

Gamifying a financial overview application

Exploring the effects of construal level theory of temporal distance

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Gamifying a financial overview application

EXPLORING THE INFLUENCE OF DIFFERENT GAMIFICATION LEVELS IN A FINANCIAL CONTEXT

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Executive Summary

People in the Netherlands are becoming more reliant on their own financial resources, as some government services declined or even disappeared during the last years. Therefore, people need to plan their finances in order to save enough for the future and for unexpected situations. However, to be able to plan, they need to have a complete overview of their current financial situation. At the moment, it is very difficult for people in the Netherlands to get a complete overview of their financial situation, as the information is stored at a lot of different places. In response, the foundation Financieel Paspoort has started to develop a financial overview application to provide people with a complete overview of all their finances. However, the acceptance of such a tool might be problematic as on average, people perceive financial services as complex and a lot of mobile applications are only used once.

Recently, researchers and practitioners started to apply gaming elements to non-game contexts. This has been referred to as gamification. By doing this, researchers and practitioners want to encourage desired outcomes, such as higher purchase intentions and better school performances. As the foundation Financieel Paspoort wants to increase the acceptance of their financial overview application 'Financieel Paspoort', this study researched what the effects are of applying gamification to the app. More specifically, the effects of three different levels of gamification on people's behavioural intention to use the financial overview application and on their perceptions with respect to ease of use, usefulness and enjoyment were studied. Furthermore, the influence of age has been investigated.

The foundation Financieel Paspoort developed three different versions of the app 'Financieel Paspoort' with three different levels of gamification. The first version of the app is not gamified. In this version, people can click on different buttons to see financial information. The second version of the app is gamified with badges. This application is the same as the application that is not gamified. However, in this version people can earn badges by clicking on specific buttons in the app, and a button 'Financieel Bewustzijn' is added in the menu. When clicking on the button 'Financieel Bewustzijn' people can read the task descriptions of the badges they can earn and see which badges they have already earned. The third version of the app is gamified with badges, a progress bar and levels. This app is the same as the app that is gamified with badges. However, in this version people can only earn the badges by performing the tasks in a particular sequence. Furthermore, the button 'Financieel Bewustzijn' also serves as a progress bar, which reflects the number of badges someone earned. The progress is also linked to predefined levels. Once a user has earned a specific amount of badges he or she reaches the next level. The level that a user has reached is stated below the progress bar. When clicking on the progress bar 'Financieel Bewustzijn', people can also see which badges they have to collect to reach a specific level.

An online panel in the Netherlands was used to test the effect of different levels of gamification. Panel members of 18 years and older with a Dutch social security number who own a smartphone or tablet were invited by email to participate in the study. The email contained a link to an online questionnaire. This questionnaire started with an introduction explaining the

purpose of the study, followed by an instruction of how to download the financial overview application. After participants had downloaded and opened the app, they had to fill in a code which opened one of the three versions of the app. There was a different code for each version. Participants randomly received one of the three codes. After testing their version of the app, participants had to return to the questionnaire and fill in the questions. To confirm that they actually downloaded and looked at the app, the questionnaire started with a verification question. This question asked which amount was mentioned under 'Income and Expenses' in the 'Financieel Paspoort' app. People who answered this question wrongly were excluded from the questionnaire. The total dataset that was used for this study consisted of 360 respondents.

The study indicated that, with respect to perceived ease of use, participants do not perceive the non-gamified financial overview application as significantly more or less easy to use than the apps that are gamified with either badges or badges, a progress bar and levels. However, when comparing the two gamified applications, the results indicated that people perceive the app that is gamified with badges as significantly easier to use than the app that is gamified with badges, a progress bar and levels. The effect was not different for people of different ages.

The results also showed that heterogeneity exists among participants with respect to their perceived enjoyment of the different gamified applications. The application that is gamified with badges is perceived as significantly less enjoyable than both the application that is not gamified and the application that is gamified with badges, a progress bar and levels, but only by people who are less inclined to plan their finances. The financial overview application that is not gamified and the application that is gamified with badges, a progress bar and levels are, with respect to perceived enjoyment, perceived similarly.

Furthermore, people who used a different version of the app did not differ from each other with respect to their perceived usefulness and behavioural intention to use the app. Hence, the different levels of gamification that were tested during this study do not have an influence on the perceived usefulness of the financial overview application and the behavioural intention to use it.

