DEVELOPMENT OF WASTE MINIMIZATION AWARENESS MODEL FOR UNIVERSITY CAMPUS

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To my beloved father, mother, wife and my children

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ABSTRACT

All along waste problems and issues have been discussed. One of the main problem is the lack of waste minimization awareness among citizens. Solutions have been derived, either via technology or by changing human behaviour. Nevertheless the changes in human behaviour is the ultimate solution that should be sought after. In order to change human behaviour, waste minimization awareness should be instilled in the human well-being, which should start in the education environment such as university. However there is limited model available for creating and instilling awareness in people. Thus, this research was conducted to develop the Waste Minimization Awareness Model (WMAM) for university campus. The model will act as a guide and working flowchart for university's administration, lecturers and facilities managers to raise waste minimization awareness and thus improve the waste management behaviour including reduce, reuse, recycle and compost among the universities' students. The three objectives of this research were to identify the components of awareness, to identify the channels of communications and to develop a WMAM for university campus. Soft System Methodology (SSM) was used in this research as a research technique. It has five stages which includes literature review, elements identification, conceptual model development, verification and validation. Survey through questionnaires as a research method was adopted in this research. The respondents for this research were 405 undergraduate students from three public universities, including Universiti Teknologi Malaysia, University Malaya and Universiti Islam Antarabangsa Malaysia. The analysis found that six components of awareness: values, norms, knowledge, perceived behavioural control, motivation and skills needed to raise waste minimization awareness among the students. This research identified 49 channels of communication delivering waste minimization message. These findings from the analysis were used to develop the WMAM and verified through verification by expert.

ABSTRAK

Masalah dan isu mengenai sampah telah lama dibincangkan. Salah-satu masalah utamanya adalah kekurangan kesedaran pengurangan sampah di kalangan masyarakat. Pelbagai penyelesaian telah dihasilkan, sama ada menerusi teknologi atau dengan mengubah sikap manusia. Namun begitu, perubahan sikap manusia adalah kaedah penyelesaian utama yang perlu dititikberatkan. Untuk mengubah sikap manusia, kesedaran pengurangan sampah perlu diterapkan di dalam kehidupan manusia, di mana ia perlu bermula dalam persekitaran pendidikan seperti di universiti. Bagaimanapun model sedia ada adalah terhad untuk menghasil dan menerapkan kesedaran di kalangan manusia. Maka, kajian ini dijalankan untuk membangunkan model kesedaran pengurangan sampah (WMAM) untuk kampus universiti. Model ini bertindak sebagai panduan dan carta alir kerja bagi pentadbiran universiti, pensyarah dan Pengurus Fasiliti untuk meningkatkan kesedaran pengurangan sisa dan memperbaiki tingkah laku pengurusan sisa iaitu kurangkan, guna semula, kitar semula dan kompos di kalangan pelajar universiti. Tiga objektif kajian ini adalah untuk mengenalpasti komponen kesedaran, mengenal pasti saluran komunikasi dan untuk membangunkan WMAM untuk kampus universiti. Sistem lembut metodologi (SSM) telah digunakan di dalam kajian ini sebagai teknik kajian. Ia terdiri daripada lima peringkat iaitu kajian literatur, pengenalan unsur-unsur, pembangunan model konsep, verifikasi dan validasi. Kajian ini telah menggunakan borang soal selidik untuk mendapatkan data. Responden untuk kajian ini adalah sejumlah 405 pelajar ijazah sarjana muda dari tiga universiti awam iaitu Universiti Teknologi Malaysia, Universiti Malaya dan Universiti Islam Antarabangsa Malaysia. Analisis mendapati enam komponen kesedaran: nilai, norma, ilmu, kawalan tingkah laku yang dilihat, motivasi dan skil diperlukan untuk mewujudkan kesedaran pengurangan sampah di kalangan siswazah. Kajian ini juga telah mengenalpasti 49 saluran komunikasi bagi menyampaikan mesej kesedaran pengurangan sampah. Hasil daripada dapatan kajian ini telah digunakan untuk membangunkan WMAM dan telah diverifikasikan menerusi pendapat pakar.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

xx

LIST OF ABBREVIATIONS

3R	-	reduce, reuse, recycle
ANT	-	actor network theory
BYEE	-	Bayer Young Environmental Envoy (program)
CBA	-	cost–benefit analysis
EPA	-	Environmental Protection Agency (US)
IDEF0	-	Integration Definition Language 0
IIUM	-	International Islamic University Malaysia (Universiti Islam Antarabangsa Malaysia)
IS	-	information systems
LCA	-	life-cycle analysis
MDM	-	multi-criteria decision analysis
MLA	-	Message Learning Approach
NGO	-	non-governmental organization
PBC	-	perceived behavioural control
PN	-	Petri-net
SOP	-	standard operating procedure
SPSS	-	Statistical Package for the Social Sciences
SSM	-	soft systems methodology
STD	-	socio-technical design
TPB	-	theory of planned behaviour
TRA	-	theory of reasoned action
UM	-	Universiti Malaya
UNEP	-	United Nations Environment Programme
UTM	-	Universiti Teknologi Malaysia
WMAM	-	Waste Minimization Awareness Model

