Jurnal Teknologi

Full paper

Preferred Communication Channels to Foster Energy Conservation Behaviour among Public Office Building Users: A Study in Kota Iskandar

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Article history

Received :26 April 2013
Received in revised form :
30 July 2013
Accepted :15 August 2013

Abstract

Energy is an important source for a nation to achieve development and urbanisation. In Malaysia, the need for energy efficiency was explicitly addressed in the Ninth and Tenth Malaysia Plans. The Malaysian government has directed all government office buildings to reduce their energy usage by 10%. However, the lack of awareness and inappropriate behaviour among building users are barriers. It is believed that the successful use of appropriate communication channels can improve commitment and behaviour among building users to conserve energy. Hence, this research examines which communication channels are preferred by government office users to foster energy conservation behaviour. This research focuses on government staff working in public office building at Kota Iskandar, which is located in a new developing township of Nusajaya, one of the largest property development projects in Southeast Asia. The town is newly constructed and therefore wastage due to obsolescence factors can be minimised. Questionnaires were distributed to the staff at the State Government Department Complexes. This survey indicated that respondents highly appreciate visual communication when receiving information, while posters emerged as the most effective and preferable information-delivering channel for respondents.

Keywords: Energy conservation; communication channel; visual communication; energy stimulus; energy efficiency

Abstrak

Tenaga adalah sumber penting kerana sesebuah negara bergantung kepadanya untuk mencapai pembangunan dan pembandaran. Di Malaysia, keperluan kecekapan tenaga telah jelas dinyatakan dalam Rancangan Malaysia Kesembilan dan Kesepuluh. Kerajaan Malaysia telah mengarahkan semua bangunan kerajaan untuk mengurangkan penggunaan tenaga sebanyak 10%. Walau bagaimanapun, kekurangan kesedaran dan tingkah laku pengguna di kalangan pengguna bangunan telah menjadi salah satu halangan. Adalah dipercayai bahawa saluran komunikasi yang sesuai boleh meningkatkan komitmen dan tingkah laku di kalangan pengguna bangunan untuk menjimatkan tenaga. Oleh itu, kajian ini dicadangkan untuk mengetahui saluran komunikasi yang lebih digemari oleh pengguna bangunan kerajaan dalam memupuk tingkah laku pemuliharaan tenaga. Kajian ini memberi tumpuan kepada pengguna bangunan kerajaan di Kota Iskandar dalam perbandaran Nusajaya, salah satu pembangunan projek hartanah popular di Asia Tenggara. Bandar ini baru dibina dan pembaziran disebabkan oleh faktor obsolesce boleh dikurangkan. Soal selidik telah disampaikan kepada pengguna komplex bangunan jabatan kerajaan negeri. Kaji selidik ini menunjukkan bahawa responden sangat menghargai komunikasi visual dalam menerima maklumat dan poster muncul sebagai saluran maklumat yang paling berkesan dan lebih menyampaikan bagi responden.

Kata kunci: Penjimatan tenaga; saluran komunikasi; komunikasi visual; rangsangan tenaga; kecekapan tenaga

1.0 INTRODUCTION

Energy has been transformed and converted into various forms of energy service to support human life and civilization (Mohamed & Lee, 2006), and most modern electrical appliances are now powered by electricity. According to the Ninth Malaysia Plan (2006–2010), natural gas and oil are the dominant fossil sources, which comprise 56.10% of electricity generation. The remaining sources are coal (36.50%), hydro (5.60%) and others (1.80%). Considering coal to be a source of fossil fuels, Malaysia is heavily dependent on fossil fuels, which account for 92.60% of the fuel mix. Table 1 shows the energy mix in Malaysia from 1980 until 2010, showing that Malaysia has depended on fossil fuels for the past 30 years as the energy resource for human activities, especially economic

activities. This high dependency on fossil fuels as an energy resource is unlikely to change in the near future.

