

# Gamification and Lifestyle Technologies for Personal Health Management

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## Abstract:

This paper presents a practical case study on the use of Gamification strategies and wearable lifestyle technologies for personal health management. It describes the results of a two year project in which the author explores the potential of various lifestyle tracking and health monitoring equipment and the impact that had on his health parameters and well-being. The paper will describe the lessons learned from project and the techniques used to effect simple but long-lasting changes in exercise and eating patterns that significantly improve personal health management. The data captured and visualized by the mobile applications linked to these lifestyle technologies illustrates how gamification and enabling technologies have evolved in support of pervasive personal health management. The paper will also suggest how these technologies and practices are likely to evolve over the next few years and the potential benefits for society in tackling global lifestyle related conditions such as obesity and diabetes.

**Keywords :** Gamification, Health, Lifestyle Technologies

## 1 Introduction and Background

Lifestyle related conditions such as obesity and diabetes represent one of the most serious challenges to global health which threatens the sustainability of health services. In countries like the UK, there are regular headlines about the likely consequences of growing levels of obesity, especially in children, for future generations. The challenge therefore is to find sustainable practices which tackle this issue successfully and avoid the serious consequences of a breakdown in health services and consequent incidence of avoidable mortality.

There is a general acceptance of the need to change lifestyle behaviours of all ages of citizens but there are a number of important barriers to affecting these changes which include :-

- Lack of motivation and practical inability to change lifestyle
- Lack of awareness and understanding of the consequences of obesity on future health
- Ready availability and attractiveness of fast food with poor nutritional content
- The belief that free health services on demand will be available when needed
- A model for health insurance which does not link premiums to lifestyle behaviours

These factors, coupled with a perception that the Government should take responsibility for ensuring the health of its people, leads to demands for Government intervention on issues such as sugar content in food, penalties for poor fast food provisions and the display of nutritional content on food packaging.

All of these suggested interventions are designed to allow citizens to continue their chosen lifestyle practices without any responsibility for managing their own health.

This situation is increasingly unsustainable and requires interventions which facilitate a shift change in the citizen's acceptance of more responsibility for personal health and the necessary tools, motivation and incentives to change lifestyle practices in a positive way.

## 2. Case Study on Gamification and Wearable Technologies for Personal Health Education

This paper explores the impact of disruptive technologies such as the internet of things, big data and wearable technologies on personal health management and is based on a case study carried out over the last 2 years by the author who has explored the potential of these technologies to improve his own personal health management.



**Figure 1.** Impact of Case Study on the Author's Appearance

Figure 1. illustrates the impact of the project on the author's change in appearance over the two years of the project. The majority of the weight loss (21Kg) was achieved within 3 months of starting the project in June 2013. Health Education is a very good example of the difference between Education for the acquisition of Knowledge and Education to influence behaviours, understanding and actions.

At the start of this project, the author was obese and in a pre-diabetic condition but these circumstances, although lifestyle related, did not present any serious medical problems or impact on the author's daily life. As a consequence, although aware of his obesity, the author was not motivated to make any changes to his lifestyle or undertake education activities to improve his knowledge or understanding of the potential long term consequences of his condition.

Without motivation for change or incentives to better understand and adopt best lifestyle practices, the author was not engaged in developing personal healthcare management skills or practices and would have been reliant on corrective medical interventions instead of preventative interventions. The author would not have been truly engaged in the personal health education initiatives available and increasingly promoted today because, although health knowledge was of interest, it made no impact on the author's daily life. The author was effectively a "spectator" of his own health rather than an engaged practitioner.

It was combination of circumstances in June 2013 which led the author to explore the potential of gamification and wearable technologies for personal health management. The primary factors for triggering this activity were the discovery from a DNA analysis that the author has a 32% probability of contracting Diabetes 2 and reading an article on the BBC website about wearable technologies.

### **Gamification, Measurement and Feedback**

The case study involved wearing fitness tracking bracelets which measure physical activity and sleep, collect the data and display the results within free mobile applications. These devices and applications combine gamification strategies, sensor technologies, cloud computing, big data analytics, data visualization technologies, wireless broadband, artificial intelligence, mobile devices and social media.



**Figure 2.** Example Wearable Fitness devices used by the Author

Figure 2 shows two of the devices used by the author during the case study. One of the devices, the Jawbone UP device provided a smartphone application which not only shows trends in physical activity and sleep patterns but also provides tools to calculate calorie consumption and nutrition based on food and drink consumed. This requires the user to enter the food and drink manually and, in some cases, to enter the nutrition data found on the food packaging.

The key factors for influencing behaviour in this project are automatic measurement and feedback, coupled with good data visualization that assists understanding. The fact that the data is personal and is displayed on demand in a format which helps the user to understand the impact of their actions leads to immersive learning linked to behavioural change and putting into practice the lesson learnt.

Immersion in the process of self-directed learning informed by automatic data collection and analysis provided for better understanding of health management and, more importantly, practical implementation of changes in lifestyle.

### **3. Conclusions - Pervasive Gamification and Self-Directed Personal Healthcare**

Immersion in any activity by focusing attention and limiting distractions helps to facilitate absorption of knowledge but does not necessarily affect behaviours or develop understanding and skills. Behavioural change can be influenced by motivating factors which can either be extrinsic or intrinsic or a combination of both.

Extrinsic motivation can be provided by potential rewards e.g. money, qualifications, penalties for failure whereas intrinsic motivation comes from the pleasure and satisfaction of the activity. Games generally provide intrinsic motivation and more sustainable outcomes whereas extrinsic motivation in behavioural change whilst it can support the acquisition of knowledge, is less likely to be sustainable and have a long term impact on behaviours and true understanding.

The main conclusion drawn from this case study exercise is that disruptive technologies which provide ambient and automatic personalized performance measurement and feedback coupled with good data visualization and “Smart” coaching not only creates a far more engaging experience but also goes beyond the acquisition of knowledge into greater levels of understanding and behavioural change.

Since the original drafting of the paper, the author has been involved in 3 European projects which apply the same principles to target both physical and cognitive wellbeing improvements through the use of gamification strategies and games-based technologies. The PEGASO project (<http://www.pegaso4f4.eu/>) uses wearable technologies and games to encourage healthy lifestyles amongst teenagers whilst the DOREMI project (<http://www.doremi-fp7.eu/>) uses games technologies to promote healthy ageing. The Rehab@home project uses the Microsoft Kinect to support physical rehabilitation in the home environment whilst the data analytics from the games support medical professionals to assist with customised rehabilitation programs. All these project applications involve development by Italian Serious Games specialists, Imaginary.