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Introduction

The aim of this chapter is to introduce the entire thesis. This chapter is divided into eight sections. Section 1.1 discusses the focus of the study, followed by the problem statement in section 1.2. Section 1.3 then highlights the research objectives; while section 1.4 discusses the methodology of the study and section 1.5 describes the scope of the study. Meanwhile, section 1.6 discusses the significance of the study and its contributions to the body of knowledge. Finally, the last section (Section 1.7) presents the structure and a summary of all the chapters in this thesis.

1.2 Focus of the Study

The research aimed to construct a Waste Minimization Awareness Model (WMAM) focusing within the scope of public universities in Malaysia. This research started with the exploration of problems and issues relating to management of waste, internationally and locally. Then in the later stage, waste management problems and issues in universities were assessed. Chapter 1 was aimed to discuss these problems and issues.

1.3   Problem Statement

This section is intended to explore the issues and problems pertaining to waste management globally, locally and in universities. The following three sub-sections will discuss these problems and issues in more detail.

1.3.1   Global Concern on Waste

Problems and issues regarding waste have been encountered in almost every nation and civilization. It has been discussed widely in reports, journals, conferences and white papers, with the main goal – to find the solutions.

Problems and issues that are pertinent to poor waste management include expensive land prices; strict environmental regulations (Fullerton and Kinnaman, 1995); health and safety issues stemming from improper management of waste disposal sites (Ministry of Housing and Local Government Malaysia, 2005); public health, natural resources and climate change (United Nations Environment Programme, 2009);depleting landfill spaces (Bartelings and Sterner, 1999; Malakahmad, Nasir, Kutty, and Isa, 2010); policy problems (Choe and Fraser, 1999); and, the reluctance of local communities in accepting new technologies and facilities in their own back yards (Petts, 1995). Failure in managing solid waste could increase operation cost and subsequently cause damage to the environment (Ghiani, Laganà, Manni, Musmanno and Vigo, 2014; United Nations Development Programme Malaysia, 2008; Weitz, Thorneloe, Nishtala, Yarkosky and Zannes, 2002; Agamuthu, 2001).

There are multi-solutions to solving waste management issues and problems which fall into two categories. First, in term of technology, (i.e. high-tech solutions) which rich countries can develop and buy (Shekdar, 2009) and second, in term of behavioural change, (i.e. low-tech solutions) which are being applied by third world countries (Anne Scheinberg and Wilson, 2010; Zurbrugg, 2002).

The technologies which are being used in the waste industry include incinerators, composting machines, and thermal recovery among others. While low-tech solutions refer to creating awareness which has a high impact in changing behaviour towards minimizing waste. According to Anne Scheinberg and Wilson (2010, p. 2), "…gradually, as many city authorities will confirm from their own experience, the world community learnt that no technology can solve the problems related to economic and social sustainability of waste management solutions". It shows that even though technologies can be developed or bought by rich countries, but if their communities are not motivated and educated on how to change their attitude towards implementing the sustainable waste management, the technology could not solve the waste problems.

Table 1.1 shows the status and technology gaps in managing waste in Asian countries (i.e. Bangladesh, Bhutan, Cambodia, India, Indonesia, **Malaysia**, Philippines, China, Thailand and Vietnam). Interestingly, this table indicates that Malaysia has been formally managing its waste. However, there is a technology gap in the areas of sorting, pulverizing and composting.

According to Visvanathan, Adhikari and Ananth (2007), when focusing on the developing Asian countries, these countries experienced solid waste management problems in terms of collection efficiency, disposal facilities, limited financial resources and weak policy interventions.

It was also observed that in most Asian countries, informal waste managing activities are highly dominant owing to lack of funding, poor government initiation, lapse in policy and general public ignorance on waste management issues (Visvanathan et al., 2007).