Overall, the study showed that people perceive the 'Financieel Paspoort' app as relatively easy to use. Participants also perceive the app as slightly useful and enjoyable. However, with respect to their intention to use the application, the results indicated that people are neutral. Participants are slightly concerned about the safety of their financial information when they would use the app. In addition, they are neutral about whether they perceive the financial overview application as a useful tool to share their financial information with an advisor.

The results also showed that older people have higher behavioural intentions to use the 'Financieel Paspoort' application. People's perception with respect to perceived ease of use does not have a direct effect on their behavioural intention to use the app. However, the easier people perceive the application to use, the more they perceive it as useful and enjoyable. In addition, the more enjoyable and/or useful people perceive the application to be, the higher their intentions are to use it. People's concerns about the safety of their financial information when using the app have a negative effect on their intention to use the application, whereas participants' perception about whether they perceive the application as a useful tool to share their information with an advisor does not influence their behavioural intention to use it. The

enjoyment perception showed to be the strongest predictor of behavioural intention, followed by the usefulness perception.

The results of the study suggest some managerial implications for the foundation Financieel Paspoort. The foundation should focus on improving the perceived enjoyment and perceived usefulness of their application, as these perceptions mainly influence people's intention to use the app. Participants indicated slightly positive perceptions with respect to usefulness and enjoyment. However, as these can still be improved, the foundation should implement additional content in the app that is useful and enjoyable. Furthermore, the study indicated that people are slightly concerned about the safety of their financial information when they would use the app. The foundation Financieel Paspoort should aim to lower these safety concerns, as these result in lower intentions to use the application. The usability of the app can also still be improved. However, this should not be the main focus as people already perceive the application as relatively easy to use. In addition, people's perceived ease of use does not have a direct effect on people's intention to use the application. The study also indicated that people's perception about whether they perceive the app as a useful tool to share their financial information with an advisor does not have an influence on their intention to use the app. Therefore, the value proposition of the application should not be focussed on this functionality when marketing the app. People will not base their decision to use the application on presence of this functionality.

With respect to perceived ease of use it does not matter whether the financial overview application will be gamified or not, as the application that is not gamified is not perceived as more or less easy to use than both gamified applications. However, as the development costs are higher for developing a gamified app, and it takes more time to develop such an app, no gaming elements should be implemented in the financial overview application. However, if for other reasons a gamified application will be developed, it is advisable with respect to perceived ease of use to gamify it with badges, as an application that is gamified with badges is perceived as easier to use than an application that is gamified with badges, a progress bar and levels.

The results also showed that people are heterogeneous with respect their enjoyment perceptions of different levels of gamification. People who are less inclined to plan their finances perceive the application that is gamified with badges as significantly less enjoyable than both the application that is not gamified and the application that is gamified with badges, a progress bar and levels. As also people who are less inclined to plan their finances belong to the target population of the foundation Financieel Paspoort, the app should, with respect to perceived enjoyment, not be gamified with badges but either with badges, a progress bar and levels or it should not be gamified.

As the foundation Financieel Paspoort aims increase the usage intention of the 'Financieel Paspoort' app, it is advisable not to gamify this application. This because gamification has no direct effect on people's behavioural intention to use the application. Furthermore, gamification has no positive effects on the constructs that positively influence the usage intention of the app, i.e. perceived ease of use, perceived usefulness and perceived enjoyment. Gamification in the form of badges even has a negative effect on perceived enjoyment for people who are less inclined to plan their finances. At last, developing a gamified application will cost more and takes more time. Hence, the 'Financieel Paspoort' app should not be gamified.

