



APPENDIX D

UNIVERSITI TUNKU ABDUL RAHMAN
FACULTY OF ACCOUNTANCY AND MANAGEMENT
UNDERGRADUATE FINAL YEAR PROJECT

Final Year Project Assessment Form - Report

Final Year Project Title: _____ **FYP No.** 8/2022

Impact of Automated Valuation Model on Valuation for Residential Property

Name:	Lim Zheng Jie	Student ID:	19UKB01982
--------------	---------------	--------------------	------------

Assessment	Criteria	Marks (%)	Awarded (%)	Subtotal (%)
Introduction	Background of study	5		
	Problem definition/ research problem	5		
	Objective(s) of study	5		
	Significance of study	5		
Literature Review:	Review of theoretical/empirical model/ conceptual framework	10		
	Hypotheses / propositions development	5		
Research method	Data collection/sources	5		
	Research instruments/techniques	5		
	Theoretical/ empirical model/ conceptual framework	10		
Results and interpretation	Presentation of results (tables, figures, etc.)	5		
	Interpretation on major findings	15		
Conclusion and policy implications	Summary	5		
	Discussion and conclusion	5		
	Limitation and recommendation	5		
Overall presentation of the report	Referencing	5		
	Writing skills	5		
TOTAL		100		

Remarks:

<i>Please circle</i>	Supervisor	2nd Examiner
Signature:		
Name:		

**IMPACT OF AUTOMATED VALUATION MODEL
ON VALUATION FOR RESIDENTIAL PROPERTY**

BY

LIM ZHENG JIE

A research project submitted in partial fulfillment of
the requirement for the degree of

**BACHELOR OF BUILDING AND PROPERTY
MANAGEMENT (HONS)**

UNIVERSITI TUNKU ABDUL RAHMAN

**FACULTY OF ACCOUNTANCY AND
MANAGEMENT**

**DEPARTMENT OF BUILDING AND PROPERTY
MANAGEMENT**

APRIL 2023

Copyright @ 2023

ALL RIGHTS RESERVED. No part of this paper may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, graphic, electronic, mechanical, photocopying, recording, scanning, or otherwise, without the prior consent of the authors.

DECLARATION

I hereby declare that:

- (1) This undergraduate research project is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.
- (2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.
- (3) The word count of this research report is _____.

Name of student:

Student ID:

Signature:

Lim Zheng Jie

1901982

Date: _____

ACKNOWLEDGEMENT

First of all, I would like to thank my final year project supervisor, Ms Puteri Ameera Binti Mentaza Khan for her guidance and advices throughout the two semesters period where I carried out this research. I am grateful for her patience and generosity in advising me and sharing her knowledge that assisted me to complete this final year project. Furthermore, I would also like to show my gratitude to Sr Dr Tajul Ariffin Bin Mohd Idris for providing feedbacks and comments on my research during the VIVA presentation.

I would also like to express my appreciation to all registered valuers, probationary valuers, valuation executives and valuation assistants who supported me by participating in my research and completed the questionnaire that was distributed. On top of that, I am also thankful for those registered valuers who had provided extra information regarding the automated valuation model which gave me more knowledge, thus allowing me to enhance this research.

Lastly, I would like to thank my family members and friends for their understanding and support.

Thank you.

DEDICATION

Firstly, I would like to dedicate this research to Universiti Tunku Abdul Rahman for providing me this opportunity to conduct this research. Through this study, I gained better insights about the impact of the automated valuation model towards the valuation practice in Malaysia.

Besides, I would also like to dedicate this research to my final year project supervisor, Ms Puteri Ameera Binti Mentaza Khan. She had continuously provided me her guidance, patience and assistance throughout the two semesters period where I conducted this study.

Last but not least, I would like to express my gratitude to the 45 valuers who had participated in this research. I appreciate their guidance, assistance and cooperation that allowed me to complete this research.

TABLE OF CONTENTS

	Page
Copyright Page.....	ii
Declaration.....	iii
Acknowledgement.....	iv
Dedication.....	v
Table of Contents.....	vi
List of Tables.....	xi
List of Figures.....	xii
List of Abbreviations.....	xiii
List of Appendices.....	xiv
Preface.....	xv
Abstract.....	xvi
Chapter 1 Introduction	
1.1 Research Background.....	2
1.2 Problem Statement.....	3
1.3 Research Questions.....	5
1.4 Research Objectives.....	5
1.5 Significance of Study.....	6
1.6 Chapter Layout.....	7
1.7 Conclusion.....	9

Chapter 2	Literature Review	
2.1	Definition	
2.1.1	Automated Valuation Model.....	12
2.1.2	Valuation Method.....	13
2.1.3	Valuation Practice in Malaysia.....	16
2.2	Automated Valuation Model Application in Malaysia.....	17
2.3	Issues regarding Automated Valuation Model Application.....	19
2.4	Aspects that affects Automated Valuation Model	
2.4.1	Cost.....	21
2.4.2	Time.....	22
2.4.3	Accuracy.....	23
2.4.4	Knowledge.....	24
2.5	Review of Theoretical Framework.....	25
2.6	Proposed Framework.....	26
2.7	Conclusion.....	27
Chapter 3	Methodology	
3.1	Research Design.....	28
3.1.1	Quantitative Research.....	29
3.1.2	Qualitative Research.....	29
3.1.3	Descriptive Research.....	29
3.2	Data Collection Method.....	30
3.2.1	Primary Data.....	30
3.2.2	Secondary Data.....	30

3.3	Sampling Design.....	31
3.3.1	Target Population.....	31
3.3.2	Sampling Location.....	31
3.3.3	Sampling Element.....	32
3.3.4	Sampling Technique.....	32
3.3.5	Sampling Size.....	33
3.4	Research Instrument.....	33
3.4.1	Design of Questionnaire.....	34
3.5	Construct Measurement.....	35
3.5.1	Pilot Test.....	36
3.5.2	Nominal Scale.....	36
3.5.3	Ordinal Scale.....	37
3.5.4	Likert Scale.....	38
3.5.5	Open-ended question.....	39
3.6	Data Processing.....	36
3.6.1	Data Checking.....	39
3.6.2	Data Editing.....	40
3.6.3	Data Coding.....	40
3.6.4	Data Transcription.....	40
3.7	Data Analysis.....	41
3.7.1	Reliability Test.....	41
3.7.2	Relative Importance Index.....	42
3.7.3	Content Analysis.....	43
3.8	Conclusion.....	43

Chapter 4	Data Analysis	
4.1	Descriptive Analysis	
4.1.1	Age.....	44
4.1.2	Gender.....	46
4.1.3	Years of Experience in Valuation Field.....	47
4.1.4	Registered Valuer under BOVEAP.....	48
4.1.5	Awareness of Automated Valuation Model.....	49
4.1.6	Application of Automated Valuation Model.....	50
4.2	Relative Importance Index.....	51
4.3	Content Analysis	
4.3.1	Effect of AVM on Job Opportunities of Valuers in the Near Future.....	53
4.3.2	Possibility of AVM Completely Replacing Valuers in the Future.....	55
4.3.3	Possibility of AVM Becoming a Common Method to Practice Valuation in Malaysia in the Next Five Years....	57
4.4	Conclusion.....	59
Chapter 5		
5.1	Summary of Statistical Analyses	
5.1.1	Descriptive Analysis for Demographic Profile.....	60
5.1.2	Relative Importance Index.....	61
5.1.3	Content Analysis.....	61
5.2	Discussion of Major Findings.....	62
5.3	Implication of Study.....	65

Impact of Automated Valuation Model on Valuation for Residential Property

5.4	Limitation of Study.....	66
5.5	Recommendation for Future Research.....	66
5.6	Conclusion.....	67
	References.....	68
	Appendices.....	70

LIST OF TABLES

	Page
Table 3.1 Construct Measurement	35
Table 3.2 Result of Reliability Test	41
Table 3.3 Range of Cronbach's Alpha Reliability	41
Table 4.1 Statistics of Respondents' Age	45
Table 4.2 Statistics of Respondents' Gender	46
Table 4.3 Statistics of Respondents' Years of Experience	47
Table 4.4 Statistics of Registered Valuers	48
Table 4.5 Statistics of Respondents' Awareness	49
Table 4.6 Statistics of Respondents' Application	50
Table 4.7 Relative Importance Index	51
Table 4.8 Ranking of Factors	52
Table 4.9 Effect of AVM on Job Opportunities	53
Table 4.10 Possibility of AVM Replacing Valuers	55
Table 4.11 Possibility of AVM Becoming a Common Method	57
Table 5.1 Ranking of Factors	62

LIST OF FIGURES

	Page
Figure 2.1 Theoretical Framework	24
Figure 2.2 Proposed Framework	25
Figure 3.1: Illustration of Nominal Scale	36
Figure 3.2 Illustration of Ordinal Scale	37
Figure 3.3 Illustration of Even Likert Scale	38
Figure 3.4 Illustration of Open-ended Question	39
Figure 3.5 Relative Importance Index Formula	42
Figure 4.1 Percentage of Respondents' Age	44
Figure 4.2 Percentage of Respondents' Gender	46
Figure 4.3 Percentage of Respondents' Years of Experience	47
Figure 4.4 Percentage of Registered Valuers	48
Figure 4.5 Percentage of Respondents' Awareness	49
Figure 4.6 Percentage of Respondents' Application	50

LIST OF ABBREVIATIONS

AVM	Automated Valuation Model
BOVEAP	Board of Valuers, Estate Agents and Property Managers
MVS	Malaysian Valuation Standards
IVS	International Valuation Standards

LIST OF APPENDICES

	Page
Appendix A: Survey Questionnaire	68
Appendix B: Tables and Figures	70

PREFACE

Property valuation is an industry that had existed for centuries which can be traced back to the ancient Rome era. Ever since property valuation existed, it had been conducted manually by human valuers where the valuers calculate the market value of the subject property by synchronizing mathematical formulas and also their personal point of view towards the subject property. Valuers are often required to provide their personal opinion when it comes to decision on adjustments to be made especially when the comparison method is applied. Due to the advancement of technology, machineries, computers and artificial intelligence had eliminated the need of humans to carry out business activities. As for the valuation industry, the automated valuation model (AVM) had been developed and emerged as a alternative to conduct valuation. Although it is a relatively new technology, it had shown an uprise trend in number of users as it is slowly being enhanced. In this research, the impact that the automated valuation model towards the valuation practice will be studied. Several factors such as cost, time, accuracy and knowledge will be looked into as well as the threat of the AVM towards the job opportunities of valuers. Lastly, it is hoped that this research will provide a comprehensive understanding on the AVM and a thorough discussion on the benefits and drawbacks of the AVM.

ABSTRACT

This research was carried out to study the impact of the automated valuation model towards the valuation practice in Malaysia. Four factors had been tested which are cost, time, accuracy and knowledge. This study had applied both qualitative and quantitative research method. The target population of this research is Malaysian valuers who are aware of the AVM. Primary data of this research was obtained through the distribution of 45 copies of questionnaires and was analyzed using the SPSS software. The constructs of the questionnaire were reliable as the Cronbach's Alpha value of all the factors were above 0.6. The data analysis applied for this research are the relative importance index and content analysis. Through the relative importance index, the four factors were ranked from most important to least important and the ranking is as follow: accuracy, time, knowledge, cost. As for the content analysis, it analyzed the opinions of valuers towards the threat on job opportunities. In short, the AVM poses low threat for the time being but it might develop and emerge as a bigger threat in the future. This study serves as an update to earlier research on the automated valuation model and offers data for upcoming academics who want to study the model in the future. There are extremely few publications and articles about valuation, particularly for the automated valuation model, due to the nature of the sector. As a result, this study contributes to the expansion of knowledge about the automated valuation model. Additionally, valuation firms who are thinking about using the automated valuation model can put this research to use. The findings of this study outline the benefits and drawbacks of the automated valuation model, allowing valuation business owners to weigh the pros and downsides before deciding whether to use the model or not.

Chapter 1: Research Overview

1.0 Introduction

The aim of chapter one of this final year project is to give readers an introduction to the concept of automated valuation model in terms of how the model works and the issues that emerged from the application of automated valuation model. For the research background section, a brief explanation on the history of automated valuation model and some current issues regarding automated valuation model that were mentioned by other researchers will be discussed. Moving forward to the problem statement section, the main issue regarding this topic, 'impact of automated valuation model on valuation for residential property', will be discussed. A broad issue regarding the topic will be pointed out to act as the main direction for this study. To correspond with this broad issue, more specific and detailed questions will be formulated in order to break down the broad issue that is complex into questions that are more direct and simpler. In this significance of study section, the importance of this study and also the benefits that this study can provide will be discussed. The group of people that will benefit from this study will also be mentioned in this section. Lastly, in the conclusion section, a quick summary of the essential aspects that were mentioned throughout chapter one will be written to sum up the entire chapter one.

1.1 Research Background

Automated valuation model is a software or program that is able to automatically calculate property market value. It formulates the property market value using mathematical algorithms and statistical modelling based on data that is stored in database. Previously, the valuation field solely depends on manual calculation of property market value that is calculated by valuers. This traditional method of valuation is deemed to be a trustworthy method to determine a property's market value as the value obtained is accurate and consistent. However, this traditional method is considered to be time consuming as valuers might take hours to obtain the market value and it also increases the cost as the wage of the valuer is included. Therefore, some companies started to introduce automated valuation model into the valuation field. The model is able to calculate market value much faster than the traditional method but some would say that the value obtained is neither accurate nor consistent.

Currently, the traditional method is still the main method to conduct valuation where it is used for more than 90% of the valuation cases but however the automated valuation model is also adapted by some companies in Malaysia to conduct some portion of the valuation cases which are simpler and only to update valuation. According to Renigier-Bilozor (2019), the automated valuation model that can be found in the market is still not mature or perfect yet, the market value obtained is sometimes far off from the expected value as the model works based on the data provided in the database, and through the research, the database is said to be insufficient and incomplete. In valuation, especially for comparison method, there are many adjustments that need to be done due to the characteristic of real estate which is heterogenous, there are no two similar properties thus the differences between these properties need to be adjusted in order to obtain the accurate market value. For the traditional method, valuers do adjustments based on their opinion and experience. However, when it comes to automated valuation model, it can merely depend on the data provided in the database and it does not have any artificial

intelligenece system to allow it to think like a human to do adjustments, thus the market value obtained might not exactly reflect the true market condition.

From the two researches mentioned above, we can notice that the automated valuation model is still not reliable as there is still technical problems behind the model and most valuation firms only applies the model for valuation updates. This can be proved as currently in Malaysia, there are only a few companies adopting automated valuation model into their operation.