Table 1.1: Status and technology gaps in 3R implementation in developing Asian countries (Visvanathan et al., 2007)

Technology	Bangladesh	Bhutan	Cambodia	India	Indonesia	Malaysia	Philippines	China	Thailand	Vietnam
Thermal recovery	O	□	□	O	□	●	O	O	O	□
Fuel recovery	O	□	□	O	□	●	O	O	O	□
Material recovery	O	□	○	▣	○	O	○	○	O	○
Sorting	○	▣	○	▣	○	□	□	○	□	○
Pulverizing	O	□	○	▣	□	□	□	▣	□	○
Composting	●	□	□	O	○	□	□	O	○	O
Incineration	▣	□	□	O	▣	●	▣	●	O	▣
Collection	▣	▣	▣	○	▣	O	○	O	O	○

LEGEND:

●	Formal, Strong
O	Formal but weak
▣	Informal, Weak
○	Informal but Strong
□	Technology Gap

NOTE:
- Formal and Informal denote the presence of regulations, laws and rules to govern an activity.
- Strong and Weak represent the level and scale of a particular activity.
- Where no law or rule exists and the practice is totally absent, it is denoted to be a gap.

Approximately 70% of the waste in developing countries are considered as wet waste, while 30% are dry waste. The followings are the example of waste composition in the third world countries; in Jaipur city in India shows the composition of 70%:30% ratio of wet-dry waste (Jain and Singhal, 2014), Bangladesh shows 70%:30% ratio of wet – dry waste (Enayetullah, Sinha and Khan, 2005); Indonesia 70%:30% ratio of wet – dry waste (Idris, Inanc and Hassan, 2004); Samutprakarn and Pattaya, Thailand 70% - 30% ratio of wet – dry waste (Chiemchaisri, Juanga and Visvanathan, 2007); and in **Kuala Lumpur, Malaysia**,

a research shows that 62-72% are wet waste (Consumers' Association of Penang, 2001) and 30% are dry waste.

Much of the thirty percent (30%) dry wastes include those types of wastes which can be reused and recycled. This is not considered a major problem to Asian countries (Idris, Inanc and Hassan, 2004), especially in the developing ones. On the other hand, the 70% wet waste in developing countries do pose a major problem to their landfill and their overall waste management system (Othman, Zainon Noor, Abba, Yusuf and Abu Hassan, 2013). As was described by Fehr (2006), Brazil, an example of a developing country, has successfully recycled 30% of its wastes following the high demand from recycling industries. Conversely, its 70% wet waste has caused a rise to the percentage of landfill usage. Many researchers have found that composting is the best way to divert biodegradable waste from landfill (Enayetullah and Sinha, 2000; Fehr, 2006; Zurbrugg, 2002). Pitot (2003) stated that the biodegradable waste (wet waste) has been successfully composted in Delhi, thus diverting some significant rates from the use of landfills.

The main reason for the higher percentage of wet waste in Asian countries is due to the higher level of rural populations, who produced more kitchen waste and fewer recyclable items (Idris et al., 2004; Samah et al., 2013).

Interestingly, Japan, being one of the developed countries, is looking back into low-tech solutions focusing on human relations, awareness and education. The Sound Material-Cycle Society (SMCS) model has been developed and promoted by the Japanese as one of the possible solution for the waste management problems.

Through the Earth Summit in 1992, the United Nations has produced the Agenda 21 (Björklund, 1998; Freeman, 1996). The summit agreed that to give a real substance to the meaning of sustainable development, the agenda should begin at a local level, thus enhancing the function of local authorities as a lead role in the Local Agenda 21 (LA21) process (Freeman, 1996).

According to Freeman (1996), the main objectives of LA21 are to "reappraise and redevise the structure of local authorities, to allow the local community to work with the local authorities in order to find suitable and innovative methods in solving local problems".

Therefore, the functions of local authorities in promoting and implementing the sustainable development are; managing public health and sanitation; waste removal and management; town planning; environmental protection and building control; social and economic development; and; general maintenance functions of urban infrastructure.

1.3.2   Local Concern

Malaysia is a developing country. In order to facilitate the management of waste generated by the public, the government has engaged four groups of concessionaires to undertake the responsibilities of waste management according to four regions; i.e. northern, middle, southern parts of the Peninsular; and for Sabah and Sarawak. The four concessionaires are Northern Waste Industries Sdn. Bhd. (for northern region), Alam Flora Sdn. Bhd. (for middle region), Southern Waste Sdn. Bhd. (for southern region) and MMC Engineering (for Sabah and Sarawak states) (Yahaya and Larsen, 2008).

The Ministry of Housing and Local Government Malaysia (2005) stated that, in 2005, there were 17,000 tonnes of municipal solid wastes generated in Peninsular Malaysia daily, and then it is estimated to increase to more than 30,000 tonnes in the year 2020.However these amount of 30,000 tonnes have reached its peak in 2011.

