Targeting Gamification Applications to Increase User Participation

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ABSTRACT

As advances in Information Technology allow us to digitize everything around us, new applications arise. One of these is gamification: *the use of game design elements in non-game contexts*[7]. More and more (IT-)suppliers offer services to implement gamification in their customers' organizations [2]. What should be considered when starting such a project? What are critical success factors to get users involved? This paper is aimed at identifying ways to improve user involvement, specifically by targeting a target audience by its demographics. It aims to do so through literature research and interviews about completed projects. The goal of this research is to add an overview of not only the aforementioned success factors but also a view on if and how they are applied.

Keywords

Gamification, success factor, behaviour, game-based technologies, games, motivation, player types, change, involvement, playing, gaming.

1. INTRODUCTION

In [7] Deterding et al. describe gamification as *the use of game design elements in non-game contexts*, focusing on using computerized, competitive elements in a situation where the user does not choose to play a game, i.e., in a situation that is changed to contain a game and not specifically designed to be a game. Key in this definition are the concepts game, meaning that it has a competitive element, design elements, meaning it's not about a complete video game, but about small parts of a game experience, which is again stated by non-game contexts: it's not about playing a video game behind a screen: the key point is implementing it in the real world.
An excellent illustration is a project by Scania [25], aimed at fuel reduction. By monitoring, in real time, how truck drivers were handling their trucks and monitoring things like fuel consumption, Scania was able to award each driver points for a good driving style: on each of seven parameters a driver could obtain three points. By allowing drivers to compete against each other in getting the most points, Scania was able to use the drivers' pride and their wish to be acknowledged as the best driver to establish good driving behaviour and a permanent reduction in fuel consumption.
this example shows how elements from games (for example: the point system) use competition (getting the most points is an objective) are used in the real world (they are received if you drive a real truck the right way). Kapp [12] refers to an analysis of previous research done by Randel [23] that shows the effectiveness of using games or gamification in a learning environment with overwhelming results in favour of using game technology. For further clarification the diagram in Figure 1 based on work from [7] places gamification in a context. It shows the use of game elements versus playing a complete game and places that on a grid with the use of Game versus Play. In this context *play* is explained as behaviour that isn't governed by rules (e.g. a bunch of kids just kicking a ball around) whereas *game* is considered to be behaviour governed by rules (e.g. a football match).

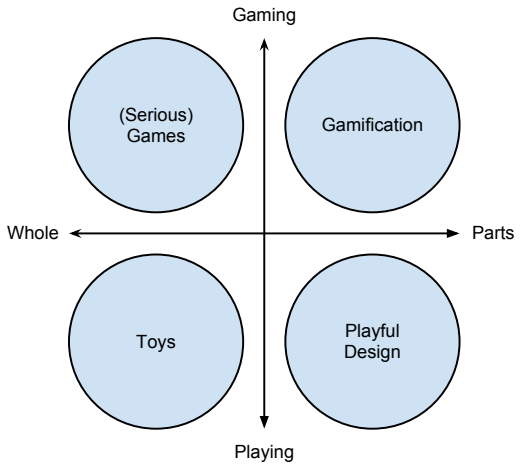

Figure 1. A matrix showing gamification using parts of games as opposed to using whole games or playing.

In the following sections, this paper will define a problem statement and propose research questions. It will then give the reader a context and an overview of related literature. It will then proceed to answer the research questions and finally mention future work.

1.1 Problem statement

In order to clarify the scope of the problem addressed in this paper one can look at a gamification project, reducing the scope until the problem statement remains.
As with all projects it is important that the benefits exceed the costs to make the project successful. It is there-

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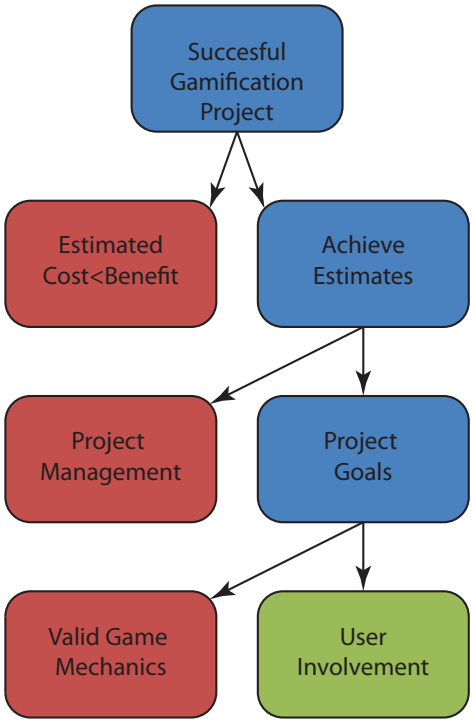

