
GAMIFICATION: MOTIVATING USERS' ENERGY CONSERVATION BEHAVIOUR

Wee Siaw Chui¹, Choong Weng Wai²

*Department of Real Estate, Faculty of Geoinformation and Real Estate,
Universiti Teknologi Malaysia, Malaysia.
Email: ¹scwee89@hotmail.com, ²cwengwai@utm.my*

Abstract

The energy issues such as energy shortage, high energy price, environmental problems and so forth have long become the world concern. Previous research pointed that, energy issues are much related to human behaviour and subsequently can be improved through promotion of better energy use behaviour. Therefore, this paper intends to introduce a concept known as gamification, to motivate the engagement of the users in conserving energy through a fun and enjoyable environment. Gamification is defined as the use of game design elements in a non-game context to create a fun environment to promote particular behaviour. In game play environment, we can always see a common scenario of players tend to have high engagement and attachment to game playing. This is due to some elements in game context created the fun playing environment to the game players. So, gamification is a concept that intends to apply those elements that normally exist in game (which called game design elements) in the non-game context to create fun environment for promoting particular behaviour. Previously this concept has been proven effective in motivating the engagement of the users' on particular behaviour. Thus researcher has carried out a preliminary review on previous relevant studies to identify the relevant game design element for application of gamification in energy saving context. This paper will present the most common game design elements extracted from previous relevant studies and few examples will be provided as a reference for application of gamification in promoting and motivating energy saving behaviour.

Keywords: *Gamification; Energy Conservation Behaviour; Energy Saving Campaign; Game Design Elements*

1.0 INTRODUCTION

As the rising world energy consumption has brought many issues such as energy shortage, sky high energy price, unsecure of energy supply, un-eco-friendly use of energy, the issue of enormous wastage, environmental problems and so forth (Singh and Bajpai, 2010; Kofi *et al.*, 2012; Low *et al.*, 2010; San *et al.*, 2012; Chen *et al.*, 2006), there is urgent need for energy conservation. Generally, there are two approaches for energy conservation, namely structural approach and non-structural approach. Structural approach emphasizes on installation of technological tools, whereas non-structural

approach emphasizes on behavioural changes among the users. Many researchers (Choong, 2009; Abrahamse *et al.*, 2005; Low *et al.*, 2011; Kok *et al.*, 2011; Ouyang *et al.*, 2009; Herring, 2006) support the ideas of energy related issues are related to human behaviour and subsequently can be reduced through behavioural changes.

To change the users' behaviour to conserve energy and promote energy conservation behaviour, energy saving campaign is the common effort made by most of organizations. However, most of the existing campaigns to foster sustainable behaviour have been designed as information intensive are unsuccessful; where in these campaigns, media advertising and the

distribution of printed materials are used to foster behaviour change (MzKenzie-Mohr, 2000). Information intensive campaign refers to the campaigns that merely provide information regarding certain issues and knowledge, which less motivates users to engage on it. This typical type of energy saving campaign which is information intensive would rarely motivate the much interest of the users to engage on it even the users are aware such campaign.

2.0 GAMIFICATION: A NOVEL APPROACH FOR FOSTERING ENERGY CONSERVATION BEHAVIOUR

Lately, there is an emerged concept closely related to the aim of motivating and increasing people engagement on particular behaviour through fun environment, which known as gamification. Gamification is a new concept defined as the use of game design elements, characteristic for games, in non-game contexts (Deterding *et al.*, 2011a). This concept intends to use elements from video games in non-game applications to motivate and increase people's engagement and to promote certain behaviours (Simoes *et al.*, 2013). According to Hamari (2013), there is strong belief in the effectiveness of gamification based on the conception that because games are fun, any service that uses the same mechanism should also prove to be more valuable and engaging.

Gamification concept has been defined as "the use of game design elements in non-game contexts" by Deterding *et al.* (2011a). Further, Deterding *et al.* (2011b) mentioned that gamification is the use of video game elements rather than full-fledged games to improve user experience and user engagement in non-game context; meaning that, gamification is not about creating a real game, but is about using the game design elements which exist in game context to a non-game context for the purpose of enhancing user experience and engagement.

According to Deterding *et al.* (2011a), the game design elements in gamification refer to all the elements characteristics to games. Meanwhile, Erenli (2012) stated that, all the elements that correlate with the term "game" can

be considered as "game design elements". It is a more general concept that applies to everything that has the qualities of a game without specifying the medium used. Therefore, it could be concluded that all the game related elements such as game-thinking, game mechanics, game dynamics, game-like principles and so forth can be considered as game design elements during the application of gamification concept.

Non-game context in gamification is defined as "gamification uses games for other purposes than their normal expected use for entertainment (asserting that entertainment constitutes the prevalent expected use of games)" by Deterding *et al.* (2011a), which means that gamification is the use of game design elements for the purposes other than games. Further, Erenli (2012) pointed that gamification is the use of game elements in contexts that had originally no link to game related elements. So, the term of non-game context in gamification can be concluded as the context that is not related to the game.