Table 1 Energy mix in Malaysia

Source	1980 (%)	1990 (%)	2000 (%)	2005 (%)	2010 (%)
Oil/ Diesel	87.9	71.4	4.2	2.2	0.2
Natural Gas	7.5	15.7	77.0	70.2	55.9
Hydro	4.1	5.3	10.0	5.5	5.6
Coal	0.5	7.6	8.8	21.8	36.5
Others	-	-	-	0.3	1.8

Source: BioGen (2003); 9th Malaysia Plan (2006–2010), Table 19-5

As stated by Mekhilef *et al*. (2011), economic growth is signified by increased energy demand. Thus, growth in the economy will lead to rising GDP, which in turn shapes growth in energy demand. It is reported that for every 1% rise in GDP, there is an increase of around 1.5% in electricity consumption in Malaysia (Saidur, 2009; Oh, Pang & Chua, 2010). Malaysia's final electricity consumption in 2000 (61,162 GWh) increased to 104,588 GWh by 2010. Figure 1 shows the total electricity consumption trend for 2000 to 2010. Moreover, commercial energy demand almost doubled from (0.35×10^{12} kwh) in 2000 to (0.62×10^{12} kwh) in 2010 (Ninth Malaysia Plan 2006–2010, Table 19-2). These statistics show that there is a tendency towards the increased usage of fossil fuels to generate more electricity to support human activities.

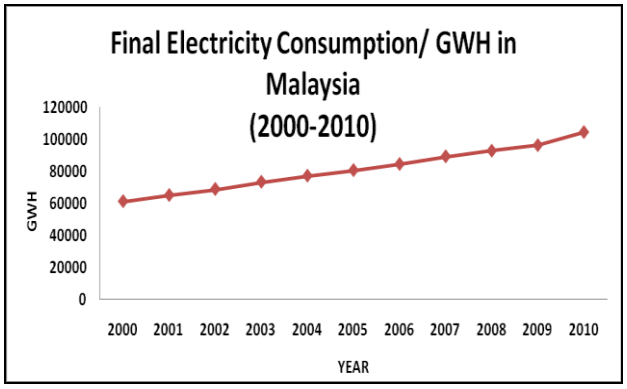

Figure 1 Total electricity consumption in Malaysia from 2000 to 2010 *Source:* Malaysia Energy Information Hub (MEIH), Suruhanjaya Tenaga

Therefore, excessive energy demand by human beings will draw the nation to the issue of energy scarcity and adverse environmental damage due to the usage of depleted fossil fuels. In order to overcome these problems, selecting the most effective way to deliver energy conservation messages is vital in increasing energy conservation awareness and fostering energy conservation behaviour.

2.0 LITERATURE REVIEW

In an effort to address the issue of energy wastage, the government of Malaysia has directed all government office buildings to reduce energy usage by 10% (Chua & Oh, 2011). One of the bold moves is to direct government buildings to set their air conditioning temperatures to 24 degrees. As stated by Yang, Lam and Tsang (2008), the consumption of energy (per metre squared) in large public buildings accounts for 70–300 kwh, which is 10–20 times higher than that in residential buildings. Efforts to reduce energy consumption in public buildings can thus bring about enormous energy savings. Government office buildings tend to use centralised air-conditioning systems, variable speed drive heating and cooling system (VSD) and building-integrated photovoltaic systems to provide excess energy generated during the daytime and other technology-fixed approaches to conserve energy. The best way to meet rising demand for energy is not to supply more or solely depend on technology-fixed methods (Choong, 2008). The behavioural approach is a complement to the current technology-fixed methods that results in effective energy conservation (Wedge, 2003).

Present research focuses on office buildings to achieve energy efficiency through informational interventions (Staats, Van Leeuwen & Wit, 2000), energy audits that focus on the potential energy savings from electrical equipment (Bagci, 2009) and the usage of energy efficient motors and variable speed drives for electrical components (Saidur, 2009). However, the use of appropriate communication channels to encourage energy conservation behaviour among government office users is left uncovered. Hence, this research aims to find out which communication channel is preferred by government office building users to foster energy conservation behaviour. It is believed that the successful use of the most appropriate communication channel will improve energy-efficient usage among government office users.

2.1 Energy Conservation Behaviour

Human behaviour is essential in energy conservation efforts. As highlighted by De Young (1993), conservative behaviour is imperative for a sustainable future. Still, people are not performing this behaviour even though they know the importance of preserving energy (Steg, 2008). Failure to perform energy conservation behaviour, such as neglecting turning off electrical equipment when not in use or unplugging electrical equipment, can soon become a habit and lead to further wastage. As a consequence, these actions of ignorance may cause energy wastage and lead to the exhaustion of energy resources and energy inefficiency. A scholarly review showed that a 'lack of energy awareness and energy-use behaviour" is the main reason for energy inefficiency (Yik & Lee, 2002).

