HOUSE PRICE VOLATILITY METAMODEL FOR MANAGING HOUSE PRICE VOLATILITY KNOWLEDGE

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ABSTRACT

A change in house price is a situation that is very dynamic and unpredictable. The study found that changes in house price volatility are more dynamic than the changes in the price of goods or household income. Demographic changes, market forces and the rise of speculation are among the factors that influence the volatility in house prices. Through this research all the determining factors associated with changes in house price volatility were identified because the changes on the determinant factors have an impact on the pattern of the house price market. For the purposes of showing a comprehensive relationship between the determinants of house price with house price volatility, the methods in modelling the concept in software engineering known as metamodelling has been adapted. Through metamodelling, an artifact known as 'metamodel' is produced. Specifically for this study, the metamodel is known as House Price Volatility Metamodel (HPVM). By combining qualitative and quantitative methods, the development of HPVM implemented using 8 Step Metamodelling Creation process, where HPVM is capable of modeling the determinant factors that determine the volatility in house prices in three major categories: i) Socio-Economic view, ii) Economic view and iii) HPV Significant Value view. Three types of validation technique, Expert Review (Face to Face Validation), Frequency-Base Selection and Tracing (Case Study) in three states in Malaysia, namely Penang, Johor and Kuala Lumpur have been used to assess the effectiveness of the metamodel. Metamodel development is believed to be beneficial to various stakeholders in the domain of property market such as the government like from Ministry of Finance, real estate investors, economists, buyers and real estate practitioners where they are able to get a variety of views and considerations in assessing house price market and house price volatility. These considerations are very important in evaluating the real estate market, as it will be an input in decision-making basis for this field.

ABSTRAK

Perubahan kenaikan harga rumah merupakan suatu keadaan yang sangat dinamik dan tidak menentu. Kajian mendapati bahawa perubahan harga rumah adalah lebih dinamik berbanding perubahan pada harga barangan mahupun pendapatan isi rumah. Perubahan demografi, kuasa pasaran dan kebangkitan spekulasi merupakan antara faktor-faktor yang mempengaruhi kedinamikan perubahan harga rumah. Menerusi penyelidikan ini, kesemua faktor penentu yang berkait dengan perubahan harga rumah dikenalpasti. Lantaran itu, perubahan pada penentu ini memberi kesan secara langsung kepada corak pasaran hartanah. Bagi tujuan menunjukkan hubungkait secara menyeluruh di antara kesemua faktor-faktor penentu perubahan harga rumah ini, kaedah permodelan konsep dari bidang kejuruteraan perisian yang dikenali sebagai meta pemodelan telah diadaptasi. Melalui kaedah meta pemodelan, satu artifak yang dikenali sebagai 'metamodel' telah dihasilkan. Khusus bagi kajian ini, metamodel tersebut dikenali sebagai Metamodel Turun Naik Harga Rumah (HPVM). Dengan menggabungkan kaedah kualitatif dan kuantitatif, pembangunan HPVM dilaksanakan dengan menggunakan 8 proses pembangunan metamodel, di mana HPVM berupaya memodelkan faktor-faktor penentu dinamik perubahan harga rumah menerusi tiga kategori utama iaitu: i) Sosio-Ekonomi, ii) Pandangan Ekonomi dan iii) Teknik Penentu Nilai Turun Naik Harga Rumah. Tiga jenis pengesahan iaitu Kajian Pakar (Pengesahan Bersemuka), Pemilihan Berdasarkan Kekerapan dan Kaedah Mengesan (Kajian Kes) di tiga negeri di Malaysia iaitu Pulau Pinang, Johor dan Kuala Lumpur telah digunakan untuk menilai keberkesanan metamodel tersebut. Pembangunan metamodel ini dipercayai dapat memberi manfaat kepada pelbagai pihak berkepentingan dalam domain harta tanah seperti kerajaan menerusi Kementerian Kewangan, pelabur hartanah, ahli ekonomi, pembeli dan pengamal harta tanah untuk mendapatkan pelbagai pandangan dan pertimbangan dalam menilai turun naiknya pasaran harga rumah. Pertimbangan ini sangat penting bagi menilai pasaran harta tanah, kerana ia akan menjadi input dalam membuat keputusan dasar bagi bidang ini.