Figure 2. A tree showing the scope of this research within the wider field of gamification projects

fore important to calculate potential benefits and costs. It is also important to make sure that the project achieves these estimates. The latter can be divided in two steps again: doing things right (successful process management, making sure that the project is properly executed) and doing the right thing (getting the project goal right). The project goal can be devided into two parts again: doing the right thing first of all means making sure that the solution promotes good behaviour if people start using it and second: making sure that people use it.
While checking if the game mechanics properly stimulate good behaviour is an interesting topic [22] it is not specific to gamification: making sure that an incentive system doesn't promote the wrong behaviour is a topic that many industries cope with, the US financial sector is an example of what happens if you do it wrong: salesmen got rewards based on the mortgages the sold, while the system should also have rewarded low risk.
That finally leaves the subject of getting people involved with a gamified process. What are success factors in getting the right people interested in using the system and changing the way they do things? Is it the prospect of winning, of being the best? Is it completing something, like the Scania drivers could get three points on all parameters? Is it age dependant: does it work better for young adults than seniors? Maybe there are even things you can do before the product is finished: involving them in the development process for example. And then finally: are the theoretical success factors used in practice or do some prove to be infeasible when implemented in a real project?
The diagram in Figure 2 shows how the scope is narrowed down from making a gamification project successful to the aforementioned user involvement.

1.2 Research questions

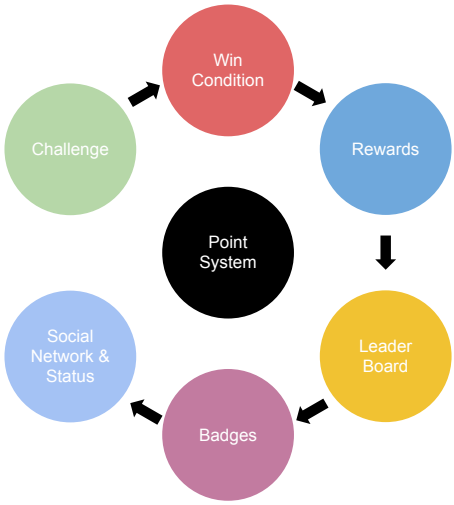

Figure 3. The gamification loop by [14], showing how players iterate over steps in games.

Following the problem statement, this research will focus on the question below:

> What are ways to target gamified applications for the intended audience to improve user participation in gamification projects and how are they used in practice?

Several questions have been formulated of which the answer leads to an answer to the main question:

1. Which ways to target gamified applications for the intended audience to improve user participation in gamification projects can be drawn from literature?
2. How are the techniques from question 1 used in practice?

2. RELATED WORK

In [7], Deterding et al. have proposed a definition of *gamification*, thereby clarifying what does and what doesn't qualify as a game, thus narrowing the scope down to reasonable proportions. They base themselves on the definition of a game from [6], that makes competition an essential element as opposed to playing without rules that govern scoring, thereby making competition impossible.
A quick glance at related literature shows that despite modern-day use of technology in gamification situations, the concept of using competition to change behaviour goes back to the early Soviet era [20] where both the US and the USSR employed competition to increase production.
Research into using computer games to make other environments more enjoyable goes back to research by Malone [16]. More recently, research like [14] has added to the knowledge about gamification, for example with the *Gamification Loop* of which a version is displayed in Figure 3. [14] also argues that:

> the desired game-like user behaviour requires comprehensive game-like experience that is supported by not only a "game structure" but also a "game-look" surface.

thereby showing the value that technology has in gamification. It is clear that gamification is a topic of interest

in the business world. In [2], Belsky makes a strong case of why. A short survey amongst IT-consulting firms and a paper by Deloitte [22] verifies his claim that *Consultants are on the case.*
From a scientific perspective, a theoretical framework has been proposed by Nicholson [21]. However, verification of whether any sophisticated models for technology-based gamification are actually used in practice are scarce although [22] gives some information.
At the same time, although scientific and professional momentum is present, gamification has its share of critics. Bogost [4] calls software that gamifies a situation *exploitationware* because it tries to exploit human desire to play games for an often economic purpose. Young et al. point out [30] that care should be taken that the solution matches the environmental: giving direct feedback on green driving performance may lead to more fuel consumption reduction but at the same time distracts drivers from other tasks they have: driving the vehicle safely. In [3], it is argued that one should not only consider the influence of a design on the behaviour while it is used but that one should always be aware of a persisting effect. Whether such a persisting effect leads to good or bad behavioural changes depends on the type of game used.

