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DEVELOPMENT PROCESS OF INTRINSIC GAMIFICATION IN A LEARNING DIFFICULTY CONTEXT

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Abstract

The paper explores the development process of intrinsic gamification in a learning difficulty context through an in-depth case study. We found out that simplicity is the most vital mechanic and the freedom in the software benefits users physically, mentally and socially. As a result, the software meets user's competence, autonomy and connection needs and thus intrinsically motivates them to use it more.

Keywords: gamification; intrinsic motivations; development process; simplicity; learning difficulty context.

1.0 Introduction

Gamification has introduced game elements in various industries and has been proven successful. Traditionally, gamification adopts extrinsic mechanics such as badges and levels. But there are raising concerns about the overuse of extrinsic motivation and scholars have proposed to increase the usage of intrinsic mechanics. However, barely any studies tried to learn the development process of intrinsic gamification. In this research, we conducted an in-depth case study of intrinsic gamification software to explore its mechanics and internal motivations. It could potentially make theoretical contributions to literature and practical contributions to the industry.

2.0 Prior Research

Gamification refers to the utilization of game elements in non-game circumstances (Deterding et al, 2011), and it has gained widespread use in industry (Huotari and Hamari, 2012). In this paper, we studied interactive software named Somability which uses game elements to encourage movements among people with profound and multiple learning difficulties (PMLD). This user group often suffers from more than

one disability and one of these is profound intellectual damage (Lacey and Oyvry, 2013). The disability usually includes sensory or physical impairment and might involve autism and other mental illness (Lacey and Oyvry, 2013).

Traditionally, gamification adopts extrinsic mechanics such as badges, levels, achievements, points to motivate people (Nicholson, 2012). These mechanics set up different tasks with clear goals, which help users stay on track and keep them focused (Schell, 2008). Although gamification has been proven successful and been warmly welcomed by many companies, there are several criticisms regarding the extrinsic mechanics. First of all, researchers are concerned that they might lose their effects once removed (Zichermann and Cunningham, 2011). Furthermore, extrinsic gamification mechanics are not appropriate methods for changing customer behaviour in the long term because people tend to lose interest in them (Nicholson, 2012). Moreover, the application of extrinsic rewards could be risky since they are very different from real life and there are rare cases where people use them to disconnect with reality (Nicholson, 2012). Besides, intrinsic motivations can be damaged by extrinsic rewards, especially when users find tasks interesting and advantageous (Deci and Ryan, 2002). These criticisms point out that gamification could be improved and consequently motivate users in a more efficient way.

In response, scholars started to introduce intrinsic mechanics to gamification. This attempt is based on Self-Determination Theory (SDT) which believes that when an event meets any of the three needs 'autonomy, competence and relatedness', people find it interesting and enjoyable, and thus carry out activities unconditionally (Deci and Ryan, 2002). This inspired people adding mechanics to gamification to trigger intrinsic motivations. However, there are few studies about real life gamification examples. In this paper, we attempted to learn how Somability was developed and what mechanics motivated users internally.

3.0 Method

In order to study the development process of intrinsic gamification, we chose an interpretive approach (Walsham, 1993) and mainly used interviews to collect data. For the first round of data collection, we met seven people that were involved in the development and interviewed them separately for appropriately 45 minutes. Additionally, we attended three events where the software was displayed and its

service users were invited to demonstrate. And this gave us a chance to observe service users' performance. We then transcribed all interviews and kept detailed notes of the observation we made during the events.

To analyse data, we stayed closely to the transcripts and carried out microanalysis of words, phrases and lines (Corbin and Strauss, 1994). Later, with the help of NVivo, we conducted low-level coding of the text and produced 55 'free nodes'. Eventually, we borrowed the concept of agile design (Martin, 2003) and categorized the nodes. After analysing activities in different categories, we established links across all categories and found evidence for applying intrinsic mechanics in gamification design. As patterns and themes emerge, we began abstracting terms (cf. Miles and Huberman, 1994) and conceptualizing the process of intrinsic gamification development.