Meanwhile a report from Japan International Cooperation Agency (JICA) stated that Malaysia produced8.7 million tonnes of municipal waste in 2004 and expected to reach 15.7 million tonnes of waste in 2020 (Japan International

Cooperation Agency, 2006). Malaysians produce approximately 0.45 to 1.44kg/day of solid waste per capita (Consumers' Association of Penang, 2001; Samah et al., 2013).

When looking at these situations, the stakeholders of the country waste management; comprising of the general public, the local authorities, the government and the concessionaires, are faced with their own responsibilities and challenges. The realization that it is all about people and their attitude is apparent. Therefore, to change the way they treat waste – from management point of view (for the management of local authorities, government and concessionaires) and that of the general public, there is a need to change the attitude of the people (Bernama, 2006 a).

The real problem with waste management in Malaysia is environmental awareness (Ali and Sion, 2014; Ministry of Housing and Local Government Malaysia, 2005). The general public is always blamed by the local authorities for not being cooperative in managing their own waste. Ali and Sion (2014) stated in their report that, there were three strategies which the Malaysia government should implement; to improve the delivery system; to create awareness and disseminate information through campaign or promotion of public awareness; and through Corporate Social Responsibility (CSR).

In the report of The Study of Waste Minimization in Malaysia (Japan International Cooperation Agency, 2006), Malaysians are seen to be lacking in waste minimization awareness. Hence, the study propose to construct an awareness program, the program should emphasize on the "necessity of waste minimization in terms of resource scarcity and possible serious consequence of increasing waste generation and disposal that will increase the cost of social overhead capitals and finally the living cost of the people".

1.3.3 Issues in university

Universities are a vital place for educating and providing the nation with future leaders and decision makers. The readiness of students and staffs towards espousing any innovations and new ideas make it a suitable place as a 'nest of improvement'.

As venues for embracing the culture of sustainable waste management, universities are one of the right places to begin, as they play an important role in addressing environmental challenges in their daily activities (through education and research) which can affect the societal change permanently (Ralph and Stubbs, 2014). But in reality, knowledge on sustainable waste management still remains a secondary priority (de Vega, Benítez and Barreto, 2008; McIntosh, Cacciola, Clermont and Keniry, 2001). As stated by Cortese (2003) "Indeed, it is the people coming out of the world's best colleges and universities that are leading us down the current unhealthy, inequitable, and unsustainable path". Even though universities are producing knowledgeable future leaders and decision makers, universities' role in promoting sustainable waste management is still at an early stage to become a real place in embracing sustainable education.

Realizing the importance of a university's role in changing a society's attitude towards implementing sustainable development, universities around the world are cooperating with each other through engaging themselves in drafting and implementing declarations. Table 1.2 shows the chronology of some declarations which are related to the efforts of higher education institutions globally to embrace the sustainable development in their education system and management. The exploration into these declarations intends to find suitable keywords for the purpose of constructing the awareness model for this research; since many of these declarations reveal the importance of creating awareness towards the implementation of sustainability initiatives in universities.

Table 1.2: Chronology of some declarations related to sustainability in higher education (Wright, 2002)

Year	Declaration
1972	*The Stockholm Declaration on the Human Environment* (UNESCO, 1972)
1977	*Tbilisi Declaration* (UNESCO-UNEP, 1977)
1990	*The Talloires Declaration* (UNESCO, 1990)
1991	*The Halifax Declaration* (Lester Pearson Institute for International Development, 1992)
1992	*Report of the United Nations Conference on Environment and Development* – Chapter 36: Promoting Education, Public Awareness and Training (UNESCO, 1992)
1993	Ninth International Association of Universities Round Table: *The Kyoto Declaration* (International Association of Universities, 1993)
1993	Association of Commonwealth Universities' 15th Quinquennial Conference: *Swansea Declaration* (UNESCO, 1993)
1994	*CRE Copernicus Charter* (CRE-Copernicus, 1994)
1997	International Conference on Environment and Society – Education and Public Awareness for Sustainability: *Declaration of Thessaloniki* (UNESCO, 1997)
1998	World Declaration on Higher Education for the Twenty-first Century and Framework for Priority Action for Change and Development in Higher Education
2001	Lüneburg Declaration
2001	Joint Declaration on Higher Education and the General Agreement on Trade in Services
2004	Declaration of Barcelona
2005	The Graz Declaration
2006	Declaration on the Responsibility of Higher Education for a Democratic Culture – Citizenship, Human Rights and Sustainability
2007	Lucerne Declaration on Geographical Education for Sustainable Development
2008	Charter for an Alliance of French Universities in Fostering Sustainable Development
2009	Palermo Declaration
2009	Tokyo Declaration of HOPE

Meanwhile Table 1.3 shows the list of factors affecting the effectiveness of sustainability initiatives (which includes waste management) in the higher educations. According to Velazquez, Munguia and Sanchez (2005), lack of awareness, interest and involvement have been ranked as the major factor affecting the effectiveness of sustainability initiatives in higher education which includes sustainable waste management practices. Ali and Sion (2014) also revealed that 'lack of awareness' is the main reason of problems in managing waste. Therefore,

to change attitude and create awareness among universities' stakeholders, is by facilitating it with proper knowledge and values.

