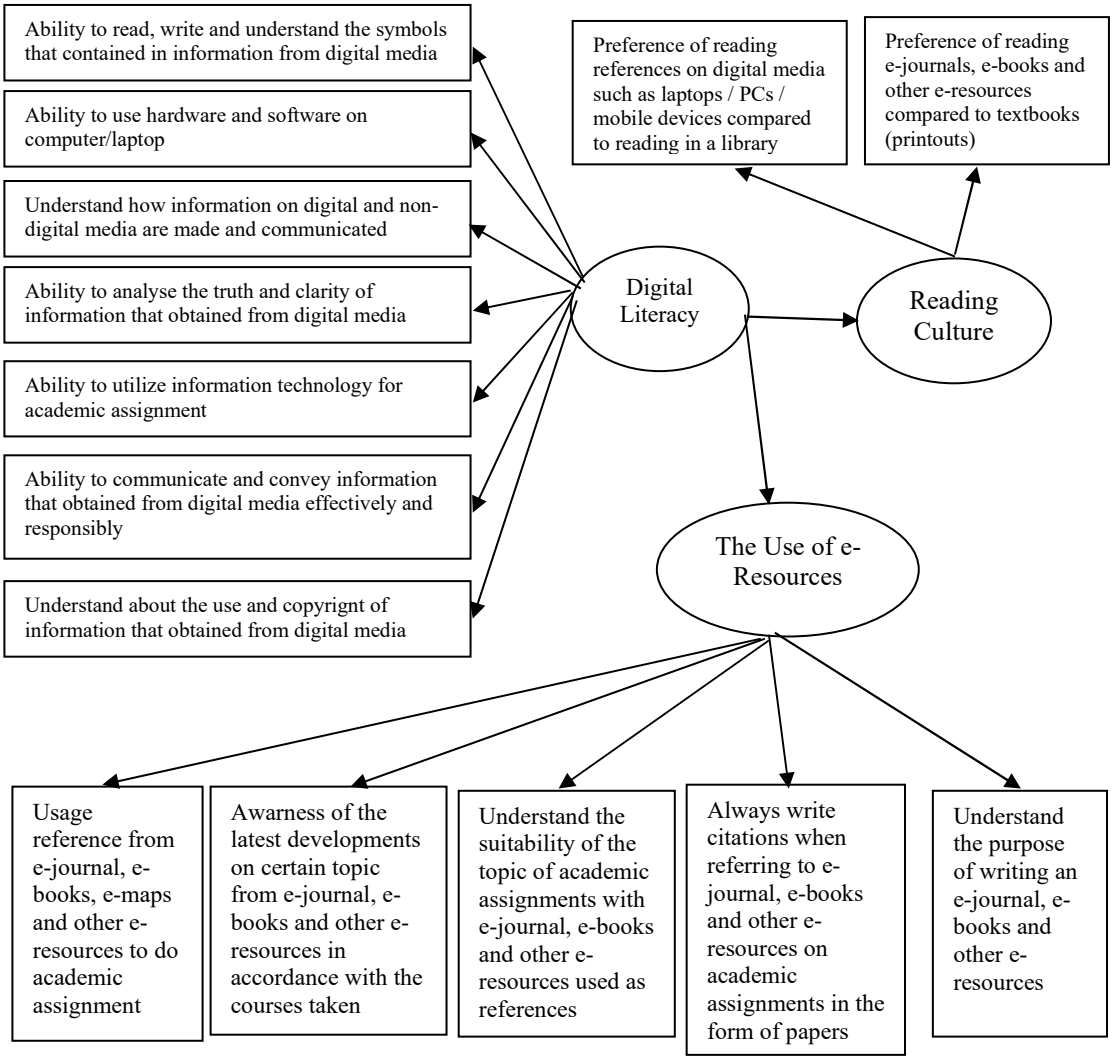

Figure. 4. Relationship model between Digital Literacy, The Use of e-Resources and Reading Culture of Students at STMIK Sumedang.

