Journal of Optimization in Industrial Engineering
Vol.15, Issue 2, Summer & Autumn 2022, 305- 311
Doi:10.22094/joie.2022.1962136.1971

Research Article

Land Administrator Personal Competency Model Using Exploratory Factor Analysis

Azmi Rohani [a], Robiah Suratman[a,*], Durrishah Idrus [a]

[a] *Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia*

Received 29 June 2022; Revised 14 July 2022; Accepted 15 July 2022

Abstract

Land administrators play a significant role in enabling sustainable development; however, there is a scarcity of debates concerning soft skills competency in relation to the systems, laws and procedures. Moreover, insufficient information has been provided through past research that has targeted the development and validation of the core competencies of land administrators. The purpose of this study was to develop a land administrator personal competency model to measure the skills, attitudes and abilities involved in the performance of land administration. Land administrators' competencies were assessed in terms of how reliable and valid they were through reliability analysis and exploratory factor analysis (EFA). Via a questionnaire distributed online, descriptive research of the Johor Land Administration, Malaysia, was undertaken between May and July 2021. Forty-two items from three competencies – skill competencies, attitude competencies and ability competencies – were designated as the initial instrument for a new conceptual model based on the Land Administrator Personal Competency Model. The results showed that all three competencies of the instrument had high reliabilities (all had Cronbach's alpha values ± > .907). EFA revealed that the three factor-structures of skills, the three factor-structures of attitudes as well as the two factor-structures of abilities explained 63.828%, 63.074% and 62.364%, respectively, of the variance in the pattern of relationships among the items. All the factor-structures of the land administrator personal competencies instrument were confirmed through this study. With this information, the model developed might be useful for obtaining further information about land administrators' levels of performance through measurements of competencies involving the skills, mental approach and capability they display.

***Keywords*:** Land Administrator;Competency; Exploratory Factor Analysis; Sustainable Development

1.Introduction

The inability of civil servants to deliver their responsibilities may cause the civil service to gain an unwelcome reputation, which may thwart the government's approach and the credibility of the governance ecosystem may be affected. Therefore, the role of civil servants as agents of change must be enhanced through certain elements of employee behaviour and achievement, i.e., integrity, accountability and transparency (Mehrabian, 2000). In land administration systems, organisation is significant as it is key to delivering effective and efficient public services (Samsudin, 2020). Embracing the new era of technology leverage, there is a demand for land administrators in particular to be responsive to environmental problems and wise in making good decisions that align with the current changes and public demand. It is important to critically anticipate the new strategic approaches and produce more people-friendly decisions so that all planned state developments and designs are balanced by an adherence to land rules and regulations.

The interrelation between competency and effectiveness in the chain process leads to the need for the provision of competent human resources in order to perform the entire process and meet an organisation's goals. Benberahim *et al.* (2017) and Sefiani (2014) defined individual competencies as an individual's ability to combine and coordinate resources, to achieve organisational goals. Hence, an organisation needs to be responsible for providing as well as empowering a comprehensive strategy to develop personal competencies.

Determining the criteria of a competent individual can involve a conflict of perspective. This is a reflection of Taylor *et al.* (2009), who noticed that the debates on competency criteria and their evaluation methods had not been finalised. However, the minimum requirements of the competency criteria for basic human resources should at least be identified to ensure an organisation has a sufficient number of qualified employees. Thus, this study was conducted to identify the land administration competency sub-criteria and their components, via exploratory factor analysis, to develop a land administrator personal competency model.

2. The Criteria for Personal Competency in Land Administration

According to Coetzer and Sitlington (2013) and Dessler (2006), human resource development should lead to three main improvement areas, namely knowledge, attitude and skills. Harris (2002) proposed that to identify competent employees who will contribute to the organisation, they should be required to possess knowledge, skills and extensive experience so they are capable of making effective decisions for the organisation. Buoy (2002) and McLemore (2015) agreed, stating in their findings that the optimal use of skills, knowledge, experience and

*Corresponding author Email address: robiah@utm.my

motivation are necessary for maximum productivity and that this could influence organisational and employment performance levels.

