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Essay: How gamification can be incorporated into a mobile app

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1.1 Aims and Objectives

The projects aim is to explore how gamification can be incorporated into a mobile app which motivates pro-environmental behavior. Through examining existing ideas using gamification as a tool to motivate, the project aims to identify what contributes to the success and pitfalls and techniques to be applied when motivating environmental behavior.

Objectives

1. Identifying what gamification is and its uses.

2. Analysis of successful instances of gamification as well as its pitfalls

3. Research existing solutions for motivating pro-environmental behaviour

4. Design an app incorporating gamification techniques to promote pro-environmental behaviour

5. Evaluate the mock-up app through use of a focus group

1.1 Project Approach

The approach of the project will involve creating a mock-up of an app which uses gamification to motivate pro-environmental behaviour and using a focus group to evaluate the effectiveness. To do this I will first need to gain an understanding of; what exactly constitutes gamification, analysing successful and unsuccessful practices and then applying the ideas to motivating environmental behaviour. Once an understanding of what it takes to successfully incorporate gamification into motivating certain behaviours the next step is designing a mock-up of an app applying these techniques. Following the creation of the mock-up a focus group will be presented

1.2 Dissertation Outline

Traditionally, dissertations tend to contain a description of each chapter:

Chapter 2, discusses the background for my project, and identifies some key techniques that can be adopted during the development of the proposed solution. Chapter 3 explains how the project will be undertaken . . . etc, etc.

This approach is acceptable, however it can make quite bland reading. You might like to consider drawing a flow-chart of your project, showing how information such as background data, questionnaire data, results of studies, running computer programs, or undertaking user studies act as input to, or output from your chapters. You can also indicate how each chapter relates to your objectives. This kind of diagram can help to add clarity for your reader, and can help you to get your head round the structure of your project.

2 Background (Gamification)

2.1 The future of Earth

Whilst the future of Earth is uncertain there is strong evidence showing that the climate is changing and not for the better. The topic of climate change is not new, in fact since 1938 'using records from 147 weather stations around the world, British engineer Guy Callendar shows that temperatures had risen over the previous century' he further showed that Carbon dioxide concentrations had also increased during the same period. Just over 60 years later in 1989 UK Prime Minister Margaret Thatcher in a speech to the UN also claimed a 'vast increase in Carbon dioxide levels reaching the atmosphere' and the same year carbon emissions reached 6 billion tonnes per year.

There are many contributing factors influencing the change in climate however many climate change scientists agree that human activity is the main cause.

Figure 1 – A Public poll on beliefs of global warming https://www.ucsusa.org/global-warming/science-and-impacts/science/scientists-agree-global-warming-happening-humans-primary-cause#.WpsxpLacZQI

A poll conducted by Yale in 2016 shows 70% of participants believe global warming is happening with just over half believing that humans are the main cause.

2.2 Solutions

There are many ways to reduce the effects of human activity on global warming. The underlying issue is that the mass production of goods requires a tremendous amount of energy which is generally produced through the burning of fossil fuels further releasing greenhouse gases in to the atmosphere. The population of Earth is also rapidly increasing with the current population at over 7 billion there are many more factors contributing to climate change than there are ways of limiting it.

For the average person aiming to limit waste is perhaps one of the most effective ways of limiting their input to global warming. The three 'R's' being; Reduce, Re-use and Recycle are part of a 'Waste hierarchy' showing the order of priority when it comes to waste management. The idea is instead of simply throwing waste in the bin to be sent to a landfill after it's lost value individuals are encouraged to manage their waste produced by for instance re-using an empty bottle or recycling an empty can, so the materials can be used again. https://www.conserve-energy-future.com/reduce-reuse-recycle.php Waste products that are not recyclables or not suitable for reuse such as food waste are generally sent to a landfill where they decompose and release methane along with other greenhouse gases.