3. ANSWERING THE RESEARCH QUESTIONS

This section will elaborate on the process used to answer the three research questions. Furthermore it contains the answers found to the three questions.

3.1 Which ways to target gamified applications for the intended audience to improve user participation in gamification projects can be drawn from literature?

This section explains the method used to answer this subquestion and thereafter proceeds to explain the results obtained.

3.1.1 Research Method

The answer to this question comes from a literature review. In order to conduct a comprehensive review of available literature, one should use a structured method to find all available relevant literature. A useful method is offered by [26]. This method uses an iterative process to sharpen criteria and widen the search in order to make it nearly certain that one finds all and only relevant papers within a field. The search engines used to find literature for this paper, and assumed the default in later references to queries, are Scopus, Web of Knowledge and Google Scholar. An simple search starts with a query for papers with "gamification" in the title, abstract or keywords on major search engines.

3.1.2 Results

When looking for ways to get different groups of people engaged in a gamification solution, one finds that much research has already been done in the field of gaming. Creators of games have wondered what would get players involved their games since they started making them and have done significant research to find out. As shown in Figure 1, games share the competitiveness of gamified solutions and thus it is possible to look for competitive and engaging elements in games to apply these in gamification contexts.

An early paper describing how different types of game elements attract different types of players was written by Bartle[1]. While working on an early Multi User Dungeon (a text-based game where users could explore a world with multiple players in it) he developed a theory about different types of players, showing various types of behaviour. As a server administrator on a server with a multitude of different users he summarized the result of a lengthy discussion between several players on a messageboard about what they were looking for when they played a game. Although there were many standpoints on what people sought in playing MUDs, four major groups of players emerged. Each of those groups had a major goal in mind when playing the game, although each player had different preferences within that goal.
The four major goals were:

1. **Achievement within the game context**, Players who set goals within the game such as acquiring large quantities of treasure or beating hordes of monsters.
2. **Exploration of the game**, Players trying to see as much of the world as possible. This starts by seeing as much of the world as possible and evolves to trying what interactions are possible between the player and different parts of the world.
3. **Socialising with others**, Players using the game to communicate with other players, to play role plays with others, help others and otherwise interact with their fellow players.
4. **Imposition upon others** Players who use the game to try and beat other players in combat or to cause them distress in another way.

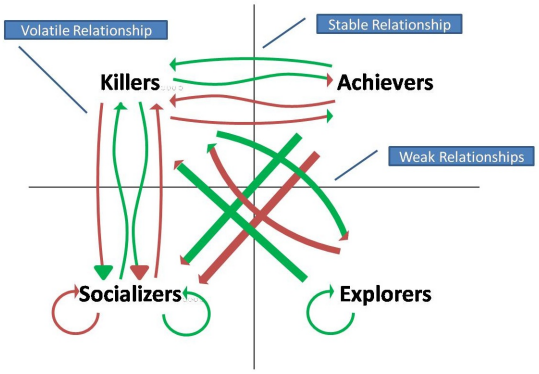

Figure 4. Bartle's player types with interactions added. Diagram by Hong [9].

He calls these players *Achievers*, *Explorers*, *Socialisers* and *Killers* and makes a comparison with a deck of cards:

> Achievers are Diamonds (they're always seeking treasure); explorers are Spades (they dig around for information); socialisers are Hearts (they empathise with other players); killers are Clubs (they hit people with them).

Bartle does not conduct any research on whether men and women have different playing styles and instead mentions only briefly that

> A cynic might suggest that the relationship between socialisers and achievers is similar to that between women and men...