He *et al.* (2016), Hoge *et al.* (2005) and David (1973) described competencies as consisting of four criteria, namely knowledge, skills, abilities and attitudes. Knowledge includes the necessary information, facts and principles to complete the task successfully (Ebisu & Ichise, 2019; Perkins, 2013; Mirable, 1997), which will be achieved by undertaking learning processes alongside a lot of experimentation. The term 'skills' refers to a person's psychological or practical capability to achieve any task with a specific output (Warr, 2020; Vernon, 2014; Marrelli, 1998), while ability expands or supports the skills involved in performing work, which spans a wide range of job scopes (Marrelli, 1998). Hence the interrelated nature of the knowledge and skills involved in the job scope; these include completing forms and addressing abstract concepts, like being a team meeting facilitator (Lucia and Lepsinger, 1999).

Other than that, attitude is an equally important land administrator personal competency. Attitude is acquired naturally and likely to be shaped and nurtured through certain methods. Attitude determines the actions of an individual in the organisation. Based on the work of Schiffman and Kanuk (2004), attitudes are acquired predispositions to act in a consistent manner towards a particular topic or item, whether favourably or otherwise. A further description of attitudes was given by Jayalath (2016), who deemed them psychological and neutral states of readiness whose organisation depended on certain experiences. These would directively or dynamically affect how an individual behaved towards all the targets and circumstances they encountered. In practice, concepts like values, judgements, views, emotions, opinions, intentions and intentions are interchangeably used with the term attitude. The presence of different attitudes plays a significant role in many applications, so measurements would help to vital decisions to be made in different domains (Jayalath, 2016). In short, through attitude, organisations can evaluate and assess the performance of individuals.

Lauby (2013) defined ability as an individual demonstration of quality while doing things. There is a fine line between ability and skill. Ability is a skill acquired naturally by an individual, while skill is a talent acquired through learning and experience. According to Appelbaum and Fewster (2002), abilities are the necessary traits for performing specific activities, while determining whether a person is capable depends on their current qualities. In summary, the criteria of the knowledge, skills, attitudes and abilities of an individual in an organisation will influence their behaviour, which affects their performance and that of the organisation.

As a result of an extensive search of past studies and discussions on the topic of land administration personal competency, 15 sub-criteria of skills, 15 sub-criteria of attitudes and 12 sub-criteria of abilities were reviewed, added to and verified through a focused group discussion consisting of experts and practitioners in the land administration and development field. Adhering to the method of this study, the criteria of knowledge in the land administration personal competency concept will be discussed separately. Therefore, the following sections explain the competency sub-criteria of skills, attitudes and abilities. These were identified and accepted by the experts and practitioners, so they could be applied for the development of a land administration personal competency model.

Table 1
The list of verified sub-criteria of the personal competency of land administrators

Items	**Sub-Criteria**
Skills	
A1	Skill of giving instructions
A2	Skill of risk management
A3	Skill of active action
A4	Skill of evaluating and making decisions
A5	Skill of understanding and influencing
A6	Skill of adapting
A7	Skill of carrying out duties and responsibilities
A8	Skill of knowledge sharing
A9	Skill of understanding and adhering to regulations
A10	Skill of being supportive
A11	Skill of coping with pressure
A12	Skill of technology knowledge enhancement
A13	Skill of being proficient in using systems and modern technology
A14	Skill of being organised by priorities
A15	Skills of collecting, analysing and synthesising information, doing assessments and preparing proposals
Attitudes	
B1	Attitude of being responsive and willing to problem-solve
B2	Attitude of being reliable
B3	Attitude of being meticulous, detailed and focused
B4	Attitude of being creative and innovative
B5	Attitude of being logical and reasonable
B6	Attitude of being ready for challenges and pressures
B7	Attitude of being controlled by emotions and behaviours
B8	Attitude of being dynamic and open-minded
B9	Attitude of being committed in accomplishing tasks
B10	Attitude of being smart and thoughtful
B11	Attitude of being independent
B12	Attitude of being diligent and earnest
B13	Attitude of being accountable in leadership
B14	Attitude of being trusted, honest and ethical
B15	Attitude of being neutral and equitable
Abilities	
C1	Ability to review and understand oral information
C2	Ability to deliver information
C3	Ability to review and understand written information
C4	Ability to deliver information in writing
C5	Ability to deliver information in a clear and easily understandable way
C6	Ability to give attention to responses and feedback
C7	Ability to observe and review in short sight
C8	Ability to make deductive determinations
C9	Ability to conduct inductive reasoning
C10	Ability to selectively concentrate when making decisions
C11	Ability to cooperate and collaborate
C12	Ability to actively enhance knowledge and skills

