Gamification of Personnel Management
Interim Planning and Investigation Report
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Introduction

This report discusses the concept of gamification and its potential utility as part of a personnel management application. This application will form the basis and of a solution to the crisis of engagement.

During my placement, I was involved with designing and developing additions to a Kanban board and project management methodology. I was tasked with creating a mechanism for project prioritisation and influencing employee engagement.

Employee engagement is of increasing concern. Statistics collected by Gallup suggest that, despite investment by companies, the amount of employees in the US that are engaged remained at around a third from 2000 to 2015 (MANN; HARTER, 2016). Previous studies conducted by Gallop suggest that the UK has significantly lower levels of engagement (CRABTREE, 2013). This is reinforced by studies conducted by Kenexa (WILEY, 2009) indicating the UKs Performance Excellence Index (PEI) is 8th among the countries studied, one of the contributing factors of this is low employee engagement. The issue is that a lack of emotional investment with a job or company causes fundamental problems with workers motivation and may lead to merely meeting expectations instead of striving to grow and improve.

Gamification of a workflow can be considered to foster emotional engagement and motivation in employees. Gamification is the process of applying game design fundamentals to otherwise non-game activities. It can be used to improve peoples lives through adding reward to otherwise non-fulfilling tasks and promoting positive behavioural change (HAMARI; KOIVISTO; SARSA, 2014).

When taking Tekinbas and Zimmerman's definition of games and play, (TEKINBAŞ; ZIMMERMAN, 2004) we can take play to also mean "use" of a gamified system. Therefore the "player" is the

equivalent of a user and the "game" is the application or system. Actions that take place, facitiltated by the rules in application or system, enable play.

Reward can be added to a system by the facilitation of "meaningful play" (TEKINBAŞ; ZIMMERMAN, 2004) provided by engagement with it. By adding actions that are both discernible and integrated to a gamified system, a team can deal with some of the problems arising from the crisis of engagement.

There are several applications that can be used to organise teams, two of the more popular ones are Jira and Monday. Although they have some elements that could be considered gamified such as performance graphs, but game reward is not their main purpose.

Aims and Objectives

I aim to create an application that, using gamification, adds additional reward to completing tasks. I see the app having the potential to be used in professional teams that are seeking to increase productivity and promote community and loyalty (OPRESCU; JONES; KATSIKITIS, 2014).

I aim to allow the prioritizing of work using reward systems of the application. In this way there should be an indirect motivation to achieve goals/complete tasks in a specific order. I see this as an effective way to promote a sense of personal power and control whilst still incentivising team and organisation goals.

Successful engagement with digital gamified systems may also involve following implementation of motivational affordance (ZHANG, 2008). Some of the motivation sources more relevant to a system such as this and principles proposed by Oprescu, Jones and Katsikitis (OPRESCU; JONES; KATSIKITIS, 2014) have highlighted several common properties that should be observed. A significant amount of these draw parallels with the Octalysis framework proposed by Chou (CHOU, 2016)

A synthesis of these ideas creates a set of common elements that form the basis of properties the application requires: User focused, appropriate level of challenge / accomplishment, promoting a sense of community / relatedness and timely feedback.

Deliverables

The main part of this project will be the development of the application. This will be accompanied by application design documentation and a report.

The application will be web based with a focus on mobile based UI design, the user will be able to create teams inviting others to participate in them. Users will then be able to assign tasks to the team, allowing any users that is part of the team to complete or post messages about tasks. Tasks will be real world based and contribute to team goals, after completion the user then marks it as complete in the app.

Users can complete tasks in order to earn experience points (EXP) towards certain skills. I initially considered EXP as superfluous to the purpose of the application, after researching I realised this was necessary to add enough complexity to allow user integration in the game system while adding feedback (ZHANG, 2008) and "persuasive elements"(OPRESCU; JONES; KATSIKITIS, 2014).

The EXP the task has will depend on values given to it at creation. The amount of EXP tasks award is how the app encourages task prioritisation. Through correct use of this, a task creator can incentivise the completion of specific tasks.

The application will have multiple skills; these will correspond to real life skills. Ccompleting a task such as cutting a tree may award EXP for the physicality of the task or developing a website may give you experience in your programming or html skill.

In order for multiple users to see updates, development will involve interacting with some form of persistent data, either a SQL or noSQL(document) database. This data will be secure, only being accessible to members of a specific team. Appropriate measures will be in place to conform to 2016 GDPR regulations. It requires minimal reliance on data transfer to allow for mobile device compatibility.

In order to keep data accessible only to team members some form of authentication process is required. This will uniquely identify the user and therefore the tasks and team data they have the security privileges to view.

Not in scope

As the potential scope for the project is very large, I have had to make decisions early on considering what is essential to the project. The following items are not going to be part of the application but are potential extensions.

