

The Impact of Gamification on Motivation

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Abstract

Gamification is the concept of using game design elements as a means of attracting users to a product, initially starting as a business decision. There are benefits to understanding what makes gamification work, as a motivated userbase would result in better products, even helping individuals manage themselves and their energy consumption. Research has been conducted to show a clear link between gamification and motivation, as well as implementations of the subject in sustainability and individual health monitoring. This review highlights what game design elements have primarily been used in gamification and its effects on motivation, which could allow developers to better understand the relationship between games and the user, as well as see what other elements of game design which can still be implemented.

Keywords: game design, gamification, motivation, autonomy

Introduction

Games as a form of entertainment have existed as a popular part of society for millennia, with the advent of computer-based games in the past century necessitating further research and application of user interface and experience due to new forms of engagement. As time went on, the computational power of devices grew rapidly, and so too did games. Along with this group came the concept of gamification, combining the psychological underpinnings that are involved with games within non-game applications to reap the benefits outside of games themselves. This paper aims to evaluate the uses gamification in health software and sustainability initiatives, as well as understand what makes gamification work as a concept to further implement game design ideas into popular applications.

What Is Gamification?

It is first necessary to understand what gamification is before looking into its applications and potential for application in other areas. The general principle of gamification comes from the idea of “using game design elements in non-game contexts”, with the concept gaining popularity following the success of the application *Foursquare* (Deterding et al., 2011). In the instance of *Foursquare*, the app was a location-based service app acting as a location based social media, where users formed social networks and shared their location with their friends. The app rewarded users with badges and “mayorship” for visiting new places or returning to ones they had already been to. These rewards heavily incentivized the users to engage with their physical spaces in ways like never before. The spaces range from physical to hybrid, morphed partially into the digital world through the application and users. This hybridity is what pushed users to engage with the physical world in an exploratory way, and has had an impact on the users

behavior in an observable way (Frith, 2013). Foursquare's methodology was not in isolation, as proven by the success of Pokémon Go upon its release in 2016. During the first month of the games release, those who engaged with the application saw upwards of a 26% increase in their daily step, regardless of BMI group (Althoff et al., 2016). These were two examples of gamified applications, with one using an already internationally popular gaming franchise as a base.

The general idea of gamification, as noted earlier, began in the field of marketing to drive customer engagement (Deterding et al., 2011). As of 2011, it was estimated that over 50% of organizations will gamify their products by the year 2015 (Hamari et al., 2014). This trend evolved with the idea of gaming becoming a popular activity for all age groups rather than merely children. As of 2015, 62% of people claimed to play video games in a social manner rather than alone (Seaborn & Fels, 2015). Even within video games themselves, the idea of games as tools rather than entertainment is one that has existed for some time, with Serious Games being used by corporations to make their employees solve problems in manners that they normally would not have (Azadegan & c. k. h. Riedel, 2012). Serious Games were used by companies a total of 256 times, with 39% being relevant to business (Azadegan & c. k. h. Riedel, 2012). The rest covered a broad variety of fields; gamification is used in such places as education, health, sustainable consumption, data gathering, and more (Hamari et al., 2014). However, only 23% of the Serious Games identified were implemented in a meaningful way in the workspace. Employees did suggest that in terms of learning, they would prefer to use a game-like model for learning over other models (Azadegan & c. k. h. Riedel, 2012). One of the most important ideas of gamification is the way it taps into behavioral studies of psychology, namely the relationship between motivational affordance, psychological outcomes, and behavioral outcomes. Looking at the idea of motivational affordance, there were ten categories defined

across studies, those being points, leaderboards, achievements/badges, levels, story/theme, clear goals, feedback, rewards, progress, and challenge (Hamari et al., 2014).

One framework to look at regarding gamification leverages this link between motivational affordance, psychological outcomes, and behavioral outcomes; however, the relation is changed to mechanics, dynamics, and emotions (Robson et al., 2015). Mechanics and dynamics are both principles of games and game design, so before delving into this framework it will be important to understand the difference between a playful experience and a gameful one. Gameful applications leverage the idea of games in particular, which are rule-bound and game-oriented (Deterding et al., 2011). This binding makes gamification useful, as it is inherently contained and thus can be applied to various factors. Contrast that with the idea of playfulness, which leverages the more abstract idea of play. Play specifically has the behavioral qualities of being free, open, and exploratory (Deterding et al., 2011). While this is useful for understanding the human mind, ultimately, this freeness makes it difficult to define attributes that would be useful for the purpose of engagement with a user. With that distinction made, we return to the discussion of mechanics, dynamics, and emotions.