Referring to Table 1 above, the additional sub-criteria of skills and attitudes have been emphasised by experts and practitioners to ensure a wise, fair (neutral) and non-biased element in making decisions related to land administration. Procedurally, these verified sub-criteria of the land administration personal competency were distributed to the group targeted in the study.

3. Methodology

In the current research, the purposive sampling method was employed since a small number of individuals are able to become primary sources of data. This is because of the characteristics of a particular study, such as its design, targets and goals. The authors deliberately choose the study area and those who participate so that a phenomenon can be reviewed deeply (Creswell, 2005). According to Kamarul (2015), as well as Bailey and Bailey (2006), the number of respondents chosen for purposive sampling may be minimal, but the most important aspect is that the selected respondents must be knowledgeable for the systematic studies to succeed. This study involved 166 respondents from the Johor Civil Service, all of whom had a background in land administration from grade N41 to Turus III. The survey consisted of 53 Johor Civil Service personnel who were serving in land administration at the time of writing and 113 Johor Civil Service personnel who had served in land administration for more than a year before transferring to other fields.

4. Exploratory Factor Analysis (EFA)

Factor analysis is conducted on the items of a study to classify the items according to the structure of factors (Hair *et al.,* 2010) and to assess the accuracy of the subsequent analysis (Chua, 2009). Factor analysis is an appropriate method of analysis for identifying, reducing or rearranging the variables involved to identify their relationships with each other (Yong and Peace, 2013; Chua, 2006). It was also stated by Hair *et al.* (2010) and Chua (2009) that the statistical method of factor analysis can be employed when analysing inter-variable relationships, as well as describing differences between variables that are being observed and correlated in regard to factors. These unobserved variables might be fewer in number than the observed variable. The advantage of applying factor analysis is it will reveal the implied factors of a large group of independent variables. This form of analysis aims to identify the scale of the importance, significance and satisfaction of a factor. Factor analysis seeks to summarise or minimise a large set of items into a smaller set of factors (Ayob, 2005). Hence, factor analysis enables researchers to identify a concept that is difficult to measure through a simple calculation. Simply put, factor analysis is simplified by collapsing large items into smaller and easy interpretable factors (Rahn, 2018). This analysis method uses SPSS software, which is known as a data reduction technique (Doling *et al.,* 2006).

Exploratory factor analysis (EFA) can be described as an order to summarise interrelated variables. It is a variable reduction technique that shows the number of latent constructs and the structure of the factors underlying a set of variables (Hair *et al.,* 2010; Chua, 2009). According to Child (1990), EFA is used to explore the structure of the factors that might underlie a set of variables without forcing the structure to be formed. Thus, EFA must be employed to reveal the latent structure underlying scale development research (Orcan, 2018; Schumacker and Lomax, 2010; Brown, 2006). Through EFA, the number of constructs and structures of the factors underlying the variables studied can be identified.