Table 1.3: Factors affecting effectiveness of sustainability initiatives in Higher Educations (Velazquez et al., 2005)

Lack of awareness, interest and involvement
Organizational structure
Lack of funding
Lack of support from university administrators
Lack of time
Lack of data access
Lack of training
Lack of opportune communication and information
Resistance to change
Profits mentality
Lack of more rigorous regulations
Lack of interdisciplinary research
Lack of performance indicators
Lack of policies to promote sustainability on campus
Lack of standard definitions of concepts
Technical problems
Lack of designated workplace

Dahle and Neumayer (2001) surveyed six higher education institutions in London, UK and found that there were four barriers in implementing green initiatives in those universities. The four barriers were financial – lack of financial resources, awareness – lack of environmental education, cultural – a non-environmental attitude prevailing at campus, and urban – lack of space for storing waste and constructing new, more energy efficient buildings.

Other barriers are long pay periods, and a general lack of incentives and information on environmental issues (Meyerson and Massy, 1995), organizational structures and the predominating culture of the university preventing the introduction of greening initiatives (case study of Utrecht Universities in the Netherlands) (van Ginkel, 1996), lack of expertise and lack of tradition (case study of Universitat Autonomia de Barcelona) (Riera, 1996), lack of interest and commitment towards green initiatives among administrators, staff and students,

lack of financial resources and environmental education within the campus community (case study of Tufts University) (Creighton, 1998), misconceptions of sustainability terminology (Leal Filho, 2000) and lack of facilities such as recycling bins provided (case study of Universiti Petronas) (Malakahmad et al., 2010).

From the literature review above, awareness has been identified as a first step for any movement for any society to manage waste in a sustainable manner despite availability of technology. Even though awareness terminology has been stated in many declarations, policies and reports, but still it has not been practiced systematically. Thus, this research aimed to produce a Waste Minimization Awareness Model (WMAM) which integrates various techniques to create awareness towards minimizing waste.

1.4   Objectives of Study

In order to achieve the aim of this study, there are three research objectives that need to be fulfilled. The objectives of the study are:

1. To identify the components of waste minimization awareness development process
2. To identify channels of communication in the creation of waste minimization awareness model
3. To develop a Waste Minimization Awareness Model (WMAM)

1.5   Methodology of Study

The aim of the research is to develop an awareness model of waste minimization in Malaysia's universities campuses. The Theory of Planned Behaviour (TPB) and Theory of Reasoned Action (TRA) will provide a research platform, as these theories investigate the human conduct towards achieving the expected behaviour.

Figure 1.1 shows the research gap analysis. TPB and TRA served as a research platform which includes the well-established prerequisite factors in the creation of intended behaviour. From this figure it can be deduced that even though TPB and TRA have identified knowledge, social and moral values, and perceived behavioural control, awareness has not been linked together with attitude. Therefore, this research will investigate awareness among universities' students towards implementing waste minimization in their campuses.