Due to the time it would take and the existence of services such as Firebase, Firehose and Parse Server, it is not necessary for me to write a data engine. Furthermore, this opens options for hosting and removes the reliance on access to database capable hardware.

My preliminary research has highlighted potential issues with leader boards; this was initially a component of the design. Further research showed that comparison with peers can cause anxiety in individuals(ZHANG, 2008), although this could have the desired motivational effect I consider it

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the wrong route to take in progression of gamification in general. It could be considered a "black-hat" motivational factor and may backfire reducing motivation in the long run (CHOU, 2016). It is because of this I have chosen to leave this out of scope.

Although often considered a significant part of successfully gamified systems (OPRESCU; JONES; KATSIKITIS, 2014) statistics gathering will not form part of the project. In order to build an effective useable dataset, a large volume of data is required, it will also take a significant amount of time to develop storage and processing of usage data.

Chosen Approach

Throughout my time at university the majority of the development I have done has been using Object Orientated Design (OOD) principles. Using encapsulation, abstraction, inheritance and polymorphism; code is more modifiable, easier to test and importantly more atomic. Following this will reduce some of the risk associated with uncertainty of some elements having the ability to modify components without affecting unrelated functionality.

When developing system architecture through OOD, an effective way of evaluating system objects and their interactions can be achieved using Unified Modelling Language (UML). This is a technique I have learned at university and will be using it for both design and documentation of the application.

In order to gather functional requirements for the project I will be using a combination of user personas, use cases and wireframes. This will help generate a feature list and aid in prioritising development of them.

This project will have significant amounts of functional dependency, for example, the user will need to be able to log-on in order to uniquely identify them and the documents they have the privilege to access. For this reason, I considered using a Waterfall approach to development as this would have the advantage of being able to strictly plan each of the individual dependencies. Due to my choice in following OOD waterfall became a much less attractive methodology. Being more compatible with OOD and having better mobility to deal with uncertainty, Agile has become my choice of development methodology.

Agile has much tighter feedback loops, this allows the testing of elements in the project as I develop, enabling change of design and reallocation of time, based on results of tests. This also allows for restructuring of the project if specific functionality takes longer to make than initially planned. Further research revealed Agile is considered to increase efficiency and the successfulness of a project (SERRADOR; PINTO, 2015).
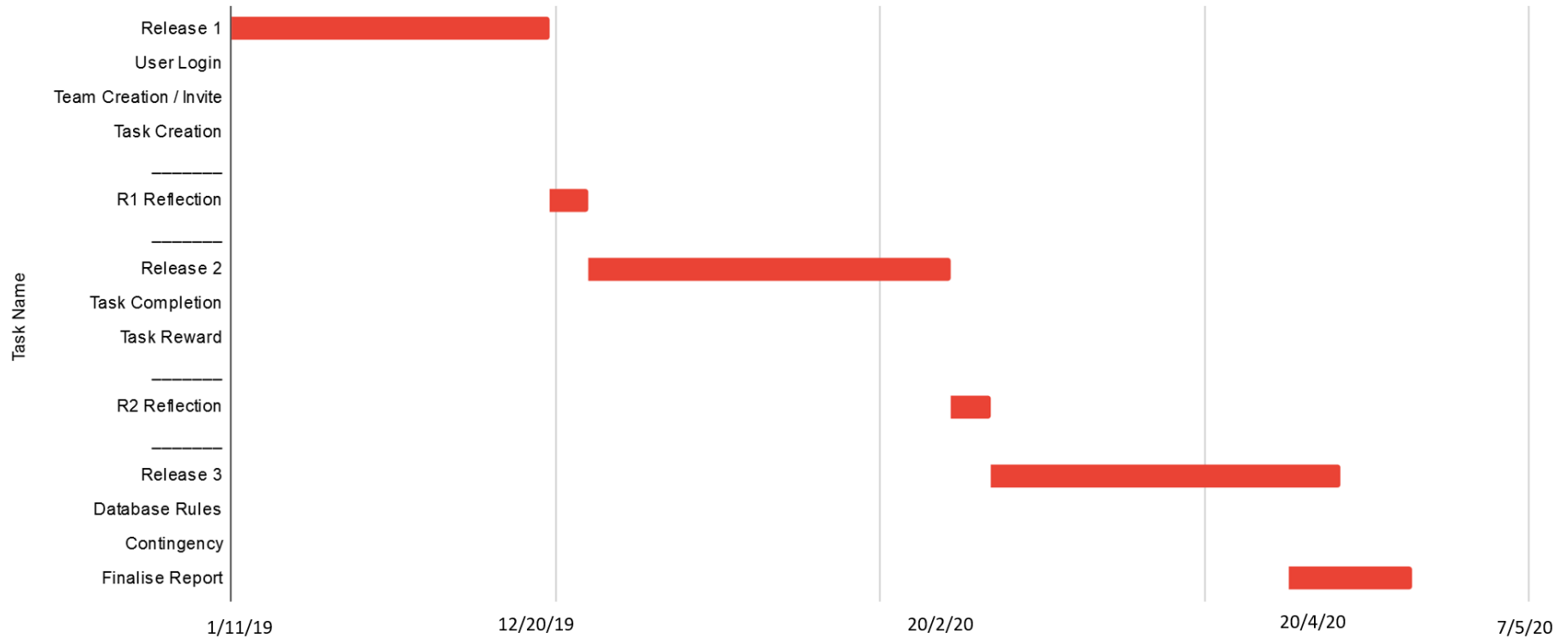
Schedule of Activities

