Energy Conservation: A Conceptual Framework of Energy Awareness Development Process

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Abstract

Energy is wasted each day due to lack of awareness among societies. Past research suggest that there are two main energy conservation methods – technology fixed and behavioural approach. Technology fixed is based on instruments such as motion sensor control lighting and photovoltaic. Behavioural approach requires changes in human attitudes by using motivation, raising awareness and skill developing. This paper intends to explore the roles of behavioural approach in promoting energy conservation through raising energy awareness. Two related theories– Information Processing Theory and Three Term Contigency were reviewed. The information processing theory explains how people perceive information from their environment, operates on it, integrate it with information available in the memory, and used the product as the basis for deciding how to perform. The three-term contingency theory was invented to experimentally analyze human and animal behaviour, by dividing the behaviour into three key parts which constitute - stimulus, operant response and reinforcer/ punishment. A conceptual framework of energy awareness development process was proposed based on these two theories. The conceptual framework consists of nine phases – energy awareness stimulus, transference methods, interpretation, comprehension, awareness, reinforcement, short term motivation, obedience and long term motivation. Energy awareness stimulus explains that employees can be stimulated to support an energy management program. Transference methods are techniques or tools that could effectively transfer the stimulus to the receiver. The stages of interpretation, comprehension and awareness is receiver dominant, meaning that these phases is beyond the control of the building or facility manager. Reinforcement phase is required to strengthens the association between a response and preceding stimuli. Short term motivation is whatever activities that make people to act voluntarily in a certain way and then to persist in the face of difficulty. The employee is expected to be in the phase of obedience that shows the early success of the energy awareness development process. The long term motivation such as public recognition, personal pride and energy award should be introduced to the receivers so they can continuously practice energy conservation. Finally the paper explains that validations are required to determine the effectiveness of the conceptual framework and to identify desired improvement.

Keywords: Energy Conservation, Behavioural Approach and Energy Awareness Development Process

1. Introduction

The prices of oil and natural gas have gone through the roof and are expected to stay there. Campbell and Laherrère (1998), once estimate that oil decline will begin before 2010. However, in April 2006, international oil price already reaches new historic peak US$74 (RM270.93) a barrel level (New Straits Times, April 21, 2006, page 1). A continuously increasing trend of such high energy price will have negative effects on the global economy and society . The effects include recession, inflation and higher unemployment on global economy and society. Malaysia also feels the effects of energy problems as the price of petrol and diesel sought a new hike on February 28, 2006. The decision to increase the price of fuel was to overcome the impact of rising international crude oil prices and to curb the increase in subsidies paid by the government (New Straits Times, February 28, 2006, page 1).

The increase in energy price means that energy conservation efforts should be taken to reduce the effect

of energy cost. As stated by Yukata Mizuta (2003), energy conservation may not only bring reductions in carbon dioxide emission, but may also lead to savings in the expenditure on energy. It should therefore be one of the first problems to receive the attention of the government to be tackled. Besides saving money, energy saving effort can also improve the quality of environment and extend the life span of non renewable energy resources. In general, there are two kinds of energy saving methods that are technology fixed and behavioural approach (Wong, 1997; Mohan et.al, 1983). These two energy conservation methods were highlighted in the next two sections and discussions for each method will focus on the definition, example and usefulness.

2. Technology Fixed

Technology fixed is an instrument based by using tools to conserve energy. Typically, the technology fixed refers to applying technology instruments and large-scale investment. These include the introduction of new processes, change to automation systems, or installation of large energy-saving devices such as heat recovery system, new building designs, inverter, pre-heater, motion sensor, building envelope system and others. In the technology fixed, the payback is a significant issue, the 'return of investment' must be decide first before applying any technology equipments. It is very effective in conserve energy and in the short terms, the results of can be seeing. However, the initial cost for technology fixed is very high and not suitable for the organisation that have only limited budget. Moreover, one of the disadvantages of the technology fixed is it appear only as a temporary solution. As we develop physical technologies to improve energy efficiencies, we only migrating the effects of energy use by human, not curing the energy problem we are experiencing (Kempton and Schipper, 1994). Since technology fixed requires no behaviour changes of the users, it means the user still can waste energy in the same way. For the reason of that, technology fixed only suitable as a short term energy conservation methods, human attitudes towards energy consumption should be considered for the long term benefits.