Figure 2- World leaders of recycling http://www.eunomia.co.uk/eunomia-creates-world-recycling-league-table/

The graph above shows the world leaders of recycling and their recycling rates, Germany in the lead has a rate of about 54%. The report from Eunomia claims the leaders have both good funding for recycling as well as incentives for citizens such as 'Pay as you throw' where individuals are charged a rate depending on their amount of waste produced. http://www.recycling.co.uk/pay-as-you-throw.html

There are a number of existing incentives to encourage people to manage their waste more effectively. Some schemes offer reward for waste management whilst others take the approach of consequences for excessive waste production. Generally, the approaches that use consequences for excess waste work through use of monetary charges such as the 'Pay as you throw scheme' or deposit refund schemes where a product such as a bottle of water would have part of the price 'made up by a deposit, which would then be returned when the customer returns their empty bottle or bottles'. Germany has already adopted this scheme and '90%' of bottles are returned successfully. https://www.envirotech-online.com/news/water-wastewater/9/breaking-news/how-can-a-deposit-refund-scheme-help-the-environment/44186

There are a number of limitations the existing incentives set to increase recycling rates. One of the most significant would be availability, there are many existing schemes that only exist in specific locations only providing incentive to a limited number of people. In the borough of Bracknell forest there exists a scheme where residents can register for a 'e+' card where they are able to collect points every time their recycling bin is taken. Residents are then able to spend these points on a set list of rewards such as DVD rentals or Golf sessions. https://www.bracknell-forest.gov.uk/bins-and-recycling/recycling-incentive-scheme/benefits-and-rewards-list Whilst this scheme may provide incentive for people to recycle the fact that it's only available in this particular borough heavily limits the extent at which this scheme can be effective.

Another limitation of the existing incentives is that they generally only offer reward for a particular behaviour. Whilst an incentive scheme designed to increase recycling may boost the recycling rate there are many other important behaviours that should be encouraged to further benefit the environment. For instance, minimising energy wastage by using energy saving bulbs or boiling the amount of water required and not more should be encouraged however
the existing schemes generally focus on motivating a particular behaviour instead of positive environmental behaviour as a whole.

2.3 Gamification

Deterding et al. (2011) definition

Gamification involves adding game design elements to a non-game context such as education, exercise or in the workplace. The game elements applied can range from levels indicating progress being made to points being awarded when certain actions are completed. The purpose of gamification is to increase engagement and provide motivation for the gamified situation.
https://www.sciencedirect.com/science/article/pii/S074756321630855X

There are many instances where different gamification techniques have been applied to a range of contexts with varying levels of success. Starbucks as well as other retailers such as Nando's have seen significant success through implementing loyalty programs where customers are awarded gifts for engagement with the brand. Starbucks in particular offers an app where customers can pay for their goods and earn 'stars' for transactions.

Figure 3 – Starbucks tiers https://www.starbucks.co.uk/card/rewards

As shown in figure 3 Starbucks also offers levels in their loyalty program, customers start of in the 'Green Level' and after fifty transactions are made within a year they are upgraded to the 'Gold Level' where some additional benefits are provided to improve the customer experience.

The Starbucks rewards scheme works slightly differently in other countries, in America customers are awarded 2 stars for every Dollar spent rather than a single star per transaction. By adjusting the number of stars awarded depending on the amount being spent higher spending customers are able to earn points at a faster rate than the lower spending customers results in better benefits for the higher spenders. With over 13 million customers using Starbucks rewards the loyalty scheme through using simple game elements such collecting stars Starbucks has been able to boost customer engagement as well as their revenue.