In game environment, the game players tend to have high motivation and engagement on game playing. There are some attractive game design elements motivate them to do so, such as different levels to be achieved in a game give them a sense of challenging; multiplayer feature which can enable them to connect and compete with their friends; and so forth. Underlying the concept of attractive game design elements will motivate players' high engagement towards game environment; gamification is a concept that intends to use the game design elements to motivate people particular behaviour and engagement in a non-game environment. A fun environment will be created through the application of gamification, as if the users were playing the game. However, this does not mean and should not be confused that, gamification is about playing game. Gamification is not about creating a real game; it is just a concept of applying the game design elements in non-game context, aims to create a fun and engaging environment to enhance user engagement.

Previously, this concept has been proven effective in motivating the engagement of individuals on particular behaviour. However, to date, there is lacking relevant research done on the application of gamification in motivating the

energy conservation behaviour among the users. As mentioned earlier, the engagement of the users in efficiency use of energy is very important to conserve energy effectively and reduce the energy wastage. Gamification which is used to motivate and increase the engagement of the users, has the potential to apply in the context of motivating the energy conservation behaviour among the users in this research. This is further supported by Simoes *et al.* (2013), where they stated that, "Although the concept has been explored primarily in the marketing area, the potential of its application has been extended to other areas such as Health, Environment, Government or Education." Thus, the potentiality of applying the gamification concept in the environment context of motivating energy conservation behaviour among the users could be foreseen.

To apply gamification concept for the purpose of motivating the engagement of users to conserve energy, first of all, the possible and suitable game design elements for application of gamification in energy saving context should be identified. A literature search and review on previous studies should be carried out to identify the existing game design elements for application of gamification concept. The following section will present few most common game design elements reviewed from previous relevant studies in gamification and few examples on using game design elements to promote users' energy conservation behaviour.

3.0 PRELIMINARY REVIEW AND DISCUSSIONS ON APPLICATION OF GAMIFICATION

There are many available game design elements can be employed during application of gamification concept, however, through the preliminary review of relevant studies by researcher, the most common game design elements in gamification application are points (Betts *et al.*, 2013; Nah *et al.*, 2014; Ionica and Leba, 2015), badges (Thom *et al.*, 2013; De-Marcos *et al.*, 2014; Hanus and Fox, 2015), levels (Herzig *et al.*, 2013; Hamari *et al.*, 2014; Müller *et al.*, 2015) and leaderboard

(Cornelissen *et al.*, 2012; Raftopoulos and Walz, 2013; Seaborn and Fels, 2015). Meanwhile, the other examples of game design elements which were in used by previous studies but not popularized are such as prizes, trophies, avatar, virtual money, virtual goods, etc. Some of the game design elements are resemble with each other; whereas some of the game design elements are interrelated to each other. For instance, prizes and trophies are resemble with each other as they are sharing the same nature of rewarding and encouraging the users for completing the particular task. Points, badges, and levels are interrelated to each other as when the users' points increase, users' badges and levels will be awarded and increased accordingly. Therefore, to apply gamification concept into energy saving campaign, aims on creating a fun environment to motivate the engagement of the users, the suitable game design elements are necessary to be identified and put into the designation of energy saving campaign. Followings are some ideas on using four most common game design elements to promote users' energy conservation behaviour; points, badges, levels and leaderboard.

3.1 Points

Normally, during application of gamification, points will be handed out when users perform actions. These actions can be weighed, so different actions give different points. Points provide instant feedback to the users, and thus address the feedback motivational driver. Players may also motivated by collection, to see their points count go up as points encourage engagement.

For example, in energy saving campaign, the participants would be given points automatically once participating in the campaign and the points could be further increased based on the later performance during the campaign. The specified amount of collected points could later be exchanged with gifts.

3.2 Badges

Once the player has accumulated a certain number of points, they may be awarded badges. Badges are a form of virtual achievement by the

player. They provide positive reinforcement for the targeted behaviour.

In an energy saving campaign, the campaign planner could provide badges to be achieved by the participants. Those badges represent the achievement of the winners and there are forms of affirmations on the participants' abilities in saving energy. The participants who tend to prove themselves to be capable in energy-saving and contributing on reduction of energy related issue would try to perform well and get the badges as recognition on their abilities. These badges could motivate the interests and participations of users on such energy saving campaign.

3.3 Levels

Levels are often point thresholds, meaning that when reaching certain amounts of points the user's level is incremented. Levels are the perfect solution for creating a constant sense of forward motion. Users are encouraged to return to complete tasks, achieve goals and much more whilst in the pursuit of achieving the next 'level'. Levels represent the performance of users. The level of the users increase as the users becomes better in the performance.