Over time, unwillingness to change in user behaviour has been cited as the reason for poor energy conservation progress (Nandi & Basu, 2008). In order to reduce energy inefficiency, society should be concerned about the strategy and their behaviour in consuming energy because achieving a sustainable future relies on changing individual behaviour (McKenzie-Mohr, 2000). However, energy conservation behaviour is multifaceted and complex (McMakin, Malone & Londgren, 2002), and it is difficult to elucidate as people behave and respond differently. Although some technology aids energy conservation, failure to use and control it may reduce success since people operate technology (Masoso & Grobler, 2010). Therefore it is up to human behaviour after all. Moreover, some studies show that energy savings can be achieved by improving consumer behaviour (Loozen & Moosdijk, 2001; Matutinovic, 2008; Ouyang *et al*., 2009).

2.2 Energy Stimulus

As stated by McKenzie-Mohr (2000), changing individual behaviour is essential to achieve a sustainable future. Raising energy awareness and fostering conservation behaviour are thus crucial to reduce energy wastage. According to Choong (2011), the first step is through stimulus, which is a single or series of events that trigger environmental concern, whereas Fogg (2009) suggested that triggers should be used first to stimulate certain behaviour. Briefly, energy users need to be encouraged to perform pro-environmental behaviour voluntarily. Choong (2011) introduced a model that is simplified from the Conceptual Model of Energy Awareness Development Process.

This model consists of three components: Stimulate, Strengthen and Sustain. As explained by Choong (2011), stimulus is the fountainhead to trigger conservation behaviour. A stimulus can exist unintentionally or intentionally. An incident that occurs accidentally and creates awareness is an unintentional stimulus, while advertising and campaigns to raise energy conservation awareness are intentional stimuli. The most common intentional stimulus is delivered to the public in the form of either speech or a picture (poster, flyer, sticker, etc.). It is assumed that people tend to act in more environmentally beneficial ways with better information (Froehlich, Findlater & Landay, 2010).

There are several ways to stimulate the public intentionally about the importance of conservation, such as social advertising campaigns, nationwide education programmes and even television and radio shows (Chong & La Ferrara, 2009). Another interesting way to stimulate energy conservation behaviour is through gamification. For example, Geelen *et al*. (2012) examined the use of a game (Energy Battle) to encourage home occupants to conserve energy. Fogg (2003) added that games tap into intrinsic motivation, which is powerful in persuading or influencing people to perform certain actions. In brief, games seem to influence saving energy and some could change participants' behaviour. However, the use of games to stimulate energy conservation is only effective with small groups of respondents. Moreover, it is impractical to use game stimuli in office buildings, especially during working hours.

In this study, an intentional stimulus is proposed to stimulate energy users' behaviour. This paper aims to select the most appropriate intentional stimulus as the communication channel to motivate and encourage energy conservation behaviour among government office users so that they can voluntarily change their conservation behaviour. Moreover, an intentional stimulus is suggested in this research because of its successful findings in previous research, including an application in a health education campaign (Sugiyama *et al*., 2011; Chang *et al*., 2011; White, Webster & Wakefield, 2008). Furthermore, it has been successful in promoting stair use through the intervention of visual messages in office buildings (Kwak *et al*., 2007; Eves, Webb & Mutirie, 2006) and shopping malls (Kerr, Eves & Carrol, 2001). Considering the use of an intentional stimulus as the communication channel can result in people's behaviour to change, which is essential for fostering energy conservation behaviour.

2.3 Communication Channel

Communication is not an isolated activity, as it occurs at multiple levels (Schelly *et al*., 2011). For example, conveying messages through speech, visuals, signals, writing or behaviour occurs when there is communication between the receiver and the sender. However, conveying messages through different kinds of communication channels has to be creative and eye-catching (Adiloglu, 2011), as these kinds of messages create positive value in communications. Thus, an interesting message can attract the attention of the receiver, and if the receiver gets the messages, the communication can be said to be effective. In order to communicate effectively, the selection of an appropriate communication channel is important in delivering messages.