1.2 Problem Statement

In this urbanized era, the competition between valuation firms had become intense, more and more new valuation firms had set up their business and joined the market, thus splitting up the market share of the valuation industry into smaller pieces. On top of that, valuers not only receive pressure from other firms, bankers also often hasten valuers to submit the valuation report as they are desperate to complete their customers' loan application. Therefore, valuation firms will have to perform better and prepare better quality valuation reports in a shorter period in order to maintain their competitive advantage as if their performance is inferior and submit valuation reports to banks slower compared to other valuation firms, that firm will lose their business as banks will prefer the better firms. Even though valuers put in lots of effort to prepare valuation reports more quickly, but they still need to bear in mind that the market value obtained and also other contents in the report need to be correct as there will be serious consequences that the valuation firm will have to face if they make mistakes, thus the main concern is to prioritize the accuracy and correctness of the valuation reports but at the same time shortening the period of time needed to complete the report. Therefore, valuers had been seeking for ways to overcome these issues so that they can maintain or even improve their competitive advantage in the valuation industry and to secure their market share and revenue.

However, as per the research done by others, the automated valuation model is said to be inferior and still not perfect enough. Therefore, the question here is whether the automated valuation model is capable to solve the valuers' issue and in detail, how it helps to solve the issue. According to Razali (2008), the awareness and application rate of the automated valuation model was at a low level and the knowledge regarding the AVM is relatively low as well. Valuers in Malaysia do not know much about the AVM and the impact of it towards the valuation practice.

The main issue regarding this topic is whether the automated valuation report will help to improve the efficiency and productivity in the preparation of valuation reports for valuation for residential properties. Furthermore, another important issue would be how the automated valuation model will affect the valuation for residential properties in terms of cost, time, creditability of value provided by the automated valuation model. Another issue will be the employment rate of valuer, whether the automated valuation model will affect the job opportunities for valuers. Therefore, the aim of this research is to study the effect of automated valuation model on the valuation practice for residential properties.

1.3 Research Questions

The research questions of this study are as follow:

1. What are the aspects in valuation that are affected by automated valuation model?
2. How automated valuation model affect the productivity of valuation for residential properties?
3. How does the automated valuation model become a threat to valuers?

1.4 Research Objectives

1. To determine the effect of application of automated valuation model towards valuation practice.
2. To rank the aspects in valuation that are affected by automated valuation model.
3. To analyze the threat of automated valuation model to job opportunities of valuers.

1.5 Significance of Study

Valuers will be the main group of people that will benefit from this study. After this study, valuers will be able to know the pros and cons of the automated valuation model for each aspect. After taking into consideration of all the aspects, they will be able to know whether it is a good idea to adopt automated valuation model into their operation and whether the implementation of the automated valuation model is able to increase their efficiency in preparing valuation reports. Time needed and accuracy of market value obtained is already measured in efficiency, thus another essential aspect that valuers or business owners of valuation firms would concern is cost. Even if the efficiency had increased but the cost required is higher as compared to the traditional method, valuation firms will still not accept and implement automated valuation model. Therefore, this study provides a clear overview of the entire issue so that valuers can analyze and make decision on whether to implement automated valuation model or not.

Furthermore, BOVEAP and other related government sectors will also benefit from this study. Not just in the valuation industry, literally every industry will face reduce in job opportunities whenever there is an advancement in technology as most of the time, technology or machinery are able to complete the workload of several workers at the same time. Therefore, when one machinery can replace few workers, business owners would cut down on employees and opt for technology, thus reducing job opportunities. Same goes for automated valuation model, if the model is able to obtain market value faster than valuers, business owners of valuation firms might layoff valuers as there is no more demand for valuers. If this scenario happens, it would be a problem for the real estate industry as there will be numerous unemployed valuers, hence increasing the unemployment rate for the real estate industry and losing confidence from the valuers towards the industry as well. Therefore, BOVEAP may identify whether this scenario will occur or not and if it will, BOVEAP can start to formulate plans or regulations to prevent it from happening so that the real estate industry can be sustained.

1.6 Chapter Layout

In Chapter One, a brief introduction of the background and major issues regarding the automated was mentioned. Besides, the research questions which are what are the aspects in valuation that are affected by automated valuation model, how automated valuation model affect the productivity of valuation for residential properties, what is the effect of automated valuation model application to the job opportunities of valuers are formed to act as the base of this study and to notify readers about the issues that will be discovered and investigated throughout this research. Furthermore, research objectives that correlate with the research questions are also stated to provide a direction and guideline for this research so that the study will be kept on track. After that, a subsection in chapter one mentions about the significance of this research and also the group of peoples that will benefit from this study. The main group of people that will be benefited are valuers and also members of BOVEAP.

As for Chapter Two, the definition of several key terms and ideology regarding valuation and automated valuation model will be discussed. After that, the application of automated valuation model and also issues regarding the model will be mentioned to provide a general idea to readers on the current situation and difficulties that the automated valuation model is facing. Further into chapter two, the aspects that will be tested in this research will be listed out and discussed on its effect, relation and significance towards this study. After that, a review on theoretical framework that is based on past research and other studies will be prepared to identify the aspects that had already been studied by other researchers previously and a proposed framework will be prepared to act as the improvement or add on to the reviewed theoretical framework by adding in more elements and aspects into it. Lastly, hypotheses that consists of null and alternative hypothesis will be prepared to test and examine the aspects one after another to determine whether each of them shows a positive or negative response.

In chapter three, research methodologies of this research will be explained. The sampling design will also be discussed to mention about the target population,

sampling location, sampling element, sampling technique and sampling size of the respondents for the questionnaire survey. After that, followed by the design of the questionnaire where the questions that will be asked will be formulated. Furthermore, the stages in data processing will be listed out which includes data checking, data editing, data coding and data transcription. Lastly, in the subsection of data analysis, the data analysis methods such as relative importance index, content analysis and reliability test that will be used to analyze the data collected will be further discussed.

Moving forward to chapter four, it will be divided into three main parts. The first part which is descriptive analysis will analyze the respondents' demographic profile such as age, gender, years of experience in valuation field and so on. As for the second part, relative importance index, the average index for each of the factors will be computed and will then be ranked accordingly from highest to lowest to indicate the importance of the factors. Lastly, for content analysis, the response of the respondents for the open-ended questions will be listed out and analyzed respectively.

As for the last chapter, a summary of the results that were mentioned in chapter four will be discussed. After that, several major findings of this research regarding the relative importance index and content analysis of the data obtained will be analyzed, discussed and concluded. After that, the implication of this study will be mentioned to discuss about the significance of this research and the group of people which will be benefited by this study. Besides, several limitations that were found during this study will be pointed out and recommendations to solve such limitations will also be proposed.

1.7 Conclusion

In a nutshell, in section 1.1 research background and section 1,2 problem statement, the background and history of automated valuation model and also the current issues that emerged regarding the automated valuation model was discussed. Firstly, the principle of how the automated valuation model function was discussed, it is a computer program or software that uses data from databases to calculate market value of the subject property. This technology is still relatively new; thus, it is still not mature enough. Currently, automated valuation model is still not a common thing in the valuation industry, its performance is claimed to be unstable. The valuation industry is a professional industry which tolerates zero mistakes, hence most of the valuation firms loses their confidence in automated valuation model when it is said to be unstable and might cause mistakes.

For section 1.3 research questions, three questions were formulated based on the major issue that was mentioned in section 1.2. The major issue that was mentioned is that the automated valuation model is not matured enough and unable to reduce the burden of valuers. Therefore, based on this issue, three questions were formulated which are 1. Is automated valuation model able to increase the productivity of valuation for residential properties? , 2. What are the aspects in valuation that are affected by automated valuation model? and 3. Will the automated valuation model threaten the job opportunities of valuers? . These three questions are mentioned to narrow down or break down the major issue that was complex into simpler questions. As for section 1.4 research objective, one general and one specific objective was formed to state the purpose of this research and also the goals that is wished to achieve at the end of this study which is to identify the efficiency in preparing valuation reports after adopting automated valuation report and to identify the aspects in valuation that are affected by automated valuation model.

Lastly, in section 1.6, the significance of study was discussed as well. In this section, two groups of people are prospected to benefit from this study. The two groups of people are valuers and BOVEAP. For valuers, they will be able to get to know automated valuation model better and the results obtained will assist them in deciding whether to adopt this model into their business operation or not. As for BOVEAP, they will be able to forecast whether the model will cause increase in unemployment rate for valuers or not in the future, thus allowing them to take precautionary actions to prevent it from happening so that the valuation industry will not be harmed.

Chapter 2: Literature Review

2.0 Introduction

In Chapter Two, the definition of several terms related to this topic will be discussed. Firstly, the definition of valuation method will be stated and the difference of traditional valuation practice and automated valuation model in terms of valuation method will be discussed as well. On top of that, the valuation practice will also be defined to brief readers about the ways that valuation is conducted, firstly in terms of the general valuation practice that most countries adopt and also for Malaysia. Furthermore, the application of automated valuation model in Malaysia will be discussed, mentioning about the amount of valuation firms in Malaysia that started to adopt automated valuation mode and to what extent had the valuation firms apply the automated valuation model. Besides, the issues that arise during the application of automated valuation model will also be mentioned to allow readers to know about the problems that are faced by valuers while applying automated valuation model and also the negative outcomes that occurred during the application. In the next subsection, the aspects that effects the application of automated valuation model will be listed out and discussed.

For this research, the main aspects that will be studied are cost required, period of time needed, accuracy of market value obtained and et cetera. These aspects will act as indicators for this research to help justifying whether the automated valuation model is able to improve the productivity of valuation for residential properties or not. If all the aspects show positive response, thus we can conclude that the automated valuation model is able to improve productivity and vice versa. After that, a review of theoretical models will be conducted. In this review, aspects that were studied by other researchers for the similar topic will be listed out and discussed. After reviewing these aspects, additional elements or aspects will be proposed to consummate this study. As for hypotheses of study, null and alternative hypotheses will be formed based on the aspects mentioned in subsection 2.4 aspects that effect automated valuation model application. The null and alternative hypotheses are two inverse statements, one being positive and the other negative.

Lastly, a conclusion will be written to summarize the essential key terms or ideas that were mentioned in chapter two to extract the essence of chapter two.

2.1 Definition

2.1.1 Automated Valuation Model

For automated valuation model, its method of valuation is through computer calculation by using statistical modelling. It analyses data that are provided in the database and calculates the market value based on past sales history of similar properties. According to Hayes (2021), the automated valuation model includes two algorithms or modelling which are hedonic model and repeat sales index. To further explain about hedonic model, referring to Hargrave (2021), the model determines the price factors that may affect the market value which can be further classified into two categories which are internal factors that comes from the subject property itself and also external factors such as macroeconomics that relates to the global or regional financial market and real estate market. As for repeat sales index, it is a model that calculates the fluctuation in sales price for similar properties within a certain period of time. This is to forecast the potential uprise or decrease in the market value based on the pattern shown by the data of past transactions. According to Liberto (2022), the repeat sales index is usually used to forecast or predict the fluctuation of property market value over a certain timespan. Therefore, the automated valuation model combines these two models to ascertain the price factors and forecast of market value trend for the near future to formulate the market value of the subject property.

2.1.2 Valuation method

Generally, there are five valuation methods that can be applied to calculate the market value of a subject property which are comparison method, investment method, residual method, profit method and cost method. Valuers will apply either one out of these five methods to conduct valuation. These five methods are regulated under the Malaysian Valuation Standards and valuers are to adhere to these regulations. Furthermore, based on the International Valuation Standards, the definition of these five valuation methods is also provided.

Firstly, the comparison method is the method where several comparable properties are chosen to compare with the subject property. As properties have the characteristic of heterogenous, which means that every single property is unique and there will be no two properties that are hundred percent identical to each other, thus valuers can only select properties that are highly similar to the subject property and manually apply adjustments in order to obtain a market value that reflects the actual condition of the subject property. Adjustments such as location, physical condition of the property, size, negative factors such as near to oxidation pond, facing T-junctions or positive factors such as facing open area and et cetera will be considered during the calculation of the market value for the subject property. The average value of the comparables will act as the base or foundation of calculation and by adjusting the said adjustment depending on the difference between the subject property and the comparables, valuers will be able to acquire the market value of the subject property. According to the Malaysian Valuation Standard published by LPPEH, there are several restrictions that restrict valuers whenever the valuer uses this method to conduct the valuation. The first restriction is that the valuer has to clearly list out all the comparables that are used during the calculation in the valuation report prepared. After that, only comparable properties that are alike in terms of market sales can be chosen and selected to be as the comparables. Furthermore, valuers must at least mention or provided the following details of the comparables, which are identification of comparables, date of transaction, consideration for transaction and a brief description of the comparable. The comparison method is the most common method used by valuers as it is less

complex and the availability of information required is high as compared to the other methods.

The second valuation method is investment method. Investment method is the method that calculates the market value based on the annual market rental of the subject property. This method is more suitable for properties that are used for investment such as shops that are rented out. It calculates the market value of the subject property based on the potential profit that the property is able to generate in terms of rental revenue. Similar to comparison method, some considerations also need to be made while applying investment method. One of the considerations is outgoing, it is the cost required needed to carry on the investment. In the case of real estate, outgoing is the cost needed to maintain or repair the property and other necessary costs. Another important element for investment method is vacant rate. It is a rare scenario where a property is able to maintain hundred percent occupancy rate throughout its lifespan, the property will always have a period of time where it is vacant, whether the previous tenant had just quit and is waiting for the newfound tenant to take over the property or the property is unable to acquire any demand and no person is interested in renting the property. The annual market rental assumes that the property is rented out all year long for 365 days, thus consideration need to be made to include the vacant period that does not generate any revenue.

The third valuation method is profit method. Profit method is used to value properties that are meant to conduct business and generate profit through the business activities conducted in the building. The profit or income generated varies based on the business carried out. This main income will be added with the other income that is generated alongside during the operation of the main business activity and deducted with the expenses incurred during the operation to acquire net profit per annum. The net profit will then be multiplied with the years purchase to obtain the market value. In short, for profit method, the market value of the subject property is higher when the property is able to assist in conducting business activities that is highly profitable and generates high income.

The fourth valuation method is residual income method. Residual income method mainly applies on valuation for property that have high potential for development, usually referring to vacant land. First, the potential and possible development that can be carried out on the subject property need to be identified. The amount of revenue that can be generated through the future development will be calculated as the gross development value. The gross development value will then be deducted with the development cost that consists of all the cost required for the development such as construction cost, legal fee, mortgage and et cetera. Lastly, as the proposed development is a future idea that is currently not fulfilled yet, thus the value acquired earlier needs to be multiplied with present value to obtain the current value of the property.