In an energy-saving campaign, the campaign planner could set different energy-saving goals to be achieved for different levels. For example, participants who could achieve reduction of 5%, 10% and 15% monthly energy use would be labelled with level of silver, gold and platinum respectively.

3.4 Leaderboards

Leaderboards provide users with an easy way to show their points and levels, and how they perform compare against others in a gamified program. Leaderboards bring aspiration of fame, of having one's name noticed and remembered by other users and also drive desired behaviour through competition and collecting. Leaderboards can take many different forms during application of gamification.

In energy saving, leaderboard could be used to show to all the campaign's participants on who are participating and how are their performances. This could later motivate them to

compete among each other to engage more on such campaign in practicing energy saving behaviour. The leaderboard could be presented in many ways, such as in a publically accessible forum, official website, notice board and so forth, where the participants could always easily view their own and others performances.

4.0 CONCLUSIONS AND RECOMMENDATIONS

As mentioned earlier, the existing energy saving campaigns have been designed as information intensive where the campaign provide the information on how to conserve energy to increase their ability of energy saving and provide reminder to users on when to perform it in order to trigger their action on performing energy conservation, yet neglecting the need of motivation for the users to participate on such campaign. For example, the campaign provides few ways of energy saving tips to the participants to increase their ability in saving energy and put up prompt messages and posters at the surrounding to trigger the action of participant, however, do not provide any motivation for participants to take actions on energy saving. So a gamified energy saving campaign (add gamification concept into energy saving campaign) can help in motivating the actions of participants yet increase their ability and trigger their actions in energy conservation.

Gamification is just a concept that applies the game design elements into energy saving campaign to attract the attention and motivation of the participants towards the campaign. A fun environment is believed to be able to motivate the interest of participants to participate in such energy saving campaign. According to Carroll and Thomas (1988), fun has a more powerful influence on individuals with regard to their motivation to try to do something or their perseverance when doing it. So a gamified energy saving campaign can overcome the existing campaign issue where it can create a fun and enjoyable environment just like the gaming environment to motivate the interest and participation of the users towards energy saving campaign.

The application of gamification is believed to be able to make the process of promoting and motivating energy conservation behaviour more fun and engaging as it applies the game design elements into the process. The practice of energy conservation behaviour will become engaging and attractive to individuals as they could have fun while doing energy saving. Through the rising engagement of the users to the energy conservation behaviour, the awareness of the users toward energy issues and the importance of energy conservation might be increased as well.

Researchers recommend future research to carry out a further expert review to truly identify the suitable game design elements for application of gamification in energy saving context. Afterward, carry out the experimental study as a means to examine the effectiveness of applying gamification to promote and enhance users' engagement in conserving energy.

REFERENCES

- Abrahamse, W., Steg, L., Vlek, C., and Rothengatter, T. (2005). A Review of Intervention Studies Aimed at Household Energy Conservation. *Journal of Environmental Psychology*, 25(3), 273 – 291.
- Betts, B. W., Bal, J., and Betts, A. W. (2013). Gamification as a Tool for Increasing the Depth of Student Understanding Using a Collaborative E-learning Environment. *International Journal of Continuing Engineering Education and Life Long Learning*, 23(3), 213 – 228.
- Carroll, J. M., and Thomas, J. C. (1988). Fun. *ACM SIGCHI Bulletin*, 19(3), 21-24.
- Chen, L., Heerink, N., and van den Berg, M. (2006). Energy Consumption in Rural China: A Household Model for Three Villages in Jiangxi Province. *Ecological Economics*, 58(2), 407 – 420.
- Choong W. W. (2009). The Conceptual Model of Energy Awareness Development Process. *3rd International Conference on Energy and Environment*. 7th-8th December. Malacca, Malaysia.
- Cornelissen, F., Neerinx, M. A., Smets, N., Breebaart, L., Dujardin, P., & Wolff, M. (2012). Gamification for Astronaut Training. *The 12th international conference on space operations, Stockholm, Sweden*.
- De-Marcos, L., Domínguez, A., Saenz-de-Navarrete, J., and Pagés, C. (2014). An Empirical Study Comparing Gamification and Social Networking on E-learning. *Computers & Education*, 75, 82 – 91.
- Deterding, S., Khaled, R., Nacke, L. E., and Dixon, D. (2011a). Gamification: Toward a definition. In *CHI 2011 Gamification Workshop Proceedings*. Canada.
- Deterding, S., Dixon, D., Khaled, R., and Nacke, L. (2011b). From Game Design Elements to Gamefulness: Defining “Gamification”. *Proceedings of MindTrek*.
- Erenli, K. (2012). The impact of gamification: A recommendation of scenarios for education. In *Interactive Collaborative Learning (ICL), 2012 15th International Conference*. 26 – 28 September, Villach, Austria: IEEE, 1-8.
- Hamari, J. (2013). Transforming Homo Economicus into Homo Ludens: A Field Experiment on Gamification in a Utilitarian Peer-to-Peer Trading Service. *Electronic Commerce Research and Applications*, 12, 236 – 245.
- Hamari, J., Koivisto, J., and Sarsa, H. (2014). Does Gamification Work? – A Literature Review of Empirical Studies on Gamification. In *System Sciences (HICSS), 2014 47th Hawaii International Conference on System Science*. January, IEEE. 3025 – 3034.
- Hanus, M. D., and Fox, J. (2015). Assessing the Effects of Gamification in the Classroom: A Longitudinal Study on Intrinsic Motivation, Social Comparison, Satisfaction, Effort, and Academic Performance. *Computers & Education*, 80, 152 – 161.
- Herring, H. (2006). Energy Efficiency—A Critical View. *Energy*, 31(1), 10 – 20.
- Herzig, P., Strahringer, S., and Ameling, M. (2012). Gamification of ERP Systems—Exploring Gamification Effects on User Acceptance Constructs. *Multikonferenz Wirtschaftsinformatik, GITO*, 793 – 804.