As mentioned earlier, one way to deliver messages is through visuals. Heskett (2005) stated that visual imagery has a persuasive influence in both good and bad ways, as it may stimulate or confuse the receiver. Hence, the selection of visual imagery has to be cautious. The selection of the most appropriate message and image can lead to effective communication and vice versa. Thrasher *et al*. (2012) found that messages can be delivered to users effectively if graphics and clear propositional language are amalgamated. Therefore, this research aims to find out which communication channel is preferred by government office building users to foster energy conservation behaviour among them. There are several choices such as through workshops, campaigns, posters and newsletters as well as on television, radio and the Internet. It is believed that the successful use of the most appropriate communication channel will improve energy-efficiency usage among government office users.

■3.0 CASE STUDY: KOTA ISKANDAR

This research aims to find out the preferred communication channel to foster energy conservation behaviour among government office building user, in this case, the government staffs at Kota Iskandar in the Iskandar Development Region. Throughout this paper, the term 'building user" will be used to refer government staff working in public office building. Kota Iskandar (Johor State New Administrative Centre) is located in the township of Nusajaya, one of the largest property development projects in Southeast Asia. Kota Iskandar is a 320-acre integrated development comprising Johor state and federal government offices. Kota Iskandar's milieu of state and federal government complexes in one area will contribute to the government's efficiency and benefits the status of a modern and progressive administration. The components that will establish Kota Iskandar as the seat of Johor's government include: (i) Johor State Assembly (Bangunan Sultan Ismail); (ii) Chief Minister & State Secretary Complex (Bangunan Dato' Jaafar Muhhamad); (iii) State Government Departments Complex (Bangunan Dato' Abdul Rahaman Andak, Bangunan Dato' Mohammad Salleh Perang, Bangunan Dato' Mohammad Ibrahim Munsyi); and (iv) Plaza Dataran Mahkota.

Kota Iskandar was selected as the case study for the reason that the Government of Malaysia has directed all government office buildings to reduce their energy usage by 10% (Chua & Oh, 2011). Secondly, the buildings in Kota Iskandar are newly constructed. Hence, energy wastage due to obsolesce factors can be minimised. Thirdly, those who do not pay for electricity do not feel that they are wasting energy; this applies to government office building users and such an attitude should be eradicated.

■4.0 METHODOLOGY

This study focuses on Kota Iskandar which is situated at the new township of Nusajaya under the Iskandar Malaysia. Iskandar Malaysia is a designated corridor for economic development in the Johor Bahru metropolitan area (Rizzo and Glasson, 2012). The role of Iskandar Malaysia as a special development vehicle has a selected demographic and there is an absence of natural mix in population. However, this study focuses on the government office building users at Kota Iskandar where the respondents (government staffs) are from different background and culture. Hence, bias towards the selected demographic and absence of organic growth can be eliminated.

Before the development of the questionnaire, an interview was conducted in the State Government Department Complexes. Six office building users who work at the complexes were involved in the interview session. The design of the questionnaire considers the results of these interviews and feedback from office building users. Then, a questionnaire survey was carried out at the State Government Department Complexes in order to establish the energy use pattern and preferred communication channel to foster energy conservation behaviour among government office building users.

The designed questionnaire comprises two sections. Section A is the personal details of respondents. This section comprises four questions, including gender, age, race and

education level. The purpose of these questions is to gather background information on respondents. Section B comprises 12 questions, which includes open-ended and closed-ended questions. This section consists of several measurements to measure respondents' awareness, knowledge, motivation and behaviour. In addition, their recommendations on preferred communication channels were measured.

Before the questionnaires were distributed, cluster sampling was conducted at the State Government Department Complexes. A total of 200 questionnaires were distributed to the selected building; 149 questionnaires were answered and returned. The high return rate is due to the assistance from heads of departments in distributing the questionnaire among employees. Data collected from the questionnaire survey were analysed through frequency analysis and cross tabulation analysis to summarise and group the results into categories. While for open-ended questions, content analysis was applied.

5.0 RESULT

Section A consists of the respondent's profile, which consists of 72% female and 28% male. The educational level for respondents consisted of secondary school (50%), Diploma (33%), Degree (15%), Postgraduate and others (2%). Based on the analysis, all respondents believe that it is necessary to conserve energy in office buildings. According to Figure 2, 94% of respondents do conserve energy in their office buildings, while 6% do not. These results suggest that most respondents somehow perform energy conservation activities in the office building.