Abstract

Nowadays, researchers and practitioners apply gaming elements to non-game contexts. This has also been referred to as gamification. By doing this they want to encourage desired outcomes, such as higher purchase intentions and better school performances. However, there is a lack of understanding on how different levels of gamification influence financial planning behaviours. This study has examined whether different levels of gamification are able to influence the intention of people to use a financial overview application, and whether they influence this intention differently. Furthermore, the effects of different levels of gamification on the perceptions of people with respect to the ease of use, usefulness and enjoyment of a financial overview application are researched. The effect of age has also been investigated. An online panel in the Netherlands (n = 360) has been used to test the effect of different levels of gamification. Participants were randomly assigned to test a financial overview application that was not gamified, that was gamified with badges, or that was gamified with badges, a progress bar and levels. It was hypothesized that the effect of gamification on the intention of people to use a financial overview application is mediated by perceived ease of use, perceived usefulness and perceived enjoyment. The results showed no significant effect of different levels of gamification on perceived usefulness and behavioural intention. Furthermore, an application that was gamified with badges was not perceived as significantly more or less easy to use than a non-gamified application. Also an application that was gamified with badges, a progress bar and levels was not perceived as more or less easy to use than a non-gamified application. However, the two gamified applications were found to differ significantly from each other with respect to perceived ease of use. An application that was gamified with badges was perceived as easier to use than a financial overview application that was gamified with badges, a progress bar and levels. This study also revealed that heterogeneity exists with respect to gamification. People who are less inclined to plan their finances perceive a financial overview application that is gamified with badges as significantly less enjoyable than both a non-gamified financial overview application and a financial overview application that is gamified with badges, a progress bar and levels. In addition, this study showed that the intention to use a financial overview application is positively influenced by perceived usefulness, perceived enjoyment and age. The effect of perceived ease of use on behavioural intention is found to be fully mediated by perceived usefulness and perceived enjoyment. The findings of this study have relevant implications for the design of technologies that provide a financial overview.

Keywords: gamification, technology acceptance model, financial overview application, badges, progress bar, levels

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List of Abbreviations

AFM	Authority for the Financial Markets
BI	Behavioural intention
ENJ	Perceived enjoyment
ERP	Enterprise resource planning
FPLAN	Propensity to plan
GAME 1	The non-gamified financial overview application
GAME 2	The financial overview application gamified with badges
GAME 3	The financial overview application gamified with badges, a progress bar and levels
KMO	Kaiser-Meyer-Olkin measure
PAF	Principal axis factoring
PEU	Perceived ease of use
PU	Perceived usefulness
SDT	Self-determination theory
TAM	Technology acceptance model
TRA	Theory of reasoned action
VIF	Variance inflation factor

1. Introduction

Compared to a decade ago, people in the Netherlands are nowadays more reliant on their own financial resources when, for example, faced with unemployment or retirement. This is due to the decline or even disappearance of some government services (Ferber, 2008). People are, for example, confronted with declining accrual rates for their pension and a declining payment time of unemployment benefits (Rijksoverheid, n.d.; Rijksoverheid, n.d.). As people have to rely more on their own financial resources and have to make responsible choices, it is important for them to have insight into their personal financial situation (Prast, 2005). This is particularly important because they need to plan their finances in order to save enough for their pension and for other (unexpected) situations, such as becoming unemployed. Ameriks et al. (2003) showed that financial planning is positively related to wealth accumulation. However, to be able to make financial plans, people need to have an overview of their current financial situation, as their plans need to be based on this situation. At the moment, it is difficult for people in the Netherlands to get a complete overview of their current financial situation, as there is a lot of financial data available, and this data is stored at many different places. For example, people need to go to their bank or log in at the website of their bank to check their bank account. Their savings may be at another bank, so in that case they need to go to the other bank or log in at the website of the other bank to check their savings. To check their future pension, people need to log in at mijnpensioenoverzicht.nl. To check their mortgage, they need to log in at the website of their mortgage lender. A study conducted by Motivaction (2013) revealed that the enormous amount of financial information leads to a loss of overview, and that for some people finance leads to stress and anxiety. The study furthermore showed that people prefer one digital place for all their financial matters. People do not want to log in on the website of each service provider separately. In 2015, the Authority for the Financial Markets (AFM) conducted a research into pension communication. This research also diagnosed a need for one overview of

people's personal finance. Several communication tools have been developed to create more pension awareness, such as the *'Uniform Pensioenoverzicht'* and *'Mijnpensioenoverzicht.nl'* (Pensioenkiijker.nl, n.d.). These tools try to aim for more pension awareness by making pension-related information easily accessible. However, the AFM (2015) argues that these tools lack an overview of the 4th and 5th pillars. The AFM (2015) accordingly advises the development of an online tool that shows all relevant financial products in one overview in order to reduce the complexity for people to get insight in their financial situation.