Figure 1: project plan:

This project plan (figure 1) contains an estimation of the time I think it will take to develop all the significant parts of the application. Each release will involve 3 sprints consisting of planning, development and testing stages. This plan has been and will continue to be developed on .

The plan above is a second revision, the initial revision had all the design and planning stages at the beginning of the timeline. This is not compatible with Agile methodology and I could potentially run into problems when needing to redesign functionality midway through.

After developing the plan above, I found an excel template that is a better tool for laying out agile planning. I am now using this new template as my working document. Application functionality is split down into releases, these releases are further broken down into 2-week long sprints. I am allocating tasks that belong in my current sprint during sprint planning, this gives greater flexibility and allows me to review release timescale as I move through the project. I will be bringing this document to the Viva as it would be difficult to include in this report in a readable form.

Investigations conducted

September

I created an initial draft user stories and use cases to help consider some of the functionality of the application. This simplified my design considerably and gave me requirements of the technology I will go on to use.

I created a node.js server to interact with a mongo database on a Raspberry Pi. The purpose of this was to try and evaluated the work needed to produce an API with the capability I require. I realised, from this, that I would not have the time to develop an API and client with this much functionality.

I began researching gamification and picking out some of the more relevant and prominent professionals.

October

I researched gamification in more depth and started to think about the design of my application and how I can incorporate some of the ideas I was reading. This was an informative process and shaped my design significantly.

I learned about firebase from a tutor at university and began to research it extensively. I created several test projects to evaluate whether it can fulfil my requirements. Test proved that firebase is capable of, secure login and data access and live updates to data changes.

November

I have created 3 iterations of my plan at this point and will continue to build on this as I go. So far I have realised some of my duration estimates for tasks have been off. One of the reasons for this is I did not break down bigger tasks into more atomic parts which would have provided a more accurate estimate.

Sprint one development involved a significant amount of planning and design creating wireframes and flow diagrams to evaluate user actions. Development so far has been creating

custom elements that are capable of displaying and modifying data of teams. Teams turned out to be a good place to start as there was a significant amount of risk and unknowns. Although I have overrun in terms of hours estimated vs hours worked, I am happy with how development is coming along.

Below is a table documenting some of the risks involved in developing my project. I have considered their impact and what protections I can put in place to mitigate issues that may arise.

Risk	Impact	Protection
Low performance of client-side application on low spec hardware.	Potential UI lag and browser crashes.	Choice of technology needs to have the capacity to control updates.
Time taken to develop sections of the application maybe more than estimated.	I could run out of time to properly develop and test each component.	Using Agile and OOD to break down production into sections. Enables reallocation of time on individual tasks. I have also allocated a month-long contingency period.
Reaching the usage cap of a cloud hosted service.	May incur hosting costs to allow application to proceed.	Pay careful attention to database metrics and move testing to a different billing/usage period when appropriate.
Data-engine unable to fulfil application requirements.	Functional requirements are either impossible or time consuming to produce. Potential lacking in implementation quality.	Extensive research and proof of concepts as part of the design and planning for the initial release.
Changes to framework/API methods or functionality.	Any changes to the way API methods are called will impact development time and could remove functionality all together.	Choosing only well established and well documented external APIs. Only upgrading client-side packages if required.
Changes to IDE and development environment applications.	Potential loss of code through file format changes. Applications either don't work altogether or require relearning.	Use commonly used IDEs and application. Pay careful attention to release notes before updating.
Database downtime	Loss of ability to test/develop. Downtime at the point of marking/examination.	Any service managed by me will be carefully monitored and include redundancy. Any external services must have a proven track record. Segmentation of project to allow for non-database reliant work.
Data loss/corruption	Inaccessibility of current dataset. Loss of modification to hierarchy/schema.	Maintain backups of dataset and testing of restoration. Backup of any substantial hierarchy/schema changes.
External service outage/deprecation	Inaccessibility or complete loss of data. Time impact on configuration of a new service.	Maintain backups of datasets. Only use tried and tested external services. Selected services need to have high availability. Maintain access to website code so hosting can be moved.