4.0 Case description

4.1 Somability and Cariad Interactive

Somability is an application that was produced by Cardiff Metropolitan University in partnership with Cariad Interactive. It gives service users access to recreational activities through affordable technologies, with musicality and rhythmic, hence promotes dynamic movements. It contains three applications reach, balance and flow, as well as three modes mirror, skeleton tracking and colourful shadows.

Cariad Interactive has four main partners, Wendy, Joel, Pete and Marek, each of whom played different roles in the development of Somability (table 1). During the development of Somability, Cariad Interactive partnered with Rhondda Cynon Taf Skills for Independence and Artis Community and did beta tests with Gladys Resource Centre in Aberdare. In order to collect data for this paper, we managed to interview people from each organization to talk about their contribution to the development of Somability. Table 1 illustrates the interviewees' positions and organizations they belong to.

Name	Position	Organizations
Wendy	Managing director and project manager	Cariad Interactive
Joel	Lead programmer	Cariad Interactive
Pete	Art Director	Cariad Interactive
Leah	Research assistant of Wendy	Cardiff Metropolitan University
Zoe	Dancer	Artis Community
Kath	Facilitator	Rhondda Cynon Taf Skills for Independence
Florence	Carer	Gladys Resource Centre

Table 1 Information of interviewees

4.2 Development process of Somability

As explained in Figure 2, the development of Somability contained four stages: user analysis, design, implementation and release.

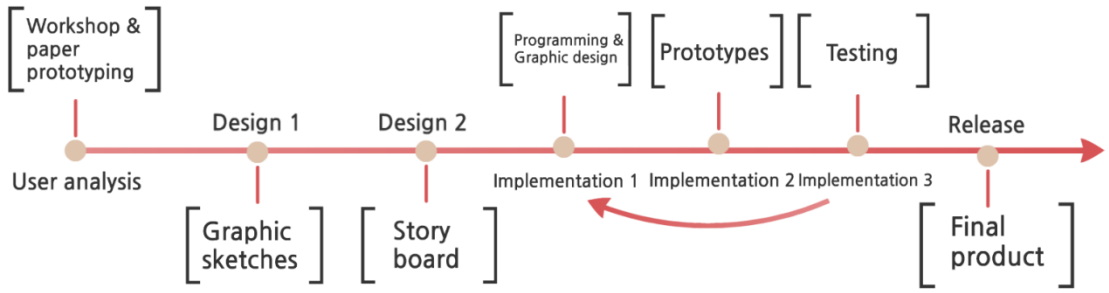

Figure 2 Process model

In the user analysis stage, the development team gathered around for workshops and did paper prototyping to learn users' needs. This involved people from Cardiff Metropolitan University, Cariad Interactive, Artis Community and Gladys Resource Centre. And they were engaged through role-playing, rehearsal and performance. This allowed the team to discover the idiosyncrasies of individual service user's needs, and thus to find basic daily movements that could engage anyone even with limited movability. In order to avoid over complicated design and to make the software accessible for everyone, the simplicity mechanic was raised and was kept towards the end.

In the design phase, the team translated basic movements into graphic sketches. Later, they built story boards to demonstrate how certain type of interaction may achieve the goals that they would like to achieve. Dividing by the scenarios that they wanted to implement at, the stories boards contained the movement sequences and special properties in the environment. These story boards were used in the next stage and they became a series of prototypes.

The implementation stage is an iteration of programming, graphic design, prototypes and testing. Pete and Marek were in charge of programming while Wendy and Joel did graphic design. They then brought out prototypes and tested them in Gladys Resource Centre. By observing users' performance and talking to carers, the development team found out that users would prefer an even simpler design. Therefore they removed some old gamification mechanics and iterated to the first sub-stage to improve the software. By consistently testing prototypes and making adjustments, the team came to a final product.

Nowadays Somability is finished and free to download from the project website and Windows Store. It is not only used in one day care centre but has been spread to more locations including disabled centres and schools.