3. Behavioural Approach

As mentioned previous, technology fixed is based on instruments such as motion sensor control lighting and photovoltaic. On the other hand, behavioural approach requires changes in human attitudes by using motivation, raising awareness and skill developing. According to Wedge (2003), the outcome of behavioural approach is very effective and helpful in energy conservation as in the case of the South Island Wood Processing Plant when they embrace on management initiatives – encourage staff participate in switch-initiatives during break and when areas were vacated. Experiments have shown that 5 to 10% of the domestic energy use can be saved by correct domestic behaviour (Loozen and Moosdijk, 2001).
Related research reveals that behavioural approach is vital in any energy conservation program and regarded as one of the key of success in energy management (Dahle and Neumayer, 2001; Loozen and Moosdijk, 2001). Facility manager should realize that the behavioural approach is useful to manage energy. Nowadays, the responsibility of a facility manager is not only limited to managing buildings, but it also includes management of energy and people. Sheila Sheridan, chairman of the International Facility Management Association (IFMA) during an interview with Druckman (2004) had given her opinion that facility management professional have growing shared responsibilities with human resources. So, besides focusing on technology fixed to conserve energy, human behaviour should also be considered. It is important to take account of human behaviour factors in energy conservation. As stated by Energy Efficiency Office (1993), being successful in saving energy is thus a question of motivating people to behave differently.

According to Wong (1997), awareness is the seed for tomorrow changes and this suggests that, the first step in behavioural approach in energy saving is to raise energy awareness. The following section will define and discuss energy awareness in promoting behavioural changes.

4. Energy Awareness

The Microsoft Encarta Dictionary (2005) define awareness as knowing something, having knowledge of something because you have observed it or somebody has told you about it, noticing or realizing something, mindful that something exists because you notice it or realize that it is happening, knowledgeable, well-informed about what is going on in the world or about the latest developments in a particular sphere of activities. In this paper, awareness refers to having knowledge or realizing something.

Energy awareness is significant in energy conservation program (Vesma, 2002, Wong, 1997, Mohamed El Halimi *et al*., 2000). Williams (1993) states that one of the most successful means of motivating employees to conserve energy is through awareness. Besides that, according to Camp (2005), staff awareness plays a crucial role in reducing utility bill and can make a big impack and therefore, raising awareness is large part of the solution.

In the past, raising awareness has been utilized as the method to conserve energy, for instance, the Imperial College of Science, Technology and Medicine in London, has defined objectives to focus on raising staff and student awareness of energy conservation issue as one

of the strategy to help protect the environment through more efficient energy use and to save money on fuel bills (Pancucci, 1998).

As from the above discussion, raising awareness is so significant. However, most managers still do not pay much attention to the benefits of raising energy awareness. This is because facility managers and plant operators tend to be sceptical of behavioural approach and have little understanding of them and their potential (Geller, Richard and Peter, 1982). Because of that, 'lack of awareness' becomes one of the reasons of energy inefficiency. According to Yik and Lee (2002), one of the key barriers to improving energy efficiency of buildings is lack of knowledge and motivation of the operation and maintenance (O&M) staff. In their other research, Yik *et al*. (2002) pointed out that the key barrier to energy efficiency improvement in existing buildings is the knowledge. Awareness is defined as knowledge, lack of knowledge also means lack of awareness.

5. How to Raise Awareness?

The process of creating awareness would require a review of the relationship between learning and awareness. Learning refers to developing a specific skill, for example: read, type, playing a game and even walk and talk (in early human stages). It is an outcome of the end product of some process. On the other hand, awareness is to develop a sense of mind towards an issue, event or subject so that people can realize about the fact (already exist), later change perception and behaviour towards that issue. Both learning and awareness process can make changes in the human behaviour. The following discussion will focus on the relationship between awareness and learning.