In response, the foundation Financieel Paspoort has started to develop the financial overview application 'Financieel Paspoort' (<http://www.financieelpaspoort.nl>). This application provides people with one digital place for all their financial data, and thereby aims to make it more convenient for people to get a complete overview of their financial situation. All financial data of citizens, such as their income and expenses, property and debt and retirement income, will automatically be retrieved from different authorities and financial service providers and will be shown in the app. In this way, a person does not have to log in at each provider separately anymore to get an overview of his or her their financial situation. The application furthermore allows people to compare themselves to others, search for a consultant and to fill in financial goals (such as for example a particular pension income). Finally, the application allows people to calculate their specific options in their financial situation by determining, for example, the maximally achievable mortgage.

Financial services are perceived as complex by most (Balasubramnian & Brisker, 2016; Lusardi, 2008). This may be a potential barrier for the 'Financieel Paspoort' application to get adopted, as people are more likely to use products they regard as easy to use (Davis et al., 1989). Furthermore, O'Connell (2016) writes in her blog post that research showed that 23% of the mobile application users only use an app once. Therefore, it is important for the foundation

Financieel Paspoort to develop the financial overview application in such a way that people will be motivated to use it.

Recently, researchers and practitioners started to experiment with gamification as a motivational tool for tasks such as, among others, exercising and studying (Hamari & Koivisto, 2015; Hew et al. 2016). Gamification involves the use of gaming elements in other contexts than games (Deterding et al., 2011). Extant gamification literature shows positive effects of gamification on several outcomes, such as school performances, purchase intentions and enjoyment (e.g. Alcivar & Abad, 2016; Bittner & Schipper, 2014; Denny, 2013; Hew et al., 2016). The current studies all use different levels of gamification; some only use one gaming element to gamify a context, whereas others use several gaming elements. For example, Denny (2013) tested the effect of badges only, Hew et al. (2016) investigated the effects of points, badges and a leaderboard, and Alcivar & Abad (2016) examined the application of points, levels, achievements, missions, badges, avatars, a leaderboard, a progress bar and performance stars. However, there is a dearth of research which investigates whether different levels of gamification have different effects on a certain outcome. The effects of different levels of gamification on the intention to use a particular technology, or more specifically a financial overview application, have not been studied thus far. Davis (1993) has shown that system design features can influence the acceptance of new technologies. Gaming elements can be used as design features for a financial overview application. If gamification can positively influence the acceptance of such an application, it will be a valuable tool to increase the usage. However, this needs to be investigated. Furthermore, the technology acceptance literature revealed that, among others, the perceived enjoyment of a technology can influence people's intention to use it (Davis et al., 1992). It has been argued that gamification is a manner to make other contexts than games more enjoyable (Hamari, in press). Hence, gamification might influence people's intention to use a technology indirectly through perceived enjoyment. However, empirical

evidence of the effect that gamification has on the perceived enjoyment of a technology, or more specifically a financial overview application, is still scarce. Until now, only Alcivar & Abad (2016) empirically investigated this effect in a work context and found that a gamified enterprise resource planning's (ERP) training application is perceived as more enjoyable than a non-gamified one. Furthermore, as Alcivar & Abad (2016) used a lot of gaming elements to gamify the application, it is unclear how many gaming elements need to be present to have a significant effect on the perceived enjoyment. Hence, additional research is needed here.

To address the aforementioned research gaps, this study will address the following research question:

To what extent should gamification elements be included in a financial overview application to have a positive effect on the perceived enjoyment and the usage intention of the application?

From a theoretical viewpoint, this thesis contributes to the existing literature by extending the technology acceptance model with a new system design feature, gamification. More specifically, this thesis investigates the effects of different levels of gamification on the perceived ease of use, perceived usefulness, perceived enjoyment and usage intention of a financial overview application. This enables to test whether higher levels of gamification have stronger effects on these constructs than lower levels of gamification. Specifically, the effects of no gamification, gamification in the form of badges and gamification in the form of badges, a progress bar and levels applied to a financial overview application are examined. To investigate the effects of gamification in the form of badges, the financial overview application is gamified by rewarding users with badges for performing specific actions within the application. To investigate the effects of gamification in the form of badges, a progress bar and levels, the application is gamified with these gaming elements. Here, the badges are rewarded to users after performing a specific action within the application. However, the badges are only

rewarded to users when they perform the actions in a particular sequence. The progress bar indicates how many badges the user has already earned. Furthermore, the progress of the users is linked to predefined levels. This means that once a user has earned a specific amount of badges he or she reaches the next level.