.

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LIST OF ABBREVIATION

ADF	Augmented Dickey-Fuller
ARCH	Autoregressive Conditional Heteroscedasticity
BLS	Bureau of Labour Statistics
CPI	Consumer Price Index
DoC	Degree of Confidence
DSR	Design Science Research
EMF	Eclipse Modelling Framework
ER	Entity Relationship
ERM	Entity-Relationship-Model
FBS	Frequency-Based Selection
GARCH	Generalized Autoregressive Conditional Heteroskedasticity
GFC	Global Financial Crisis
GST	Goods and Services Tax
HP	House Price
HPV	House Price Volatility
HPVKR	House Price Volatility Metamodel Knowledge Representation
HPVM	House Price Volatility Metamodel
JPPH	Valuation and Property Services Department
LM	Lagrange Multiplier
MDA	Model-Driven Architecture
MDD	Model-Driven Improvement
MDE	Model Driven Engineering
MIF	Model Importance Factor
ML	Modelling Language
MOF	Meta Object Facility

OMG	Object Management Group
PPI	Producer Price Index
REHDA	Real Estate and Housing Developers' Association Malaysia
RPGT	Real Property Gains Tax
UML	Unified Modelling Language

CHAPTER 1

INTRODUCTION

1.1 Overview

Comfortable housing will contribute to health and well-being in living. It is a basic need of every individual living in this world. Home became a sanctuary to humans and becomes a major resting place in their lives. According to Marcussen (1990), a house is referred to as a shelter; it also includes the concept of security, love, peace and freedom. Therefore, owning a home is the dream of every individual. Consequently, most household expenditures will be used for owning a home. Normally, to enable an individual to buy a home, these individuals need to make a large investment to finance the cost of their dream home. The measurement of whether a person is capable of having their desired home is viewed in terms of their ability to pay for their desired home (Mahamud & Salleh, 2004).

The growth in the housing or property market may have a significant influence on financial stability. Change in house prices will have an impact directly and indirectly by the demand for credit in households, particularly in an environment where the rising in house prices was not accompanied by income standards which is tight. The fear is whether the outcome will result in an excessive debt accumulation to the households and developers. If house prices fell sharply, the impact on the banking economic institutions could become so dire that it would pose a major risk to financial firmness (B.N. Malaysia, 2012). Furthermore, the global economic

predicament recently has enlarged the house price volatility (HPV) and attracts the interest of law creators and investors in the significance of HPV.

Although the fluctuations of economic property have been broadly researched in the economic literature, there are a few studies that have been conducted on the housing market volatility. This research aims to explore the knowledge of the House Price domain by examining HPV and its attributes to find the determinant which has a significant impact to the volatility of HP and manage the knowledge found by using metamodel structure. The contributions of this study will be organised in twofold. First, this research will contribute to examining the housing volatility clustering and collect significant determinants and attributes that have implications on the house prices in Malaysia. Secondly, this study will use the metamodeling approach as a high-level structure to build a model structure of HPV knowledge and its attributes, as a decision support system for future research.

1.2 Problem Background

The growth in the housing or property market has a significant influence on the stability of the financial system. Changes in demography, market force and the rise of speculation will eventually lead to HPV. From a macroeconomic viewpoint, the housing market has become an essential sector and is also the backbone of the property market for many developing countries. A house can become the major investment compared to other needs. The volatility of house prices always attracts attention and large responses from country residents. (Björk, 2013) in his research stated that the large movement of house prices will likely affect the economic growth of a country. With the rapid increase in demand for properties, house prices have continued to change and this has largely impacted on other goods and services, making it a highly volatile investment when compared to other investments.