Wexley and Latham (1991) state that learning is a relatively permanent change in behaviour that occurs as a result of experience or practice. According to Barker (1997), learning is more or less permanent change in behaviour resulting from personal experiences with an environmen. Indeed, through appropriate learning process, awareness can be developed. To understand the process of how to create awareness through learning process, we need to look at the well-known theory of learning - the classical condition or the Pavlov's theory. This theory describes how stimuli that occur together may come to evoke similar responses. During his experiment, Pavlov rang a bell every time he offered food to his dog and then he found out that it always salivated. After some time, he found out that his dog automatically salivated when he rang the bell although without foods. This experiment suggests that appropriate stimulus can change someone's behaviour and awareness can be gained through the learning process. The process of gaining awareness could be refered as an acquisition process. For instance, a child will learn to be aware of dog after being bitten by it and would try to avoid a direct contact with dogs after that incident. During acquisition process, availability of stimulus is a must. In the above case, incident bitten by a dog acted as the stimulus. If appropriate stimuli are provided, awareness towards something can be gained. For example, although oil crisis in 1970-1980 had contributed to a worldwide recession, but at the same time, the world also realized and concerned about the energy issue. In this case, the event of oil crisis is the stimulus to create awareness in energy saving.

The above discussion has pointed out that awareness can be developed through an appropriate learning process. The prerequisite is that the stimulus of that particular awareness needs to be sent out through an effective method. In order for someone to gain awareness, relevant information or knowledge of that awareness must be provided. The process of acquiring and processing information is significant as it will affect the final output (response). To understand such processes, we have to discuss the Information Processing Theory and the Three-term Contingency Theory. The following sections discuss the relevance of these theories in developing the framework for creating awareness in energy saving.

5.1 Information Processing Theory

Information processing is one of the study areas of cognition psychology. The study areas of cognition are wide. These include attentions, perception, memory, reasoning, judgment, imaging and thinking. Nevertheless, the main study of cognition is on information handling. In cognition psychology, the theories based on computer models are commonly known as information-processing theories. They refer to the way people receive information from their environment, operate on it, integrate it with information available in memory and use the product as a basis for deciding how to perform (Bourne and Bruce, 1976).

Information processing theory can be used to explain how people achieve awareness. Originally, this theory is used to explain how people perceive information from their environment, operates on it, integrate it with information available in the memory, and used the product as the basis for deciding how to perform. Wogalter and Laughery (1996) summarize four important stages that will lead behaviour complying with warning order, which is attention, comprehension, beliefs and attitudes, and motivation as shown in Figure 1.

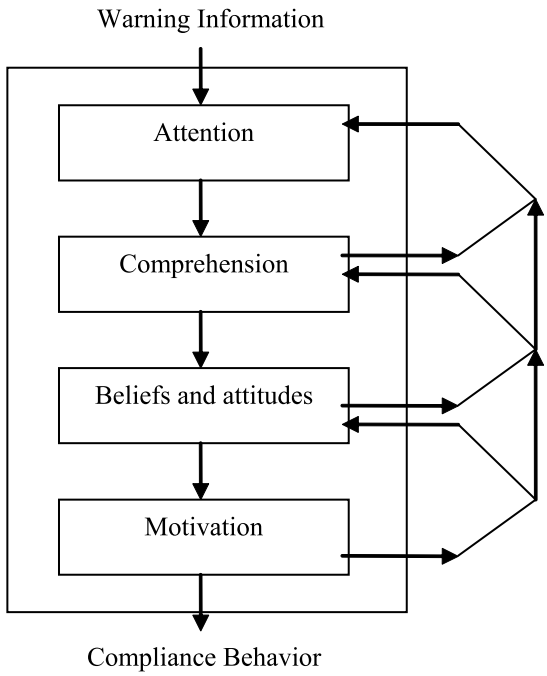

Figure 1 : A human information processing model showing a sequence of stages leading to behaviour complying with a warning.
Sources : Wogalter and Laughery (1996; 33)

