

DEVELOPING AND VALIDATING THE MEASUREMENT MODEL FOR FINANCIAL LITERACY CONSTRUCT USING CONFIRMATORY FACTOR ANALYSIS

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Article History: Received on 28th January 2020, Revised on 26th March 2020, Published on 04th April 2020

Abstract

Purpose of the study: This study aims to develop and validate the instruments measuring financial Literacy construct.

Methodology: The pilot study randomly sampled some 100 school-teachers using a self-administered questionnaire. The Exploratory Factor Analysis (EFA) procedure has explored the usefulness of measuring items and determined the dimensionality of the construct. Finally, using the newly developed instruments, the field study obtained a random sample of 300 school-teachers to survey using a self-administered questionnaire. The data from the field were used to validate the instruments through the Confirmatory Factor Analysis (CFA) procedure.

Main Findings: The EFA procedure found three components that emerged from the items. The CFA procedure validated the instruments measuring Financial Literacy construct for uni-dimensionality, validity, and reliability.

Applications of this study: The result showed that the measurement model of the Financial Literacy construct achieved the requirement for construct validity and reliability and should be able to be used in the future of research.

Novelty/Originality of this study: This study produced instruments to assess Financial Literacy performance specifically among school teachers in Malaysia. School teachers consist of the highest number of employees in the country besides their nature of works and job characteristics differ from another group of employees.

Keywords: *Financial Literacy, Exploratory Factor Analysis, Confirmatory Factor Analysis, Validity, Reliability, Malaysia.*

INTRODUCTION

Financial literacy can play an important role in addressing the issue of financial management in a global environment. Briefly outlined by [Yew et al., \(2017\)](#) this phenomenon turns out to be a critical issue when most people do not have an effective way of managing their money. [Xu and Zia \(2012\)](#) claim that the low level of financial literacy occurs at all levels of social class regardless of different levels of countries' income includes low-middle, high middle- or high-income.

Commonly in Malaysia, these issues may lead to critical financial conditions to the consumer such as bankruptcy, poor financial planning, unable to save and many more. Various problems are occurring in society such as financial difficulties; financial hardships and poor financial well-being due to poor financial literacy among the public. In Malaysia, both young and older individuals have a lesser level of financial literacy education. They are not exposed much about the basic financial literacy education like concepts, with the thoughtful effect of saving, retirement planning, mortgages, and other decisions ([Moorthy et al., 2012](#)).

The survey by Bank Negara Malaysia (BNM) revealed that three out of every four Malaysians are having difficulties raising even RM 1,000 for an emergency. More surprisingly, the study found nine out of every ten households have no savings for emergencies besides having other debts of their own ([Nguie, 2016](#)). Also, the bankruptcies due to car loans have risen steadily between 2007 and 2015 as reported by the Malaysian Department of Insolvency.

According to the [Asian Institute of Finance \(2015\)](#), young Malaysian possessing poor financial knowledge and heavily financially indebted ([Murugiah, 2016](#)). Further, less than a quarter had any kind of investment. The survey also showed that a majority of Malaysians tended to spend for instant gratification instead of planning for the long term. This can be seen where only 40% of Malaysians considered themselves financially ready for retirement, despite the steadily increasing life expectancy of Malaysians. Therefore, it is important to study the level of financial literacy among Malaysians.

This paper intends to develop and validate the instruments for measuring Financial Literacy construct among Malaysian Working Adults (MWA). This study adapted the instruments from the previous study and modified to suit the present study. On top of that, the researchers had added a few more items to measure the construct. All items were measured using the ten-point interval scale using 1 for strongly disagree and 10 as strongly agree with the given statement. The interval-scale was employed to meet the assumption of parametric statistical analysis. The study has gone through Pre-test, pilot test, and field study. In the pre-test, content validity, face validity, and criterion validity have been obtained from the relevant expert. In the Pilot Study stage, the study obtained pilot study data and employed the Exploratory

Factor Analysis procedure, and in the field study stage, the study obtained data from the field. The data from the field was used to validate the constructs for validity (construct validity, convergent validity, and discriminant validity) and composite reliability.

LITERATURE REVIEW

Financial literacy refers to understanding finance and the capability to utilize it to make a sound personal financial decision (Hogarth and Hilgert, 2002). More specifically, it refers to the set of skills and knowledge that allow an individual to make informed and effective decisions through their understanding of finances. (Norman 2010). According to Remund (2010), financial literacy is a person's ability to understand and use financial matters.

