

## CHAPTER 6

# **Energy Conservation Behaviour Through Gamification Elements in Sustainable Building**

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### **6.1 INTRODUCTION**

In most countries, at least 40 percent of energy consumption comes from buildings; and energy efficiency in the building sector has been incorporated into building rules as a vital component of energy conservation and contributes to reducing global carbon emissions (Hartungi & Jiang, 2012). Building operations always consume a significant amount of energy to run activities like lighting, heating, cooling and ventilation. The greenhouse effect, is also known as global warming, is one of the key environmental challenges caused by increased energy usage. In United States (U.S.), the construction industry accounts for more than one-third of all GHG (Greenhouse Gas) emissions (Felius et al., 2020). Moreover, the combustion of fossil fuels accounts for around 92% of total U.S. anthropogenic CO<sub>2</sub> emissions (U.S. Energy Information Administration, 2022). The improper and unfriendly use of energy resources causes environmental disruption, as the burning of fossil fuels for energy supply has resulted in an increasing amount of carbon dioxide emissions to the atmosphere and, as a

result, global warming, which destroys the ecosystem and causes many public health issues.

To reduce the negative consequences, the construction industry has placed a greater emphasis on the factor of sustainability (Ayarkwa et al., 2022). Sustainable building has gained the interest of stakeholders as a means of improving environmental quality and preventing the worsening of global climate change. Undoubtedly, the designation of sustainable building has factored in the green features or technologies to ensure an environmentally friendly operation of the building. However, it should be noted that global climate change is mostly caused by human energy consumption behaviour, which can be improved by engaging in energy conservation behaviour. According to Abrahamse et al. (2005), the issue of energy use is closely tied to human behaviour; thus, the issues can be improved through behavioural change. According to Low et al. (2011), the best strategy to preserve energy is to focus on behavioural issues through improving or modifying users' energy consumption behaviour. Despite the focus on energy-efficient technologies and renewable sources, improving the behaviour of energy consumers may also help reduce energy usage (Kok et al., 2011). According to Ouyang et al. (2009), optimising energy consumption behaviour can reduce 10% of electricity use. Furthermore, Herring (2006) also argued that changing user behaviour can contribute significantly to the energy-saving capabilities of current technologies. Studies have also shown that the building industry may potentially save 20% to 40% of its energy by increasing the energy efficiency of buildings (Hong et al., 2015; Chirarattananon & Taveekun, 2004).

Therefore, fostering energy conservation behaviour among occupants is not only important to develop a sustainable community within sustainable building, but also optimise the energy efficiency of the technologies installed. However,

sustainable building operator should consider on occupant well-being during the behaviour fostering process. The development of sustainable building is rooted on the sustainability concept that covers three main pillars: economic, environmental and social; where social welfare of the occupants should not be neglected while striving for economic and environmental sustainability during the building operation. Therefore, this chapter will present the concept of fostering energy conservation behaviour among the occupants in sustainable building using gamification elements that taking care occupant well-being.

This chapter is organized by firstly presenting gamification concept in Section 6.2. Section 6.3 presents the data and analysis result while Section 6.4 discusses the findings of this chapter. Finally, Section 6.5 of this chapter provides the conclusion drawn on the study.

## **6.2 GAMIFICATION**

There are several definitions proposed by researchers in defining the term of Gamification. However, the most common and useful definition adopted by most of the gamification practitioners is “the use of game design elements in non-game contexts” by Deterding et al. (2011). Gamification involves applying game design principles to non-game contexts in order to enhance user engagement and user experience.

By incorporating game elements into a product, gamification aims to increase user engagement and encourage certain behaviour (Fitz-Walter et al., 2011). In the gaming environment, the players are commonly seen to be highly engaged and motivated in their games due to the elements such as different rewards to be achieved, different levels to be challenged and leaderboard which makes them compete with their friends. Hence, in gamification, those