Attention acts as notice or mental focus, about how far the design of the stimulus can attract attention of people. The factors such as novelty, size, illumination, contrast, and location (both spatial and temporal) do affect salience. *Comprehension* is defined as understanding, related to the level of understanding of the people towards the issue. The understanding is significant in any awareness development process, the receiver should clearly understand the information that he received. Without the understanding, the awareness is impossible to be developed. *Belief and attitude* is defined as respondent's mindset, the design of awareness process must be strong and concrete enough to sway the target's negative beliefs. Then, if the message is noticed, understood and fits with a person's beliefs and attitudes, then the remaining essential element is *motivation*. A critical determinant of motivation is the cost of compliance. Cost can be of any expenditure of effort, time, and money. If a person perceives the costs of complying more than the benefits of complying, he or she is less likely to comply if the benefits appear to outweigh the cost. The social influence is another motivational factor affecting compliance. If people see another person comply with a warning, they are more likely to comply.

5.2 Three-Term Contingency Theory (A-B-C model)

Another theory that relates to awareness development is the Three-Term Contingency Theory. The Three-term contingency theory was invented by the famous behavioural scientist, B. F. Skinner. In order to experimentally analyze human and animal behaviour, he divided the behaviour into three key parts which constitute - stimulus, operant response and reinforcer/ punishment. The term 'Contingency' defined as relationship between the events, three term contingency refer to the sequential relation between the stimulus, response and reinforcement/punishment that prompt and maintain behaviour. Three-term contingency theory also known as A-B-C (Antecedents-Behaviour-Consequences) model and being applied in education to monitor school children behaviour. Figure 2 illustrates the three-term contingency theory.

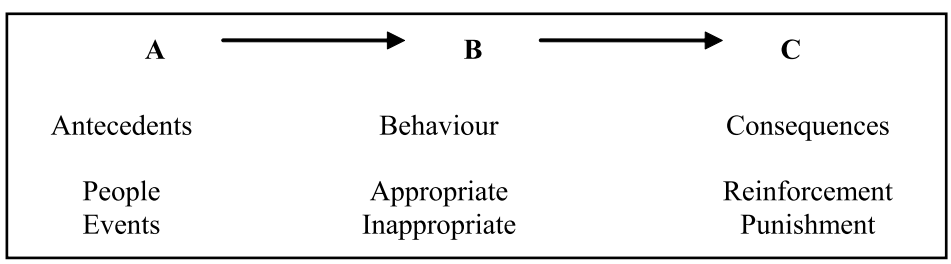

Figure 2 Three Term Contingency or A-B-C (Antecedents-Behaviour-Consequences) model
Sources: Maag (2004; 9)

The A-B-C model can be used to explain how people achieve awareness and manage their behaviour. Table 1 outlines and summarizes the characteristics of each key part.

Table 1: Characteristics of the key parts of the A-B-C model

(A) Antecedent	(B) Behaviour	(C) Consequence
• Stimulus or setting event. External environment that set the occasion for behaviour to occur.	• Cognitive (thinking) - Voluntary behaviour that we choose to do or not to do • Respondent (physical) – Biochemical or physiological changes occurring within our body. • Operant (acting) – Voluntary behaviour that we choose to do or not to do.	• Events (external) that occur during and/or after a particular covert and/or operant behaviour.

Sources: Kahn, (1999; 13)

Maag (2004) defines antecedents as the circumstances that exist in the environment before behaviour is exhibited. This means that, antecedents are the reason, cue or prompt for some one to behave in a certain way. For example, students tends to waste energy (did not switch off electric equipments when not using it, air conditioning system operated to the overcooling) in the university because they do not pay energy bills directly. In this case, 'free from paying any electricity fee' act as the antecedent for the reason of why students do not appreciate energy.

The behaviour section in the three-term contingency theory is divided into three parts - cognitive, respondent and operant. The cognitive behaviour represents how people think, imagine and self talk, all of these will affect people's decision in the later stage. Respondent behaviour refers to involuntary physiological/biochemical changes in our body when we are ready to take certain action. Operant behaviour is behaviour that is voluntary and operates on the environment to produce desirable consequences (Kahn, 1999). More accurately, operant behaviour refers to the action that we take.