Others, however have used Bartle's types as a basis for further research into types of gamers.
In an article by Yee [27], 3000 players were asked a to answer 40 questions related to their motivation. These questions used Bartle's types as a basis. The results yielded 10 major components that player considered important in they gaming experience:

- In the **Achievement** category: Advancement, Mechanics, Competition.
- In the **Social** category: Socializing, Relationships, Teamwork.
- in the **Immersion** category: Discovery, Role-Playing, Customization, Escapism

Male participant were shown to score significantly higher on all of the Achievement components, while female players score significantly higher on the Relationship Component. Yee also mentions a significant difference between genders when looking at the social area and hints that the component from the achievement category differs with the age of male users, however he neglects to specify what that difference is.
In [29], Yee et al use World of Warcraft as a way to test which game elements are most attractive to different parts of their test population. Via an on-line survey they recruited 1.037 players and gathered demographic data such as age, genders as well as their in-game character data.

They use World of Warcraft's Armoury system to track what players do in six categories:

1. **Quests**, the individual missions that the game developer has designed for the players.
2. **Exploration**, trying to systematically see the whole game world without being given a reward by the game.
3. **PvP**, "Player versus Player" combat, fighting other human players alone or in groups.
4. **Group** missions, time consuming missions where groups of players try to defeat a powerful monster for high rewards.
5. **Professions**, learning to make in-game goods, equipment and services.
6. **World Events**, thematic, seasonal events that provide rewards in the form of visible in-game items.

Furthermore, the researchers have tracked how much time participants spent playing the game (to be more precise: how often they were seen on-line during hourly checks).
The researchers then proceeded to use several regression analyses to find correlations between the players' demographic profile and playing styles. They conclude that young and/or male players have a tendency to engage in the competitive activities and that they enjoy rewards. Having children increases the interest in playing against others while being young and single increased interest in playing in groups (*raids*). Women and older players tend to prefer non-combat activities such as exploring the game.

In a third study by Yee [28], involving 6675 respondents, he draws several conclusions, among which are:

- Yong male players tend to use the game and other players to maximize their achievement.
- Hours of usage per week correlates with the relationship factor, which could either mean that being able to form relationships engages players, or that playing much causes players to start forming relationships.

While research into users of MMORPGs may give valuable pointers as to where one may look to discover how people become engaged in gamified situations, it is important to remember that knowledge from this field may not be transferable into gamification. For example, A.J. Kim proposes an alternative to Bartle's playing styles when dealing with less extensive games such as social games or gamified situations which she calls the "Social Engagement Verbs" [13] as displayed in 5. Hong [9] describes several types of player

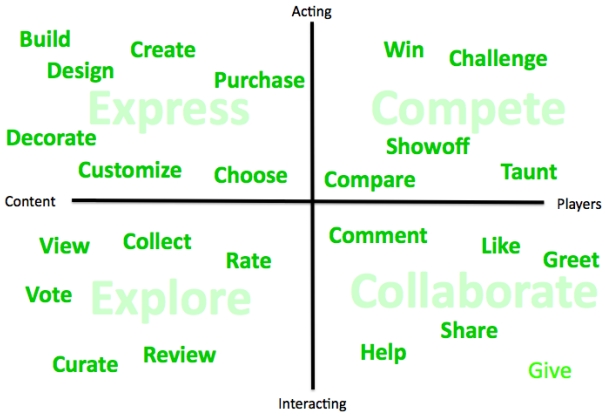

Figure 5. The Social Engagement Verbs by Kim [13]

populations that one may hope to achieve as only several combinations of the player populations work due to their interactions amongst each other. His diagram (Figure 4) describes the interactions between the players. He derives three situations:

1. Games oriented towards Achievers/Killers
2. Games oriented towards Socializers
3. Games oriented equally towards each group.

He proposes that any other situation is unlikely to ever stabilize and thus never obtain a large user base because interactions between the different groups would lead to one of the groups losing their motivation to play. For example: if a game is aimed towards Socializers and Killers and at some point the number of Killers surpasses the number of Socializers, the negative impact of Killers on Socializers (i.e. Socializers becoming annoyed because Killers interfere with their playing style) leads to a self-enforcing loop of Socializers leaving the game and the remaining Socializers becoming increasingly annoyed by the Killers who now have fewer targets.
When looking at three very successful games it becomes clear that they follow these guidelines quite closely:

1. Games oriented towards Achievers/Killers: First Person Shooters, aimed at obtaining a high score by killing others. The Call of Duty series is an example of a very successful franchise in this genre.