The remainder of this paper is organized as follows: first, an overview of the extant gamification literature is provided and the technology acceptance model is discussed. Subsequently, the hypotheses are formulated and the resulting research model is presented. The fourth chapter elaborates on the research methodology. The fifth chapter provides the results of the data analysis. Next, the findings are discussed. The final section elaborates on the theoretical and managerial implications, discusses the limitations of the study, and provides suggestions for further research.

2. Literature Review

2.1 The gamification construct

It has been shown that games are successful in engaging people (Entertainment software association, 2016). A game is ‘a system in which players engage in an artificial conflict, defined by rules, that result in a quantifiable outcome’ (Salen & Zimmerman, 2004, p. 96). Due to the success of games, several practitioners, such as Nike for example, attempted to transfer its potential to other, non-gaming, contexts (Seaborn & Fels, 2015). Nike has introduced a service, NikeFuel, which enables Nike+ users to track their sports performances and compare them to those of others (Nike, n.d.). In addition, users can obtain different statuses and receive badges reflecting their performances. In this way, Nike integrated gaming elements in exercising. Using gaming elements in other contexts than games, has been referred to as gamification (Blohm & Leimeister, 2013). Different conceptualizations of gamification have been proposed. Deterding et al. (2011, p.2) define gamification as ‘the use of game design elements in non-game contexts’. This definition is used most often. In line with this definition, Werbach & Hunter (2012, p. 26) define gamification as ‘the use of game elements and game design techniques in non-game contexts’. According to Huotari & Hamari (2012, p.19) ‘gamification refers to: a process of enhancing a service with affordances for gameful experiences in order to support users’ overall value creation’. Those three definitions are all process definitions; they describe the method to apply gamification. However, the definition of Huotari & Hamari (2012) has been conceptualized in line with the service marketing perspective and focusses also on creating experiences. By doing so, Huotari & Hamari (2012) presuppose an outcome of gamification, in contrast to Deterding et al. (2011) and Werbach & Hunter (2012), as they argue that gamification should lead to the provision of gameful experiences in order to support the overall value creation of the users. However, Huotari & Hamari (2012) do not further explain what these gameful experiences are. Deterding et al. (2011) argue that gamification is mostly

being applied to improve the user experience. However, they do not limit their definition to this outcome because other beneficial outcomes may also result from gamification. Taking this into account, this study will adopt the definition of Deterding et al. (2011, p.2): ‘gamification is the use of game design elements in non-game contexts’.

Gamification can be distinguished from games, as games consist of nothing but gaming elements, whereas contexts that are gamified only partly consist of gaming elements (Alcivar & Abad, 2016; Deterding et al., 2011; Muntean, 2011). In the same manner, gamification also distinguishes itself from another relational concept, called serious games. Serious games are complete games which are being played in a full game environment and which are being developed for non-entertainment purposes such as training users or conveying a message to them (Darejeh & Salim, 2016; Werbach & Hunter 2012). Another way in which gamification can be distinguished from games is its purpose. The main purpose of gamification is a serious purpose, whereas the main purpose of games is creating a fun experience (Darejeh & Salim, 2016).

2.1.1 Gaming elements

Gamified contexts thus consist partly of gaming elements. These elements are specific characteristics of games (Deterding et al., 2011). The game design elements that can be used to gamify a non-game context are divided in three categories, namely game dynamics, game mechanics and game components (Blohm & Leimeister, 2013; Werbach & Hunter, 2012). The most important game design elements that can be used for gamification are shown in Table 1. Badges, points and leaderboards have been used most often to gamify contexts (Hamari et al., 2014). Hamari (2013) even states that badges have been used so frequently to gamify a context, that gamification has also been referred to as badgification. Badges are visual representations of achievements and are rewarded to users for completing predefined tasks. Points are

numerical representations that can be accumulated when performing predefined actions. Leaderboards are overviews that show the progression of players and their achievements compared to other players (Denny, 2013; Werbach & Hunter, 2012).