Gamification has also seen success in many other areas, another example of success is Nike's running app 'Nike+' which tracks a user's running statistics including time, distance and speed these figures are then converted to 'NikeFuel'. The app incorporates gamification in a number of ways such as using 'missions' where users have limited time to earn a specific amount of 'NikeFuel' in addition leader boards are available allowing users to compete with friends for the highest scores. The idea proved to be successful with millions of users signing up and 'more than 1 billion fuel points' being earned daily.
https://mashable.com/2013/02/22/nike-fuelband-stats/#gVA04JdtUZqf

https://digitalsport.co/nike-takes-gamification-to-the-next-level-with-nikefuel-missions

2.3.1 Behaviour change

Getting people to change their behaviour and become more pro-environmental first requires an understanding of how to instigate behaviour changes. Dr. BJ Fogg a behaviour scientist has produced a number of models regarding what causes behaviour change and the types of behaviours to expect.

Fogg's model states that if the elements of motivation, ability and a trigger at the same time this can lead to a behaviour being displayed.

Figure x: Fogg Behavior Model http://www.behaviormodel.org

The behaviour model above shows how high motivation can lead to trigger action for something hard to do whilst low motivation can only lead to easy to do actions. The elements each have sub-components that are also important when considering how to design for behaviour change.

Motivation: Fogg considers 3 types of core motivators being: Sensation (Pleasure/Pain), Anticipation (Hope/Fear) and Belonging (Social acceptance/rejection). Using these motivators when designing can help motivate certain behaviours depending on context.

Ability: Sometimes replaced with simplicity this element considers an individual's capability of completing an action

2.3.2 Why Gamification works

There is substantial research into the reasons why using game elements in non-game contexts can incite motivation and behavioural change. Blohm and Leimeister (2013) highlight some of the most important game-design elements and their motives.

Table x?

Game mechanics refer to the techniques in gamifying a context offer for instance points and trophies badges. Game dynamics instead describe the effects of the mechanics on the user experience over time and relate to the user's motives (Huotari and Hamari, 2012). In relation to gamifying pro-environmental behaviour, including mechanics such as a ranking creates a competitive dynamic. When an individual's performance is compared to the performance of others particularly relevant other such as friends 'social pressure may be evoked' which can prove to be effective in motivating certain behaviours. Abrahamse, W., Steg, L., Vlek, C. and Rothengatter, T. A review of intervention studies aimed at household energy conservation. Journal of Environmental Psychology 25, 3 (2005), 273-291.

Competition which can be consider a game element is commonly included in approaches aimed at reducing energy usage. A study on dorm residents in over 150 campuses, and these effects of competitions have 'achieved median reductions of 22% in energy use from students' (Johnson et al., 2012).

Game elements such has group tasks can also produce opportunities for social exchange, essentially a distribution of ideas within a relevant community. With reference to pro-environmental behaviour, allowing users to interact with one another by displaying their thoughts and experiences and encouraging users to partake through rewards. There are a number of ways this can be implemented; an example would be a forum where users can create threads regarding relevant topics or experiences they've come across. Having an area where users can display sustainable behaviours for others to see allows for these ideas to be used as a reference to many (McKenzie-Mohr, 2011)

Another strategy to incite behaviour change is to use normative social influence between players. Normative social influence is essentially a type of social influence that can lead to conformity. A study conducted by (Hamari & Koivisto, 2015) investigating the role of social influence in gamified exercise found that 'social influence, positive recognition and reciprocity have a positive impact on how much people are willing to exercise as well as their attitudes and willingness to use gamification services' an empirical study also showed how 'getting recognized, receiving reciprocal benefits and network effects contribute to use continuance' of their gamified application.

Allowing participants, the freedom to choose the ways they want to present a behaviour can increase intrinsic motivation (Patall, Cooper, & Robinson, 2008) and self-determination (Agran & Krupp, 2011). In the domain of pro-environmental behaviour there are many different ways ranging from recycling items to cycling instead of using motor vehicles or even installing solar panels each of which can have a positive impact on the environment. Whilst there are many ways to display pro-environmental behaviour not everyone may be willing or capable to partake in certain actions for instance individuals living without gardens are unlikely to be composting however since composting is a pro-environmental behaviour it should be rewarded.