2. Games oriented towards Socializers: Farmville, where high scores are achieved by socializing with friend and having them interact with your character

3. Games oriented equally towards each group: As Yee shows, World of Warcraft allows all player types to coexist.

3.1.3 Conclusions

Based on the aforementioned literature a conclusion is that much of the research on what motivates people to play games is based around the player types as defined by Bartle or on variations on that. It also becomes clear that Bartle's remark

> A cynic might suggest that the relationship between socialisers and achievers is similar to that between women and men...

could leave out the cynic as research does indeed show that the lower half of the grid in Figure 4 contains roles preferred by women and that the upper half is preferred by men.
Bartle's types are however a coarse representation of reality and a more precise description of gameplay elements can be made and smaller elements can be shown to attract different players.
When designing a game, one should determine a target audience and a target set of player types. One may then choose what game elements should be included in the game to encourage the desired play styles. Although the player types and their links to genders as well as the research by Yee linking game elements to gender and age provide some rules on how to shape a gamification situation for it's intended audience, there seem to be large gaps in the research that has been done on other characteristics such as intelligence, social background and education.

3.2 How are the techniques from question 1 used in practice?

After reading the previous section one might wonder whether these techniques are used in practice and whether they have been proven to work. This section first explains the method used to answer the question stated above and thereafter proceeds to explain the findings.

3.2.1 Research Method

No studies into the use of the methods mentioned above have been conducted. Therefore, to answer this question, a series of case studies have been analysed to see whether they have used the characteristics of their target audience and the available targeting mechanisms to increase user participation.

3.2.2 Microsoft Visual Studio Achievements

Microsoft has introduced achievements and a leaderboard in its 2010 iteration of software development product Visual Studio [18]. Users can unlock various badges for using features of the IDE (Integrated Development Environment) and compete against each other in obtaining these badges through a leaderboard. Several of the badges are based on using Microsoft's new Azure platform and are an incentive to start developing for this service.
The focus in this project lies with the badges that can be collected an the leaderboard on which one may compare ones performance against others. When reviewing the literature from question one it turns out find that scoring badges and scoring high on a leaderboard matches the Achiever profile although finding out where all the badges are can also be categorized as exploring.
A look at the leaderboard shows that the users of the system are mostly males, which may lead to either the conclusion that Microsoft has correctly matched the male preference for the achiever profile to their target audience which are, by stereotype, male software developers or that the system was incorrectly developed and presented to a mixed population of which only the male part started to participate. No documentation about the development process was available at the time of writing.
Kim [13] points out that just using badges and a leaderboard is a pretty weak way of gamification, a statement that is further explained by Hong's analysis of which types of player mixtures work well: a game with just achievers isn't on the list of successful player mixtures. Again, looking look at the leaderboard [19] one can see that there are several groups of people with virtually the same scores: these are the people that have completed all challenges available to them (Different editions of Visual Studio have different amounts of badges. Only the most extensive version has all badges and costs over $11.000, leading to Visual Studio Achievements being called one of the most expensive games ever [5]) and there is one group that has only one badge which is given for installing enough extensions to Visual Studio, the Achievements Extension being one of them.
Both categories (the players who have finished and the players who haven't stared) are not to be called a success as neither is keen to keep playing. Possible improvements are:

- Allowing player to challenge each other in challenging each other, for example in writing the most efficient algorithm for solving a certain problem. This would trigger players with a *killer*-mentality and could enable companies to get their developers to create more efficient software.

- Allowing players to get badges or points for helping colleagues or other people, triggering players with the a *socializer*-profile, thereby also targeting a larger audience. An analysis of whether the target audience contains any socializers would be a prerequisite.

- Enlarging the current set of achievements to keep achievers playing instead of hitting a wall when all achievements are finished.

3.2.3 Nike+

Nike+ is a series of elements that can be used to measure ones sporting performance. It began with a sensor that could be placed in a shoe and now consists of a range of gadgets that allow sporters to measure and keep track of their performance[17][15]. The whole system revolves around an on-line system where sporting events are stored and statistics can be seen. The system converts every activity into 'Nike+Fuel', allowing players to compare between different sports. For example, a workout consisting of running a few miles can be compared to playing a basketball game, based on the estimated amount of energy used. The system also allows players to set their own goals and rewards them with achievements based on how those goals are attained. Players can post the start of their workouts on Facebook and hear, in real time, every *like* that their run gets.
As the previous sentence implies, the system is aimed primarily at achievers who are interested in accumulating Nike Fuel and the badges associated with it. The feature of posting to Facebook is an attempt at including more of

the player types, but overall the interaction with others is a bit lacking, leaving the killers and socializers wanting for more.