In this section I have included several sources that have contributed to my understanding of gamification, the employ engagement crisis and how gamification can by used to address these issues.

(CHOU, 2016)

Chou proposes Octalysis framework as a way to synthesise the driving factors of human nature with properties of gamified systems. Importantly it raises ethical concerns including the separation between the "black hat" and "white hat" motivational factors. Occasionally drawing comparison between real world motivation and motivation found in games to promote connection to game design.

After watching Ted talks from Chou, I wanted to know more about his proposition of Octalysis. From reading actionable gamification, I gained an understanding of the framework and how it can be utilised to discuss and evaluate gamification. A significant amount of the principles expressed share properties with high motivational affordance and proposed solutions to employee engagement.

(CRABTREE, 2013)

This was the second article of findings produced by Gallop that I read. I needed to be sure that issues with employment engagement weren't restricted to the United States. Findings in this article suggested that engagement statistics in the rest of the world are even lower. This report provided a much more transparent review of data showed the study was of substantial size adding reliability to the statistics.

(HAMARI; KOIVISTO; SARSA, 2014)

This literature review uses empirical based studies to review how successful gamification has been. Motivational affordance is used to classify the different studies and form a basis for review. The paper shows general positive effect of gamification, albeit tentatively. This is due to the lack of consistency, in terms of the different motivational affordances, and methodology use in the individual papers.

This paper introduced me to the concept of motivation affordance which required further reading to understand. It has contributed to my belief that gamification works as a solution to engagement. Due to the nature of the paper, studies involved and scope of the review it is somewhat inconclusive in terms of saying gamification categorically works. The papers reviewed also don't contain anything specifically addressing personnel management.

(MANN; HARTER, 2016)

This article reviews data gathered about employee engagement over a 15-year period. This forms a basis of evidence that employee motivation is not increasing despite investment. A few reasons for this phenomenon are highlighted within: there is a focus on monitoring employee satisfaction rather than "developing managers and employees", the surveys themselves are flawed in their construction or purpose and the actions taken by employers don't invest in engagement.

Although there is a lack of critical evaluation and presentation of the studies presented the organisation publishing this material can be trusted. As a result, it provides additional evidence regarding the engagement crisis. This paper also cites ways to improve engagement common to some of the properties in writing from Zhang, Chou, Hammari, Koivisto and Sarsa.

(OPRESCU; JONES; KATSIKITIS, 2014)

This article highlights some of the advantages to both employees and employers of gamifying work practices. The article is discussing gamification, in particular to the workplace, something that poignant and worth considering when designing an app for personell management. The major shortcoming with this article is that it doesn't include any empirical evidence to confirm some of the claims made.

This article introduced some features common to motivational affordance and Octalysis enhancing their importance. Due to the context of the article it is very relevant to employment engagement.

(SERRADOR; PINTO, 2015)

I was already aware of the benefits of using Agile having assisted with development management during my placement. This paper gave significant evidence supporting my belief that Agile is both popular and successful as a development methodology. The paper goes into a lot of detail in breaking down the study revealing a trend with amount of Agile incorporation and an increase in efficiency and stakeholder satisfaction. The coupling of developer and stakeholder in this project decreases the relevancy of this paper.

(TEKINBAŞ; ZIMMERMAN, 2004)

This book talks about game design and introduces and defines terminology that is useful to the discussion of gamification. Some of the sections particularly relevant are the definition of games and play, in particular the cultivation of meaningful play through design. This book has helped shape my perception of games and play in the wider context and informed me of recognised game design fundamentals that can be applied to gamification.

(WILEY, 2009)

This helps reinforce studied conducted by Gallop indicating that PEI the United Kingdom is low. It was important to read a different body of research comparing the UK's performance with other countries. Comparison of this research helps reinforce studies conducted by Gallop in 2013 and 2015 and suggests that the UK's employee engagement is affecting output. The study Research was conducted by Konexa and measures employee engagement and operational performance. High employee engagement can be considered a contributing factor in positive operational Performance.

(ZHANG, 2008)

This article discusses motivational affordance and its relevance to computing. It then lays out a set of principles that can be used to fulfil the needs relevant to user, of an ICT system. This article connects psychological/social needs with design and arbitration principles of computer systems. Despite the non-specific context of this article it can be applied to digital gamification.

After first reading about motivation affordance in a literary review (HAMARI; KOIVISTO; SARSA, 2014) I needed to understand and principals involved in order to interpret the study effectively. I learned what comprises of motivational affordance and its relevance to the appeal of ICT systems. It shares some design principles common to Chou and Oprescu, Jones and Katsikitis.

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