Basic knowledge of financial concepts, and the ability to apply numeracy skills in a financial context, ensures that consumers can manage their financial affairs independently and respond appropriately to news and events that may have implications for their financial well-being (Morgan and Trinh, 2017). Financial literacy is considered an important adjunct for promoting financial inclusion, financial development and ultimately financial stability (Ramakrishnan, 2011). Besides, financially savvy investors are more likely to diversify risk by spreading funds across several ventures (Abreu and Mendes, 2010). According to Mahdzan and Tabiani (2013), increasing financial literacy and capability promotes better financial decision-making, thus, enabling better planning and management of life events such as education, housing purchase, or retirement.

Financial Literacy Dimensions

Financial knowledge is an integral component of financial literacy, but not identical to financial literacy (Huston, 2010). Meanwhile, Remund (2010) reviewed the conceptual definitions of financial literacy and determined that definitions fell into five categories: (1) knowledge of financial concepts, (2) ability to communicate about financial concepts, (3) aptitude in managing personal finances, (4) skill in making appropriate financial decisions, and (5) confidence in planning effectively for future financial needs.

Huston (2010) identified four main categories that emerged from these studies' definitions of financial literacy and knowledge: personal finance basics, borrowing, saving/investing, and protection. Huston proposed that financial literacy could be conceptualized as having two dimensions: understanding personal finance knowledge (theory) and using personal finance knowledge (application). Financial literacy, therefore, should be defined as measuring how well an individual can understand and use personal finance-related information.

On the other hand, according to Lusardi & Mitchell (2014) the most common way financial literacy is measured is using the time value of money, inflation, and risk diversification.

There is as yet no single standard measurement of financial literacy and/or financial knowledge. Nevertheless, previous studies agree that a lack of financial knowledge is a growing problem in the U.S. and other countries including Malaysia. The literature overview also shows that the terms "financial literacy" and "financial knowledge" often have been used interchangeably, but the current literature suggests that the two terms are not equivalent. To be considered financially literate, one must be able to use knowledge of personal finance to make sound financial decisions.

Exploratory Factor Analysis

Exploratory Factor Analysis (EFA) was conducted first before proceeding to subsequent analysis which is Confirmatory Factor Analysis (CFA) (Nasir et al., 2020). EFA has been one of the most widely used in statistical procedure especially in social science research. Research suggests that the EFA system provides a more accurate result when each common factor is represented by multiple measured variables that are exogenous constructor endogenous constructs in the analysis (MacCallum et al., 1999). In conducting EFA, the investigator has no expectations of the number or nature of the variables and as the title suggests, is exploratory. That is, it allows the researcher to explore the main dimensions to generate a theory or model from a relatively large set of latent constructs often represented by a set of items. EFA consists of principal component analysis (PCA) used for data reduction and did not differentiate between common and unique variance (Bentler and Kano, 1990).

Once the EFA procedure is applied, the author suppresses the value at the threshold of 0.60 or above as recommended by Hair et al. (2011). High factor loading shown an important indicator. Moreover, EFA suggested the factor loading into the same component besides reducing the number of variables involved in this study. Indicators composed in the same component connoted that this outer loading has a similar intention to reflect the measurement model. Once the authors execute the EFA procedure, this component will be employed in structural equation modeling (SEM). In this context, SEM has two models namely measurement model (for CFA approach) and structural model (for path estimate).

Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) is used for validating the factor loading and measurement involved in this study. In CFA, the researcher uses this approach to test a proposed theory (CFA is a form of structural equation modeling), or model and in contrast to EFA, has assumptions and expectations based on prior theory regarding the number of factors, and which factor theories or models best fit. Previously, EFA procedure is dependent on the outer loading solely, but this

approach is a concern at two folds namely factor loadings and fitness indexes. In other words, the high factor loading is inadequate to be accepted as long as the fitness index fails to meet the requirement. The assessment of the fitness index comprised three categories namely parsimonious fit, absolute fit, and incremental fit. Indeed, Analysis Moment of Structure (AMOS) package serves numerous fitness but the researcher deserves to choose any fitness so as long the fitness chosen represents each category. This is in agreement with [Dalila et al., \(2020\)](#) the use of at least one fitness index from each category of model fit. Therefore, the researchers should ensure both of these two folds meet the requirement. Also, the implementation of CFA ascertains the researchers to identify to what extent the strength of indicators and measurement model relates to financial literacy. Thus, the valid measurement model can help the researchers make a true interpretation based on their findings.