The first objective of this research aims to identify the components of awareness which have not been covered under TPB and TRA. Meanwhile the second objective aims to identify channels of communication which will be used to spread the awareness among universities' students. These two objectives will be used as two important components of Waste Minimization Awareness Concept Model. The model is based on the Message Learning Approach (Cameron, 2009) which highlighted components of awareness and channels of communication as two important factors in the model.
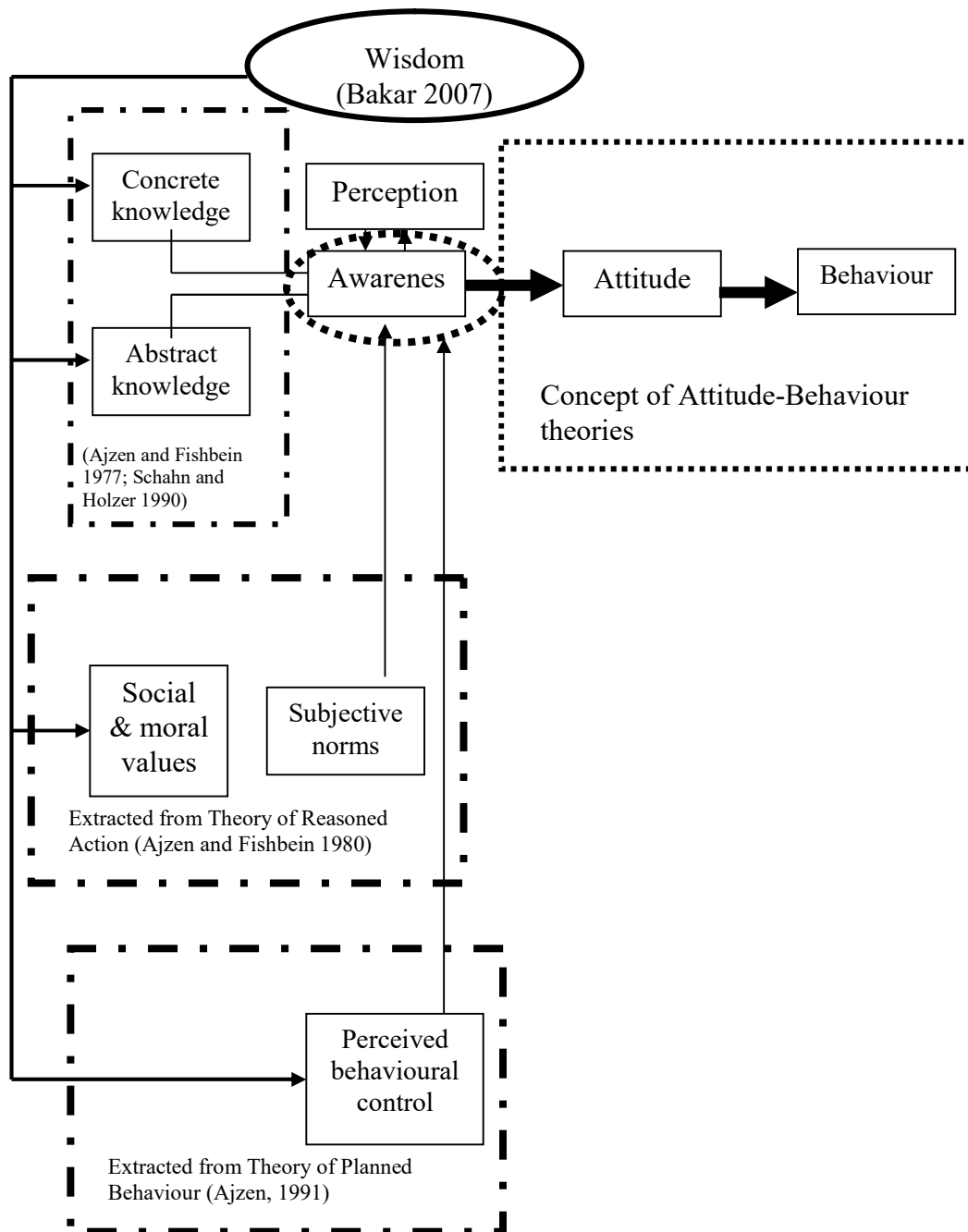
Figure 1.1: Research gap analysis

1.5.1 Research Design

Soft system methodology (SSM), a seven-stage research method, is the approach taken in this study. The whole research work is distributed into three phases; Phase 1 focusses on identifying the components of awareness through

literature review, thus answering the first objective. Phase 1 is correlated with Stage 1 and 2 of SSM. Phase 2 focusses on identifying the components of awareness and channels of communication through literature review and questionnaires, and to answer the first and second objectives. Phase 2 is correlated with Stage 3 of SSM. Phase 3 focusses on developing the Waste Minimization Awareness Model (WMAM), and answering the third objective. Phase 3 is correlated with Stage 4, 5, 6 and 7. Figure 1.2 depicts the flow of research methodology used in this research. Details of these Phases and Stages will be discussed in Chapter 5.