The last valuation method would be cost method. For the market value that is obtained through the cost method consists of two elements which are land value and building value. For building value, it is the cost required to construct the building minus the depreciation. For this method, the valuer needs to determine the cost to reconstruct the building of the subject property and deduct it with the depreciation of the building based on its age and also the physical condition whether it is well maintained or damaged. Cost method is usually applied for properties that have extremely limited data of transaction, thus unable to apply comparison method, such as hospitals, temples and so on. On top of that, these properties are also not centered on generating profit, thus unable to apply investment method and profit method.

2.1.2 Valuation Practice in Malaysia

Referring to the Malaysian Valuation Standards, valuation is defined as literal opinion of the value of a property with consideration of interest in property. Furthermore, according to A.F. Millington (1994), valuation is said to be a combination of arts and science, which requires mathematical formulas but also humans' personal perspective when it comes to abstract considerations. On top of that, there are several purpose of conducting valuation that is written under the Malaysian Valuation Standards: Standard 7 which are financing purpose, fire insurance purpose, financial reporting purpose, sale and purchase purpose, sale under foreclosure purpose, requirement from Securities Commission, requirement from Director of Insurance and Takaful Supervision, compulsory acquisition, and rating purpose.

For the valuation process, the valuation exercise usually starts from receiving the letter of instruction from the bank. Once the valuer receives the letter of instruction, he or she will then verify the subject property and will make an appointment to conduct site inspection. On the day of site inspection, the valuer will conduct both external and internal inspection on the subject property to examine the actual condition of the subject property. After the site inspection, the valuer will start to calculate the market value of the subject property using one out of the five valuation methods. Currently, most of the valuation firms in Malaysia prefer to apply the comparison method when valuing residential properties as it is the simplest method and sales evidence is sufficient and made available to them as it can be acquired from the authorities. The next step of this valuation exercise is the preparation of valuation report. In the valuation report, important aspects of the subject property such as the market value obtained, locality, building features, data of comparable properties et cetera. Once the valuation report is complete, it will be sent to the party that issued the letter of instruction for their perusal.

2.2 Automated Valuation Model Application in Malaysia

According to Tajani (2017), in the research entitled “Automated valuation models for real estate portfolios: A method for the value updates of the property assets’, the amount of time needed to acquire market value of the subject property using automated valuation model is tested to be shorter as compared to the traditional method when it comes to update of market value. This can also be seen in the actual reality of the valuation industry in Malaysia where more than ninety percent of the valuation firms still prefer to apply the traditional method rather than the automated valuation model.

Referring to Razali (2008), there are about 63.64% of valuation firms in Malaysia are aware about the automated valuation model. However, although the awareness can be said to be slightly above average among valuation firms in Malaysia, when it comes to willingness of them to replace valuers with the automated valuation model, 96.3% of the valuation firms provided a negative response which means they reject to adopt automated valuation model and is more willing to continue their operation with the traditional method. This is due to several issues which will be discussed later in subsection 2.3 issues regarding this topic. However, through the statements mentioned above and also the statistics extracted from other research, we can notice that even though valuation firms are aware about the existence of the automated valuation model, they still refuse to adopt it to their business operation. By looking at the numbers obtained in the previous research, we can even say that nearly all the valuation firms are not willing to replace valuers with automated valuation model, thus we can conclude that the application of automated valuation model is very poor in the valuation industry in Malaysia, most of the firms still prefer to conduct valuation in the traditional way which is conducted by valuers manually. Automated valuation model is now seldomly used when there is a need to update the market value for the valuation.

Furthermore, the valuation fee for conducting valuation is based on the market value, the higher the market value, the higher the valuation fee. As for rural areas, the market value of property there is definitely lower as compared to properties located in sub-urban and urban areas, thus the valuation fee for conducting valuation for properties in rural areas will be lower as well. On top of that, most of the valuation firms are usually based in the state capital, which is usually not a rural area, thus travelling from the office to rural area will take a longer distance, which will then incur higher transportation cost. With the lower valuation fee and higher cost, the profitability of the valuation will further decrease. In this case, valuation firms start to seek for alternative methods to conduct their business in order to lower down the cost to sustain their profitability as they are unable to manipulate the valuation fee as it is regulated by BOVEAP. Therefore, some parties tried to look into the application of automated valuation model for valuation at rural areas as it is said to be more cost-effective as compared to the traditional method, thus it might help to reduce cost. Through the review of the research titled 'Appraisal accuracy and automated valuation models in rural areas', the statistics obtained shows that the automated valuation model tends to obtain a higher market value than what is expected by the valuers. Therefore, although it may help to reduce cost, however valuers still unable to accept and adopt the automated valuation model fully as the accuracy of market value is always their top priority.

2.3 Issues Regarding Automated Valuation Model Application

As mentioned in the previous subsection, there are many valuation firms that do not want to adopt automated valuation model. In this subsection, the issues or reasons behind this matter will be discussed. The first and most concerned issue is the accuracy of market value. This is the most essential aspect in valuation as valuation is a highly professional profession and it is strictly regulated by BOVEAP as to prevent illegal activities such as bribery, thus the market value obtained need to ensure to be accurate and error-free. However, according to Renigier-Bilozor (2019), the data that is made available to the automated valuation model in the form of database is insufficient and incomplete. As the automated valuation model depends solely on the data from the database, thus whenever the data is insufficient, it will directly affect the market value obtained.

On top of that, although the similar data is provided to valuers, however when they carry out valuation manually, they are able to do adjustments onto the data based on their experience and knowledge on valuation, thus it is less flexible for automated valuation model as the model is unable to think like humans, they can only perform specific instructions based on all the materials provided. As valuation is said to be a combination of science and art, human element is very essential in order to perform the ‘art’ part of the valuation where valuers provide professional opinions and adjustments that are very individualistic and personal, one’s opinion might differ from the other, however in a whole, the difference would not differ too much. As automated valuation model only focuses on the ‘science’ part, it only performs the mathematical calculations and based on black and white data that is often a concrete statement, either positive or negative.

However, in the actual scenario, valuation often involves abstract ideas such as location and negative factors that derive from human preference. For instance, location of a property is abstract as one cannot categorize it into positive or negative categories. There is no location that is absolutely good or definitely bad. Therefore, valuers can analyze the locations and state that one location is inferior to another

and also estimating the logical amount of difference in terms of value for properties, then adjusting the market value of the subject property with the percentage that the valuer believes to be suitable and relevant. As it is abstract and there is no definite formula to follow, the percentage suggested by each valuer will differ, some might suggest a higher amount and vice versa, but however the amount suggested will usually be within a certain range. As for automated valuation model, it does not consist of Artificial Intelligence to carry out the above said action, it will give very definite suggestions, hence ending up being too extreme, either too high or too low, unlike the traditional method where valuers provide a more workable figure. According to Bogin (2019), he concludes that the automated valuation model tends to be upward biased, meaning that the model provides a market value that is higher than what it should be, thus unable to provide an accurate figure for the market value.

Another issue would be the lack of knowledge and skill to conduct valuation using the automated valuation model. According to Muhammad Najib Razali (2008), the awareness of AVM during that time was only about 36%, more than half of the valuation firms in Malaysia are not aware about the AVM. As the automated valuation model is still a relatively new technology in the valuation industry especially in Malaysia, the knowledge on how to apply and use the model is very rare. Therefore, even if a valuation firm wishes to adopt the automated valuation model, they will face difficulties in finding an expert to operate the model. The readiness of elements needed to apply automated valuation model is still unappealing within the valuation industry in Malaysia.

The third issue would be threat to job opportunities of valuers. In the most ideal scenario, automated valuation model is expected to replace valuers and do whatever a valuer is capable of doing. Although the performance of automated valuation model is still up to debate, but there is still risks where the automated valuation model is perfected in the future and totally replacing valuers. Even for now where the automated valuation model still has flaws, it still can reduce the need for valuers to a certain extent. Therefore, valuers and members of the Board of Valuers, Appraisers, Estate Agents and Property Managers are concerned about this issue as

the job opportunities will decrease tremendously and hiking up the unemployment rate for valuers. This will cause the current valuers that are in service to lose their source of income and also affecting the confidence for students who are getting prepared to enroll into the valuation industry, hence causing a severe damage to the entire industry.

2.4 Aspects that affects Automated Valuation Model

Application

2.4.1 Cost

As valuation firms are profit oriented companies where their main aim is to generate profit through the business activities, the stakeholders focus on increasing their revenue while maintaining their cost at a desirable level. For the traditional method, cost required is mainly the salary of valuers or valuation executives. Study shows that the average annual income of valuers in Malaysia is around RM76,795 which is approximately RM 6,400 per month. Valuation firms do not only hire one employee, but several valuers are also often required to cater the high amount of valuation cases received, thus the cost required is quite frightening. Therefore, when it comes to automated valuation model, stakeholders of valuation firms will highly concern about the cost required to apply the model as if the cost required is lower compared to the traditional method, these stakeholders would opt to apply automated valuation model into their operation and vice versa. However, according to Glumac (2020), the AVM can be subscribed on a monthly basis or per-case basis, the cost and limitations of these two types of subscription are different. Therefore, cost is an element that will affect the automated valuation model application.

2.4.2 Time

As mentioned in chapter one, one of the issue that valuation firms are facing currently is high amount of valuation cases where valuers are unable to cope, thus causing loss of cases as banks would offer the case to other valuation firms that are able to deliver the valuation report on time. For the traditional method of valuation which is done through manual calculation by valuers, it takes hours or even days to complete the calculation of market value depending on the complexity of the valuation. According to Glumac (2020), the hedonic model and also the usage of data stored in the database helps to reduce the time required to calculate market value, the AVM is able to calculate market value faster than humans. Therefore, if the automated valuation model is able to shorten the time required to obtain the market value, more valuation cases can be completed within the same period of time that is needed for the traditional method. For instance, previously the traditional method is only able to complete one case in a day and for the model, it is able to complete two in a day, the valuation firm will be able to generate more revenue where the other variables are kept constant. On top of that, it will also affect the firm's competitive advantage as if the firm is able to deliver valuation reports faster than other firms that do not apply the automated valuation model, banks or other customers would be more willing to offer the letter of instruction to the first firm.

2.4.3 Accuracy

The valuation field is a highly professional profession that does not tolerate any level of flaws and errors especially for the market value stated in the valuation report. Serious consequences will be faced by any valuers that delivers valuation report with flaws. Therefore, valuers must put in a lot of effort and energy when conducting the valuation exercise. According to Renigier-Bilozor (2019), the AVM calculates the market value using the hedonic model and repeat sales index. However, if there is limited amount of sales transaction to be used as data or reference by the model, the market value obtained might be far off the expected value by valuers. As the automated valuation model only calculates the market value of the subject property, hence the main concern of valuation firm stakeholders would be the accuracy of the market value provided by the model. As mentioned earlier, if flaws are found in the market value provided, the valuation report will be denied and punishments in terms of legal lawsuits or compensation will be charged to the responsible valuer. Worser scenario would be the valuation firm loses its creditability and trust from banks, causing the firm to lose businesses. Therefore, whether or not a valuation firm will adopt the automated valuation model into their business operation will be based on the accuracy of the market value provided.

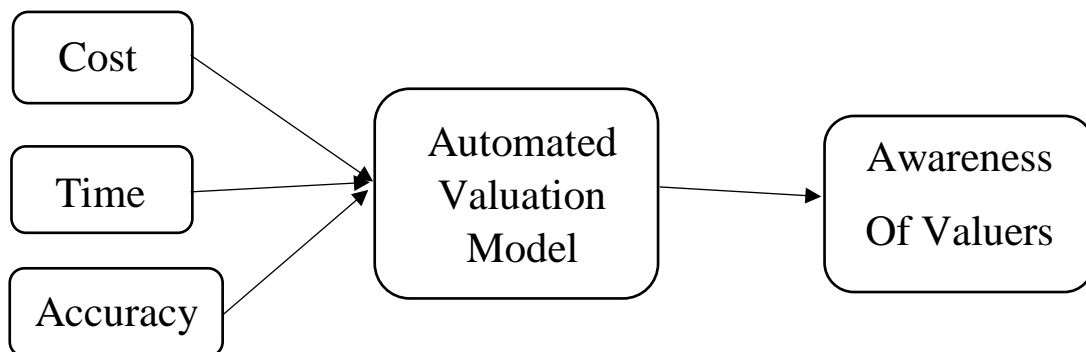
2.4.4 Knowledge

Another aspect or factor that would affect the application of automated valuation model is knowledge on the model. According to Razali (2008), most of the knowledge regarding the AVM is in the hands of the operators of the headquarters of valuation firms. As the automated valuation model is still arguably a new technology that is introduced to the industry, thus many of the valuers in Malaysia do not have much knowledge or only have limited knowledge about the model and especially knowledge on how to operate the model. Therefore, the knowledge on the automated valuation model can be mainly categorized into two which are awareness or acknowledgement about the existence of automated valuation model and also the knowledge on how to apply the model. For the first scenario, if the awareness about the model is low and stakeholders of valuation firms do not even know about the model, thus they would definitely not apply the model. As for the knowledge on how to apply the model, if the firm is unable to acquire a skilled employee that is able to apply the model, the firm would also not apply the model.

2.5 Review of Theoretical Framework

For this literature review, several journals and articles were reviewed to act as reference for this study. Among those are ‘Automated Valuation Model based on fuzzy and rough set theory for real estate market with insufficient source data’ by Bilozor (2019), ‘Practice briefing – Automated valuation models (AVMs): their role, their advantages and their limitations’ by Glumac (2020), ‘Automated valuation models for real estate portfolios: A method for the value updates of the property assets’ by Tajani (2017), ‘Appraisal Accuracy and Automated Valuation Models in Rural Areas’ by Bogin (2019) and ‘The existence of automated valuation models among valuation firms in Malaysia’ by Razali (2008). For these studies, the aspects that were studied are accuracy, time and cost. As these studies were carried out few years ago, automated valuation model was still relatively new at that time, thus researchers were very concerned about the performance of the model and how can it benefit valuation firms.