Acknowledgments.

The deepest gratitude to the Ministry of Research, Technology and Higher Education, Directorate General of Strengthening Research and Development, Republic of Indonesia, for research aid funds through PDP Program, 2019.

References

[1] A. P. J. I. Indonesia, "Penetrasi & Perilaku Pengguna Internet Indonesia, Survey 2016." pp. 1–34, 2016.

[2] N. Kurniasih, "Reading Habit in Digital Era : Indonesian People do not Like Reading , is it," *Web Cult. Forum'Site*, no. September, pp. 1–3, 2016.

[3] E. Nurjanah, A. Rusmana, and A. Yanto, "Hubungan Literasi Digital Dengan Kualitas Penggunaan E-Resources," *Lentera Pustaka*, vol. 3, no. 2, pp. 117–140, 2017.

[4] H. S. Egberongbe, "The Use and Impact of Electronic Resources at the University of Lagos The Use and Impact of Electronic Resources at the University of Lagos," *Library Philosophy and Practice (e-Journal)*. p. 472, 2011.

[5] A. Noreh, "Impact of Electronic Resources on Academic and Research Programs of the University." 2009.

[6] S. Bala, "Usage of Electronic Resources and Their Impact on Reading Culture : A Case Study of Punjab Agricultural University, Ludhiana," *Int. J. Digit. Libr. Serv.*, vol. 6, no. 3, pp. 59–66, 2016.

[7] T. Madondo, N. Sithole, and C. T. Chisita, "Use of Electronic Information Resources by Undergraduate Students in the Faculty of Management and Administration at," *Asian Res. J. Arts Soc. Sci.*, vol. 2, no. 2, pp. 1–12, 2017.

[8] M. Akussah and R. Adu-sarkodee, "Impact of Electronic Resources and Usage in Academic Libraries in Ghana : Evidence from Koforidua Polytechnic & All Nations University College , Ghana," *J. Educ. Pract.*, vol. 6, no. 33, pp. 33–38, 2015.

[9] S. A. Ajayi, "The Influence of Electronic Resources Use on Students' Reading Culture in Nigerian Universities : A Case Study of Adeleke University EDE, Osun State," no. December. p. 1182, 2014.

[10] V. N. Akpokodje and S. C. Ukwuoma, "Evaluating the impact of eBook on reading motivation of students of higher learning in Nigerian Universities," *Columbus IFLA WLIC*. pp. 1–15, 2016.

[11] Q. S. A. Dr. Rullie Nasrullah, Wahyu Aditya, Tri Indira Satya, Meyda Noorthertya Nento, Nur Hanifah, Miftahussuri, *Literasi Digital , Gerakan Literasi Nasional*. Jakarta: Kementrian Pendidikan dan Kebudayaan, 2017.

[12] M. Yanti, "Determinan Literasi Digital Mahasiswa : Kasus Universitas Sriwijaya," *Bul. Pos dan Telekomun.*, vol. 14, no. 2, pp. 79–94, 2016.

[13] K. K. Wong, "Partial Least Squares Structural Equation Modeling (PLS-SEM) Techniques using SmartPLS," *Marketing Buletin, 24, Technical Note 1*, pp. 1–32, 2013.

[14] M. S. Joseph F. Hair, G. Tomas M.Hult, Christian M.Ringle, *Partial Least Squares Structural Equation Modeling (PLS-SEM)*. United States of America: SAGE Publications, Inc, 2014.

[15] J. F. H. Jr, L. Hopkins, M. Georgia, and S. College, "Partial Least Squares Structural Equation Modeling (PLS-SEM) An Emerging Tool in Business Research," *Eur. Bus. Rev.*, vol. 26, no. 2, pp. 106–121, 2014.

[16] R. C.M., W. C., and B. J.M., "SmartPLS 3." Boenningstedt: SmartPLS GmbH, 2015.