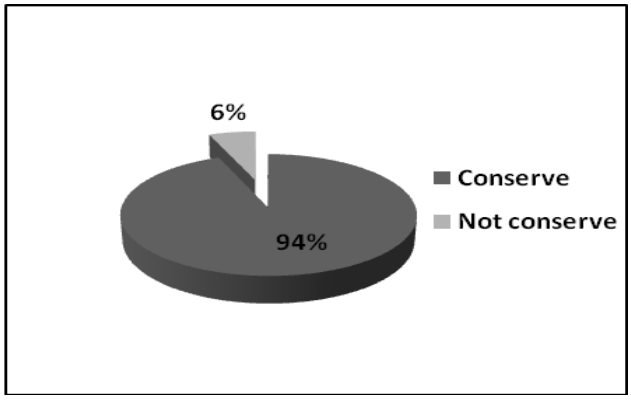

Figure 2 Respondent behaviour in office building

Figure 3 shows the reasons to conserve energy among respondents who conserve energy. The main reason for them to conserve energy is cost reductions or money savings (70.70%). They are less influenced by others (25.70%) to conserve energy in the office building. Figure 4 shows the reasons that encourage energy conservation for those who do not conserve energy in the office building. For those who do not conserve energy, the motive that would encourage them is still cost reductions or money savings (66.70%). Cost reductions or money savings are the major reason for why respondents perform energy conservation or not.

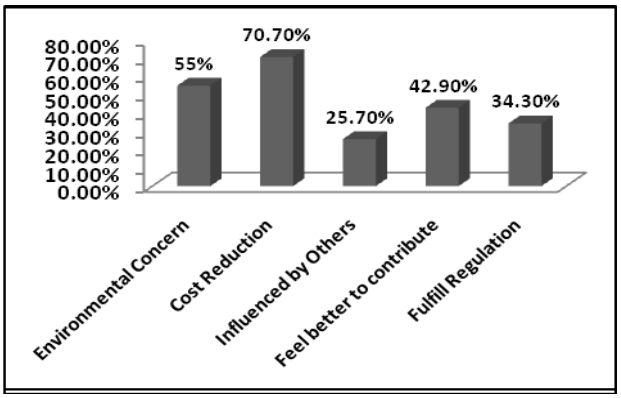

Figure 3 Justification of energy conservation action among office building users with energy conservation behaviour

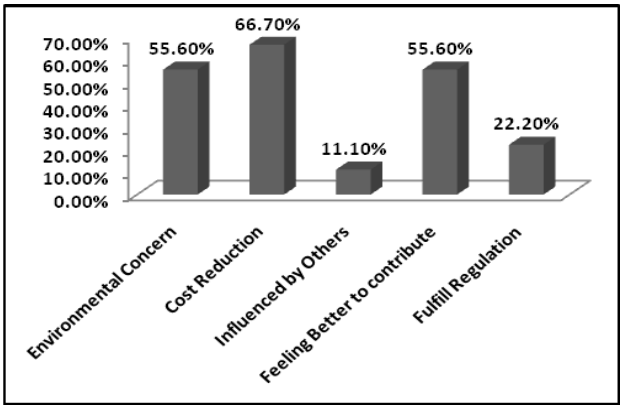

Figure 4 Energy conservation motives among office building users without energy conservation behaviour

Figure 5 illustrates ways to conserve energy among respondents. Most respondents conserve energy by switching off lights (79.90%), followed by turning off or hibernating the computer (60.40%), unplugging electrical equipment after use (36.90%) and taking the stairs instead of the lift (35.60%). Switching off lights is the highest as it is convenient, while taking the stairs is not as convenient as taking the lift. Figure 6 shows how respondents obtain information on energy conservation. The majority of them obtain information from television (77.20%), campaigns (67.10%) and posters (53.70%). These three sources are high due to frequent exposition among respondents.