Consequences are immediate or long-term events or changes in the environment following target behaviour (Zirpoli and Melloy, 1997, Kahn, 1999). Generally, consequence can be defined as effect or cause of previous action or condition. Consequences can be reinforcing (positive) or punishing (negative). As mentioned by Maag (2004), "consequences affect future behaviour by serving to either increase, decrease or maintain it." If the consequences are reinforcing, then probably the respondent will repeat it to obtain the desirable results/events/changes. On the other hand, respondent will not repeat it for the purpose of avoiding the undesirable results/events/changes. For instance, if a student receives verbal reprimand after being caught for wasting energy, for example: did not switch off the fan upon leaving hostel, he would probably be more aware in future.

6. Awareness Development Stage

From the previous discussion and the literature review, the researcher concludes that there are three major stages to develop awareness (Figure 3). The first is the environmental stage (input) where external stimuli functions as the primary input. The theory of learning states that a person will change behaviour because of his experiences with the environments. The second is the mind stage (process). Here, perception and cognition plays important roles for handling, selecting and interpreting information acquired. The third (output) is behavioural stage where all the information received will be reflected in the receiver behaviour. The following section discusses the conceptual framework of energy awareness development process.

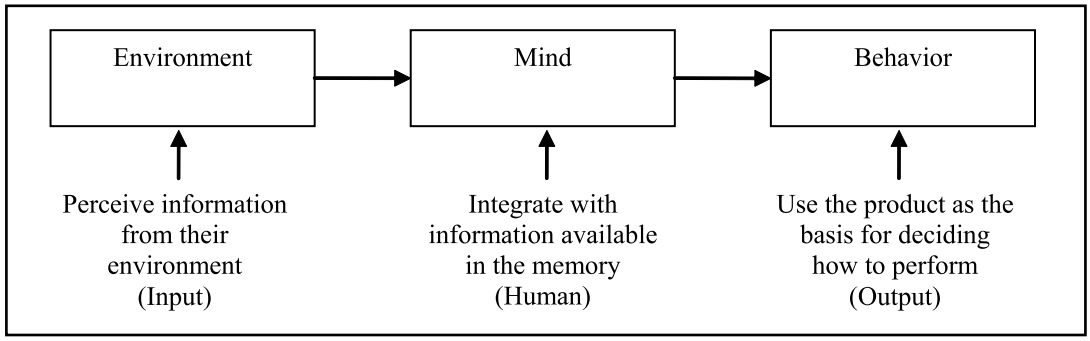

Figure 3 Major stages of awareness development process

7. Conceptual Framework of Energy Awareness Development Process

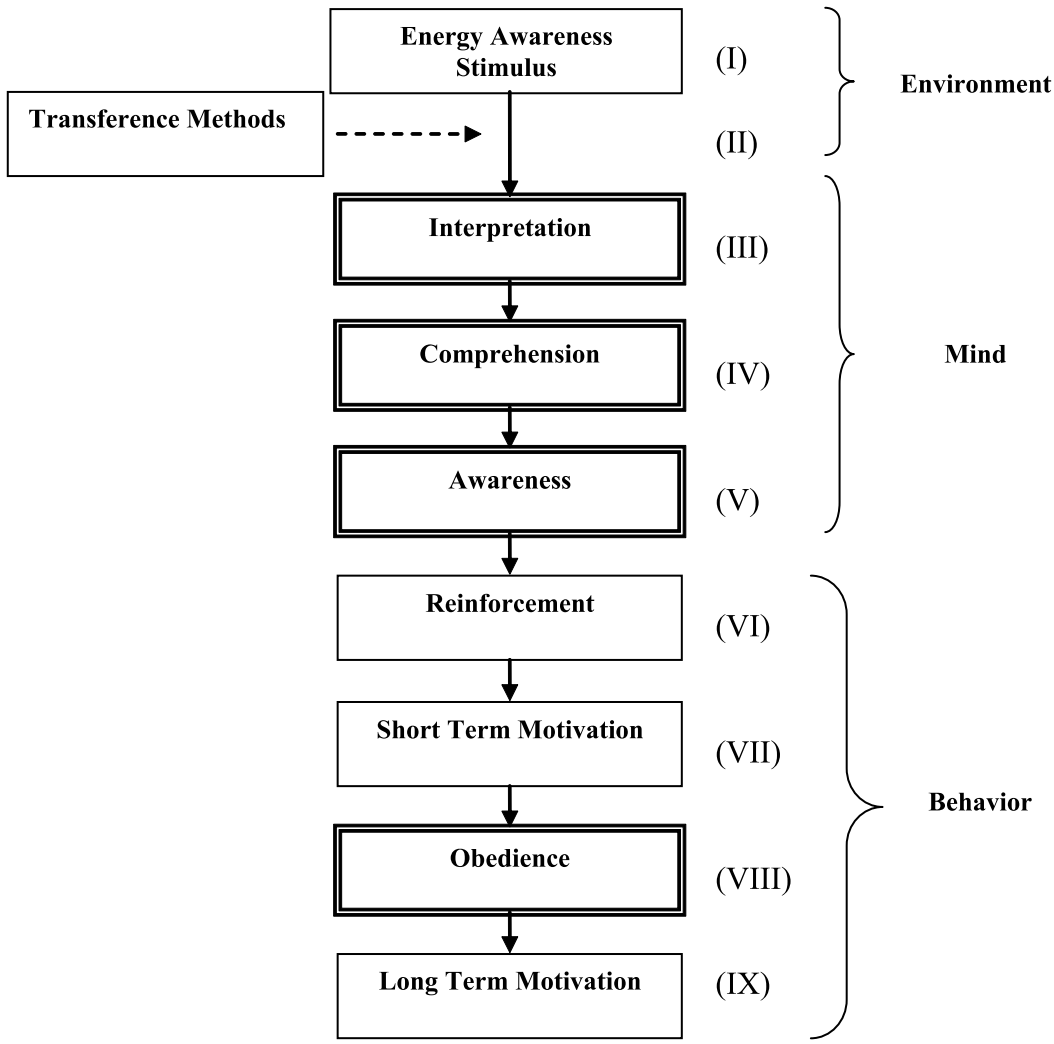

Figure 4 Conceptual framework of the Energy Awareness Development Process

Figure 4 illustrates the energy awareness development conceptual framework. The entire process contain nine phases – energy awareness stimulus, transference methods, interpretation, comprehension, awareness, reinforcement, short term motivation, obedience and long term motivation. Overall, energy awareness phases can be divided into two types – (i) phases dominated by the transferor and (ii) phases dominated by the receiver. Transferor is defined as conveyor, somebody to transfer the stimulus and develop energy awareness to another person. The phases dominated by the transferor refer to the phases that can be monitored by them. Examples of transferor are facility manager, building manager, energy manager, energy director or who ever wants to raise energy awareness among the receiver. On the other hand, receiver is defined as somebody who takes or accepts the stimulus for developing energy awareness. The phases dominated by the receiver refer to the phases that cannot be monitored by the transferor and is self-achieved by them. Examples of receiver include employees and building users.