- Ionica, A. C., and Leba, M. (2015). Gamification & Research – Partnership for Innovation. In *Procedia Economics and Finance, 2nd Global Conference on Business, Economics, Management and Tourism, 30 – 31 October 2014, Prague, Czech Republic: Elsevier B.V.* 23, 671 – 676.
- Kofi Adom, P., Bekoe, W., Amuakwa-Mensah, F., Mensah, J. T., and Botchway, E. (2012). Carbon Dioxide Emissions, Economic Growth, Industrial Structure, and Technical Efficiency: Empirical Evidence from Ghana, Senegal, and Morocco on the Causal Dynamics. *Energy*, 47(1), 314 – 325.
- Kok, G., Lo, S. H., Peters, G.-J. Y., and Ruiters, R. a. C. (2011). Changing Energy-related Behavior: An Intervention Mapping Approach. *Energy Policy*, 39(9), 5280 – 5286.
- Low, S. T., Hakim. A., Choong, W. W., and Alias, B. (2010). Facilities Management: Paths of Malaysia to Achieve Energy Sustainability. *International Journal of Facility Management*, 1(2).
- Low, S.T., Hakim, A., and Choong, W. W. (2011). Promoting Energy Conservation Behaviour: A Plausible Solution to Energy Sustainability Threats. *2011 International Conference on Social Science and Humanity*, 5, 372 – 376. Singapore.
- McKenzie-Mohr, D. (2000). New Ways to Promote Proenvironmental Behavior: Promoting Sustainable Behavior: An Introduction to Community-based Social Marketing. *Journal of Social Issues*, 56(3), 543 – 554.
- Müller, B. C., Reise, C., and Seliger, G. (2015). Gamification in Factory Management Education – A Case Study with Lego Mindstorms. In *Procedia CIRP, 12th Global Conference on Sustainable Manufacturing*, 26, 121 – 126.
- Nah, F. F. H., Zeng, Q., Telaprolu, V. R., Ayyappa, A. P., and Eschenbrenner, B. (2014). Gamification of Education: A Review of Literature. In *HCI in Business Springer. International Publishing*. 401 – 409.
- Ouyang, J., Gao, L. L., Yan, Y., Hokao, K., and Ge, J. (2009). Effects of Improved Consumer Behavior on Energy Conservation in the Urban Residential Sector of Hangzhou, China. *Journal of Asian Architecture and Building Engineering*, 8(1), 243 – 249.
- Raftopoulos, M., and Walz, S. P. (2013). Designing Events as Gameful and Playful Experiences. In *CHI 2013 Changing Perspective*. Paris, France
- San, V., Sriv, T., Spoann, V., Var, S., and Seak, S. (2012). Economic and Environmental Costs of Rural Household Energy Consumption Structures in Sameakki Meanchey district, Kampong Chhnang Province, Cambodia. *Energy*, 48(1), 484 – 491.
- Seaborn, K., and Fels, D. I. (2015). Gamification in Theory and Action: A survey. *International Journal of Human-Computer Studies*, 74, 14 – 31.
- Simoes, J., Redondo, R. D., and Vilas, A. F. (2013). A Social Gamification Framework for a K-6 Learning Platform. *Computers in Human Behavior*, 29, 345 – 353.
- Singh, S., and Bajpai, U. (2010). Integrated Energy Planning for Sustainable Development in Rural Areas: A Case Study from Eastern Uttar Pradesh. *International Journal of Energy and Environment*, 1(6), 1083 – 1096.
- Thom, J., Millen, D., and DiMicco, J. (2012). Removing Gamification from an Enterprise SNS. In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work*, 1067 – 1070.