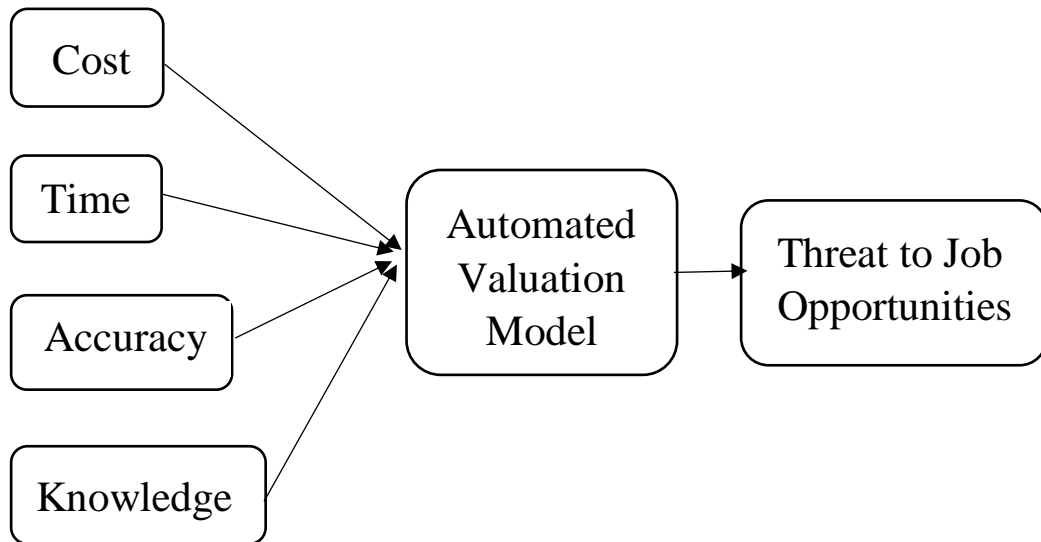
Figure 2.1 Theoretical Framework



Source: ‘The Existence of Automated Valuation Models among Valuation Firms in Malaysia’ by Razali (2008)

2.6 Proposed framework

Figure 2.2 Proposed Framework



Source: Developed for research

2.7 Conclusion

In conclusion, for the first half of chapter two, statements and discussions about the automated valuation model and traditional method was mentioned. Definitions of several key terms regarding this topic was written to explain about the meaning of these terms and how are they important in this study. After that, the current application level and application method of the automated valuation model was also discussed to provide a brief idea to readers on the current condition and scenario of the application of automated valuation model in Malaysia. Besides, issues or limitations faced by the automated valuation model when it is applied in the valuation industry in Malaysia is also mentioned such as lack of accuracy on market value obtained, lack of skilled employee to operate the model and also potential threat to job opportunities of valuers. For the next half of chapter two, aspects or factors that are wished to be tested and examined for this study is listed out. The aspects are cost, time needed, knowledge and accuracy. These aspects will help to provide an answer to this study, meaning that it will explain how the automated valuation model will impact the valuation for residential properties.

CHAPTER 3: METHODOLOGY

3.0 Introduction

In this chapter, the research methodologies used for this research will be stated and explained. The research design, data collection method, sample design, research instrument, construct measurement, data processing, and data analysis are the chapter's main components. These research methodologies will assist to acquire data, analyze the data obtained, interpret them into useful information which will lead to the purpose of this research.

3.1 Research Design

Research design is also known as the master plan or approach of a research to acquire solutions to the problems mentioned in the research with the aid of the experimental data retrieved (McCombes, 2019). There are several research design types which are qualitative research, quantitative research, descriptive research, experimental research et cetera. For this research, three of the research design types will be applied which are quantitative research and descriptive research. Quantitative research is used to analyze the data based on the four factors, cost, time required, knowledge and accuracy whereas descriptive research will be used to discuss about the job opportunity of valuers. As for the qualitative research, it analyzes the non-numerical data of the research.

3.1.1 Quantitative Research

Quantitative research is an approach where it analyzes numerical data and process these numerical data into information in the forms of prediction and forecast (Bhandari, 2020). It helps to detect patterns or trends based on the numerical data.

3.1.2 Qualitative Research

According to Pathak (2013), qualitative research refers to the type of research that identifies the respondents' behavior, attitude, perspectives et cetera. It involves the process of analyzing non-numerical data, in which for this case is text written by respondents in the questionnaire.

3.1.3 Descriptive Research

Descriptive research is a type of research used to interpret qualitative data and generate answers to questions in the form of what, where, when and how. The advantage of descriptive research is providing thorough information, generates high quality information, short time to perform and forms basis for decision making.

3.2 Data Collection Method

Data collection method refers to the approach to gather data that will be further processed into information for the research purpose. There will be two types of data which are primary data and secondary data.

3.2.1 Primary Data

Primary data refers to the initial data that a researcher collected by himself through methods such as surveys, experiments and questionnaire. These data collected is fresh and is up to date as the data provided are from participants of the survey or questionnaire. This helps to reflect the accurate and current respond of the participants relating to the matter. For this research, the primary data will be collected through the questionnaire method, where questions will be formulated and respondents will respond to each of the questions. The respond or answer to the question will be the primary data for this research.

3.2.2 Secondary Data

Secondary data is the previous data that was collected by a third party or other researchers. This secondary data is collected from websites, books, journals, et cetera. Secondary data can be acquired more quickly and easier, however the data might be outdated as it was collected in the past and the data might not exactly fit for the research purpose. For this research, journals, websites and articles relating to automated valuation model will be referred and the data provided in these publications will be used hand-in-hand with the primary data.

3.3 Sampling Design

Sample is a targeted group of people that is sorted out from the population. Sampling thus refers to the process of sorting the targeted people out from the population to be the respondents of this research. For the sampling design, there will be five main aspects, which are target population, sampling location, sampling elements, sampling technique and sampling size.

3.3.1 Target Population

As per the title of this research, the main concern is the automated valuation model. Therefore, the target population for this research will be narrowed down to people that are working in the valuation industry regardless of whether they apply the model in their work or not. Therefore, the targeted group of people will be registered valuers as well as valuation executives and valuation assistances that know about the automated valuation model. According to the Boards of Valuers, Appraisers, Estate Agents and Property Managers' official website, there are currently 1008 registered valuers and 1506 probationary valuers in Malaysia, thus the population is the total of both of them which is 2514.

3.3.2 Sampling Location

As the automated valuation model is still not widely implemented yet in Malaysia, thus it would not be practical if the sampling location is narrowed down to a certain state or area. Therefore, the sampling location will be the entire country which is Malaysia to allow all the people that are involved in Malaysia's valuation industry to be eligible to participate in this research.

3.3.3 Sampling Element

As for the sampling element of this research, the research participants will be Malaysian valuers. However, the research is still limited to valuers who are applying or knows about the automated valuation model. Valuers who are unaware of the automated valuation model is unable to become a respondent for this research.

3.3.4 Sampling Technique

The sampling technique that would be suitable for this research is judgmental sampling or also known as purposive sampling. Judgmental sampling technique is a non-random sampling technique where the samples are gathered strictly based on a certain purpose or specific criteria, which means not all individuals in the population is suitable to be a participant for the research. Judgmental sampling helps to gather respondents or participants that are able to provide the essential information needed for the purpose of the research which cannot be acquired from the unselected group of people (Taherdoost, 2016). For this research, the main purpose is to identify the impact that the automated valuation model brings to the valuation industry, thus only those who are working in the valuation industry and on top of that those who knows about automated valuation model or those who are applying the model in their work is suitable for this research. Although the person might be working as a valuer but he or she does not know about or apply the model, he or she would still not be suitable for this research. Therefore, judgmental sampling will be applied in this research to gather respondents that are able to provide suitable answers that would satisfy the purpose of this research.

3.3.5 Sampling Size

According to the Boards of Valuers, Appraisers, Estate Agents and Property Managers' official website, there are currently 1008 registered valuers and 1506 probationary valuers in Malaysia, thus the population is the total of both of them which is 2514. As for the margin of error, it is estimated to be around 15% which is 0.15. To calculate the sample size, the Slovin's formula is used. The formula is $n = \frac{N}{1 + Ne^2}$, where n is the sample size, N is the population size, e is the margin of error. Referring to the figure acquired as stated above, the sample size calculated using the Solvin's formula is 43.67. Therefore, for this research, the sample size is set at 45 person.

3.4 Research Instrument

Research instrument refers to the tools used to collect and gather data. Several types of research instruments are questionnaire, survey, interview and so on. With accordance to the research methodology and the desired type of data that is wished to be obtained, the research instrument can be designed to suite for the purpose of the research in the form of quantitative or qualitative. For this research, the research instrument used to collect data is questionnaire.

3.4.1 Design of the Questionnaire

The questionnaire for this research is distributed in the form of Google Forms which is through the online platform. A brief introduction about the research is provided at the very beginning of the questionnaire that tells the respondents about the purpose and nature of this research. After that, there are three main parts in this questionnaire which are section A, section B and section C.

In section A, questions are designed to acquire demographic information about the respondents. General demographic information such as name, age and gender are asked in the first few questions. As for the information about working experience in valuation field, whether or not the respondent is a registered valuer and whether the respondent is aware of or applies automated valuation model. The latter part of section A helps to identify whether the respondent is suitable for this research and eliminates those who do not know about automated valuation model.

As for section B, questions are formulated in accordance with the factors mentioned earlier which are cost, accuracy, time needed and knowledge. Several questions are prepared for each of these factors. The data that will be acquired for section B will be quantitative in order to determine the ranking of importance or significance of each factors towards the purpose of this research. This is done by utilizing 6-point likert scale which is providing the respondents options from one to six where one indicates strongly disagree while six indicates strongly agree.

In section B, three open-ended questions are designed to acquire the respondents' opinion on the threat of automated valuation model towards the job opportunities of valuers in the future. The responses acquired will be qualitative which will then be discussed in the latter part of this research.

3.5 Construct Measurement

Table 3.1 Construct Measurement

Measurement Statements	Item in Questionnaire	Reference(s)
Factor 1: Cost		
The initial set-up cost of AVM discourages the application of AVM.	Section B Question 1.3	Glumac (2020), Bogin (2019)
Factor 2: Accuracy		
Market value provided by AVM is less accurate, thus only can be used as reference.	Section B Question 2.3	Bilozor (2019), Glumac (2020), Tajani (2017), Bogin (2019)
Factor 3: Time		
Application of AVM helps to reduce time needed for market value calculation	Section B Question 3.3	Glumac (2020)
Factor 4: Knowledge		
Low awareness of AVM among valuers lead to low application rate of AVM.	Section B Question 4.2	Razali (2008), Sunderajoo (2017)
Threat of AVM to Job Opportunities		
Will AVM become a common method to practice valuation in Malaysia in the next five years?	Section C Question 3	

Source: Developed for research

3.5.1 Pilot Test

Pilot test is a small-scale test run on the questionnaire to determine whether the questionnaire done is feasible and effective or not. For this research, twenty respondents will be acquired to conduct the reliability test.

3.5.2 Nominal Scale

Nominal scale refers to a measurement scale where numbers is only used as tags or labels, the number itself does not carry any numerical value. The number helps to categorize elements in a questionnaire. Nominal scale is the most fundamental scale among the four measurement scales. This is applied for section A, the numbers are used to label the criteria such as age, gender and so on. For instance, 1 = male, 2 = female, 3 = others.

Figure 3.1: Illustration of Nominal Scale

Gender *

Male

Female

Others

Source: Developed for research

3.5.3 Ordinal Scale

Ordinal scale refers to the scale in which it displays the order of variable as opposed to their differences. Ordinal scale is used to capture qualitative data and provides a rank. It is commonly applied to describe non-mathematical elements such as frequency, satisfaction and so on. For this questionnaire, the ordinal scale is applied in section B where it is used to assess the agreement of respondents towards the question in terms of strongly agree, agree, neutral, disagree and strongly disagree.

Figure 3.2: Illustration of Ordinal Scale

The "1" stands for **Strongly Disagree** with the statement.

The "2" stands for **Disagree** with the statement.

The "3" stands for **Slightly Disagree** with the statement.

The "4" stands for **Slightly Agree** with the statement.

The "5" stands for **Agree** with the statement.

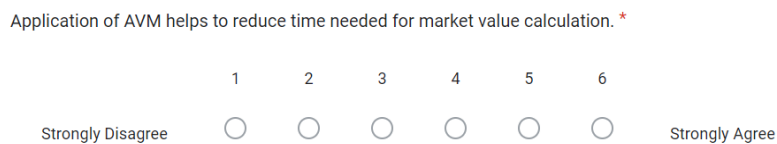
The "6" stands for **Strongly Agree** with the statement.

Source: Developed for research

3.5.4 Likert Scale

Likert scale is also a measurement scale that acquires the opinion of respondents towards the question. The type of likert scale used in this questionnaire is even likert scale. Even likert scale is used to collect extreme response from respondents as it does not provide an option for neutral opinions, the respond can only be agree or disagree. By using even likert scale, we will be able to acquire a result that only shows positive or negative result regarding to the impact of automated valuation model.

Figure 3.3: Illustration of Even Likert Scale



Source: Developed for research

3.5.5 Open-ended Question

Open-ended question is a free form question that does not restrict the respondents to any fixed answer. The respondents are given the freedom to provide any kind of response. Open-ended questions often ask questions that starts with what, why, how et cetera. The responses collected from open-ended questions will be qualitative data and it reflects the respondents' opinion towards the questions asked. For this research, the open-ended questions will be used to ask respondents about their opinion of the threat of AVM towards the job opportunities of valuers.

Figure 3.4: Illustration of Open-ended Question

Will AVM become a common method to practice valuation in Malaysia in the next five years?

Short-answer text

Source: Developed for research

3.6 Data Processing

3.6.1 Data Checking

The initial stage of data processing is to ensure that all the questionnaires distributed had been completely filled up. During this stage, the data needs to be checked and eliminate any undesired data found to prevent it from compromising the research. It helps to ensure the validity of the data acquired and also enhance the quality of the feedback.

3.6.2 Data Editing

Data editing involves the process of identifying and amending any incomplete or illogical data. Data editing needs to be done after data collection but before data analysis. Errors that may be present in the data obtained such as missing values and inconsistency needs to be identified and amended. This helps to ensure that the data acquired is accurate and consistent, thus will ensure the smooth progress of data analysis.

3.6.3 Data Coding

Data coding is the process of converting data into a form where it can be analyzed by the computer. Numerical codes will be given to the respondents' response and the data will then be able to be analyzed by the statistical software, which is SPSS. It makes it achievable for researchers to upload massive quantities of data to databases, which promotes software-based data analysis.

3.6.4 Data Transcription

Data transcription is the process where the researcher converts data from one format to another. Transcribing audio or video recordings into text, digitising handwritten notes, or translating information from one language to another are all examples of this. In many fields, including healthcare, law, and market research, where precise and trustworthy data are essential for decision-making, data transcription is a key responsibility. For data transcription, a variety of products and services are available, ranging from manually transcribing data by humans to automatically transcribing data using machine learning algorithms. For this research, the coding was converted from Microsoft Excel to SPSS.

3.7 Data Analysis

In data analysis, it involves the action of interpreting data into useful and meaningful information. To do so, statistical and mathematical algorithms will be used to identify the trend or relationship in the data sets obtained. The Statistical Package for the Social Sciences (SPSS) software will be applied for this research to conduct reliability test and relative importance index.