Table 1 *Most important game design elements for gamification (Werbach & Hunter, 2012)*

Dynamics	Mechanics	Components
Constraints	Challenges	Achievements
Emotions	Chance	Avatars
Narrative	Competition	Badges
Progression	Cooperation	Boss fights
Relationships	Feedback	Collections
	Resource acquisition	Combat
	Rewards	Content unlocking
	Transactions	Gifting
	Turns	Leaderboards
	Win states	Levels
		Points
		Quests
		Social graphs
		Teams
		Virtual goods

The elements that can be used to gamify a context show that gamification is not a totally new concept, as loyalty programs, for example, have been used by companies for years. A loyalty program offers customers a free reward once they have made several repeated purchases with a firm (Liu, 2007). For example, Starbucks offers its customers a free coffee, when they have made ten repeated purchases (Werbach & Hunter, 2012). In this way, customers receive a reward, which is one of the gaming elements. The process of buying coffee therefore becomes gamified. However, the author classifies loyalty programs as a specific form of gamification because they have the specific aim of creating loyal customers (Bojei et al., 2013), whereas gamification aims to invoke beneficial outcomes in general (Deterding et al., 2011).

2.2 Effects of gamification

A review of the extant literature revealed that gamification influences both behavioural and psychological outcomes. As a lot of contexts already have been gamified, research into

gamification has been conducted in several domains (Hamari et al., 2014; Seaborn & Fels, 2015). The outcomes of gamification in these domains will be discussed now.

Research into gamification has been mostly conducted in educational contexts (Hamari et al., 2014). Domínguez et al. (2013) tested the effects of gamifying an e-learning platform. Students were randomly assigned to use a gamified or non-gamified e-learning platform. Results showed that students who used the gamified e-learning platform performed significantly better in the practical assignments and had higher overall scores than the control group. However, it was also found that these students had lower scores in the written assignments. Similarly, de-Marcos et al. (2016) found that implementing gamification in an information technology course has a positive influence on practical skills of the participants, but no effect on their examination scores in which the knowledge acquisition is being assessed. Research conducted by Hanus & Fox (2015) only showed negative effects of gamification. The researchers gamified a course by implementing badges and a leaderboard. Students who followed the course with gaming elements implemented were less motivated, less satisfied and obtained lower scores than the students who followed the same non-gamified course. In contrast, Hew et al. (2016) found that the use of points, badges and a leaderboard in a course has a positive effect on the quantity of difficult tasks performed and on the performance quality. Participants also indicated that they enjoyed the gamified course. Attali & Arieli-Attali (2014) showed a positive effect of rewarding points in a mathematics assessment, in which participants were assessed on their accuracy and speed of responses. Participants in the points condition responded faster without a loss in accuracy. Denny (2013) found positive effects when using badges in an application where students had to create and answer questions. Students in the gamified condition used the application on more days and answered more questions.

Gamification has also been applied and researched in other contexts than education. Hamari (2013) investigated the effects of implementing badges in an online trading service. The author

found that people who actively monitored the badges obtained by themselves and others, used the trading service significantly more actively than people who did not do this. Farzan (2008) found a positive effect of rewarding points to participants of a social networking website, i.e. participants in the points condition generated more content on the website. In a similar vein, research revealed that removing points from a social networking service leads to a reduction in the contribution of content (Thom et al., 2012). Alcivar & Abad (2016) found that in a work context, participants performed better in an ERP training when they used a gamified system than when they used a non-gamified system. The researchers furthermore found that the gamified ERP training system was perceived as significantly more enjoyable. In a commercial context, Bittner & Schipper (2014) researched the effects of a gamified advertisement slogan on the purchase intention for the advertised product. Participants who were exposed to an advertisement with a slogan that emphasized gaming elements, compared to one that did not, reported higher purchase intentions for the advertised product. Hamari & Koivisto (2015) investigated the effects of gamification on exercising. The authors gamified an exercising service by implementing points, levels and achievements that were rewarded to people after performing some specific exercises. The service furthermore allowed people to 'like' and comment on updates of points, achievements and levels obtained by other users. The results showed that positive recognition and social influence positively influence people's willingness to exercise and to use the exercising service (Hamari & Koivisto, 2015). Hence, gamification is also a way to manifest social influence.