5.0 Analysis

Because this research is still in its early stage, we only managed to carry out a limited analysis basing on seven interviews.

As an application originally designed for people with profound and multiple learning difficulties, Somability partly followed a common software development process agile design (Martin, 2003) but also made adjustments according to its special service users. After comprehensive user analysis and prototype iterations, Cariad Interactive stuck to the simplicity mechanic, which results in improvements in user's physical, mental and social conditions, and in return intrinsically engages them (Figure 3).

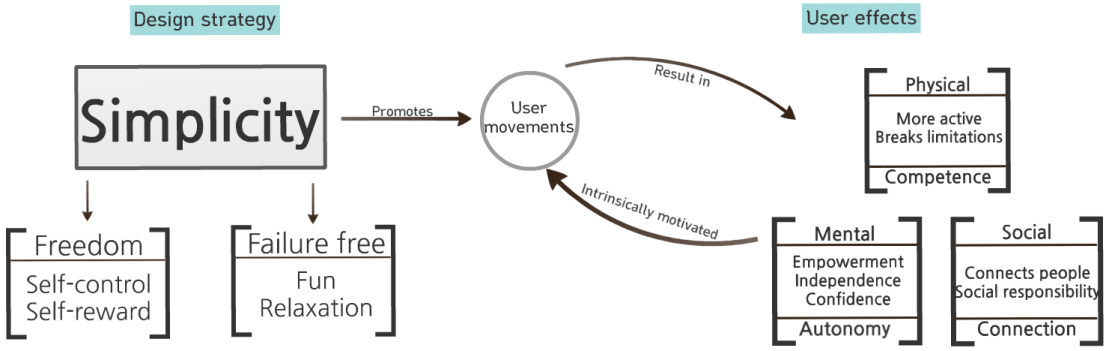

Figure 3 Grounded conceptual model

The simplicity provides a control-free and failure-free environment and therefore users could relax and control their own pace. More importantly, users can have a sense of achievement when they have made any progress. This leads them to perform expressive movements internally which results in physical, mental and social advancements. Physically, it is proved that service users are much more active than

they used to be and they have made some movements that broke their physical records. Carers have also pointed out that because everyone wants to have a go in front of the machine, there is often competition. Mentally, the software helps people gain empowerment, independence and confidence and all of these meet their autonomy need. Socially, Somability connects people together and it made people more socially responsible and some of the active users became leaders of their dance group. This meets people's connection needs. Altogether, service users not only benefit from physical exercise, their competence, autonomy and connection needs could also be met via the software, and therefore be intrinsically motivated.

6.0 Discussion and implications

Gamification differs by contexts and its mechanics vary. Scholars have tried to discuss general intrinsic mechanics that gamification could adopt, however they might not be suitable for all software. Nicholson (2012) suggests that intrinsic mechanics could include a large range of choices, elements in the real physical world and tools to design by users. But these are not entirely applicable in a learning difficulty context due to users. To conclude, gamification development should always consider users and context of use.

This paper has contributions in both theoretical and practical worlds. Theoretically, it provides a process model for developing intrinsic gamification in learning difficulty context and it points out that the most important stage is user analysis. Practically, depending on the context, this simplicity mechanic could solve some of the challenges that gamification faces. The absence of extrinsic mechanics makes sure that users' interests in physical movements are long-lasting and not overtaken by the joy of collecting points.

7.0 Conclusion

Overall, we suggest that simplicity is one of the most important mechanics that drive gamification to success, especially in the learning difficulty context. This mechanic is discovered from careful user analysis, and proved to be intrinsically engaging. Thanks to the space and freedom in the software, users are motivated to try out anything without stress or control brought by extrinsic mechanics. The software not only benefits users physically, but also mentally and socially. As a consequence, the

software meets users' competence, autonomy and connection needs and thus intrinsically motivates them to use it more. However, due to the limited data collected, this conclusion is still tentative and the researchers are continuously working on it.

8.0 Future work

This research is the starting point for our intrinsic gamification study. We are planning to expand it to more software and more design companies.

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