EFA and CFA Procedures

The study employed the Exploratory Factor Analysis (EFA) procedure to explore and assess the usefulness of items measuring the construct, and the Confirmatory Factor Analysis (CFA) to validate the measurement of the construct. The EFA procedure was carried out using data from the pilot study while the CFA procedure was carried out using data from the field study. This study adopted items measuring Financial Literacy construct from previous literature and modified the statement to suit the current study, and on of that, the study also added a few items which deemed suitable to measure Financial Literacy.

The EFA procedure would compute factor loading for every item, which indicates the usefulness in measuring the construct, as well as determine the dimensionality of items. The minimum acceptable value for factor loading is 0.60 ([Bahkia et al., 2019](#)). The EFA procedure also determines the Total Variance Explained for the construct. The TVE indicates how much the measuring items and their components manage to estimate the construct ([Mahfouz et al., 2019](#)). The minimum value for TVE is 0.60; in other words, the items and their components (if any) should be able to measure at least 60% of the construct ([Shkeer & Awang, 2019](#)). Finally, the study would compute the internal reliability for the measuring items through Cronbach Alpha. The internal reliability indicates how much the selected items are holding to each other in measuring the construct ([Rahlin et al., 2019a](#)). The minimum value of Cronbach Alpha is 0.7.

Once the items and their components are determined, the study used the retained items (items with factor loading greater than 0.6) and collect data from the field. Using this data, the study employed the CFA procedure to validate the construct. The CFA would determine the validity and reliability of the instruments for measuring the construct ([Mohamad et al., 2019](#)). Three types of validity are required under CFA procedure namely construct validity, convergent validity and discriminant validity ([Yusof et al., 2017](#)). As for reliability, using the CFA results, the researcher could compute the composite reliability for the construct ([Aimran et al., 2017](#)). The construct validity is determined using a set of fitness indexes produced by the CFA procedure. The fitness categories to be satisfied for construct validity are parsimonious fit, absolute fit and incremental fit ([Awang et al., 2018](#)). The summary of validity and reliability requirements are presented in Table 1.

Table 1: Type of Validity and Reliability

Validity	Name of Category	Threshold	Sources
Construct Validity	Fitness Indexes	Absolute Fit	Awang, 2015 and Awang et al., 2018 .
		Incremental Fit	
		Parsimonious Fit	
Convergent Validity	Average Variance Extracted (AVE)	AVE > 0.5	
Discriminant Validity	Discriminant Validity Index Summary		
Composite Reliability	CR	CR > 0.6	

RESEARCH METHODOLOGY

Sampling and data collection

This study employed a cross-sectional design to obtain data for the pilot study as well as a field study. The population of this study was school teachers in Kelantan and Terengganu, the two adjacent states on the east coast of peninsular Malaysia. The sampling frame was obtained from the education department of both states. The data was conducted in two stages namely, pilot study and field study. For both stages, the simple random sampling method was used to select a sample of 100 respondents for a pilot study and a sample of 300 for field study. The selected respondents were given a self-administered questionnaire through their school as well as an email address.

FINDINGS FOR THE PILOT STUDY

Reliability Analysis

The reliability of the scale is determined by computing the coefficient alpha. So, the traditional method specifically of Cronbach alpha was conducted to determine the reliability of the items included in the study. Based on [Nunnally's \(1978\)](#) suggestions, the better coefficient alpha is above 0.70 and this has also been admitted by [Sekaran and Bougie \(2010\)](#). He

states that the Cronbach alpha is a consistent coefficient which indicates that the relationships, among the items set, are proportionally correlated to each other. Besides, he contemplated that the reliability below 0.60 is considered a weak model.

Table 2: Reliability Analysis

Construct	Cronbach's Alpha	No of items
Financial Literacy	0.819	15

Table 2 represents the reliability analysis of the financial literacy construct. Cronbach's alpha value is 0.819 for 15 items in the questionnaire shows the construct items are acceptable and reliable in measuring the response.