Phase (I): Energy Awareness Stimulus

The first phase of the energy awareness development process is the availability of energy awareness stimulus. Based on the classic stimulus-response (S-R), awareness happens because of specific stimuli. Practically, stimulus is incentive - something that encourages an activity or a process to begin, increase or develop. Stimulus can exist in various kinds of forms, such as visual, audio, taste, smell and feel. However, for the purpose of energy awareness development, only two senses are given concentration - audio and visual, as other senses are not appropriate. In energy awareness development process, stimulus refers to information and should cover criteria such as clear, understanding, interesting and strongly impress. Different communities will need different kind of stimulus, appropriate stimulus must be carefully considered before further steps are taken. In practice, during the first phase of awareness development, the transferor can utilize two types of stimulus – energy tips and energy problems. Energy tips are very important in showing the building users how easy they can conserve energy. Simultaneously, this raises their knowledge about the importance of energy. Examples of energy saving tips are switching computer into sleep mode when not in use, switch off the light when not using it, remove dust from fluorescent tube and likewise. Such simple energy tips will encourage and provide the respondents a better way to conserve energy in their daily activities. Reverting to the second types of stimulus - energy problems, it is believed that bringing people's attention closer to the energy problems will help them to better understand about the energy issue. People may take energy conservation as a responsibility if they realized the energy wastage that they make every day. Summarizing from Williams (1993), employees can be stimulated to support an energy management program if they are informed of (1) the amount of energy they are using, (2) the cost involved, (3) critical part that energy plays in the continued viability of their job, (4) the relationship between production rate and energy consumption, (5) the seriousness of the energy problem and its potential effects upon our nation's economy in the future.