3.7.1 Reliability Test

Reliability test is an analysis to determine the consistency and reliability of the questionnaire. If the reliability test shows a result that says it is unreliable, thus the questionnaire should be amended before conducting the actual distribution of the questionnaire. To conduct reliability test, the Cronbach's alpha method is applied.

Table 3.2 Result of Reliability Test

No	Construct	Cronbach's Alpha	No. of items	No. of Respondents	Strength
1	Cost	0.6677	3	20	Questionable
2	Accuracy	0.6809	2	20	Questionable
3	Time	0.9635	3	20	Excellent
4	Knowledge	0.9222	2	20	Excellent

Source: Developed for research

Table 3.3 Range of Cronbach's Alpha Reliability

<i>Cronbach's Alpha Score</i>	<i>Level of Reliability</i>
0.0 – 0.20	Less Reliable
>0.20 – 0.40	Rather Reliable
>0.40 – 0.60	Quite Reliable
>0.60 – 0.80	Reliable
>0.80 – 1.00	Very Reliable

Source: https://www.researchgate.net/figure/Cronbachs-Alpha-Level-of-Reliability_tbl5_316859646

According to Ahdika (2017), once the Cronbach's alpha score for a construct exceeds 0.60, that construct is said to be reliable whereas those which exceeds 0.80 is said to be very reliable. For the reliability test of this research, the score for two factors which are cost and accuracy exceeds 0.60 while for time and knowledge, their score exceeds 0.80. Therefore, it can be concluded that the reliability of this research is said to be acceptable and reliable.

3.7.2 Relative Importance Index

Relative importance index is a statistical method that is applied to identify the importance of factors of a research in forecasting an outcome. To acquire the relative importance index for each of the factors, first the frequency of each respond needs to be multiplied with the weightage of that respective option. For instance, for the option 'Strongly disagree', it carries the weightage of '1' and the frequency of it is 10, thus getting the result of 10 and repeating this for the other options. After that, the sum of it needs to be divided with the total number of respondents times the highest weightage. For this research, the total number of respondents is 45 while the highest weightage is 6 for 'Strongly Agree', thus it will be 270.

Figure 3.5 Relative Importance Index Formula

Formula of Relative Important Index (RII)

$$RII = \frac{\sum W}{(A \times N)}$$

Where:

W= Weightage given by the respondent to each factor

A= Highest Weightage

N= Total number of respondent

Source: <https://research.mitwpu.edu.in/publication/effect-of-hybrid-annuity-model-on-road-project>

3.7.3 Content Analysis

Content analysis is a type of research tool that is applied to determine specific contents such as words or concepts in the acquired qualitative data. As questions in section C of this questionnaire are open-ended questions, the response obtained will be qualitative data which are written opinions of the respondents. Through content analysis, we are able to analyze and interpret such qualitative data to identify the underlying meaning of the responses.

3.8 Conclusion

In short, 45 respondents will be required to participate in this research. In the questionnaire, two types of questions will be asked which are likert-scaled questions and open-ended questions. The analysis that will be used are relative importance index and content analysis. The data acquired will be analyzed and processed using the SPSS software while the results will be further discussed in chapter 4.

CHAPTER 4: DATA ANALYSIS

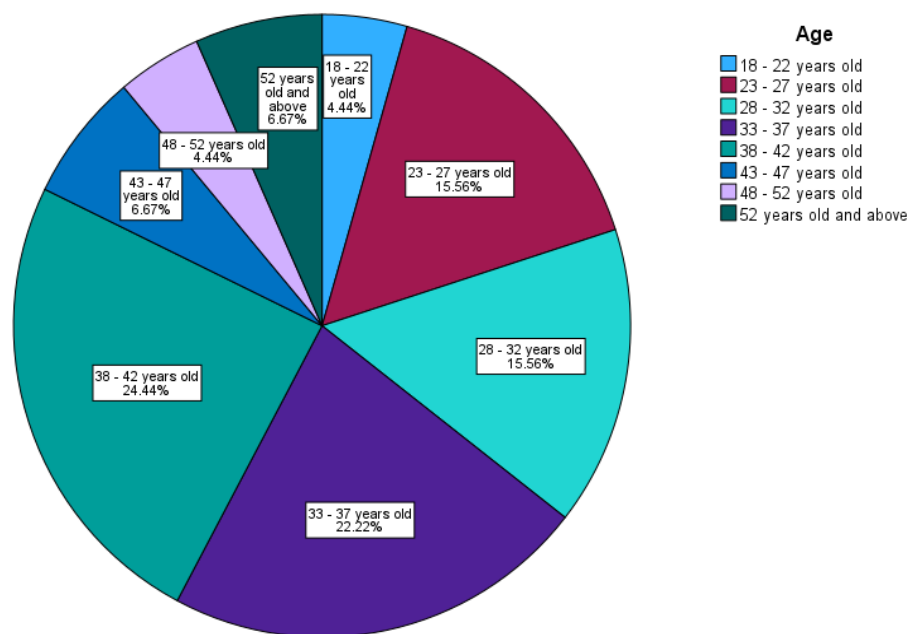
4.0 Introduction

In Chapter 4, data collected from the questionnaire will be analysed using the SPSS software. The data on demographic of respondents will be discussed in the form of graphs and tables while data acquired using the likert scale will be analysed using the relative importance index.

4.1 Descriptive Analysis

4.1.1 Age

Figure 4.1: Percentage of Respondents' Age



Source: Developed for research

Table 4.1: Statistics of Respondents' Age

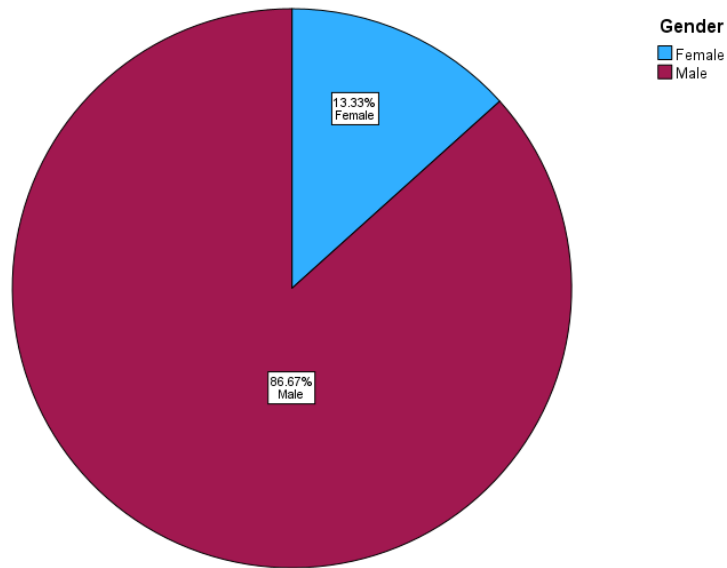
Age	Frequency	Percentage (%)	Cumulative Percentage (%)
18-22	2	4.44	4.44
23-27	7	15.56	20.00
28-32	7	15.56	35.56
33-37	10	22.22	57.78
38-42	11	24.44	82.22
43-47	3	6.67	88.89
48-52	2	4.44	93.33
52 years old and above	3	6.67	100
Total	45	100	

Source: Developed for research

The age group of the respondents is categorized into eight groups. Most of the respondents are 38-42 years old which makes up 24.44% of the total respondents, followed by 33-37 age group of 22.22%. For age group 23-27 and 28-32, the percentage of this two age groups is 15.56%. As for age group 43-47 and 52 years old and above, the percentage is 6.67% Lastly, the age groups with the lowest percentage of 4.44% are 18-22 and 48-52.

4.1.2 Gender

Figure 4.2: Percentage of Respondents' Gender



Source: Developed for research

Table 4.2: Statistics of Respondents' Gender

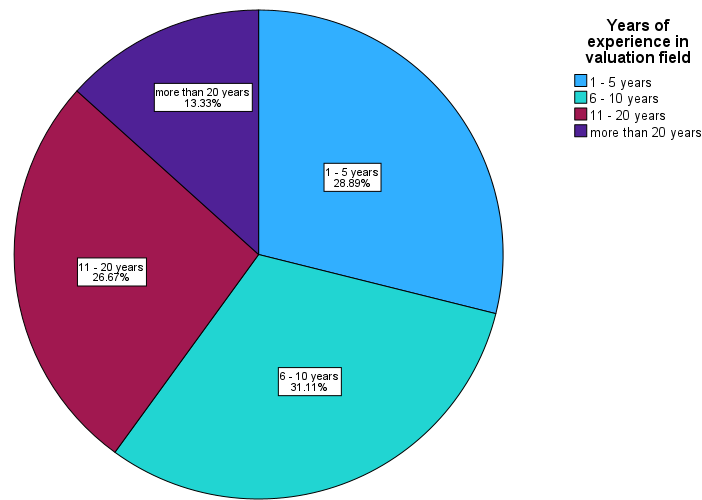
Gender	Frequency	Percentage (%)	Cumulative Percentage (%)
Male	39	86.67	86.67
Female	6	13.33	100
Total	45	100	

Source: Developed for research

Out of the 45 respondents, 39 or 86.67% of them are male while the remaining 6 or 13.33% are female.

4.1.3 Years of Experience in Valuation Field

Figure 4.3: Percentage of Respondents' Years of Experience



Source: Developed for research

Table 4.3: Statistics of Respondents' Years of Experience

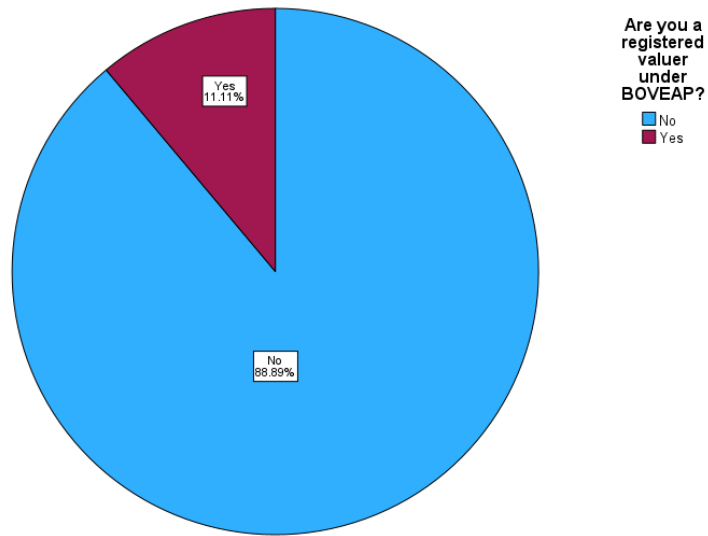
Years of experience	Frequency	Percentage (%)	Cumulative Percentage (%)
1-5 years	13	28.89	28.89
6-10 years	14	31.11	60.00
11-20 years	12	26.67	86.67
More than 20 years	6	13.33	100.00
Total	45	100	

Source: Developed for research

Most of the respondents have 6-10 years' experience, which makes up 31.11% of the total number of respondents, followed by 1-5 years which makes up 28.89%. 26.67% of the respondents have 11-20 years of experience while those who have experience of 20 year and above only makes up 13.33%.

4.1.4 Registered Valuer under BOVEAP

Figure 4.4: Percentage of Registered Valuers



Source: Developed for research

Table 4.4: Statistics of Registered Valuers

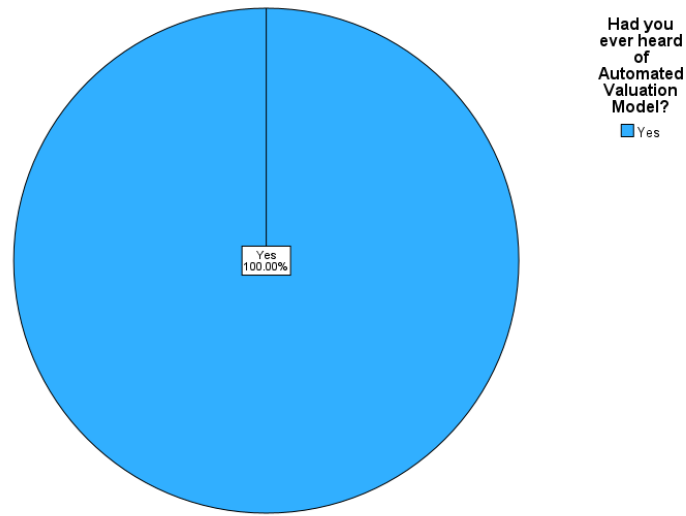
Registered Valuer	Frequency	Percentage (%)	Cumulative Percentage (%)
Yes	5	11.11	11.11
No	40	88.89	100.00
Total	45	100	

Source: Developed for research

Only five respondents are registered valuers which is 11.11% while the remaining 40 respondents are not registered valuers which is 88.89%.

4.1.5 Awareness of Automated Valuation Model

Figure 4.5: Percentage of Respondents' Awareness



Source: Developed for research

Table 4.5: Statistics of Respondents' Awareness

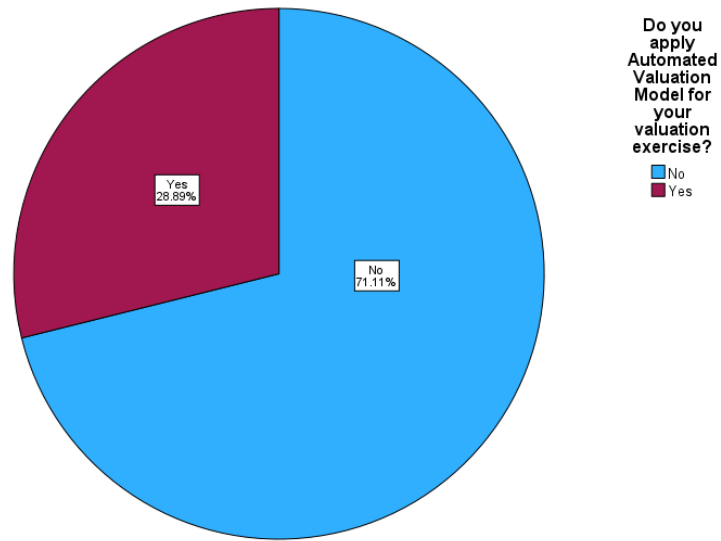
Awareness	Frequency	Percentage (%)	Cumulative Percentage (%)
Yes	45	100	100
No	0	0	0
Total	45	100	100

Source: Developed for research

All 45 respondents (100%) are aware of the automated valuation model.