3.2.4 Zombies, Run!

If just comparing your performance to the performance of others isn't enough to get you running, you can always try using Zombies, Run! Zombies, Run (ZR) adds a gamification layer to running in a way that is different from Nike's Plus-concept. ZR is a smartphone-application that places the player in the role of a runner in a zombie-infested world. The player has to escape zombies while running between different locations (or in a circle) and gathering supplies for his home town which gradually grows as the player advances. While doing this the storyline unfolds and gives a background to the game that the runner plays. The player can connect his game with an on-line environment to track and share his progress via applications such as Twitter and Facebook. The game claims to have over 150,000 players.
Looking at the characteristics of the game, it is clear that the game is mainly focussed towards achievers. The achievers get to play missions, advance in the game, build their 'village' (as shown in Figure 6 and can show their status to others. The other player types are absent, which is strange as the target audience is practically everyone with a smartphone and is thus likely to also contain the other types.

Figure 6. Zombies, Run! screenshot showing the player's village and gathered items. Image by AndroidPolice.com

In order to match up with the equilibrium for reaching an audience that is as broad as possible, the game should be upgraded to support all player types. Some inspiration could be drawn from the game Zombie, Run! (without the s).

- In order to appeal to killers, introduce game types that allow competition, such as a run to an item both parties want over an approximately equal distance for both players. This allows one player to earn a reward by outperforming the other player.
- in order to appeal to socializers, introduce game types where players can cooperate by adding a bonus to items delivered to someone else instead of your own (or traded). A game like Farmville makes use of this mechanism, thus making it more rewarding to interact with others than to just try to play the game on your own.
- In order to appeal to explorers, allow the game to change your chosen route, thereby discovering new routes on every run.

Some of the elements described above could be achieved by using ZR's integration with the Run keeper system, although that does not equal a single fully equipped application.

3.2.5 Scania Fleet Consultancy

At Scania, a major heavy truck manufacturer from Sweden, customers started asking for help to decrease their fuel consumption. With fuel on the rise and consumption making up 40% of Heavy Goods Vehicle operation costs [8], saving on fuel consumption is not only the green thing to do but a key to keeping down costs as well. At the time, the most frequently used method was a Fuel Efficient Driving course, which managed to get fuel consumption down by 15% but didn't manage to keep that effect for more than three weeks. Another method was a more permanent one, but only managed to achieve a 4% reduction[11] by showing drivers numerical feedback after each trip.

Scania then decided to work with Logica and Zeeno to try and improve the stimulation of fuel efficient driving. After an couple of interview and psychological tests with truck drivers they decided to go with gamification. They developed a system that delivered feedback on the performance of the driver, but not just in a numeric way. The interviews with the truck drivers yielded several more effective methods to present them with information. The system divides trucks into categories, comparable in terms of vehicle, usage and driving patterns. This was done to prevent drivers on certain routes or trucks to benefit from something other than their own driving style. The drivers are rated in several categories:

- Acceleration: controlled acceleration is preferred to wasting fuel on speed.
- High RPM: Gearing at the right moment is preferred to wasting fuel in a low gear.
- Rolling out: Anticipating a stop and using the truck's inertia to save fuel is preferred to braking at the last minute
- Cruise Control: Driving with Cruise Control is preferred to driving without.
- Running stationary: Turning the engine of when standing still is preferred to leaving it running
- Braking: Rolling out is preferred to braking
- Hard Braking: Braking slowly is preferred to hard breaking, as hard braking may indicate an unsafe situation.

With the information gathered directly from on-board IT-systems the driver is presented with his performance after each trip. This is done in several ways:

- Statistics on the last trip, showing performance on a scale using letters A through F.