Exploratory Factor Analysis (EFA)

The pilot study data has been analyzed for EFA procedure using IBM-SPSS 25.0. The extraction method used was Principal Component Analysis (PCA) and the rotation method used was Varimax (Variation Maximization). The EFA obtained Kaiser-Meyer-Olkin (KMO) value 0.868 as presented in Table 3. The KMO value reflects the sampling adequacy should exceed the minimum value of 0.6 ([Hoque et al., 2018](#)). The results in Table 2 also presented the value for Bartlett's Test of Sphericity. This value is significant since the p-value is smaller than 0.05.

Table 3: The KMO and Bartlett's Test Score

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.868
Bartlett's Test of Sphericity	Approx. Chi-Square	976.206
	df	55
	Sig.	.000

The EFA procedure also determined the number of components (or theme) that emerged for the items. The procedure would group items measuring a similar theme. The graph in Figure 1 indicates three components that should emerge which would divide the 15 measuring items for Financial Literacy into three distinctive components. The findings from this study would provide insightful information to the financial consultants and also the ministry of finance in Malaysia.

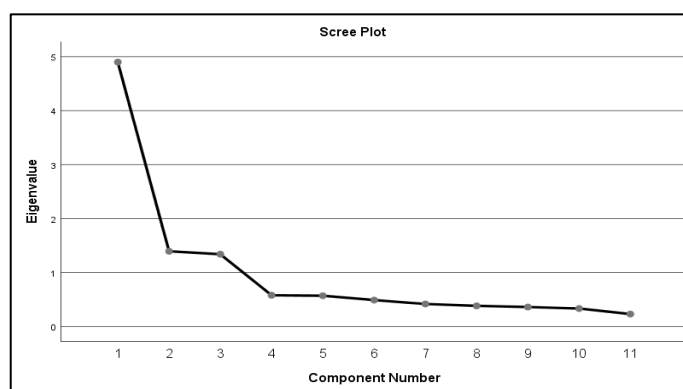


Figure 1: The Scree plot for financial literacy construct

Table 4 presented the three components that emerged with the eigenvalue for every component (column 1), the total variance explained for each component (column 2) and cumulative variance explained (column 3). The eigenvalue for each component should be greater than 1.0 and the cumulative variance explained should be greater than 60% ([Shkeer & Awang, 2019](#)).

Table 4: Total Variance Explained for every component

Total Variance Explained			
Component	Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	2.866	26.051	26.051
2	2.663	24.205	50.256
3	2.105	19.134	69.390
Extraction Method: Principal Component Analysis.			

The results in Table 4 showed the three components that emerged from the EFA procedure based on the computed Eigenvalue greater than 1.0. The eigenvalues obtained ranged between 2.866 and 2.105; the variance explained for component 1 is 26.051%, component 2 is 24.205%, component 3 is 19.134%. The total variance explained for measuring this construct is 69.390%. The total variance explained is acceptable since it exceeded the minimum requirement of 60%

(Rahlin et al., 2019a). Table 4 presented the three components that emerged with the respective items under each component.

Table 5: The Rotated Component Matrix for Financial Literacy Construct

Item Code	Item Statement	Comp 1	Comp 2	Comp 3
FL11	If the interest is 4% per annum, the saving of RM1000 will be RM1040 at the end of the first year.	0.768		
FL12	If monthly income is RM1000, it is advisable to save between RM100-RM300 per month.	0.792		
FL13	If monthly income is RM1000, the total installment for all loans must not exceed RM400.	0.818		
FL14	Given a loan RM1000 with a year with a 5% interest per annum, the amount payable is RM1050.	0.841		
FL21	High-risk investment offers high returns.		0.717	
FL22	The time horizon is an important consideration in investment decisions.		0.779	
FL23	The secured investment normally offer a lower return.		0.797	
FL24	The value of RM100 today will lower in the future.		0.805	
FL31	Inflation reduces buying power.			0.743
FL32	The rate of inflation is an important factor to consider in retirement planning.			0.826
FL34	Diversification of investment is important in order to reduce the risk of losing money.			0.794

Extraction Method: Principal Component Analysis

Rotation Method: Varimax with Kaiser Normalization

Table 5 presented the components, the items that fall under the respective component and also the factor loading for every item. The item factor loading should be greater than 0.6 for the item to be retained, otherwise, that particular item has to be deleted from the real study instruments (Awang, 2012).