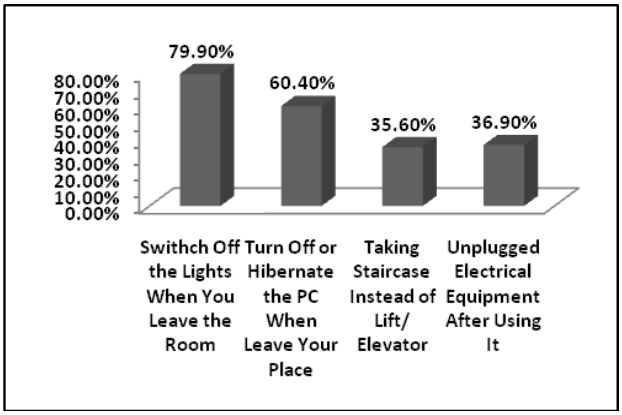

Figure 5 Ways to conserve energy in office buildings

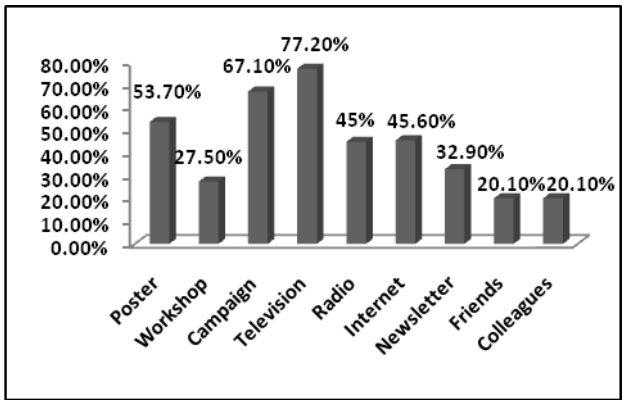

Figure 6: Source of information (channels)

With regard to the preferred communication channel, posters (69.10%) were rated as the highest, while newsletters (18.10%) were the lowest (Figure 7).

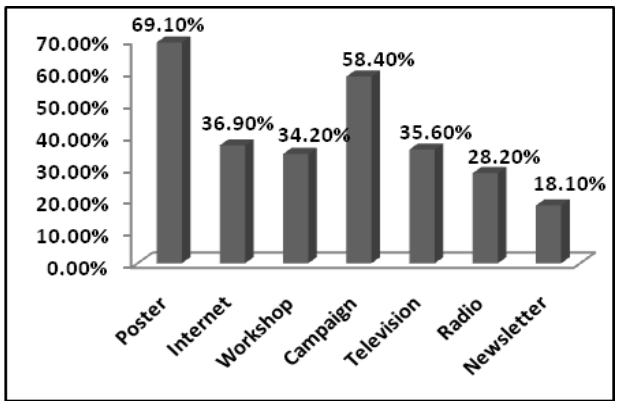

Figure 7 Preferred communication channel

For further information, a cross tabulation has been conducted between the preferred communication channel with gender, age, and education level. Table 2 shows that poster appears to be the most preferred communication channel chosen by male followed by workshop and internet. For female, poster is also their most preferable communication channel but followed by campaign. According to the result, newsletter seems to be less appreciated by both genders.

Table 3 illustrate the results of cross tabulation between age and preferred communication channel. From the table, it is obvious that the respondents from different group of age appreciate poster as their preferred communication channel except for those who aged between 31 years old to 35 years old. This group of respondents is in the opinion that campaign seems to be more favourable as compared to other communication channels. Among the communication channel, newsletter seems to be unfavourable by all age group.

The result for cross tabulation between education level and preferred communication channel is show in Table 4. The respondents who are educated above the level of diploma chose poster as their preferred communication channel. However, those respondents who are in secondary school level are more appreciate on campaign as their preferred communication channel.

From the results of cross tabulation, it can be concluded that poster are the most preferred communication channel regardless of gender, age and education level. Although one of the age group (31-35) and one of the education's level (secondary school) respondents prefer campaign more than poster, poster is still their second choice and it is significant as the preferred communication channel. Since poster is significant in this study, the application of posters in conveying messages is crucial in fostering energy conservation behaviour among government office building users.

In addition, respondents prefer simple and clear statement with images (71.80%) and least favourable on purely image (4.70%) as illustrated in Figure 8. Figure 9 summarises that the preferred ways of delivering energy conservation information are in posters and graphic displays (78.50%).