2.3.2 Player types

An important factor to consider when developing a game is the types of players interacting with the game. Research conducted by Richard Bartle has identified 4 distinct types of players being: Achievers, Explorers, Socialisers and Killers. Each of these player types have different characteristics and motives when engaging in games.

Figure x: Player types http://computerscience.chemeketa.edu/cis125gReader/Players/PlayerTypes.html

As shown in the figure above the player types vary in what their focus is when playing games: Killers have a focus on competition and aspire to be the best, Achievers focus on completing tasks and have less interest in competing with others instead they focus on themselves, Socialisers have less focus on a games mechanics and competition aspect and instead focus on the social aspect of a game and play for fun and Explorers also do not focus on competing with others or even socialising instead they enjoy interacting by exploring and discovering areas of the game.

the frequency in which people engage in the said behavior increases significantly (Phillips & Gardner, 2016). More importantly, habit formation leads to long-term behavioral maintenance even without the need for intentional motivation to maintain the said behavior (Judah, Gardner, & Aunger, 2013). Long-term behavior change will occur only if people perform the sustainable behaviors multiple times during the intervention. Gamification precisely addresses this issue by having players enter a state of flow, which intrinsically motivates the players to repeat sustainable actions.

(Deci, Koestner, & Ryan, 1999) – behavior strictly for the reward, and not because they are inherently interested in it

As soon as the competition ended, so did the behavior change (van der Linden, 2015)

http://person.eu/downloads/PERSON-Abrahamse-et-al-2005.pdf

A framework created by Yu-kai Chou presents 8 core drives of gamification.

Figure x – Octalysis framework for Gamification

This framework presents several motivational drives found in games, each drive differs from the other in the techniques used to achieve engagement. The drives on the right relate more to' 'creativity, self-expression, and social aspects' whereas the left relate more to 'logic, calculations, and ownership' Yu-Kai Chou names these 'Left Brain' and 'Right Brain' drives similar to how the hemispheres in our brain work. The 'Left Brain Core Drives' are said to have 'a tendency of being more based on Extrinsic Motivation' which relates to external motivators and the users desire to gain something whereas the 'Right Brain Core Drives have a tendency of being based on Intrinsic Motivations' which relates to internal motivators such as praise, knowledge or recognition and enjoying the activity itself.

A study conducted by Halko and Kientz identified 8 common types of persuasive strategies which can be

generalised into 4 approaches being:

1) Instruction Style

o Authoritative: Uses an authoritative agent, such as a drill sergeant or strict

personal trainer, to instruct the user on how to meet their fitness goals.

o Non-Authoritative: Uses a neutral agent, such as a friend or peer, to

encourage the user to meet their goals.

(2) Social Feedback

o Cooperative: Uses the notion of users cooperating as a team with friends or peers to complete their fitness goals.

o Competitive: Uses a strategy of competing against friends or peers to "win" a competition.

(3) Motivation Type

o Extrinsic: Uses external motivators, such as winning trophies, as a reward

for conducting healthy behaviors.

o Intrinsic: Uses internal motivators, such as feeling good about one's self or

feeling healthy, to motivate healthy behaviors.

(4) Reinforcement Type

o Negative Reinforcement: Removes an aversive stimulus (e.g., turns a brown and dying nature scene green and healthy) as the user conducts more healthy behaviors.

o Positive Reinforcement: Adds a positive stimulus (e.g., adds flowers, butterflies, and other nice-looking elements to any empty nature scene) as the user conducts more healthy behaviors.

Each of these strategies are also commonly used in games with the aim of making the game more enjoyable for instance many games have; a set of rules or instructions that players have to abide by, online games allow players to socialise in either a competitive or co-operative scenario and the majority of games offer rewards when players complete certain tasks.

-what is gamification

-starbucks

-nike

-why is it so good?