Thus, the EFA procedure for exploring the measuring items for Financial Literacy Construct has resulted in three components with component emerged. Component 1 consists of four items, component 2 consists of four items and component 3 consists of three items. The total items retained were 11 from the total of 15 items proposed. The internal reliability of the scale is determined by computing the Cronbach Alpha as proposed by Nunally (1978). The internal reliability for the Financial Literacy construct which consists of 11 items is 0.819. This value is excellent since it exceeded the required value of 0.70 as proposed by Nunally (1978).

FINDINGS FOR THE FIELD STUDY

Confirmatory Factor Analysis (CFA)

Using the result from EFA, the study constructed the final questionnaire for field study. The questionnaire for Financial Literacy now consists of three components with 11 items. The first component consists of four items that have been renamed as Numeracy, the second component consists of four items that have been renamed as Time Money, and component 3 consists of three items that have been renamed as Inflation. The second stage of data collection collected the field study data using the same procedure (self-administered questionnaire) on 300 numbers of respondents.

The study validates the measurement model for Financial Literacy as a second-order construct measured with three components. The CFA procedure was conducted using IBM-SPSS-AMOS 24.0 with the Maximum Likelihood Estimator (MLE) algorithm. The MLE algorithm is fast, efficient and accurate (Awang, 2015; Awang et al., 2018). The results of the CFA procedure using MLE are presented in Figure 2.

Figure 2 shows the second-order construct for the measurement model of Financial Literacy. This construct has three components. The first component FLC1 represent Numeracy, the second component FLC2 represents Inflation, and the third component represents Time Money Value.

Hair et al. (2006) suggested that once the requirements of the measurement model fit had been met, it is necessary to inspect the construct validity and reliability of the model before continuing with the structural model. The measurement model of latent constructs needs to pass three types of validity namely Construct Validity, Convergent Validity, and Discriminant Validity (Hair et al., 2010). The Construct Validity is assessed through the Fitness Indexes of the Measurement Model, the Convergent Validity is assessed through computing the Average Variance Extracted (AVE), and Discriminant Validity is assessed through developing the Discriminant Validity Index Summary.

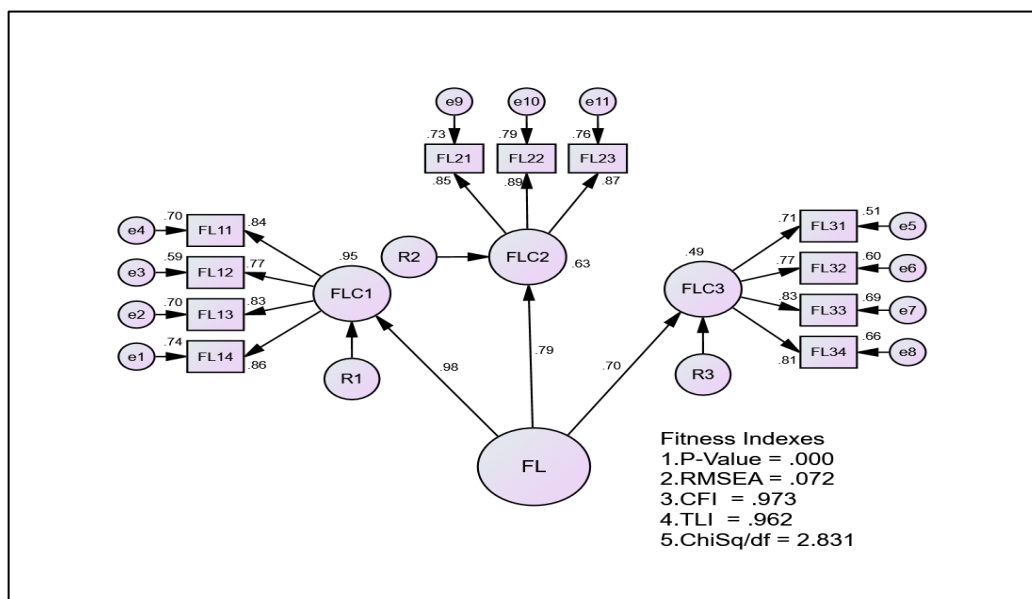


Figure 2: The CFA Results for Financial Literacy Construct

Construct Validity Assessment

According to [Awang et al. \(2018\)](#), construct validity is assessed through the fitness indexes. There are three fit categories to fulfill namely, Absolute Fit, Incremental Fit, and Parsimonious Fit. These three fitness indexes obtained from the CFA results in Figure 2 are presented in Table 5.