Table 2 Cross tabulation between gender and preferred communication channel

Gender	Poster	Internet	Workshop	Campaign	Television	Radio	Newsletter
Male	29	17	18	15	16	11	9
Female	74	38	33	72	37	31	18
Total	103	55	51	87	53	42	27

Table 3 Cross tabulation between age and preferred communication channel

Age	Poster	Internet	Workshop	Campaign	Television	Radio	Newsletter
20-25	10	9	8	8	5	5	4
26-30	32	15	15	27	14	8	5
31-35	15	6	7	17	9	8	4
36-40	12	9	8	10	6	6	2
41-45	14	8	4	11	6	6	4
46-50	12	5	5	9	6	5	6
> 51	8	3	4	5	7	4	2
Total	103	55	51	87	53	42	27

Table 4 Cross tabulation between education level and preferred communication channel

Education Level	Poster	Internet	Workshop	Campaign	Television	Radio	Newsletter
Secondary Level	41	31	25	45	34	29	18
Diploma	42	19	18	31	13	11	6
Degree	17	5	7	10	6	2	3
Postgraduate	2	0	1	1	0	0	0
Others	1	0	0	0	0	0	0
Total	103	55	51	87	53	42	27

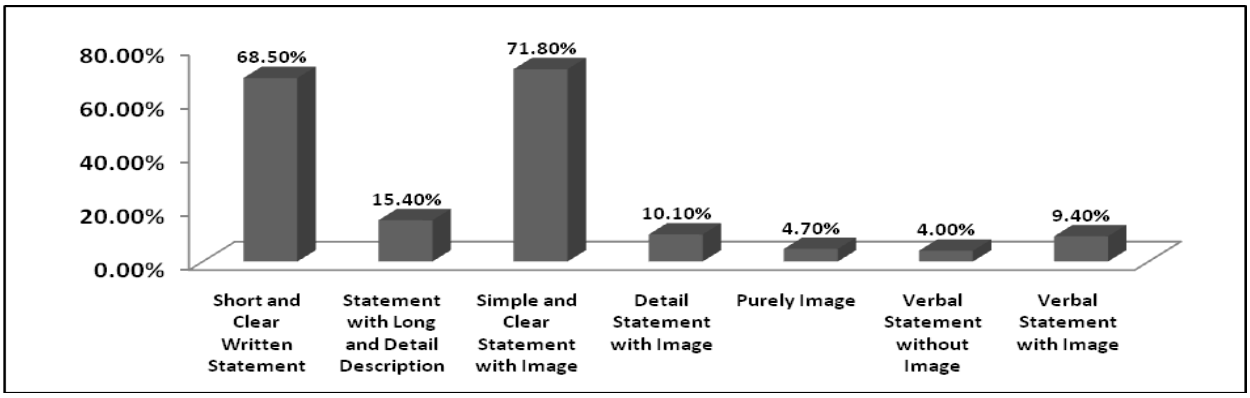

Figure 8 Preferred types of messages

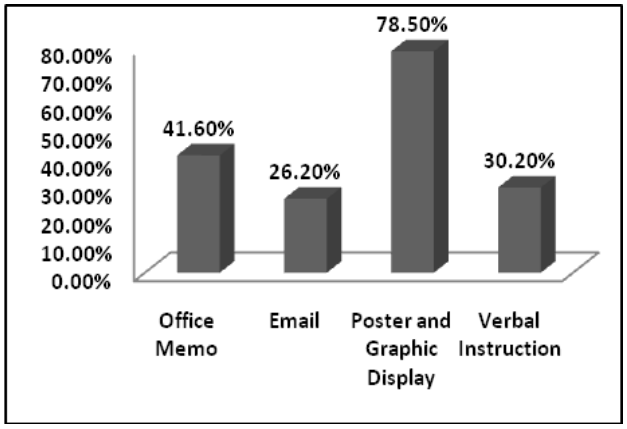

Figure 9 Preferred ways of delivering information

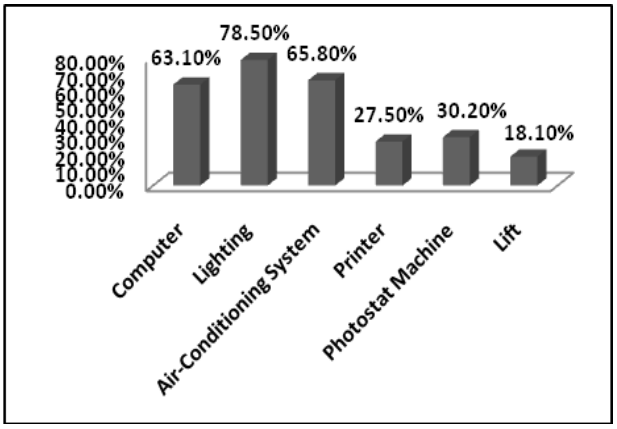

Figure 10 Types of office equipment that possess energy conservation opportunities

Figure 10 illustrates the types of office equipment that possess energy conservation opportunities. Lighting (78.50%) is rated as the highest followed by air-conditioning systems (65.80%) and computers (63.10%). These three provide the most energy conservation opportunities for respondents in their office building, whereas printers (27.50%), photocopy machines (30.20%) and lifts (18.10%) provide fewer energy conservation opportunities.