5. Results and Discussions

The researchers conducted exploratory analysis based on the recommendations of Zainudin (2012), as well as those of Hoque and Zainudin (2016), which were to adapt and customise the previous instruments constructed before running the EFA. The reason was that the subject area and the study population of the current research differed considerably from past research in regard to socio-economic rank, ethnicity, location and cultural circumstances. Therefore, the likelihood is that the small number of past studies are now unsuitable for today's researchers to use; alternatively, a new study might contain a newly developed set of items. Thus, the current instrument's reliability has to be determined using Cronbach's Alpha. The value of reliability is interpreted based on the Reliability Value Table (Lim, 2007). According to Borg *et al.* (1993) and Konting (1990), a numerical alpha value of 0.60 or more is good and acceptable. Pallant (2010) also considered that a minimum value of 0.60 is acceptable for instruments. Table 2 shows the reliability evaluation instrument for the 166 respondents from the Johor Civil Service.

Table 2
Cronbach's Alpha Values for Skills, Attitudes and Abilities

Criteria	**Item**	**Value of Alpha**	**Interpretation**
Skills	15	0.915	Very good
Attitudes	15	0.907	Very good
Abilities	12	0.907	Very good
Average Value of Alpha		0.910	Very good

Based on Table 2 above, it was found that the value of Cronbach's Alpha for each construct (criteria) was in the range of 0.907 to 0.915. The construct of attitude and ability recorded the lowest reliability value of 0.907 while skills recorded the highest reliability value of 0.915. Meanwhile, the average Cronbach's Alpha value for this instrument was 0.910. This finding shows the instrument of personal competency in land administration was highly acceptable and suitable for this study.

Procedurally, this study applied EFA to obtain the value of construct validity. EFA aims to identify and rearrange the items by factors (dimensions) based on data samples (Hair *et al.,* 1998). Since this analysis is employed to identify the factors (or components) that will be formed, the termination of non-correlated items during the construction process may occur. However, the construct validity test is based on Hair *et al.*'s (2010)

recommendation that the minimum loading value accepted is 0.40. The loading value of a factor formed is an indicator that explains the correlation between the variable (item) and the factor. Thus, if the factor's loading value is higher, the variable is of greater importance in the factor's interpretation. In addition, the range of load factor values between 0.40 to 0.60 is also a value range that is commonly used in social science. In this study, a factor as high as 0.40 was classified as a having a significant factor loading value because an adequate sample (Hair *et al.*, 1998) of 166 respondents was used.

Following the EFA procedure, the Principal Component Analysis (PCA) extraction technique and Varimax rotation were carried out on all 42 items (15 items of skills, 15 items of attitudes and 12 items of abilities) in order to accurately obtain the factors (components) of the personal competency (Hair *et al.*, 1998). Table 3 shows the value of the sampling adequacy measurement via Kaiser-Meyer-Olkin (KMO) and the value of the sampling reliability measurement via Bartlett's Test.

Table 3
The value of KMO and Bartlett's Test of Skills, Attitudes and Abilities

		Skills	**Attitudes**	**Abilities**
Kaiser-Meyer-Olkin (Measure of Sampling Adequacy)		.855	.801	.888
Bartlett's Test (Test of Sphericity)	Approx. Chi-Square	1429.778	1393.794	1162.444
	df	105	105	66
	Sig.	.000	.000	.000

The values of KMO recorded for all the three constructs - 0.855, 0.801 and 0.888 - were above the minimum of 0.60 (Hair *et al.*, 1998; Kaiser-Meyer-Olkin, 1970), which indicated that the values in the matrix were sufficiently distributed. Meanwhile, for the value obtained by Bartlett's test of sphericity, p was 0.000 for all three constructs, which was highly significant at $p < 0.001$ level (Bartlett, 1954). This indicated that the data were approximately multivariate normal (Hair *et al.*, 1998). Thus, these data met the assumptions necessary to conduct EFA.

Next, the value of communalities indicated the ratio of the variable variances described by the factors. This value usually needs to exceed 0.50. A higher communalities value indicates there is a strong influence from the constructs listed in Table 4.