Mechanics, Dynamics, And Emotions

Mechanics are defined as the rules, rewards, goals, and boundaries of the gamified experience. This property is rigid, meaning it does not change during the experience and is known beforehand to design gamification. There are three types of mechanics. Setup mechanics, which include information about the environment such as setting, necessary materials, and distribution of said materials. Rule mechanics define the goal of the experience, giving the user the permissible actions as well as the constraints. Finally, progression mechanics are instruments

provided to the user as the gamified experience is undertaken, such as rewards for desired behavior (Robson et al., 2015). Dynamics are related to the user and are defined by the behavior that emerges as players engage with the gamified experience. These are difficult to predict, but are generally defined as related to the mechanics of the experience rather than the user. As an example, team based mechanics will foster cooperative user dynamics, while individualism will lead to more competitive user dynamics (Robson et al., 2015). Emotions are defined by the mental state of the user that are evoked by the experience, with mechanics and dynamics working together to create an ideal experience engaging even on an emotional level. These emotions do not have to be positive, as negative reinforcement is a valuable tool that can be used to affect the user's behavior. Successful gamification results in the user repeating the desired outcomes by the designers of the application (Robson et al., 2015).

For the purposes of gamification, it is useful to come up with ways in which one can judge the quality of game design elements with regards to the task. A definition of good game design would be useful not only for the process of gamification, but for the creation of games as a whole (Browne & Maire, 2010). It is important to note that literature regarding game design elements implemented into non-game areas often stops early, merely looking at explicitly game related things such as badges, leaderboards, and avatars. Not only is this an unfair look at what makes the medium as a whole engaging, it also risks using the psychological underpinnings of games in an exploitative manner (Seaborn & Fels, 2015). One example of a system which looks at games is evolutionary game design, which focuses primarily on combinatorial games. Combinatorial games are defined as finite, discrete, and deterministic, with perfect information available (Browne & Maire, 2010). Though there is no concrete rubric with which a designer can measure the effectiveness of a game design decision, the idea of ludemes as a unit of game

information was solidified (Browne & Maire, 2010). To go further into what makes gamification work, it is necessary to understand the psychology behind the subject.

The Psychology of Gamification

A specific psychological benefit from gamified elements of an application comes from that of motivation. In terms of an individual, the feeling of competence and autonomy are both important and influence the motivation of users or players. Competence being the feeling users receive when their actions cause a desired effect and autonomy being that the decisions made to get to a desired result were self-determined (Mekler et al., 2017). When incorporating a socially gamified experience through means such as leaderboards, friend groups, or just general chatting, the feeling of relatedness is added as a factor, defined as feeling connected to someone else during the completion of a task (Aparicio et al., 2012). Successful gamification relies on understanding the designers' underlying objectives, and the selection of game mechanics that are employed (Aparicio et al., 2012). Some of the most popular mechanics used in gamification are points, badges, leaderboards, progression, status, levels, rewards, and roles (Seaborn & Fels, 2015). Though there is no exact measurement as specified earlier, one can view the effectiveness of their application by analyzing the fun and service quality (Aparicio et al., 2012).

Needs Satisfaction

Though competence and social relatedness have clear needs for satisfaction, autonomy has an extra dimension; it is broken down into two parts, decision freedom and task meaningfulness (Sailer et al., 2017). An experiment conducted by Michael Sailer, Jan Ulrich Hense, Sarah Katharina Mayr, and Heinz Mandl sought to understand how popular gamification techniques affected autonomy, competence, and social need satisfaction (Sailer et al., 2017).

There were two experimental conditions; the first were badges, leaderboards, and performance charts (henceforth called experimental condition one), while the second was avatars, a meaningful story, and teammates (henceforth called experimental condition two) (Sailer et al., 2017). The hypotheses formed tested the connection between the experimental conditions and competence needs satisfaction, autonomy needs satisfaction with regards to decision freedom, autonomy need satisfaction in regard to task meaningfulness, and social relatedness need satisfaction (Sailer et al., 2017). The results of this experiment pointed to experimental condition one satisfying competence need satisfaction, and autonomy need satisfaction regarding task meaningfulness, while experimental condition two accomplished social relatedness need satisfaction. Autonomy need satisfaction with regard to decision freedom was found to be satisfied by neither experimental condition (Sailer et al., 2017). Table 1 showcases these results.

Table 1: *Game Element Satisfied Needs*. This table showcases the relationship between the four types of motivational needs for the individual, as well as what experimental condition satisfied those needs. Experimental condition one consisted of badges, leaderboards, and performance charts, while experimental condition two consisted of avatars, meaningful story, and teammates (Sailer et al., 2017).