The open-ended questions surveyed energy conservation activities conducted in the office building. About 48% of office building users said that energy conservation activities took place in their building. Among these activities are (i) switching off electrical components, (ii) running energy conservation campaigns, (iii) using energy-savings tags to prompt energy conservation, (iv) requesting energy conservation via written notices and (v) unplugging electrical equipment after switching off.

6.0 DISCUSSION AND CONCLUSION

In this study, cost savings were found to be the most important reason for public office building users to conserve energy in their workplace. This indicates that although electricity is not paid by office building users, they are concerned about spending on electricity in their workplace, implying that a reduction in the electricity bill is a motivator of energy conservation. For instance, a competition could be held among

departments in the same office building (by using a percentage reduction of electricity) to motivate office building users to conserve energy.

Moreover, concern about environmental issues is another stimulus that will guide office building users towards better energy conservation behaviour. It can be highlighted here that previous studies of awareness and concern towards environmental issues suggest that people who aware of environmental issues through informational strategies are positively correlated with pro-environmental behaviour (Steg & Vlek, 2009). Posters or graphic images were selected by respondents as the preferred channel for delivering information. By using such a preferred channel, office building users would embrace better energy conservation behaviour. However, the actions of public office users to conserve or not to conserve energy remain unknown. Hence, an experimental study could be conducted to justify the usefulness of using image stimuli associated with environmental issues in raising awareness, and thus motivating office building users to conserve energy.

As for the medium of delivering information, television, campaigns and posters are the three preferred information sources. This result shows that respondents highly appreciate visual communication in receiving information. In addition, posters emerged as the most effective and preferable information-delivering channel to motivate respondents to conserve energy. Nonetheless, other aspects also influence the effectiveness of using posters to deliver information. For example, Kerr *et al*. (2001) found that setting, poster size and content influence the conveyance of messages to users, while Thrasher *et al*. (2012) found that the combination of graphics and clear propositional language delivers the message to users effectively. Both these mentioned studies acknowledge that the content of the poster decides on the success of message delivering to respondents. As reported by respondents in the interviews, they prefer posters with simple and clear text.

In conclusion, previous studies indicated that information is imperative for performing pro-environmental behaviour, but found that information campaigns find it difficulty in changing human behaviour (Steg & Vlek, 2009). Therefore, communication and education is becoming a central focus to raise public awareness. While focus has been paid to using communication and education to deliver information to laypersons, an effective channel of delivering energy conservation information has been left undiscovered. In addition, M Gangolells (2012) found out that information strategies seem to be more effective if it is combined with particularized energy consumption feedback in increasing energy saving. However, no specific communication channel is mentioned to deliver this information. In this paper, we are aware of the poster as the most preferred communication channel among government office building users. As revealed from the cross-tabulation result, regardless of age, gender and education level, respondents prefer poster as communication channel to deliver energy conservation message. Future research may focus on how this communication channel can effectively deliver information.

The focal aim of this study is to find out the preferred communication channel to foster energy conservation behaviour among government office building users. The results showed that visual communication via attractive posters was found to be the preferred communication channel in delivering energy conservation-related information because an image stimulus is more attractive compared with written statements. The discovery of a preferred information-delivering channel can contribute to increasing awareness and thus energy conservation behaviour among office building users. Campaigns aimed to reduce energy wastage and increase energy efficiency usage may incorporate visual communication via posters in delivering information to office building users. Although visual communication is the preferred channel as highlighted in this study, the effectiveness of using image stimuli to motivate office building users to conserve energy is yet to be discovered. In addition, the types of images used in posters and the wording chosen for posters in delivering information is another aspect to be investigated in future works.

Acknowledgement

This work is financed by the Fundamental Research Grant Scheme (Vot: 4F064) provided by the Ministry of Higher Education Malaysia.

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