Table 6: The Assessment for Construct Validity

Construct Validity	Name of Category	Name Index	of Level acceptance	of Index Value	Comment
	Absolute Fit	RMSEA	< 0.08	0.072	Achieved
	Incremental Fit	CFI	> 0.9	0.973	Achieved
	Parsimonious Fit	Chisq/df	< 3.0	2.831	Achieved
	The measurement model of Financial Literacy has achieved the requirement for Construct Validity				

The fitness indexes in Table 6 have achieved the requirement of construct validity; thus, we can conclude that Financial Literacy is a valid construct. The convergent validity and composite reliability are computed using the factor loading for every item retained in the model after the CFA procedure. Table 6 presented the component, the items under every component, the factor loading for every item and the computed values for CR (composite reliability) and AVE (average variance extracted).

Table 7: The Composite Reliability, convergent validity and discriminant validity

Construct	Item	Factor Loading	CR (above 0.6)	AVE (above 0.5)	√AVE	Convergent Validity
FL	FLC1	0.98	0.868	0.692	0.832	Yes
	FLC2	0.79				
	FLC3	0.70				
FLC1	FL11	0.84	0.895	0.682	0.83	Yes
	FL12	0.77				
	FL13	0.83				
	FL14	0.86				
FLC2	FL21	0.85	0.903	0.757	0.870	Yes
	FL22	0.89				
	FL23	0.87				
FLC3	FL31	0.71	0.862	0.611	0.782	Yes
	FL32	0.77				

FL33	0.83
FL34	0.81

The results in Table 7 indicate the convergent validity and composite reliability for the Financial Literacy construct has been achieved when all values for CR are greater than 0.5 and all valued for AVE are greater than 0.6 ([Shkeer & Awang, 2019a](#)). Thus, the study can conclude that the composite reliability and convergent for Financial Literacy construct have been achieved.

Another validity requirement is Discriminant Validity. Since Financial Literacy is a second-order construct with three components, the study needs to assess the strength of the correlation between these three components. The discriminant validity for the Financial Literacy construct is achieved if the coefficient of correlation among the components does not exceed 0.85 ([Noor et al., 2015](#)). The coefficient of correlation between the components is assessed and presented in Figure 3.