Table 4
Principal Component Analysis for Skills, Attitudes and Abilities

Criteria and Component	**Initial Total**	**Eigen values % of Variance**	**Cumulative%**	**Extraction Total**	**Sum of Squared % of Variance**	**Loadings Cumulative**
Skills						
1	6.971	46.475	46.475	6.971	4.483	29.890
2	1.331	8.873	55.349	1.331	2.550	46.893
3	1.272	8.479	63.828	1.272	2.540	63.828
Attitudes						
1	6.637	44.248	44.248	6.637	4.466	29.770
2	1.781	11.873	56.121	1.781	2.835	48.669
3	1.043	6.953	63.074	1.043	2.161	63.074
Abilities						
1	6.069	50.578	50.578	6.069	4.584	38.200
2	1.414	11.785	62.364	1.414	2.900	62.364

Table 4 shows that the three factor structures for skills and attitudes, as well as the two factor structures for abilities, were formed using the PCA extraction technique, based on the variable data involved. The analysis results produced three factors of skills and attitudes, while they produced two factors of abilities with eigen values exceeding 1.0. The eigen value is the sum of the variance described for each factor. Therefore, only factors with variances greater than 1.0 can be considered. The cumulative total of the three factors of skills was 63.828 per cent with a variance percentage value for factor 1 (46.475 per cent), factor 2 (8.873 per cent) and factor 3 (8.479 per cent); attitudes was 63.074 per cent with a variance percentage value for factor 1 (44.248 per cent), factor 2 (11.873 per cent) and factor 3 (6.953 per cent); while abilities was 62.364 per cent with a variance percentage value for factor 1 (50.578 per cent) and factor 2 (11.785 per cent). In addition, the scree plots shown in Figure 1, Figure 2 and Figure 3 below support the PCA results, whereby there were three main components (factors) each for skills and attitudes, as well as two main components (factors) for abilities that could be extracted to represent the data.