Needs Satisfaction Category	Experimental Condition(s) That Satisfied
Competence Need Satisfaction	Experimental Condition One
Social Relatedness Need Satisfaction	Experimental Condition Two
Autonomy Needs Satisfaction Regarding Decision Freedom	Neither Experimental Condition
Autonomy Needs Satisfaction Regarding Task Meaningfulness	Experimental Condition One

Motivation

There are two main types of motivation looked at when discussing gamification, those being intrinsic and extrinsic motivation. Extrinsic motivation is defined as motivation caused by

an exterior force such as money or peer pressure, while intrinsic motivation is defined as motivation due to enjoying and engaging with an activity (Mekler et al., 2017). The relationship between an extrinsic reward, (such money or a gift), and a persons intrinsic motivation relating back to the idea of autonomy and competence, namely whether they view the reward as informational or controlling (Mekler et al., 2017). The elements of leaderboards, points, badges, and many other game design elements can be categorized as motivators (Marache-Francisco & Brangier, 2013). There are still social and individual aspects to motivation, which are more related to the social relatedness need satisfaction described earlier. According to a study on how game elements impact motivation by Elisa D. Mekler, Florian Brühlmann, Alexandre N. Tuch, and Klaus Opwis, a task of annotating images showed the quality of the tags was not found to be different between the control group and the experimental group. The inclusion of gamified elements had a significant impact on the participation based on the needs satisfaction discussed in the previous paragraph (Mekler et al., 2017). However, for this experiment, gamification did not have a significant impact on intrinsic motivation. This is likely due to the fact that the elements did not specify what was a good performance (Mekler et al., 2017). Finally, it is time to delve into experiments of gamification performed in fields such as health and sustainability.

Implementations Of Gamification

The first instances of gamification came from business and management, with use being seen in corporations to both incentivize employees and customers to engage with platforms in a different way (Azadegan & c. k. h. Riedel, 2012). These instances of gamification will not be observed in this paper, rather, the focus will be on the use of gamification in the fields of sustainability and health. The benefits of user retention go beyond the corporate acquisition of

money, and can have a significant impact on users, getting them to pay closer attention to their health and energy usage.

Gamification In Energy Usage

A look into how gamification impacts energy usage first. On a smaller, individual level, energy usage can be difficult to keep track of or be incentivized to engage with without the use of external factors. During a research activity at the University of Hawai'i at Mānoa, Brewer, Lee, and Johnson were able to use a website with gamified elements to make students engage with the energy competition known as "The Kukui Cup" (Brewer et al., 2011). The benefits can be used to help the development of demand dispatch systems of energy. A demand dispatch system is defined by its dynamic nature; it is able to adjust loads on command, and take advantage of increasingly ubiquitous computing to cut down on energy consumption (Brooks et al., 2010). Such a system would either depend on the user to turn on energy loads as necessary, or utilize data about the user to determine when a load balance as required. While powerful in theory, by itself, it would be difficult for such a system to acquire the data necessary to make unobtrusive decisions. Gamification can be used as a form of encouragement for the user in order to collect this data, with a user interface to invoke connection with the user and a scoring system to allow the demand dispatch system to assess its own performance (Gnauk et al., 2012). Gnauk, Dannecker, and Hahmann found that, when the data collection elements of a demand dispatch system were gamified through their user interface using user scores, levels, and a leaderboard, the users ended up being more engaged with their dispatch demand systems. Social connection can also be used as a means of consumer exchange information with the energy providers (Gnauk et al., 2012).

Kinect, Virtual Reality, And Engagement

Gamification has its benefits when used in the realm of health and rehabilitation. Computer games are traditionally engaged with using a controller, though there have been instances where unorthodox control systems were implemented. An example of this is the now deprecated Microsoft Kinect, which used motion detection of user's bodies to play games. A full-body system like this has benefits in physical therapy, being used to assist in rehabilitation therapy (Lohse et al., 2013). Though this style of motion control has since fallen out of the public consciousness, the recent popularity of virtual reality (VR) systems shows promise. Researchers found that, when in VR, players of games found themselves in a more intense experience, resulting in increased satisfaction compared to those playing on a standard control system (Shelstad et al., 2017). Tracking is not absent from VR, with Facebook's Oculus Quest 2 featuring full hand tracking using a headset. Using this hand tracking makes actions such as grabbing and typing feel more realistic, leading users feel more present when compared to using a controller to interact with virtual space (Voigt-Antons et al., 2020). An area where gamification comes in use is in assisting the elderly. When participating in a series of calculations, both elderly individuals and young individuals experienced better flow, competence, and challenge while playing on the DS versus with pen and paper. Ultimately, the audiovisual components of gamified experiences had a positive effect on the elderly individuals, even though they had not grown up playing video games (Nacke et al., 2009).