-gamified learning

-elements of gamification

-why does it motivate

-theory (Fogg, Maslow, Hertbeg)

" Social Cognitive Theory / Self-Efficacy – Bandura

" Heuristic-Systematic Model (HSM) – Chaiken, Liberman & Eagly

" Elaboraton Likelihood Model (ELM) – Petty & Cacciopo

" Theory of Reasoned Action / Planned Behavior – Fishbein & Ajzen

" Transtheoretical Model / Stages of Change – Prochaska

" Resistance & Persuasion – Knowles

" Cognitive Dissonance – Festinger

" Hierarchy of Needs – Maslow

" Attribution Theory – Heider

" Expectancy Theory – Vroom

" Self-Determination Theory – Ryan & Deci

" Cost-Benefit models (various)

" Learning Theories (Behaviorism) – Watson, Skinner

environmental education

consumption awareness

energy efficiency behaviours

B=MAT. If your learners have the motivation and the ability, all you need is the right trigger. Use gamification, Epic Meaning and social learning to supercharge your learners' motivation.

-Failure

Extrinsic: Persuade the user through external motivators. For example, winning trophies, as a reward for completing a task.

Intrinsic: Persuade the user through internal motivators. For example, The good feeling a user would have for being healthy, or for achieving the goal.

2.3.3 4 – Reinforcement type[edit]

Negative Reinforcement: Persuade the user by removing an aversive stimulus. For example, turns a brown

and dying nature scene green and healthy as the user conducts more healthy behaviors.

Positive Reinforcement: Persuade the user by adding a positive stimulus. For example, adding flowers, butterflies, and other nice-looking elements to any empty nature scene, as the user conducts more healthy behaviors.

http://www.behaviorgrid.org/

3 Approach or Methodology

-Focus Group

In research circles, this chapter would often be called the methodology. Basically, it is the chapter in which you describe how you are going to go about your project in order to achieve your Aims and Objectives. Are you going to gather requirements in a certain way, build some software, and measure the results of experiments? Are you going to develop simulation models which you will test with a set of expert users, or compare to existing data sets? Will you produce a mock-up of a system and test it with a number of users to ensure that the results are statistically significant.

Whatever you do that is relevant for your project, you need to convince your reader that the approach you are taking will give rise to a set of results that are unbiased, and from which you can draw objective conclusions.

4 Application design

Using the gathered theoretical knowledge around the topic of Gamification and related research findings designing a high-fidelity prototype incorporating ideas from best practices to allow participants to focus on the motivation-specific area of design. Developing an idea with this approach is considered 'theory driven design' (Card, S.k 1989)

A method for engineering gamified software in several stages has been achieved through a 'synthesis of the current body of literature' as well as interviews with '25 gamification experts'. Benedikt Morschheusera,b,f,*, Lobna Hassanc,d, Karl Werdere, Juho Hamarid,f,g

This research produced a list of design principles to be considered when developing gamified software.

Figure x: Method for engineering gamified software WWW.

The figure above shows the stages to be taken when engineering gamified software starting with Project preparation and ending with Evaluation & Monitoring of the software.

4.1 Project preparation

The purpose of this stage is to identify the objectives of the gamification project. Activities including 'definition, ranking, and justification of project objectives are recommended'. Benedikt Morschheusera,b,f,*, Lobna Hassanc,d, Karl Werdere, Juho Hamarid,f,g. For the Planet Health project, the objective is to motivate pro-environmental behaviour through use of gamification. The plan is to understand the techniques in which gamification brings success in motivating behaviours and to apply it to an environmental context. By analysing existing solutions for motivating pro-environmental behaviour as well as successful application of gamification a prototype of an app incorporating gamification to motivate pro-environmental behaviour can be developed.

Planet Health will take the approach of rewarding positive behaviours with the intention of facilitating habit formation leading a more sustainable lifestyle. It is important to assess if gamification is applicable in the context and considering there are a number of repeatable behaviours that can be encouraged a system using gamification can be applied to further encourage desired behaviours.