4.1.6 Application of Automated Valuation Model

Figure 4.6: Percentage of Respondents' Application



Source: Developed for research

Table 4.6: Statistics of Respondents' Application

Application	Frequency	Percentage (%)	Cumulative Percentage (%)
Yes	13	28.89	28.89
No	32	71.11	100.00
Total	45	100	

Source: Developed for research

Out of the 45 respondents, 13 of them (28.89%) are applying automated valuation model while the remaining 32 (71.11%) do not apply automated valuation model.

4.2 Relative Importance Index

Table 4.7: Relative Importance Index

Factor 1: Cost	RII	Rank	Average RII
Applying AVM is more cost effective as compared to applying the traditional method.	0.3519	3	0.5679
The cost required to apply AVM is lower compared to the monthly salary of valuers.	0.5074	2	
The initial set-up cost of AVM discourages the application of AVM.	0.8444	1	
Factor 2: Accuracy	RII	Rank	Average RII
The accuracy of the market value obtained by applying AVM is at a satisfactory level.	0.8148	2	0.8556
Market value provided by AVM is less accurate, thus only can be used as reference	0.8963	1	
Factor 3: Time	RII	Rank	Average RII
The time required to conduct valuation using AVM is shorter compared to the traditional method.	0.8074	2	0.8012
While applying AVM, valuation exercise is able to be completed within the given period of time provided by clients.	0.7815	3	
Application of AVM helps to reduce time needed for market value calculation.	0.8148	1	
Factor 4: Knowledge	RII	Rank	Average RII
Lack of knowledge on AVM discourages the application of AVM.	0.7630	1	0.7611
Low awareness of AVM among valuers lead to low application rate of AVM.	0.7593	2	

Source: Developed for research

According to the table above, the factor that has the highest average RII is factor 3: time, followed by factor 4: knowledge, factor 2: accuracy and lastly is factor 1: cost. Based on the relative importance index computed above, we can rank the four factors as follow:

Table 4.8 Ranking of Factors

Factor	Rank
Accuracy	1
Time	2
Knowledge	3
Cost	4

Source: Developed for research

With this, we can conclude that the time factor plays the most important role in the impact of automated valuation model towards valuation while cost factor is the least essential factor among the four.

4.3 Content Analysis

Content analysis analyses the responds collected for open ended questions. Out of the 45 respondents, there are 32 of them who answered the open ended questions. The answers will be categorized into several main groups such as ‘yes’ or ‘no’.

4.3.1 Effect of AVM on Job Opportunities of Valuers in the Near Future

Table 4.9: Effect of AVM on Job Opportunities

How will AVM affect the job opportunities of valuers in the near future?	Yes	No	Invalid
As an aid buy will never replace valuers		1	
AVM state as reference and guide to compute market value		1	
for near future no but still possible in the future		1	
for the near future, the AVM would not affect much on the job opportunity		1	
Have litte impact if the person manning the AVM are valuers not othet	1		
I believe the profesion of valuers will not affected by AVM.		1	
I petty sure board will ensure that avm can only use as reference rather than replacing human, so the effect will be minimum.		1	
It will have no bearing		1	
job opportunity will decrease as AVM is take their place in the industry	1		
Less valuer in industry	1		
might reduce the need for VE & VA	1		
might slightly affect, slightly reduce demand	1		
More efficient			1
No affect coz AVM only calculation and mathematical that can derived the mv exactly because valuation is about art n science.		1	
no effect		1	
No longer needs to take in VE	1		
not much effect		1	
not much effect		1	
not much effect if for near future		1	
not much effect in near future		1	
Not much. As other factors like renovation, features, income approach still required experience valuers		1	
Not really affect the valuers job opportunity		1	
People is not a valuer tend to become valuer			1
possible, advancement in AI recently will boost the development of AVM	1		
probably slightly reduce demand for VA and VE	1		

Impact of Automated Valuation Model on Valuation for Residential Property

The percentage of valuers job will reduce and softskill also gone	1		
Valuation Assistants will be replaced my machine	1		
Verbal indication will be expelled			1
wont affect much		1	
Wont affect much		1	
wont affect RV but might decrease demand for VE	1		
wont affect RV but might reduce need for VE	1		
Frequency	12	17	3
Percentage (total 32)	38%	53%	9%

Source: Developed for research

For the first open question which is how the automated valuation model will affect the job opportunities of valuers in the near future, the analysis shows that 53% of the respondents who responded to this question have the concept that the automated valuation method will not affect the job opportunities of valuers in the near future. However, there are 38% or 12 respondents who thinks that the automated valuation model will affect job opportunities. Some of these respondents stated that the application of automated valuation model might decrease the demand for valuation executives and valuation assistances.

4.3.2 Possibility of AVM Completely Replacing Valuers in the Future

Table 4.10: Possibility of AVM Replacing Valuers

Is it possible where AVM will completely replace valuers in the future?	Yes	No	Invalid
If you understand MVS, this is redundant question. AVM is only one of the tools available. The registrant applies his vast experience and knowledge to make a conclusion and extends his professional liability to the Client for his expertise.		1	
It impossible because valuers will looking into more factors, justification and opinion		1	
No		1	
no		1	
No		1	
No		1	
No		1	
No		1	
No		1	
No		1	
no		1	
no		1	
no, AVM unable to conduct inspection		1	
no, AVM unable to conduct site inspection		1	
No, require physical inspection		1	
no, wont completely replace		1	
No. For certain cases,it still need the valuers experience and knowledge.		1	
No. Coz the data transaction based on automated can easily be exploited coz not take consideration on data transaction weather is developer data or subsale data that can being manipulated that data easily cross the actual market value..even today many negotiator try to become valuer and just use brick data as their sale price that will affect the current market value. so u can imagine used only AVM will make the current mv will be manipulated by those people..so valuer is important to keep that market value not become higher market value.		1	
Nope. AVM only can be used to value a standard property. Corner unit and extension unit still need conventional method		1	

Impact of Automated Valuation Model on Valuation for Residential Property

Not possible. MVS 6 require physical inspection. Unless amend the Valuers Act		1	
possible but for near future no	1		
possible if AVM develops into AI such as chat gpt	1		
Possible if people without valuation knowledge manning AVM. In which it should be discourage.	1		
possible, since AI like Chat gpt are being developed	1		
Probability not ready for right now		1	
wont completely replace		1	
wont completely replace but will take up large portion of valuer's job		1	
Yes	1		
yes as now AI system advancement such as Chat GPT is taking over the world	1		
yes as technology is constantly evolving but might need to amend MVS to comply with such technology	1		
Yes, when all human required job are replaced by automated process. Other example is accounting area, they automated software like autocount, but have the software replaced accountant?	1		
Frequency	8	24	0
Percentage (Total 32)	25%	75%	0%

Source: Developed for research

Moving on to the second open ended question, is it possible where automated valuation model will completely replace valuers in the future, 75% or 24 respondents out of the 32 who answered this question mentioned that it is not possible for automated valuation model to replace valuers in the future. Some of them mentioned that as long as the Malaysian Valuation Standard is not amended, the automated valuation model will be unable to completely replace valuers as it would still require valuers to conduct site inspection. However, the remaining 25% of the respondents had a differing opinion. They think that the advancement of technology especially AI such as chat GPT makes it possible for the automated valuation model to completely replacing valuers.

4.3.3 Possibility of AVM Becoming a Common Method to Practice Valuation in Malaysia in the Next Five Years.

Table 4.11: Possibility of AVM Becoming a Common Method

Will AVM become a common method to practice valuation in Malaysia in the next five years?	Yes	No	Maybe
AVM already been used in JPPH for standard property such as intermediate house/shop and complete within 1 day	1		
I dont think so. Human still need to give data inputs. Without inspection the datas given are not accurate.		1	
Maybe need more than 5 years to become a common method		1	
No		1	
No		1	
No		1	
No		1	
No		1	
no		1	
no		1	
no, currently the AVM is still not well developed yet		1	
No, even ten years is also no the answer will be no. Using accounting field as an example, auto account software have been existed over 10 year, but still they need human accountant. I using accounting field as an example because it was quite similar with our field. But when we search for automated accounting software we can find somethings that well-known enough, like autocount. In valuation field, we also have avm, but we don't have any mature avm software that can become common software goto when talking avm. The most nearest thing we got as avm is our pre-formated excel calculations file. I can say is not just mvs, any tech related thing will be hard to adopt into this field for many reasons. 1. This is a highly professional field, so if it not broken, dont fix. Any implications of the new technology have to ensure the things you write in the report is 200% correct and well accepted by anybody in the field. 2. Unlike other field like accounting, valuation field is more "closed" and smaller, you will know i saying when you try to find reference related with valuation. So the development of		1	

Impact of Automated Valuation Model on Valuation for Residential Property

avm or other technology related with this field is definitely harder, and required a lot of in field experience to develop avm. 3. Acceptable and awareness, most of the registered valuer definitely know / heard about avm, i also pretty sure they willing to accept and adopt new technology when available, especially for the technology that can improve their process/report, but the technology adoption MUST BE un-arguments-able, which means the new technology they adopted small not causing them any troubles in any time frame.			
No, in near future it will not be a common method		1	
No, maybe in further future yes		1	
no, the MV provided by AVM is not accurate enough		1	
No.		1	
No.		1	
Not		1	
Not necessary		1	
Not sure..Maybe for housing loan cases should be a common method.			1
Possible because can be guide to compute market value	1		
possible, might be used as common method for residential valuation	1		
probably			1
probably for simple cases such as residential valuation			1
probably, might be common method for simple valuation cases			1
Sometime needed sometime not.			1
Yes	1		
yes i highly believe as AVM is cost effective and next-level technology in the future	1		
yes possible	1		
yes possible especially for residential valuation where the case is not as complex as other valuation cases and the amount of data is more sufficient as well	1		
yes, AVM is slowly being perfected, will be able to be used as common method for common valuation cases but not for complexed cases	1		
Yes.	1		
Frequency	9	18	5
Percentage (Total 32)	28%	56%	16%

Source: Developed for research

Lastly, the third open ended question asks the respondents on whether the automated valuation model will become a common method to practice valuation in the next five years. 56% of the respondents states that it is not possible for the automated valuation model to become a common method for valuation exercise in the near future. They also mentioned that the automated valuation model is not accurate enough. However, there are five respondents that thinks that there is a possibility where the automated valuation model will become a common valuation method. On the other hand, 28% of the respondents have the opinion that the automated valuation model will become a common method for valuation exercise in the next five years. They stated that the model may be used for simple valuation exercises such as valuation for residential properties and they also mentioned that JPPH is already doing so.

4.4 Conclusion

In short, 45 sets of data were collected and analysis methods such as descriptive analysis, content analysis and relative importance index were applied to analyze the data acquired. The results of the said analysis will be further discussed and explained in chapter five.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATIONS

5.0 Introduction

In chapter five, findings and interpretation of this research will be further examined. Moreover, the primary findings, limitations and recommendations for this research will also be discussed. Lastly, a conclusion will be done to conclude this research.

5.1 Summary of Statistical Analyses

5.1.1 Descriptive Analysis of Demographic Profile

Based on the data collected on demographic profile, 2 respondents (4.44%) fall under the age of 18-22 years old, 7 respondents (15.56%) falls under the age of 23-27 years old and age of 28-32 years old respectively, 10 respondents (22.22%) are of age 33-37 , 11 respondents falls under the age of 38-42 years old, 3 respondents (6.67%) falls unde the age of 43-47 years old and 52 years old and above respectively and 2 respondents (4.44%) falls under the age of 48-52 years old. As for gender, 39 respondents (86.67%) are male while the remaining 6 respondents (13.33%) are female. Next, 13 respondents (28.89%) have 1-5 years valuation experience, 14 respondents (31.11%) have valuation experience of 6-10 years, 12 respondents (26.67%) have valuation experience of 11-20 years while the remaining 6 respondents (13.33%) have more than 20 years of valuation experience. Out of the 45 respondents, only 5 respondents (11.11%) are registered valuers, the remaining 40 respondents (88.89%) are not registered valuers. As for the awareness of automated valuation model, due to the limitation of this research, all the respondents (100%) are aware of the automated valuation model. Lastly, for the application of automated valuation model, 13 respondents (28.89%) are applying the automated valuation model while the remaining 32 respondents (71.11%) are not applying the automated valuation model.

5.1.2 Relative Importance Index

After computing the relative importance index for each sub-question under the respective factors, the average relative importance index was calculated for the four factors. The factor with the highest RII is the accuracy factor with RII of 0.8556, followed by time factor (0.8012), knowledge factor (0.7611) and lastly, cost factor (0.5679). With this, we can conclude that the accuracy factor is ranked on the top of the list while cost factor is the lowest on the list.

5.1.3 Content Analysis

For content analysis, three open-ended questions were analyzed. For the first question, effect of AVM on job opportunities of valuers in the near future, 38% out of the 32 respondents agreed that the AVM will affect the job opportunities of valuers in the near future while 53% of them stated that there will be no effect to the job opportunities.

As for the second question, possibility of AVM completely replacing valuers in the future, only 25% of the respondents agreed that there is possibility where the AVM will completely replace valuers whereas the remaining 75% thinks that there is no chance for the AVM to completely replace valuers.

Lastly, the third question asks the respondents whether the AVM would become a common method to conduct valuation in the next five years. 28% of the respondents thinks that the AVM is able to become a common method for simple valuation cases, 56% of them thinks that the AVM is unable to become a common method while the remaining 16% said maybe, which means that they think that there is a possibility where the AVM will become a common method but they are uncertain about it.

5.2 Discussion of Major Findings

For the objective of this research, to rank the aspects in valuation that are affected by automated valuation model, the four factors of this research will be ranked based on the relative importance index calculated.

Table 5.1: Ranking of Factors

Factor	Rank
Accuracy	1
Time	2
Knowledge	3
Cost	4

Source: Developed for research

According to the ranking, we can interpret that most valuers think that the accuracy of the AVM in calculating the market value of the subject property is the main concern. This is mainly due to the nature of the valuation industry where valuers will face serious consequences such as disciplinary actions from the Board when the market value stated in the valuation report is found to be inaccurate. According to the Malaysian Valuation Standard, standard one states that only valuers who are competent and have sufficient experience is allowed to carry out valuation exercise. Therefore, although valuers are applying the AVM, they still need to comply to MVS 1 which is ensuring that the market value obtained is correct and accurate. Furthermore, according to Act 242 Valuers, Appraisers, Estate Agents and Property Managers Act, section 24, it states that if a valuer is found to be guilty of professional negligence, the valuer will face several consequences such as cancellation of registered valuer title, three years suspension and monetary fine. Therefore, accuracy of the AVM is much concerned by valuers in order to prevent such consequences.