Phase (II): Transference Methods

Between energy awareness stimulus and interpretation phase, transference methods appear as a technique or tool to effectively transfer the stimulus to the receiver or in other words, to distribute the information. To develop energy awareness, both transferor and receiver have to be available. Responsibility of the transferor is to effectively transfer the stimulus (knowledge or information) while the responsibility of the receiver is to successfully receive the stimulus. The function of the transference methods is to help transferor convey the stimulus to the receiver. There are several transference methods that have been identified. Such methods are: (1) Booklet, Pamphlets, Brochures or Leaflets - this is the easiest way to distribute the information to building users, however, the disadvantage of doing so is that the transferor cannot monitor the selection process of the receiver. In fact, the receiver may not go through the contents. (2) Seminar, talk or presentation are referred as the one (transferor) to many (receivers) method. In this case, the speaker (transferor) plays an important role in conducting the speech and the designation of the speech must be suitable for the audience. Appointing a good speaker will be the main concern. (3) Sign, it is said to be very effective to remind people to be aware and to conserve energy. In one experiment by Luyben (1980), successful rate of reminding people to switch off the lights after using the class is up to 67%. In this case, the designation of the sign should be carefully considered. These include size of fonts, colour of the signboard, phases that are used and picture or figure attached. (4) Regulation, compared to the others, this is the most unfriendly method. However, regulation may be very effective in forcing employees to conserve energy. Besides that, it also reflects the organisation appears to be more serious in promoting energy conservation.

Phase (III, IV and V): Interpretation, Comprehension and Awareness

Under the mind stage, the third, fourth, and fifth phase of the energy awareness development process is receiver dominant, meaning that these phases is out of the control of the building manager or facility manager. The third phase of the energy awareness process is interpretation.

Interpretation refers to the process of how receiver explains and clarifies the information that he received. Often, the receiver will operate and integrate the new knowledge by using past experience, available knowledge and believe. The fourth phase is comprehension or understanding, it refer to the level of understanding of the receiver to the information. The fifth phase is awareness, if the previous phases are applied successfully, then the awareness probably is developed in this stage. In this case, the receiver will have the knowledge of those particular subjects and aware about it.

Phase (VI): Reinforcement

It is easier to change a participant's knowledge about energy and conservation than it is to change their attitudes (Smith, 1978). For instance, although many smokers aware (having knowledge and realize) that smoking is harmful to their health, but they still continue to smoke. In the similar circumstance, those who aware the importance of energy conservation and understand the energy conservation technique may not practice them. Hence, reinforcement is designed to overcome this problem. Reinforcer actually strengthens the association between a response and preceding stimuli. Barker (1997) defined reinforcer as any stimulus whose application following a response has the effect of increasing the probability of that response. This S-R interpretation of learning says that reinforcement is necessary for response selection, for one response to eventually become more dominant than other equally likely responses in a particular situation (Beck, 1983). For the reason of so, reinforcement should be carrying out to emphasize benefits that can be gained or hazards that can be avoid if the receiver carry out the energy conservation. During this phase, transferor should repeat the stimulus. According to Adler and Rodman (1991), repeating influence the process of selection, something can be noticeable if frequently exposed. If the respondent frequently expose to the relevant stimulus, the level of understanding of them towards the issue will be higher. Besides that, transferor may also distribute the information of benefit or detriment if or if they do not carry out energy conservation efforts, example of benefits: expand the life span of non-renewable energy sources, reduce the unnecessary energy cost and use it in more profit return sector, delay the country's movement to energy importer status and provide a better environment for future generation. On the other hand, examples of detriment includes pollution, decrease of public health, drastically increases of energy cost and likewise.