Meanwhile Figure 1.3 shows the relationship between the objectives with research methodologies used in the research.
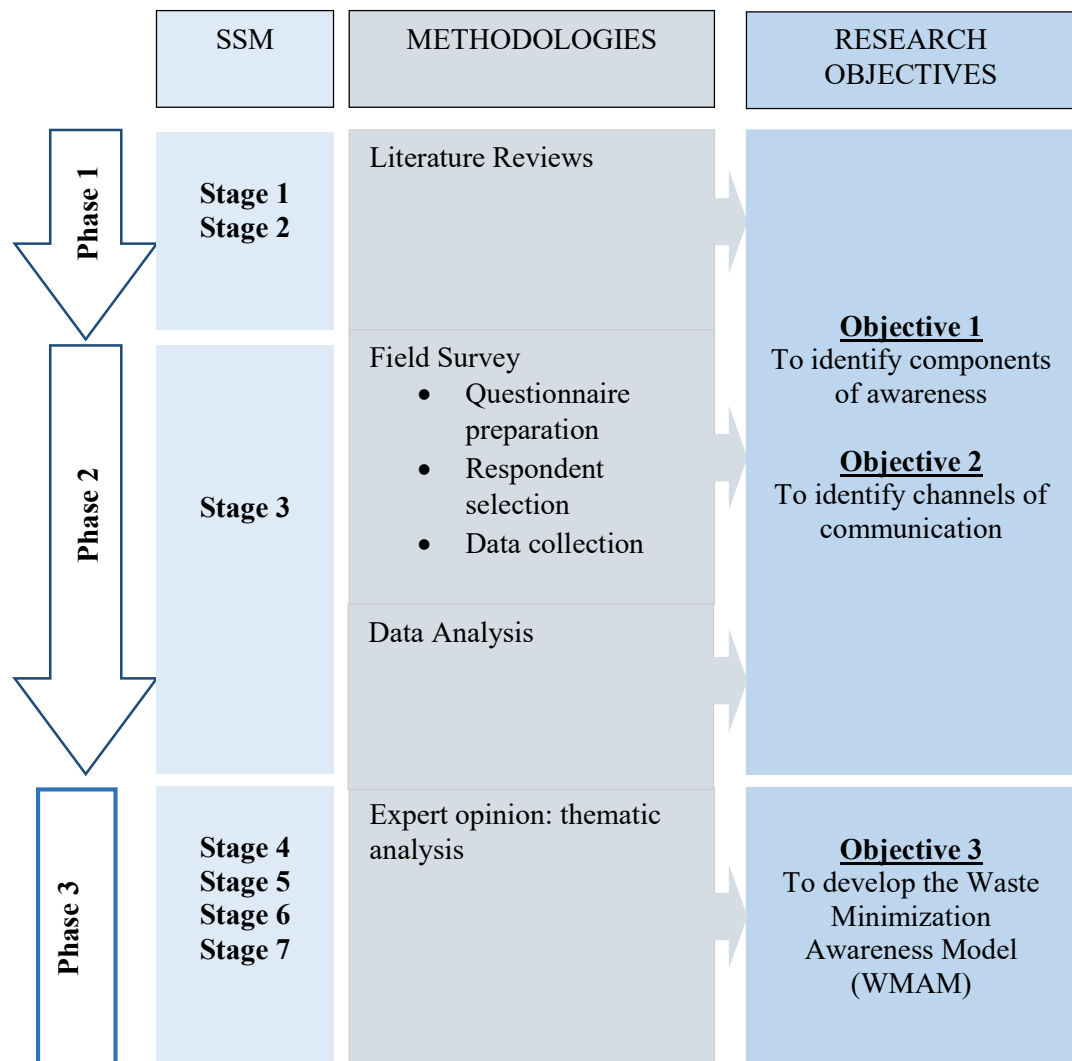
Figure 1.2: Research methodology
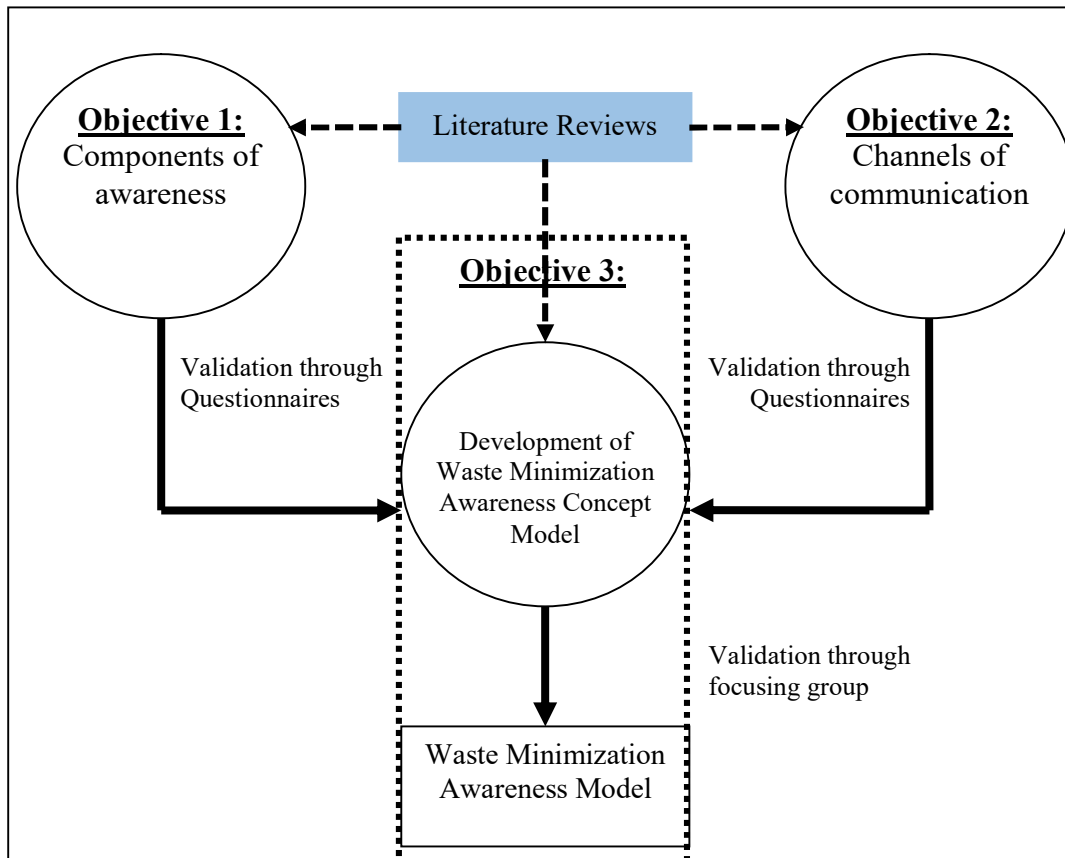
Figure 1.3: Research objectives