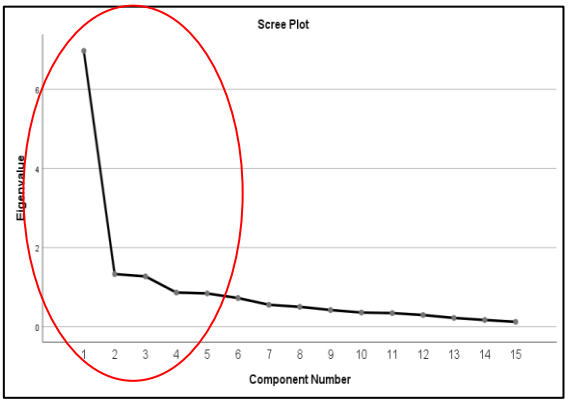

Fig. 1. Scree plot of skills

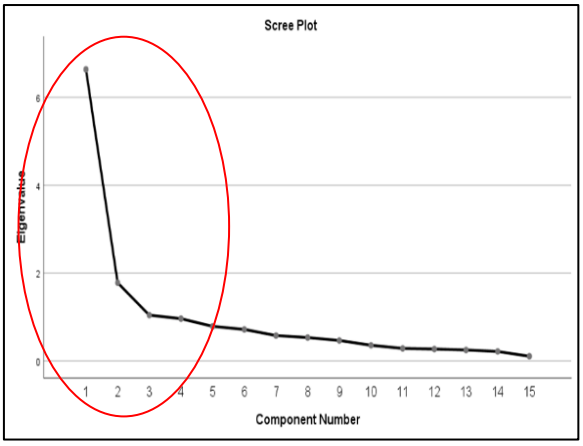

Fig. 2. Scree plot of attitudes

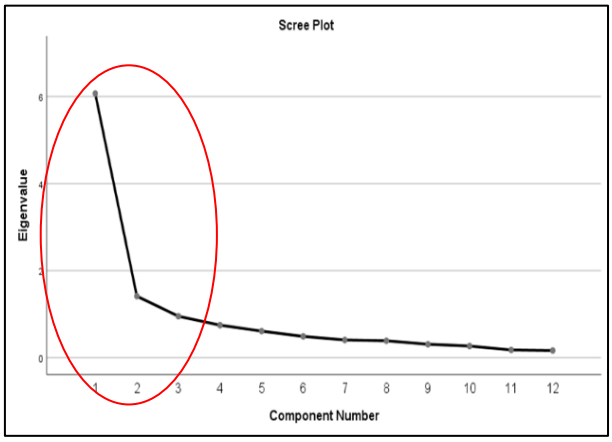

Fig. 3. Scree plot of abilities

Thus, Table 5 shows the identification of underlying factors as the main components of skills, attitudes and abilities of land administrators using the Varimax rotation method. The method was chosen because it reduces the number of complex variables and increases the expected results. The results indicate how variables are categorised based on the similarity of the characteristics among the variables.

Table 5
Components Rotated of Skills, Attitudes and Abilities

Criteria	Construct	1	2	3	Component
Skills	A7	.791			Skill of carrying out tasks efficiently and excellently
	A4	.782			
	A8	.775			
	A6	.764			
	A11	.703			
	A2	.609			
	A9	.563			
	A15	.560			
	A3		.836		Skill of working as a team
	A5		.741		
	A1		.719		
	A10		.446		
	A13			.860	Skill of applying technology and managing time
	A12			.851	
	A14			.434	
Attitudes	B4	.824			Attitude of readiness, perseverance and wisdom; and of thinking creatively, innovatively, dynamically and reasonably
	B9	.819			
	B8	.801			
	B11	.721			
	B12	.659			
	B5	.630			
	B10	.616			
	B3	.456			
	B7		.779		Attitude of being responsible
	B1		.769		
	B6		.738		
	B2		.634		
	B15			.775	Attitude of morality, ethics and integrity
	B14			.612	
	B13			.486	
Abilities	C4	.810			Ability to being responsive, understanding and delivering information precisely
	C5	.790			
	C3	.781			
	C2	.755			
	C1	.751			
	C12	.734			
	C11	.628			
	C6	.626			
	C9	.837			
	C8		.808		Ability to manifest wisdom in decision making
	C10		.744		
	C7		.672		

The results in Table 5 explain that the data were categorised in accordance with the variables involved. The values shown are the coefficients or factor loadings that inclined to each item. Factor loading values indicate a correlation between the items to be categorised and branded as the new components. The skill of carrying out tasks efficiently and excellently was recorded as the most important component of skills in developing the personal competency model of land administrator, followed by the skill of working as a team and the skill of applying technology and managing time. Meanwhile, the attitude of readiness, perseverance and wisdom; and of thinking creatively, innovatively, dynamically and reasonably was reported as the most important component of attitudes, followed by the attitude of being responsible and the attitude of morality, ethics and integrity. Lastly, the ability to be responsive, understanding and deliver information precisely was identified as the most important component of abilities, followed by the ability to manifest wisdom in decision making. All these components were reliable and validated for land administration personal model competency development.

6.Conclusion

Developing excellent performance among land administrators can be achieved when skilled, highly able civil servants with good attitudes are available to lead, face challenges and make decisions. This criterion of competency should improve the achievements of land administrators, thus convincing the population of the quality of the services promised. Therefore, human resource management should strengthen the implementation of action plans and strategies in accordance with the model of competency. Strengthening the government's approaches through processes and systems will enable a focus on improving land

administration services, specifically by enhancing decision-making capabilities and strengthening the governance ecosystem. Through this study, eight components of land administration personal competency criteria have been extracted and identified via EFA. In the future, these identified sub-criteria and components should be assessed for verification purposes before being implemented in the land administration personal competency model in Johor.