Phase (VII): Short Term Motivation

Motivation is whatever activities that make people to act voluntarily in a certain way and then to persist in the face of difficulty. In this research, reinforcement is slightly different from motivation. Reinforcement is a technique to enhance the effect of stimulus while the motivation is to continue encourages the targets to be aware and carry out energy conservation. Reinforcement offer indirect ways to influence the targets, the transferor only explains the benefit and hazard that can be obtained if doing something while the motivation is a direct ways which the transferor will provides prize or chastisement to the receivers directly. A critical determinant of motivation is the cost of compliance. Cost can be any expenditure of effort, time, and money. If a person perceives the costs of complying is greater than the benefits of complying, he or she is less likely to comply than if the benefits appear to outweigh the cost. The social influence is another motivational factor affecting compliance, if people see another person comply with a warning, thus they are more likely to comply. Although there are a lot of factors that influence human behaviour, the basic of motivation which control the great majority of human behaviour are rewards and punishments. There are various types of reward and punishment, transferor may offer rewards such as: prizes, money and recognition. Conversely, transferor may also offer punishment such as: shame and fine.

Phase (VIII): Obedience

After the short term motivation phase, the employee is expected to be in the phase of obedience. There is one thing to be given consideration, when a person (p) receive information from some sources (s) to develop some kind of awareness, for instance, energy awareness (e). We cannot say 'p' have aware of 'e' unless such exposure to 's' make a revealing difference in p's behaviour, then we can sure 'p' is aware of 'e'. Energy awareness should be followed by behavioural changes to conserve energy or in other words, complying behaviour. Definition of obedience is to act in accordance with another's command, request, rule, or wish. Obedience shows that the early success of the energy awareness development process. By observing the receiver's attitude and compare the current and previous energy bill, the transferor can know that it was not the receiver that makes changes on energy consumption attitude. In this phase, transferor may carry out evaluation or assessment such as self-administrated questionnaire, observation, bill comparison and likewise, the purpose is to check out the level of awareness of respondent.

Phase (IX): Long Term Motivation

For the benefit of long term, motivation must be carried out. Although the receiver already practices energy conservation but being continuous to practice energy conservation is thus another challenge. People have, however, very short memories for these things and easily

drop back into old ways (Dick-Larkam, 1977). Transferor should offer long term motivation to the receivers so they can continuously practice energy conservation. Once again, the reward and punishment should be the main concern. However, transferor should realize that economic incentives only suitable for the short term motivation and not so effective in the long term. Social influences and personal interest are more important, such as public recognition, personal pride and energy award.

8. Validation

The conceptual framework proposed in Section 7.0 was developed based on the literature review. Anssi Peräkylä (1997) mentions that issues of reliability and validity are important, because in them the objectivity of research is at stake. Validations are needed to determine the effectiveness of the framework and to identify desired improvements. The conceptual framework will be evaluated by the key players in the related fields such as facility manager and energy manager through questionnaire survey and interviews. The evaluation would consists of three elements – general observation, specific observation and additional comments as referred to Edgardo Esteban Agno (1980). The assessment criteria include efficiency, adequacy, usefulness, manageability and effectiveness of the framework. Finally, feedback from the evaluation will be analyzed by using quantitative and qualitative analysis. Lessons gained from the evaluation will be used to revise the conceptual framework and to identify future research directions.

9. Conclusion

Energy cost and supply is an unresolved global issue. In the long run, the only way to maintain sustainable energy supply and remain competitive with the ever rising energy cost is through energy saving. There are two types of energy saving method – technology fixed and behavioural approach. Both methods are practical and can be applied together. Under the behavioural approach, raising energy awareness is regarded as the initial step that needed to be taken in an effort to change people's behaviour regarding energy saving. This paper has presented a conceptual framework of energy awareness development process. The framework can be divided into nine phases, namely energy awareness stimulus, transference method, interpretation, comprehension, awareness, reinforcement, short term motivation, obedience and long term motivation. Validations are required to evaluate the effectiveness of the conceptual framework and to identify desired improvements.

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