4.2 Context/User Analysis

In this stage identifying and understanding the context as well as the users in which gamification is to be applied. In this case the context is motivating pro-environmental behaviour using a mobile application. Defining success metrics which are measures allowing you to quantify the performance of the idea, with reference to Planet Health a metric could be the number of times a user engages in a pro-environmental behaviour. Considering only a prototype of the application will be developed and not a pilot study testing the application, evaluating success will be achieved through use of a focus group interacting with the prototype and completing a survey gathering data on their experience.

With regard to the user analysis considering the project is an application it's expected that user's will be smartphone users additionally the projects objective being motivating pro-environmental behaviour is something that should be expected from anyone capable. Users however are likely to differ in how they interact with the game aspect of the application for instance research previously mentioned conducted by Bartle identified different player types and how each player type has different motives when engaging in a game. Since there are different player types and some users may focus on competing with others whilst others will focus on completing achievements it would be beneficial to take this into consideration when designing Planet Health as having features that fit into different player types style could prove to increase engagement.

4.3 Ideation

Ideation involves brainstorming ideas for game elements that could be applied to the gamification software. Ideas must be suitable with the context and achieve a purpose that contributes to the objective of the application.

Planet Health Ideas

Points & Rewards This would be the backbone of the application. Points will be mainly earned for users completing pro-environmental behaviours. Providing a sense of choice in what behaviours users can do should encourage more people to engage as existing solutions are generally limited to specific behaviours such as recycling however there is a significant number of other behaviours that should also be encouraged.

Competitions & Leader boards Since pro-environmental behaviours are repeatable introducing a competitive aspect could improve engagement and player types like 'Killers' enjoy competing with others so including competitions and leader boards could prove to increase engagement with certain behaviours.

Achievements Achievements could be implemented when users engage in a certain behaviour such as recycling or if they repeat a certain behaviour a number of times for instance recycling a number of cans etc. This element could prove to engage those that fit into the 'Achiever' player type it could also be effective in forming positive habits for users as repeating behaviours can facilitate habit formation.

Badges & Levels Levels can be implemented to indicate the experience of a user points may contribute to a user's level and can be publicly shown to allow for recognition. Badges can be awarded when users reach certain levels or complete milestones or achievements. The 'Achievers' player type is likely to engage by aiming to collect different badges as well as work on increasing their level by engaging in pro-environmental behaviour.

Forum A forum to allow users to discuss relevant topics to Planet Health such as discussing behaviours that

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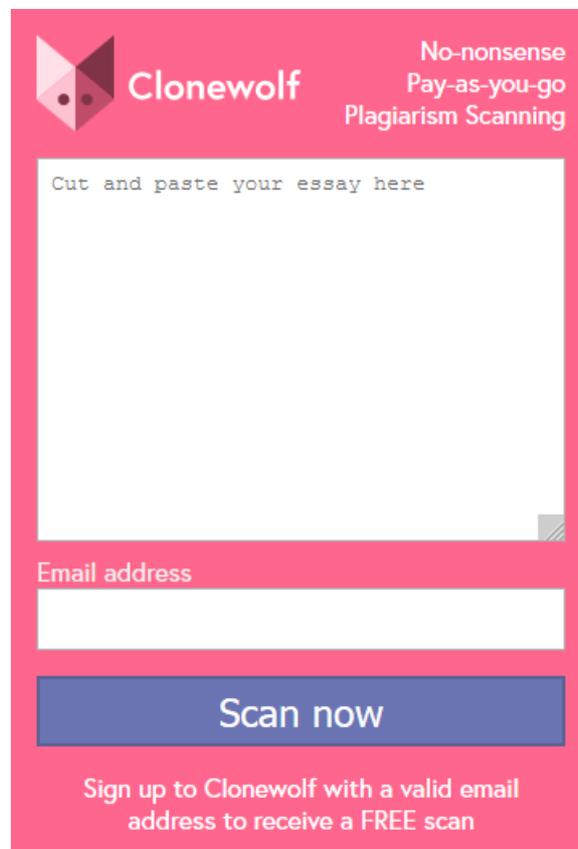
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