References

Appelbaum, S. H., & Fewster, B. M. (2002). Global aviation human resource management: Contemporary recruitment and selection and diversity and equal opportunity practices. *Equal Opportunities International.*

Ayob, A. M. (2005). *Socio-economic research methods (Third Edition) (Kaedah penyelidikan sosio ekonomi (Edisi Ketiga).* Kuala Lumpur: Dewan Bahasa dan Pustaka.

Bailey, C. R., & Bailey, C. A. (2017). *A guide to qualitative field research*. SAGE.

Benbrahim, C. F., Sefiani, N., Meddaoui, A., & Reklaoui, K. (2017). Assessment of human resource competence and performance indicator. *International Journal of Process Management and Benchmarking*, *7*(1), 20-37.

Bartlett, M. S. (1954). A note on the multiplying factors for various chi square approximations. *Journal of Royal Statistical Society*, *16*(Series B), 296–298.

Borg, W. R., Gall, M. D., & Gall, J. P. (1993). *Educational research*. New Jersey: Prentice Hall.

Brown Timothy, A. (2006). *Confirmatory factor analysis for applied research*. New York, NY: Guilford.

Buoy, L. (2002). *Employees' perceptions as 'recipients' of change: A case study* (Doctoral dissertation, Curtin University).

Child D. (1990). *The essentials of factor analysis (2nd Ed).* Cassell, London.

Creswell, J.W. (2005). *Educational research, planning, conducting and evaluating quantitative and qualitative research (2nd Ed)*. Upper Saddle River, New Jersey: Pearson Education Inc.

Coetzer, A., & Sitlington, H. (2014). What knowledge, skills and attitudes should strategic HRM students acquire? A Delphi study. *Asia Pacific Journal of Human Resources*, *52*(2), 155-172.

Dessler, G. (2006). *A framework for human resource management*. Pearson Education India.

Doling, J., Elsinga, M., & Ronald, R. (2006). Home ownership: Getting in, getting from, getting out. Part III. Retrieved from https://www.iospress.nl/book/home-ownership-getting-in-gettingfrom-getting-out-part-iii/

Ebisu, T., & Ichise, R. (2018). Toruse: Knowledge graph embedding on a lie group. In *Thirty-Second AAAI Conference on Artificial Intelligence*.

Hair, Joseph F., William C. Black, Barry J. Babin, Rolph E. Anderson, and Ronald L. Tatham. (1998). *Multivariate data analysis*. *5*(3). Upper Saddle River, NJ: Prentice Hall.

Hair, J. F., Anderson, R. E., Tatham, R. L., dan Black, W. C. (2010). *Multivariate data analysis seventh edition*. New York: Prentice Hall International Inc.

Harris, L. (2000). A theory of intellectual capital. *Advances in Developing Human Resources*, *2*(1), 22-37.

Hoge, M. A., Tondora, J., & Marrelli, A. F. (2005). The fundamentals of workforce competency: Implications for behavioral health. *Administration and Policy in Mental Health and Mental Health Services Research*, *32*(5), 509-531.

Hoque, A. S. M. M & Zainuddin, A. (2016). Exploratory Factor Analysis of Entrepreneurial Marketing: Scale Development and Validation in the SME context of Bangladesh. In *International Social Sciences and Tourism Research Conference.*

Jayalath, J. (2017). Measuring Competency using Attitudes as an Attribute. Retrieved from https://www.researchgate.net/publication/315786031_Measuring_Competency_using_Attitudes_as_an_Attribute.

Kaiser, H.F. (1970). A second generation Little Jiffy. *Psychometrika*, *35*, 401-415.

Lauby, S. (2013). The new social workplace. *Human Resource Management International Digest, 21*(3), pp. 3-5.

Konting, M. M. (1990). *Educational Research Methodology (Kaedah penyelidikan Pendidikan)*. Dewan Bahasa dan Pustaka.

Lim, C. H. (2007). *Educational Research: Quantitative and Qualitative Approach (Penyelidikan pendidikan: Pendekatan kuantitatif dan kualitatif).* McGraw Hill Education.

