Monitoring Human Dynamics in Medway NHS Foundation Trust as Part of a Persuasive System to Induce Pro-Environmental Behaviour

Topic Category: Sensors and circuit's applications.

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The large demand of energy in the building sector is strongly related to how they are used, aside from their physical exterior/interior design [1]. Along these lines, it is valid to assume that the occupant behaviour contributes and is related to the energy consumption of a building. Electricity consumption is directly related to the actions taken by human beings [1]. In a hospital, this could mean usage of equipment, heating, water and so on. This implies that energy consumption in a specific area could be a function of the physical presence of human beings, referred to as occupancy, in this same area. However, not through a linear relationship as a study carried out by [2] has shown that the electricity consumption per person decreases as the occupants in an area increase. Thereby, it is important to consider dragging occupancy as part of an energy management plan carried out in an organisation. The effect of occupancy could be due to, but is not limited to, increased temperature resulting from the number of humans in an area or could mean an increased possibility of equipment usage, whether medical in case of hospitals or general equipment.

The National Health Service (NHS) is considered an intense consumer of energy in the UK, if compared to other UK organisations. The NHS spendings on energy, across the UK, exceeds £750 million each year with a significant proportion being wasted, approximately 20% [3]. With hospitals being a busy environment that operate 24 hours on daily basis. It is important to consider efficient and sustainable energy measures to conserve energy and improve the carbon footprint.

This paper presents an occupancy monitoring system based on sensor and networking technologies to provide occupancy data on individual selected wards/areas of Medway NHS Foundation Trust. The paper contributes to a research carried out in MNFT of the UK that aims at achieving behavioural change to cut Medway hospital's electricity costs [4]. This is done through provision of feedback on electricity data through a smart metering system and motivation of staff members through goal-setting and other psychological aspects. Occupancy monitoring plays a crucial role in designing a robust system to induce pro-environmental behaviour among MNFT staff. Occupancy data would be analysed against energy consumption data to draw an understanding of the relation between them. The proposed method to achieve this, as seen in Figure 1, was to use the occupancy monitoring unit to provide occupancy information about different wards/areas of the hospital. This would then be analysed against the energy data provided by the electricity feedback system. The responsibility of the occupancy monitoring unit lies in counting the number of people in a ward/area of the hospital using sensor technology. Moreover, logging the data onto a centralised webserver for analysis against the electricity data. Prior research work introduced various techniques such as Radio Frequency Identification (RFID) [5, 6], Wi-Fi [7] and sensor networks [1, 8] to monitor occupancy for different applications rather than energy. Figure 1 shows the whole system and how the occupancy monitoring is situated among it. Apart from contributing to the hospital's carbon footprint, the data collected could be used to support the fire officers during evacuation or for space utilisation and relocation of wards/departments in the hospital.
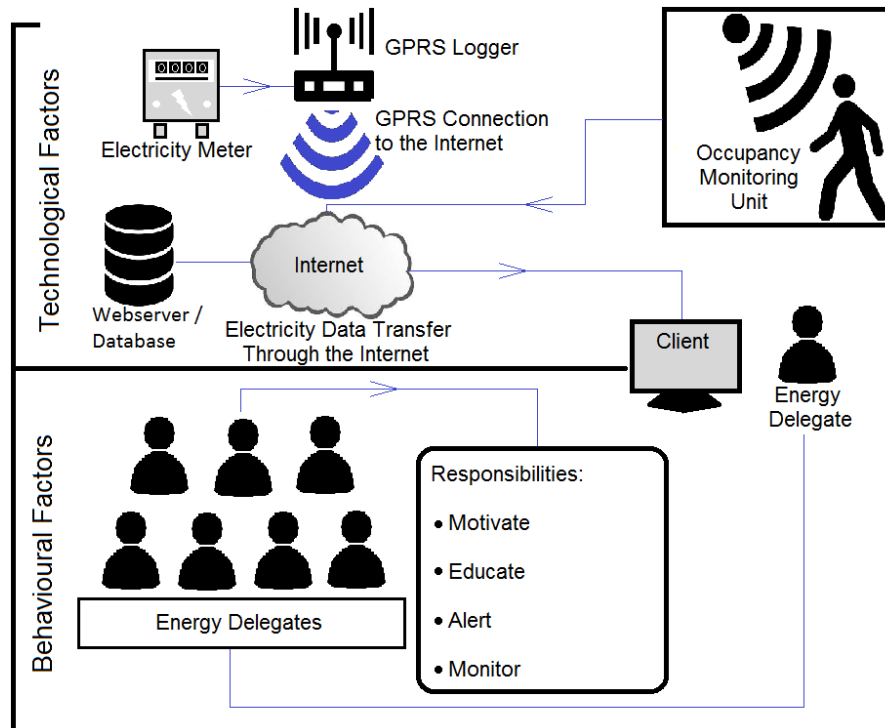
Figure 0.1Proposed System that Uses Persuasive Technology to Induce Pro-Environmental Behaviour

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