1.6   Scope

Three public universities in Malaysia - Universiti Teknologi Malaysia (UTM), University of Malaya (UM) and International Islamic University of Malaysia (IIUM) have been selected as the scope of this study. Components of waste minimization awareness and channels of communication are two major scopes of this research.

1.7 Significance of Study

The Waste Minimization Awareness Concept Model is important to the waste management hierarchy, as it is the first stage in minimizing waste dumping into landfills. This research makes significant contributions in two important areas:

1. Facilities Management

   With the model developed through this research, it will help Facilities Managers maintain a healthy workplace and manage waste in a sustainable manner. This can be rationalized by implementing the awareness model by the building or organization stakeholders.

2. Education system

   As the proposed model will be focusing at the Malaysia's public universities, therefore this research will contribute to strengthen the environmental study in higher education system.

1.8 Research Contributions

A Waste Minimization Awareness Concept Model is being proposed as a first step in implementing the Integrated Sustainable Waste Management in public universities. Contributions of this research will be benefiting:

1. Environment

   As mentioned previously in this chapter, various solutions have been introduced either by policy makers or academicians to overcome waste problems. The model proposed in this study will be an integrated medium to create awareness among universities' students which will be a nation's future leaders towards minimizing waste, thus reducing waste from entering landfill.

2. Social

The future leaders produced by the universities will be catalysts for social change, as they were formally taught and facilitated through the model. Thus, the behavioural change will be systematically continued throughout social citizens since the moral and values of these future leaders have been moulded in the universities by the Waste Minimization Awareness Concept Model.

1.9   Summary of Chapters

Chapter 1

This chapter serves as introductory part of the whole study. It provides basic framework and overview of the thesis. It also serves to describe issues and problems pertaining to waste focusing on waste minimization awareness.

Chapter 2

Chapter 2 provides a comprehensive literature review on waste management, waste management hierarchy, waste management epistemology, waste minimization (reduce), and role of universities in promoting environmental education with regard to waste management.

Chapter 3

Chapter 3 reviews behavioural studies; theories and gap analysis. The first part of this chapter discusses the Message Learning Approach, which has been identified as the framework of Waste Minimization Awareness Model (WMAM). This section is used to identify channels of communication. The second part of this chapter identifies the components of awareness.

Chapter 4

Chapter 4 explores further on the modelling technique and concludes by identifying the appropriate technique for developing WMAM. Based on the selected technique, the WMAM will be developed.

Chapter 5

Chapter 5 details the research methodology used for this research to achieve the research objectives. The first part of this chapter describes Soft System Methodology (SSM) used as a research framework. Meanwhile the second part of this chapter discusses the overall methodology process of this research, which includes the sampling selection and data collection.

Chapter 6

Chapter 6 presents the data analysis of the surveys conducted. This data analysis served as components for the WMAM.

Chapter 7

Chapter 7 details the construction process of the WMAM and validation of the model through expert interview. Feasible and desirable suggestions by the expert were used to revise the model.

Chapter 8

Chapter 8 reviews back the overall process of developing the WMAM which includes the justification of developing WMAM, and answering all objectives of this research.

Chapter 9

Finally, Chapter 9 presents the main conclusion, limitation of the research and recommendation for future investigation.

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