Time is ranked the second among the four factors, just below accuracy. The automated valuation model impacts the valuation exercise by doing it faster compared to human valuers. According to Razali (2008), he stated that as the data is already stored in the database of the AVM, it helps valuers to save time as they are no longer required to collect data for the valuation. By completing valuation cases faster, it helps the firm to be able to conduct more valuations, thus generating more profit.

As for the knowledge, the lack of awareness and knowledge to apply the automated valuation model also greatly affects the impact of the automated valuation model. The lack of awareness can be seen in the demographic profile as well where the number of respondents is low as well as the application rate of the model. Furthermore, the lack of knowledge on applying the automated valuation model also leads to valuers tend to not accept such new technology and rather stick to the traditional method. The AVM is mostly acknowledged by headquarters of valuation firms, other valuers finds it difficult to get exposed to information related to the AVM (Razali, 2008). During that time, as such knowledge are in the hands of the headquarters, other branches have inadequate knowledge in applying the AVM, thus leading to the low application rate. However, according to the higher application rate of the AVM as seen in the demographic profile of the respondents and the advancement of social media, knowledge regarding the AVM is easier to be obtained compared to the last decade. Therefore, it becomes less significant to valuers, thus only ranked the third among the four factors.

Lastly, for cost, it is ranked at the last position on the ranking. For the cost of applying the automated valuation model, the respondents think that it is not cost effective to apply the automated valuation model. By relating it with the other factors, the performance of the model is inferior compared to valuers but the cost of applying it is equal to or higher than the cost used to pay the salaries of the valuers. On top of that, the AVM is able to be applied on monthly subscription basis and per-case basis. By applying the AVM on per-case basis, the valuation firms may stop the application anytime whenever they think that the AVM is not suitable for their business operation without incurring any further costs. According to Glumac

(2020), cost of applying the AVM is less relevant compared to the accuracy of the market value obtained. Although cost is one of the aspects that is looked into by valuation firms as it will affect the profit margin, however valuers are more concerned about the accuracy and time, thus cost is ranked at the fourth among the four factors.

As for the threat to job opportunities, based on the content analysis, we can interpret that most valuers in Malaysia think that it is impossible for the automated valuation method to completely replace valuers as it is restricted by its accuracy in computing market value and also the inability to conduct site inspection. However, the respondents did mention that the application of automated valuation model will slightly decrease the demand for valuation executives and valuation assistants, thus reducing the job opportunities. However, at whole, the automated valuation model is said to be imperfect currently, thus is not as capable compared to the human valuers.

The respondents also pointed out that although the model is not as accurate as valuers, it is still capable of being used for simple valuation cases. The respondents mentioned that the model is currently being used by JPPH for valuation cases of intermediate residential houses or shops that do not require many adjustments. However, valuation firms do not only conduct simple valuation cases, but they are also instructed to conduct other various types of valuations that are much more complex. Therefore, currently, the automated valuation model may only slightly reduce the demand for valuation executives and valuation assistants as if valuation firms are to apply the model for the simple valuation cases, they will not require as much manpower compared to when they did not apply the model. As for registered valuer, the automated valuation model does not pose any threat to them as the model's capabilities are incomparable to the capabilities of the registered valuers as they had passed the test of competence and also having much more years of experience, thus able to provide a better opinion on market value.

In short, the threat of AVM to job opportunities for valuation executives and assistants exists. Valuation firms tend to demand for lesser employees as the AVM is able to increase the productivity of the firm. However, the job opportunities for registered valuers are not affected as their skills, knowledge and expertise are unable to be challenged by the AVM. As the AVM is still not matured currently, the threat to job opportunities of valuation executives and assistants is still low. However, in the future when it develops into a more matured model, it will pose a greater threat. Therefore, this study helps to forecast the potentialities so that concerned authorities such as BOVEAP may start to take precautions to prevent such scenario rather than solving it in the future where the threat is already irreversible.

5.3 Implication of Study

In this research, four factors were examined, which are cost, accuracy, time and knowledge. This research acts as an update to the previous research done on the automated valuation model and provides information for future researchers who wish to conduct research on the model in the future. Due to the nature of the valuation industry, there is a very limited number of journals and articles regarding valuation especially for the automated valuation model. Therefore, this research helps to provide more information regarding the automated valuation model.

Furthermore, this research can also be applied by valuation firms who are considering applying the automated valuation model. The result of this research states the advantages and disadvantages of the automated valuation model; thus the valuation firm owners may decide whether to apply the model or not after they balance the pros and cons of it.

Thirdly, for the automated valuation model service providers, they are able to acknowledge the drawbacks of their model through the result of this research. As mentioned in the ranking of factors, we know that accuracy is the most concerned aspect by valuers. Therefore, in order to enhance the model, service providers may focus more on improving the accuracy of the model.

5.4 Limitation of Study

The main limitation of this study was the population and sampling size. Due to the constraints of limited number of valuers in Malaysia especially those who applies the automated valuation model in their work, the data collected was unable to fully reflect the actual condition and scenario of the automated valuation model. Currently, the application of automated valuation model is low, this creates the limitation for this research where it is difficult to acquire data or responses from valuers who are applying automated valuation model themselves. In this research, most of the respondents merely knows about the model but they did not personally apply the model themselves before. Therefore, these valuers might not be fully aware of the advantages and disadvantages of the automated valuation model.

5.5 Recommendations for Future Research

In order to enhance the future research of this topic, several suggestions are made. Firstly, future researchers may conduct interviews and directly enquire valuers who are applying the automated valuation model rather than doing it in the form of questionnaire. This helps to ensure that all the respondents are fully aware of the model, thus acquiring a more precise result.

Furthermore, future researchers may also consider expanding the sampling location to neighboring countries such as Singapore, Indonesia and Thailand. This helps to increase the population and sampling size, thus obtaining more data for the research. Besides, by doing so, future researchers may also acquire information on the application rate of the automated valuation model for the mentioned countries and their perspectives towards the model.

5.6 Conclusion

To sum up this research, the four factors which are time, knowledge, accuracy and cost are ranked to determine the impact of them towards the valuation practice. The ranking indicates that the time factor of the automated valuation model impacts the valuation practice the most whereas the cost factor gives the least impact. Furthermore, through the content analysis, we can conclude that the automated valuation model does not pose much threat to the job opportunities of valuers. Moreover, the limitations and suggestions for future research had also been mentioned in this research.

References

Bhandari, P. (2020). What Is Quantitative Research? | Definition, Uses and Methods. Bogin, A. N., & Shui, J. (2019). Appraisal Accuracy and Automated Valuation Models in Rural Areas. *The Journal of Real Estate Finance and Economics*. <https://doi.org/10.1007/s11146-019-09712-0>

Chmielewska, A., Adamiczka, J., & Romanowski, M. (2020). Genetic Algorithm as Automated Valuation Model Component in Real Estate Investment Decisions System. *Real Estate Management and Valuation*, 28(4), 1–14. <https://doi.org/10.1515/remav-2020-0027>

Ejen, D. (2006). *Malaysian Valuation Standards*. Lembaga Penilai, Pentaksir Dan Ejen Hartatanah Malaysia.

Glumac, B., & Des Rosiers, F. (2020). Towards a taxonomy for real estate and land automated valuation systems. *Journal of Property*

Glumac, B., & Des Rosiers, F. (2020). Practice briefing – Automated valuation models (AVMs): their role, their advantages and their limitations. *Journal of Property Investment & Finance*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/jpif-07-2020-0086>

McCombes, S. (2021). How to create a research design. Retrieved from Scribbr website: <https://www.scribbr.com/methodology/research-design/>

Muhammad Najib Razali. (2008). The Existence of Automated Valuation Models Among Valuation Firms in Malaysia.

Pathak, V., Jena, B., & Kalra, S. (2013). Qualitative research. *Perspectives in Clinical Research*, 4(3), 192. <https://doi.org/10.4103/2229-3485.115389>

Renigier-Biłozor, M., Janowski, A., & d'Amato, M. (2019). Automated Valuation Model based on fuzzy and rough set theory for real estate market with insufficient source data. *Land Use Policy*, 87, 104021. <https://doi.org/10.1016/j.landusepol.2019.104021>

Standard, V. (2005). *International valuation standards*. International Valuation Standard Committee.

Taherdoost, H. (2016). Sampling Methods in Research Methodology; How to Choose a Sampling Technique for Research. *SSRN Electronic Journal*, 5(2), 18–27.

Tajani, F., Morano, P., & Ntalianis, K. (2018). Automated valuation models for real estate portfolios. *Journal of Property Investment & Finance*, 36(4), 324–347. <https://doi.org/10.1108/jpif-10-2017-0067>

Investment & Finance, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/jpif-07-2020-0087>

Appendices

Appendix A: Survey Questionnaire

Impact of Automated Valuation Model on Valuation for Residential Property

Dear respondents,

I am Lim Zheng Jie, a student of Bachelor of Building and Property Management (Honours) from Universiti Tunku Abdul Rahman (UTAR), Sungai Long Campus. I am currently conducting a research on 'Impact of Automated Valuation Model on Valuation for Residential Property'. Automated valuation model is a software or program that is able to automatically calculate property market value. It formulates the property market value using mathematical algorithms and statistical modelling based on data that is stored in database. The common method where the valuation exercise is conducted manually by the valuer is referred as 'the traditional method' for this survey.

There are three sections in this questionnaire, which are

Section A: Demographic of respondent

Section B: Impact of AVM application

Section C: Opinions on AVM application in future

This questionnaire aims to investigate the impact that the AVM brings towards the valuation industry and also the factors that contributes to the impact. It takes around 5-10 minutes to complete this questionnaire. Your cooperation and support are highly appreciated. Thank you.

For any inquiries, kindly contact Lim Zheng Jie at limzhengjie112601@lutar.my or 019-6693385.

Section A: Demographic of respondent

1. Name

2. Age

3. Gender

i. Male

ii. Female

4. Years of experience in valuation field

i. 1-5 years

ii. 6-10 years

iii. 10-20 years

iv. more than 20 years

5. Are you a registered valuer under BOVEAP?

i. Yes

ii. No

6. Had you ever heard of Automated Valuation Model?

i. Yes

ii. No

7. Do you apply Automated Valuation Model for your valuation exercise?

i. Yes

ii. No

Section B: Factors related to AVM

Criteria	Strongly Disagree 1 2 3 4 5 6 Strongly Agree					
Factor 1: Cost						
1. Applying AVM is more cost effective as compared to applying the traditional method.	1	2	3	4	5	6
2. The cost required to apply AVM is lower compared to the monthly salary of valuers.	1	2	3	4	5	6
3. The initial set-up cost of AVM discourages the application of AVM.	1	2	3	4	5	6
Factor 2: Accuracy						
1. The accuracy of the market value obtained by applying AVM is at a satisfactory level.	1	2	3	4	5	6
2. Market value provided by AVM is less accurate, thus only can be used as reference.	1	2	3	4	5	6
Factor 3: Time						
1. The time required to conduct valuation using AVM is shorter compared to the traditional method.	1	2	3	4	5	6
2. While applying AVM, valuation exercise is able to be completed within the given period of time provided by clients.	1	2	3	4	5	6

Impact of Automated Valuation Model on Valuation for Residential Property

3. Application of AVM helps to reduce time needed for market value calculation.	1	2	3	4	5	6
Factor 4: Knowledge						
1. Lack of knowledge on AVM discourages the application of AVM.	1	2	3	4	5	6
2. Low awareness of AVM among valuers lead to low application rate of AVM.	1	2	3	4	5	6

Section C: Opinions regarding AVM

1. How will AVM affect the job opportunities of valuers in the near future?

2. Is it possible where AVM will completely replace valuers in the future?

3. Will AVM become a common method to practice valuation in Malaysia in the next five years?

Appendix B: Tables and Figures

Appendix 3.1 Measurement Construct

Measurement Statements	Item in Questionnaire	Reference(s)
Factor 1: Cost		
The initial set-up cost of AVM discourages the application of AVM.	Section B Question 1.3	Glumac (2020), Bogin (2019)
Factor 2: Accuracy		
Market value provided by AVM is less accurate, thus only can be used as reference.	Section B Question 2.3	Renigier-Bilozor (2019), Glumac (2020), Tajani (2017), Bogin (2019)
Factor 3: Time		
Application of AVM helps to reduce time needed for market value calculation	Section B Question 3.3	Glumac (2020)
Factor 4: Knowledge		
Low awareness of AVM among valuers lead to low application rate of AVM.	Section B Question 4.2	Muhammad Najib Razali (2008), Sunderajoo (2017)
Threat of AVM to Job Opportunities		
Will AVM become a common method to practice valuation in Malaysia in the next five years?	Section C Question 3	

Appendix 3.2 Reliability Test

No	Construct	Cronbach's Alpha	No. of items	No. of Respondents	Strength
1	Cost	0.6677	3	20	Questionable
2	Accuracy	0.6809	2	20	Questionable
3	Time	0.9635	3	20	Excellent
4	Knowledge	0.9222	2	20	Excellent

Appendix 3.3 Cronbach's Alpha Reliability Level

<i>Cronbach's Alpha Score</i>	<i>Level of Reliability</i>
0.0 – 0.20	Less Reliable
>0.20 – 0.40	Rather Reliable
>0.40 – 0.60	Quite Reliable
>0.60 – 0.80	Reliable
>0.80 – 1.00	Very Reliable

Appendix 3.4 Relative Importance Index Formula

Formula of Relative Important Index (RII)

$$RII = \frac{\sum W}{(A \times N)}$$

Where:

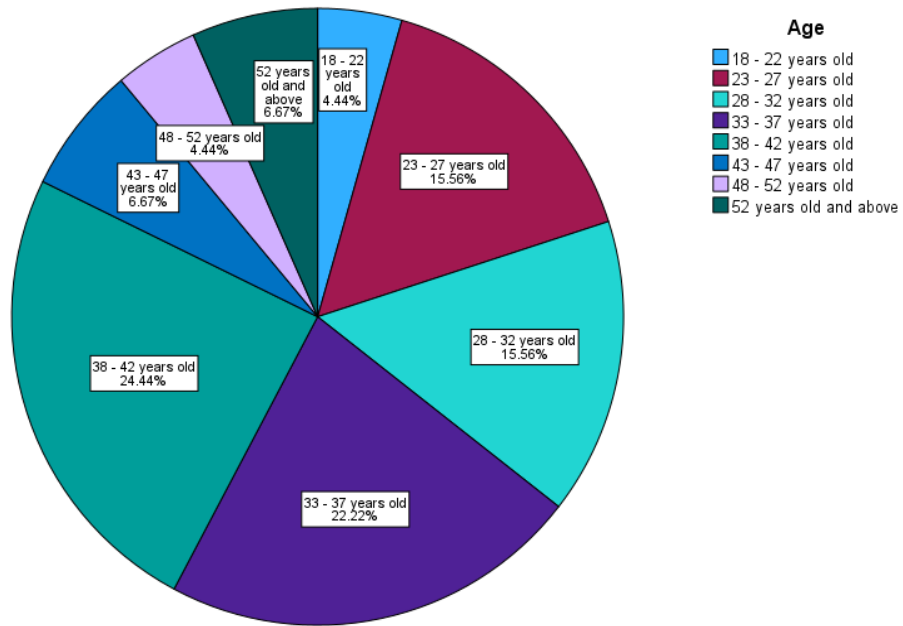
W= Weightage given by the respondent to each factor