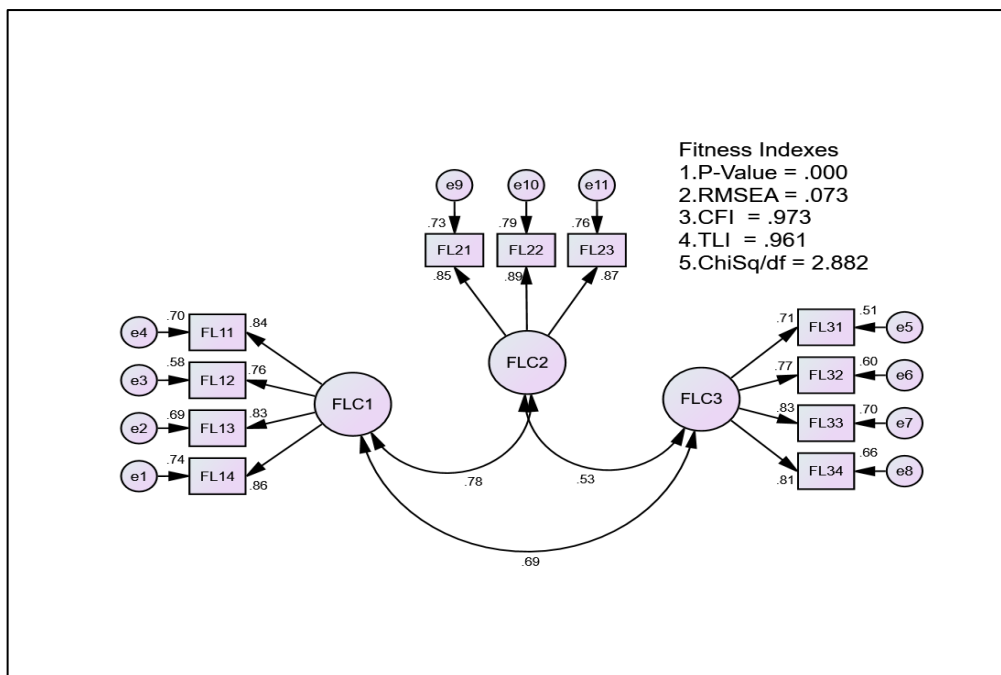


Figure 3: The Assessment of Convergent Validity for Financial Literacy Construct

Figure 3 presents the assessment of Discriminant Validity for Financial Literacy Construct. The IBM-SPSS-AMOS computed the correlation coefficient between all three components in the model. The results indicate the correlation coefficients between all components do not exceed 0.85. Thus, the study can conclude that the measurement model for Financial Literacy construct has achieved the discriminant validity.

The Assessment of Normality of the Items

Lastly, the study needs to assess the distribution of items measuring the Financial Literacy Construct. The study obtained the assessment of normality the distribution from the text-output of IBM-SPSS-AMOS and presented in Table 7. For the procedure using the Maximum Likelihood Estimator (MLE), the normality assessment is made using the skewness of the distribution since the algorithm is robust to skewed data. According to [Awang \(2015\)](#), the skewness values for all items should fall in the range between -1.5 to 1.5 for the data to be acceptable to be normally distributed, or at least the data distribution does not depart from normality distribution.

Table 8: The Assessment of normality of the Items

Variable	min	max	skew	c.r.	kurtosis	c.r.
FL23	1.000	10.000	-.837	-6.390	0.842	3.214
FL22	1.000	10.000	-.907	-6.931	0.813	3.104
FL21	1.000	10.000	-.862	-6.584	0.545	2.082
FL34	3.000	10.000	-.703	-5.369	0.281	1.073
FL33	3.000	10.000	-.509	-3.887	0.007	0.026
FL32	2.000	10.000	-.859	-6.558	0.994	3.796
FL31	2.000	10.000	-.935	-7.145	1.405	5.364

Variable	min	max	skew	c.r.	kurtosis	c.r.
FL11	1.000	10.000	-.975	-7.446	1.598	6.103
FL12	1.000	10.000	-.625	-4.771	0.724	2.765
FL13	1.000	10.000	-.920	-7.028	1.499	5.724
FL14	1.000	10.000	-.780	-5.959	0.807	3.080
Multivariate					87.451	48.371

Looking at the skewness values in Table 8, the study found all values fall within the range between -1.5 to 1.5; thus, we can conclude that the data distribution for items measuring the Financial Literacy construct achieved the normality assumption of parametric statistical analysis.

CONCLUSION AND RECOMMENDATION

The study has explored a substantial number of items for measuring the Financial Literacy construct. The developed and modified items have been subjected to pre-testing (expert verification was obtained), pilot testing (EFA has filtered the items) and field study (CFA has validated the items). The requirements for content validity, face validity and criterion validity for the instruments have been achieved through pre-testing. The requirement for KMO measure of sampling adequacy, Bartlett's Test for sphericity and Cronbach's Alpha for internal reliability have been achieved through Exploratory Factor Analysis procedure. Finally, the requirement for construct validity, convergent validity, and discriminant validity together with composite reliability and normality of items distribution have been achieved through Confirmatory Factor Analysis (CFA). Thus, the study has successfully developed and validated the instruments for measuring the Financial Literacy construct for practical use.

LIMITATION OF STUDY

This study only focuses on Kelantan and Terengganu states only which would not be able to generalize for the whole Malaysian workers adult population in terms of their Financial Literacy status. Besides, this present study was conducted on a cross-sectional research design that has a limitation of causality.

ACKNOWLEDGMENT

We would like to express the appreciation to the research participants for their response and feedback throughout the data collection process. Thank you so much.

AUTHORS CONTRIBUTION

Julaina Baistaman and Zulrahim Zulkifli wrote the research paper and design the organization of this paper; Zainudin Awang and Asyraf Afthanorhan perform the statistical analysis, interpretations and technical parts. Thus, all authors contributed equally to this research.

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