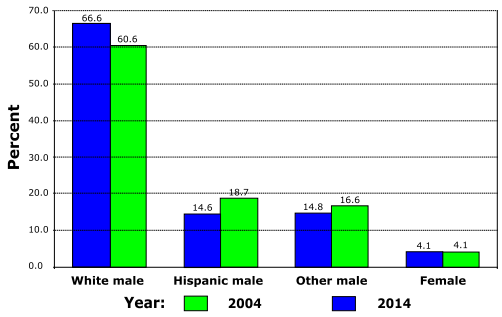

Figure 7. Demographics of the US truck drivers workforce. Public Domain.

- Statistics on the performance over time on a scale like above.
- Experience points on one of several categories mentioned above.
- Levels and badges for repeated performance. The highest level requires maintaining the highest performance.
- Duels between drivers to stimulate competing on specific performance indicators. Drivers are able to volunteer for participation in duels between themselves and other drivers.

One can clearly see game elements appealing to achievers and killers. The research into which elements to use is clearly identified in a report by Rompa [24]. A quick look at the population being targeted (see Figure 7) shows a largely male workforce in the logistics industry [10]. The match between the game elements suggested and those implemented could very well explain the success of this application which is currently being developed for wider marketing. In an interview, a Logica Consultant elaborated on the usage of the game, saying that there seemed to be a correlation between a truck driver's skill level and his participation in the game. Although the duel was designed in a way that only allowed voluntary participation, the general concept of being scored on something they weren't that good at repelled the drivers.
Another conclusion from the psychological analysis performed with the drivers was to keep the interface very simple to help truck drivers understand the game better. An example of such an interface is given in Figure 8

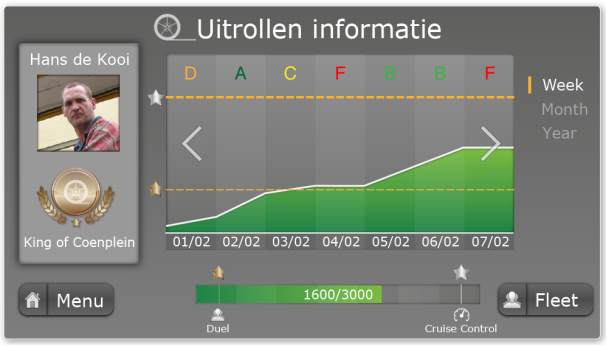

Figure 8. Screenshot from Scania's Fleet Consultancy Service

3.2.6 Conclusions

Several cases where gamification was used in an attempt to change behaviour have been analysed. These cases ranged from very bad implementations to very successful implementations. The first three cases seem to be developed without knowledge of the information present in literature. The first one especially suffers the consequences. The second and third application could be optimized, but are doing ok. The last system is developed with knowledge about gamer preferences and is very successful.
So finally, summarizing and answering the second research subquestion, the following can be said:

Although knowledge of the results of subquestion 1 is present in one of the cases reviewed in this paper, their use is not yet widespread. The one case that aimed specifically at involving their target audience has reaped the benefits of their work. Because the results found in subquestion 1 correspond with suspicions that many people have about gender roles influencing gaming preferences, two cases managed to score all right without explicit use of targeting. The case that didn't implement gamification very well saw their implementation reflected in the usage.

4. CONCLUSIONS & ANSWERING THE MAIN RESEARCH QUESTION

To find out how to better aim gamification projects at their users the following research question was posed:

> What are ways to target gamified applications for the intended audience to improve user participation in gamification projects and how are they used in practice?

A literature review revealed four player types and a gender-related preference for a player type in gamers. The literature review also brought to light large gaps in the existing body of knowledge.

An analysis of case studies then showed limited usage of these player types, sometimes leading to poor usage if users were insufficiently motivated. If used, methods for targeting a specific audience with the right game elements showed great potential.
In addition to the methods mentioned above, when the target audience is well known, interviews can help identify additional factors to take into account such as the complexity of the system.

5. FUTURE WORK

The future work proposed consists of two parts: expanding and distributing the knowledge.

First: there is much research to be done in further learning player preferences. Existing theories on motivation may be used to develop hypotheses to further elaborate on player preferences correlating with a variety of factors such as age, education and social background. Additional surveys such as the ones done by Yee can then be taken to find correlations.

Second: better distribution of current and new knowledge should lead to more practical applications such as the one seen at Scania. Together with a solid implementation of the gamification project, increased use of gameplay elements that suit the right players and other things in 2 can lead to a great deal of excellent gamification projects that can change the way we work, learn and relax.

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