Lucia, A. D., & Lepsinger, R. (1999). *Art & science of competency models*. San Francisco, CA: Jossey-Bass.

Marrelli, A. F. (1998). An introduction to competency analysis and modeling. *Performance Improvement*, *37*(5), 8-17.

McLemore, C. A. (2015). Theorizing an emotional intelligence/organizational commitment relationship affecting job performance. In *IIE Annual Conference*. Proceedings (p. 1352). Institute of Industrial and Systems Engineers (IISE).

Mehrabian, A. (2000). Beyond IQ: Broad-Based Measurement of Individual Success Potential or 'Emotional Intelligence'. *Genetic, Social & General Psychology Monographs 126* (2), p133, 107p.

Mirabile, R. J. (1997). Everything you wanted to know about competency modelling. *Training & development*, *51*(8), 73-78.

Orçan, F. (2018). Exploratory and confirmatory factor analysis: which one to use first? *Journal of Measurement and Evaluation in Education and Psychology*, *9*(4), 414-421.

Pallant, J. (2010). *A step-by-step guide to data analysis using SPSS 4th edition*. Australia: Allen & Unwin.

Perkins, D. N. (2013). *Knowledge as design*. Routledge.

Piaw, C. Y. (2009). *Advanced research statistics: regression test, factor analysis and SEM analysis (Statistik penyelidikan lanjutan: ujian regresi, analisa faktor dan*

analisis SEM (Vol. 5)). McGraw-Hill (Malaysia) Sdn Bhd.

Piaw, C. Y. (2006a). *Methods and statistics of research book 1: Research methods (Kaedah dan statistik penyelidikan buku 1: Kaedah penyelidikan).* McGraw-Hill Education Sdn. Bhd.

Rahn, M. (2018). Factor analysis: A short introduction, part 4-how many factors should I find. *Retrieved 27th September*.

Samsudin, S. (2020). The Suitability of Institutional Arrangement and Policy Assessment Indicator in Malaysia's Land Administration System. *International Journal of Academic Research in Business and Social Sciences, 10*(11), 1414-1425.

Schiffman, L. G., & Kanuk, L. L. (2004). *Consumer behaviour (8th ed.).* Upper Saddle River, NY: Pearson Education.

Schumacker, R. E., & Lomax, R. G. (2010). *A beginner guide to structural equation modelling*. New York: Routledge.

Yu, Y., Sheng, J., & He, B. (2016). College Students' Professional Ability Training Based on the Theory of Competency. In *International Conference on Education, e-learning and Management Technology*.

Sefiani, N. (2014). Contribution to the Development of Tools & Competences Management Methods (Doctoral dissertation). EMI & INSA Lyon.

Taylor, P. J., Russ-Eft, D. F., & Taylor, H. (2009). Transfer of management training from alternative perspectives. *Journal of Applied Psychology*, *94*(1), 104.

Teh, K. S. M. (2015). *Sampling Method (Kaedah Pensampelan).* Retrieved from https://www.slideshare.net/wmkfirdaus/pensampelan

Vernon, P. E. (2014). *The structure of human abilities (psychology revivals).* Routledge.

Warr, P. (2020). *Age and job performance* (pp. 309-325). CRC Press.

Yong, A. G. & Pearce, S. (2013). A Beginner's Guide to Factor Analysis: Focusing on Exploratory Factor Analysis. *Tutorials in Quantitative Methods for Psychology, 9*(2), 7994.

Zainuddin, A. (2012). *Research Methodology and Data Analysis*. Selangor: UiTM Press.

This article can be cited: Rohani, A., Suratman, R., & Idrus, D. (2022). Land Administrator Personal Competency Model Using Exploratory Factor Analysis. *Journal of Optimization in Industrial Engineering, 15*(2), 305-311. Doi: 10.22094/joie.2022.1962136.1971