A= Highest Weightage

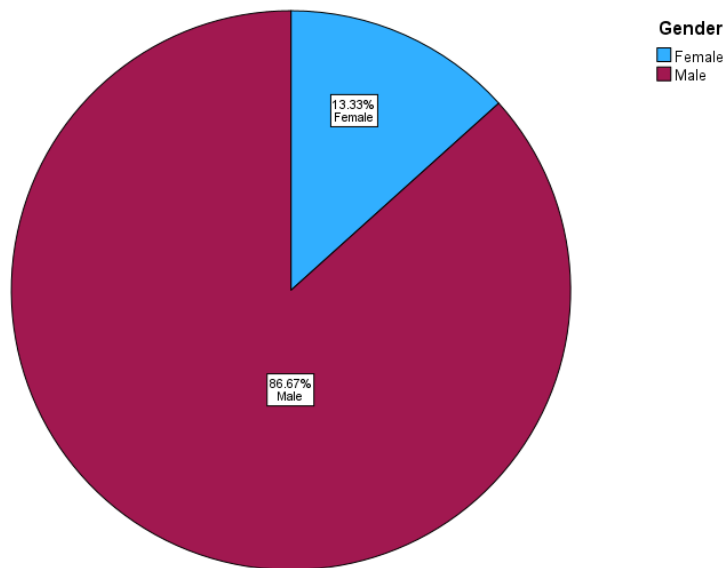
N= Total number of respondent

Appendix 4.1 Respondents' Age

Impact of Automated Valuation Model on Valuation for Residential Property

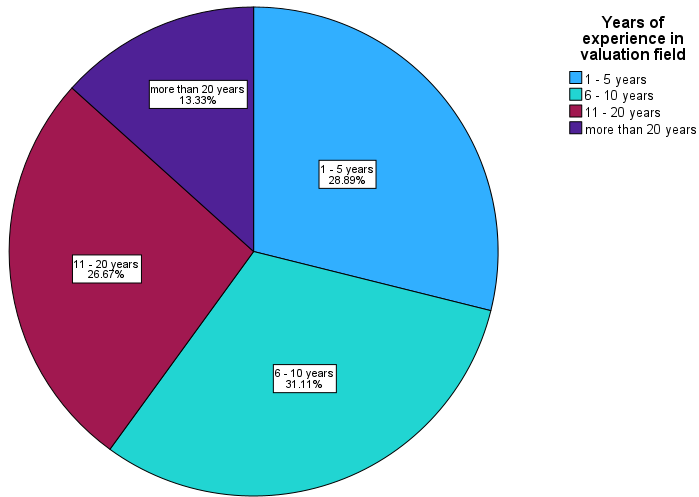


Appendix 4.2 Respondents' Gender

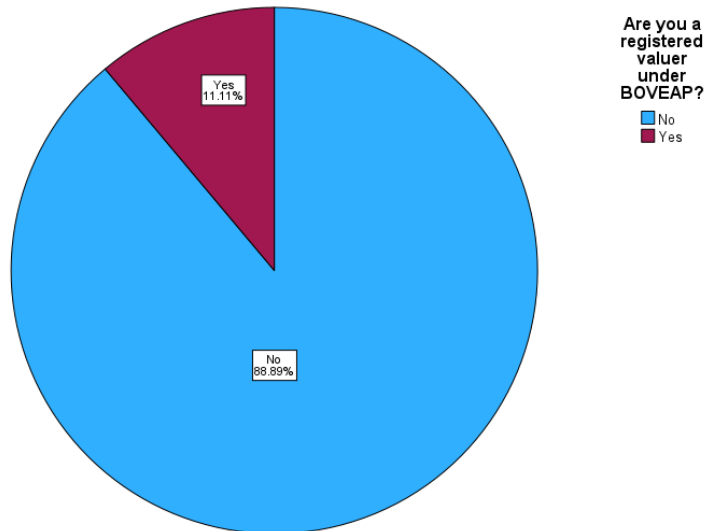


Appendix 4.3 Respondents' Years of Experience

Impact of Automated Valuation Model on Valuation for Residential Property

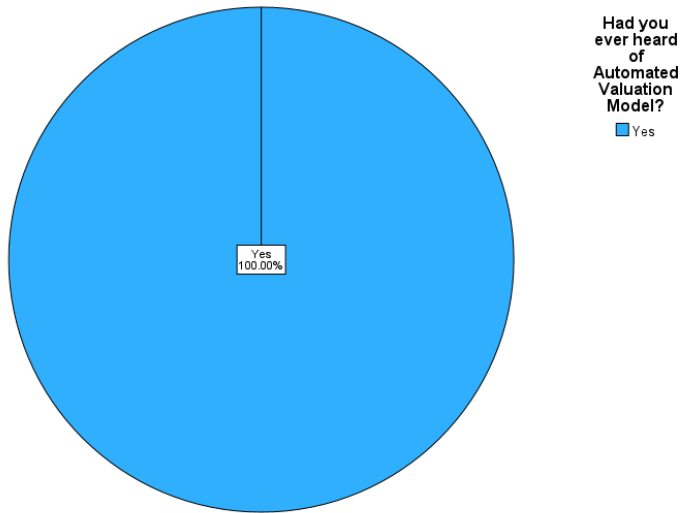


Appendix 4.4 Registered Valuers

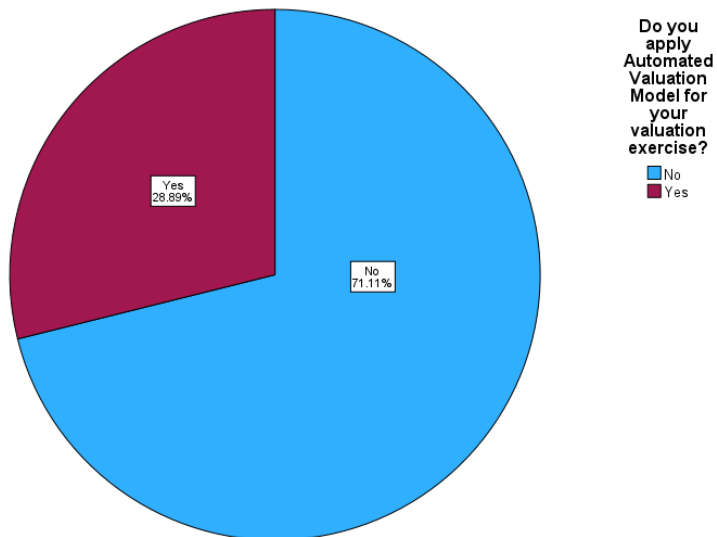


Appendix 4.5 Respondents' awareness

Impact of Automated Valuation Model on Valuation for Residential Property



Appendix 4.6 Respondents' Application



Appendix 4.7 Relative Importance Index Results

Impact of Automated Valuation Model on Valuation for Residential Property

Factor 1: Cost	RII	Rank	Average RII
Applying AVM is more cost effective as compared to applying the traditional method.	0.3519	3	0.5679
The cost required to apply AVM is lower compared to the monthly salary of valuers.	0.5074	2	
The initial set-up cost of AVM discourages the application of AVM.	0.8444	1	
Factor 2: Accuracy	RII	Rank	Average RII
The accuracy of the market value obtained by applying AVM is at a satisfactory level.	0.8148	2	0.8556
Market value provided by AVM is less accurate, thus only can be used as reference	0.8963	1	
Factor 3: Time	RII	Rank	Average RII
The time required to conduct valuation using AVM is shorter compared to the traditional method.	0.8074	2	0.8012
While applying AVM, valuation exercise is able to be completed within the given period of time provided by clients.	0.7815	3	
Application of AVM helps to reduce time needed for market value calculation.	0.8148	1	
Factor 4: Knowledge	RII	Rank	Average RII
Lack of knowledge on AVM discourages the application of AVM.	0.7630	1	0.7611
Low awareness of AVM among valuers lead to low application rate of AVM.	0.7593	2	

Appendix 4.8 Content Analysis I

Impact of Automated Valuation Model on Valuation for Residential Property

How will AVM affect the job opportunities of valuers in the near future	Yes	No	Invalid
As an aid buy will never replace valuers		1	
AVM state as reference and guide to compute market value		1	
for near future no but still possible in the future		1	
for the near future, the AVM would not affect much on the job opportunity		1	
Have little impact if the person manning the AVM are valuers not other	1		
I believe the profession of valuers will not affected by AVM.		1	
I pretty sure board will ensure that avm can only use as reference rather than replacing human, so the effect will be minimum.		1	
It will have no bearing		1	
job opportunity will decrease as AVM is take their place in the industry	1		
Less valuer in industry	1		
might reduce the need for VE & VA	1		
might slightly affect, slightly reduce demand	1		
More efficient			1
No affect coz AVM only calculation and mathematical that can derived the mv exactly because valuation is about art n science.		1	
no effect		1	
No longer needs to take in VE	1		
not much effect		1	
not much effect		1	
not much effect if for near future		1	
not much effect in near future		1	
Not much. As other factors like renovation, features, income approach still required experience valuers		1	
Not really affect the valuers job opportunity		1	
People is not a valuer tend to become valuer			1
possible, advancement in AI recently will boost the development of AVM	1		
probably slightly reduce demand for VA and VE	1		
The percentage of valuers job will reduce and softskill also gone	1		
Valuation Assistants will be replaced my machine	1		
Verbal indication will be expelled			1
wont affect much		1	
Wont affect much		1	
wont affect RV but might decrease demand for VE	1		
wont affect RV but might reduce need for VE	1		
Frequency	12	17	3
Percentage (total 32)	38%	53%	9%

Appendix 4.9 Content Analysis II

Impact of Automated Valuation Model on Valuation for Residential Property

Is it possible where AVM will completely replace valuers in the future?	Yes	No	Invalid
If you understand MVS, this is redundant question. AVM is only one of the tools available. The registrant applies his vast experience and knowledge to make a conclusion and extend his professional liability to the Client for his expertise.		1	
It impossible because valuers will looking into more factors, justification and opinion		1	
No		1	
na		1	
No		1	
No		1	
No		1	
No		1	
No		1	
na		1	
na		1	
na		1	
na, AVM unable to conduct inspection		1	
na, AVM unable to conduct site inspection		1	
No, require physical inspection		1	
na, want completely replace		1	
No. Can the data transaction based an automated can easily be exploited can not take consideration on data transaction whether is developer data or resale data that can being manipulated that data easily cross the actual market value...even today many negotiator try to become valuer and just use brick data or their sale price that will affect the current market value..na u can imagine ure d only AVM will make the current mv will be manipulated by thare people..na valuer is important to keep that market value not become higher market value.		1	
No. For certain cases, it still need the valuers experience and knowledge.		1	
Nope. AVM only can be used to value art and rare property. Corner unit and extension unit still need conventional method		1	
Not possible. MVS 6 require physical inspection. Unless amend the Valuers Act		1	
possible but far near future na	1		
possible if AVM develops into AI such as chat gpt	1		
Possible if people without valuation knowledge manning AVM. In which it should be discourage.	1		
possible, since AI like Chat gpt are being developed	1		
Probability not ready far right now		1	
want completely replace		1	
want completely replace but will take up large portion of valuer's job		1	
Yes	1		
yes or nau AI system advancement such as Chat GPT is taking over the world	1		
yes as technology is constantly evolving but might need to amend MVS to comply with such technology	1		
Yes, when all human required job are replaced by automated process. Other example is accounting area, they automated software like autacount, but have the software replaced accountant?	1		
Frequency	8	24	0
Percentage (Total 32)	25%	75%	0%

Impact of Automated Valuation Model on Valuation for Residential Property

Will AVM become a common method to practice valuation in Malaysia in the next five years?	Yes	No	Maybe
AVM already been used in JPPH for standard property such as intermediate houseshop and complete within 1 day	1		
I dont think so. Human still need to give data inputs. Without inspection the datas given are not accurate.		1	
Maybe need more than 5 years to become a common method		1	
No		1	
No		1	
No		1	
No		1	
no		1	
no		1	
no, currently the AVM is still not well developed yet		1	
No, even ten years is also no the answer will be no. Using accounting field as an example, auto account software have been existed over 10 year, but still they need human accountant. I using accounting field as an example because it was quite similar with our field. But when we search for automated accounting software we can find somethings that well-known enough, like autocount. In valuation field, we also have avm, but we don't have any mature avm software that can become common software goto when talking avm. The most nearest thing we got as avm is our pre-formated excel calculations file. I can say is not just mvs, any tech related thing will be hard to adopt into this field for many reasons. 1. This is a highly professional field, so if it not broken, dont fix. Any implications of the new technology have to ensure the things you write in the report is 200% correct and well accepted by anybody in the field. 2. Unlike other field like accounting, valuation field is more "closed" and smaller, you will know i saying when you try to find reference related with valuation. So the development of avm or other technology related with this field is definitely harder, and required a lot of in field experience to develop avm. 3. Acceptable and awareness, most of the registered valuer definitely know / heard about avm, i also pretty sure they willing to accept and adopt new technology when available, especially for the technology that can improve their process/report, but the technology adoption MUST BE un-arguments-able,		1	
No, in near future it will not be a common method		1	
No, maybe in further future yes		1	
no, the MV provided by AVM is not accurate enough		1	
No.		1	
No.		1	
Not		1	
Not necessary		1	
Not sure. Maybe for housing loan cases should be a common method.			1
Possible becuse can be guide to compute market value	1		
possible, might be used as common method for residential valuation	1		
probably			1
probably for simple cases such as residential valuation			1
probably, might be common method for simple valuation cases			1
Sometime needed sometime not.			1
Yes	1		
yes i highly believe as AVM is cost effective and next-level technology in the future	1		
yes possible	1		
yes possible especially for residential valuation where the case is not as complex as other valuation cases and the amount of data is more sufficient as well	1		
yes, AVM is slowly being perfected, will be able to be used as common method for common valuation cases but not for complexed cases	1		
Yes.	1		
Frequency	9	18	5
Percentage (Total 32)	28%	56%	16%