Use For Health Monitoring

Another direct application of gamification is its uses in incentivizing healthy behavior, be it for medical or personal reasons. Looking at the fifty most popular free health and fitness apps,

64% of those applications used gamification in some capacity, with this number climbing to 100% for physical activity or weight loss apps (Cotton & Patel, 2018). The most popular gamified elements were goal setting and social influences at 78.1%, as well as challenges at 62.5%; points and levels were not frequently used. This shows that social needs are what end up being satisfied within these popular fitness apps, as opposed to competence or task meaningfulness (Sailer et al., 2017). Though this paper did not cover the behavioral economic side of gamification, focusing more on the behavioral psychological side, it is important to note that behavioral economic principles were never used in the gamification of these popular fitness apps (Cotton & Patel, 2018). Gamification can also improve the accountability of its users who have applications to keep track of health problems, such as young people with Type 1 Diabetes. By creating a points system that had an extrinsic reward attached to them, namely that of gift cards, patients are more encouraged to self-monitor their blood glucose levels even if these points are never redeemed (Cafazzo et al., 2012). Combined with an application that is fast, discrete, and designed around the lifestyle of the user, gamification makes self-management systems viable for younger patients, which can prove to be incredibly important to their long-term health (Cafazzo et al., 2012).

Discussion

Gamification as a field, though initially implemented as a form of user attention attraction for the purposes of business, showcases potential for improving interactivity within more important fields, ones that benefit individuals as much as it benefits profit margins. There is a clear benefit to the implementation of gamification, with both use cases of helping people live healthier lives and increasing motivation for energy use being important. Demand dispatch systems have the potential to reduce emission and consumption levels across nations, which has

become increasingly important given the rise of cryptocurrency. Extrinsic rewards were also useful to encourage adolescents to better track their blood glucose level, even though some members of the study did not end up capitalizing on their points.

Of the elements that were discussed in this paper, it is important to note which are sustainable for use in applications. As an example, conflict is central to making games interesting in their storytelling, but injecting conflict into an application will likely prevent users from wanting to engage or feel motivated. The elements that were noted in this paper were points, badges, leaderboards, progression, status, levels, rewards, role (Seaborn & Fels, 2015), story, avatars and teammates (Sailer et al., 2017). Though most of these elements work well enough without the user being connected to the internet or otherwise consuming data, there are a few, such as leaderboards, avatars, status, and story, that require greater consideration of internet-based connectivity in their implementation. Specifically, statuses, leaderboards, progression, and teammates rely heavily on internet connection. Though it would be possible to emulate online features with pre-created or automatically generated features, this would either take away from social relatedness needs satisfaction or make the user wary of whether the application is using more data than it claims to.

Though there is good to be found in the game design elements that have been used in gamification thus far, there is a danger in implementing every engagement idea generated by the medium. Loot boxes have been contentious in the medium in recent memory, as they use psychological principles as a means of motivation, they often end up being exploitative of users (Zendle et al., 2020). Loot boxes are defined as items that can be earned either through engagement with a game or purchased in a bundle with real world money. The contents of each loot box are often randomly generated (Zendle et al., 2020). Though Loot boxes provide another

form of motivation, there is a noticeable link between this concept and gambling, even if their implementation is nonintrusive (Zendle et al., 2020). Motivation is great, but this type of motivation can cause more harm than good.

Beyond simply integrated elements of game design, it is important to look to the future of hardware as a point of consideration. Currently, VR exists primarily in the computer game field, and augmented reality (AR) is a far cry from being implemented in everyday life. However, as large companies invest in these technologies, (such as Microsoft with its HoloLens technology), gamification should be a factor of this research to inform user interface and user experience developers of what works for users. Even now, applications like Pokémon Go create a noticeable increase in the movement and exercise cycles of people of all ages, regardless of how primitive the AR features of the game are (Althoff et al., 2016). There is already research pointing towards current hand tracking and motion tracking hardware (such as the Kinect) being useful for aiding in physical rehabilitation (Lohse et al., 2013).

Looking towards the future of gamification research, computer games are an ever-developing industry, constantly needing new innovations with its rate of development. As such, it is important to look at currently trending game elements meant to motivate players. Two major topics are immediately relevant: The battle pass system and the login bonus system. The battle pass system acts as a different form of subscription, with a paid tier and a free tier of rewards given to players as they progress. This system was popularized with the game Fortnite, but has been implemented in many live service games since. The login bonus system rewards players for simply opening the game. These rewards start small, but eventually grow more substantial as the login streak continues.

Conclusion

The research of gamification shows a clear use for game design elements in non-game contexts for the purpose of motivation. Not only is this motivation useful in business, it can also be used to implement systems that control energy consumption, as well as serve the health and medicine field. Currently, the same gamified elements pop up across a wide variety of applications, namely being points, leaderboards, levels, and social elements. There is still research to be done regarding game design elements such as login bonuses, and what impact such systems have on the motivation of players to continue engaging with games. As games continue to evolve into new forms of interactivity, gamification research must also advance to keep pace. Understanding motivation through gamification can ultimately help gather data for development in unrelated areas, as well as encourage and assist people with pre-existing conditions to better monitor and take care of themselves.

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