On the other hand, information regarding HPV is scattered in various medium such as in thesis (Rin, 2014), journal (Lee, 2009) and government report (B.N.

Malaysia, 2012) and un-organised which makes it harder to grasp the information about HPV. Therefore, in this research, the use of a software engineering approach called the metamodeling technique to manage knowledge of the HPV determinant factors and all concepts related to these factors is proposed. This research creates an integrated view of house price volatility HPV by using a metamodel form. The metamodel will serve as a language for this HPV field or domain. A metamodeling validation and process is practised to certify that the result metamodel is comprehensive and reliable. The metamodel is validated to provide as a platform to assist and advance the access of HPV by the experts.

1.3 Problem Statement

House Price (HP) has many interacting activities that are usually mixed in with other activities and scattered in various mediums. It is found that many HPV determinant concepts were found in a previous study. However, the information found mostly varied from each other and was scattered across different places such as in thesis (Rin, 2014), journal (Lee, 2009) and government report (B.N. Malaysia, 2012) etc., which therefore makes modelling the process or the management of HP activities enormously hard and complex. This situation makes it harder for the house price practitioners such as governments and economists to capture the information. This is the gap that needs to be filled to make the information easy to grasp and understandable. After the investigation, this research found the use of information systems to gather the knowledge of HP was limited. This gap brought a proposed research that wants to bring the use of information systems to gather knowledge of HPV. Metamodeling is a covered and modular way to provide a robust methodology or modelling language that offers conceptual information, discriminating the conceptual syntax and semantics of the modelling fundamentals. Many researchers use metamodeling to gain a full view on the subject. The use of a metamodeling approach to determine HPV is a new approach to manage house price issues in Malaysia.

1.4 Research Question

To address the issues highlighted in the previous section, there are two research questions that need to be deal with:

1. How to create a generic HPV metamodel through the observation against existing HPV model?
2. How the proposed HPVM can provide a modeling guidelines for various HPV practitioner in solving their own problem.

1.5 Research Objectives

The objectives of the research are:

i. To identify determinant factor which contribute to the volatility of the house price domain from various house price existing sources.

ii. To develop a House Price Volatility Metamodel (HPVM) by using metamodeling technique.

iii. To validate the HPVM framework by using three appropriate metamodel validation techniques

1.6 Research Scope

The scopes of this study are focused on:

i. A development of the metamodel by unifying determinant factor identified in Socio-Economic factor, Economic Factor and Technique involve in determining house price volatility.

ii. The study will show how metamodel developed can be applied in real world scenario by benchmarking the HPVM in case study in Malaysia perspective.

1.7 Contribution of Research

A framework in the form of a metamodel artefact HPVM specifically developed to organise the complexity of determinant factors affecting the volatility of house price. The HPVM is expected to help many of its domain stakeholders (government, people, economists, investors, developers, real estate managers, other stakeholders and practitioners) in understanding and guiding them in house price volatility decision makings.

1.8 Research Structure

This research will present the resultant and validation of the metamodel by generalising HPV determinant factors found. This thesis has 6 (six) chapters which presenting the finding of this research. The content of this thesis is organised as follows:

- **Chapter 1** - This chapter will discuss the basis, importance and objectives of the study. It will also discuss the problem background, problem statement, research questions, contribution, research limitation and the scope of the study.

- **Chapter 2** - This chapter will discuss a review of previous studies which are related to house prices, HPV attributes and the metamodeling approach in HPV.

- **Chapter 3** - This chapter will discuss a detailed explanation of the research methodology and resources used. The methodology used in this study is Design Science Research.

- **Chapter 4** - This chapter will discuss detailed information and steps included in the development of the HPVM.

- **Chapter 5** - This chapter will discuss detailed information and technique included in the validation of the HPVM.

- **Chapter 6** - This chapter will summarise the outcome of this study and the recommendations for future study on HPV. This chapter also includes the limitations of this study.

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