Concluding, extant research shows that gamification can be very effective in influencing several variables, such as performance, usage time, enjoyment, effort and purchase intentions in different contexts (Alcivar & Abad, 2016; Attali & Arieli-Attali, 2014; Bittner & Schipper, 2014; de-Marcos et al., 2016; Denny, 2013; Dominguez et al., 2013; Farzan, 2008; Hamari, 2013; Hamari & Koivisto, 2015; Hew et al., 2016; Thom et al., 2012). However, also negative

effects on several variables, such as performance, satisfaction and motivation were found (Domínguez et al., 2013; Hanus & Fox, 2015). Hence, care should be taken when gamifying a context, because the outcomes show to be context dependent.

2.2.1 Gamification and demographic differences

A few scholars investigated the effects of demographics on the effects of gamification. Koivisto & Hamari (2014) investigated the effects of using a gamified exercising application, in which users can ‘like’ and comment on the results of others, on perceived benefits. It was found that females perceive social benefits, such as receiving recognition, as more positive than males do. Furthermore, females indicated higher intentions to continue exercising. However, as there was no non-gamified control group in this study to compare the effects, it is difficult to conclude whether these effects were caused by the gaming elements. Denny (2013), who tested the effect of badges in an educational context, did not find a difference on outcomes between males and females. Bittner & Schipper (2014) revealed that the positive effect of a gamified advertisement slogan on the purchase intention for the advertised product diminished when age increased. This suggests that gamified advertisements should be targeted only to younger customers.

2.3 Theoretical foundations underlying gamification

As gamification is still a relatively new academic topic, there are very few researches that tried to identify theoretical frameworks underlying the effects of gamification (Hamari et al., 2014). There are a few theories that have been suggested as underlying theories of gamification, but most of them have not been empirically tested (Seaborn & Fels, 2015). Nevertheless, an overview of the theories discussed in extant gamification literature will be given here.

One theory that has been discussed is the goal-setting theory. This theory posits that goals act as a motivator for performance and that harder goals lead to better task performances (Locke &

Latham, 1990). Hamari (in press) tested the effects of using badges in a utilitarian peer-to-peer trading system. Participants in the gamified condition posted more trade proposals, commented more on them, and carried out more transactions than participants in the control group. Furthermore, participants in the gamified condition viewed significantly more pages within the system. Hamari (in press) argued that the badges provide clear goals for the participants, and that these might have stimulated the increased activity. Landers et al. (in press) researched whether goal-theory can explain the effects of gamification. They gamified a classic brainstorming task by using a leaderboard. Participants were randomly assigned to the gamified brainstorming task or to the same, but non-gamified, brainstorming task with either a do-your-best, easy, difficult or impossible goal. The performances of the participants were measured. It was found that the participants who were assigned to the gamified brainstorming task performed similar to people that were assigned to difficult and impossible goals and that these participants performed better than participants in the do-your-best and easy goal group. This suggests that when participants are exposed to a leaderboard, they implicitly set their goals at the top of it. The success of gamification, when using a leaderboard, can thus be explained by the goal-setting theory (Landers et al., in press).

The theory of social comparison processes has also been suggested to explain the effects of gamification. This theory argues that in absence of objective, non-social means, people compare themselves with others, whose behaviour then serves as a benchmark (Festinger, 1954). In the research of Hamari (in press), people in the gamified condition were able to view the badges earned by others. As objective non-social means were lacking and a significant effect on performance was found, Hamari (in press) argued that the theory of social comparison processes offers a possible explanation for the effect on performance.

The self-determination theory (SDT) has also been reported as a foundation underlying gamification (Blohm & Leimeister, 2012; Kuo & Chang, 2016; Seaborn & Fels, 2015). This

theory distinguishes between intrinsic and extrinsic motivation, and argues that motivation has the power to move people to act (Ryan & Deci, 2000; Deci & Ryan, 2008). Performing a particular behaviour to attain a specific separable outcome has been referred to as extrinsic motivation (Ryan & Deci, 2000). Intrinsic motivation, in contrast, refers to performing a specific behaviour because the activity is enjoyable or inherently interesting (Kuo & Chuang, 2016). The SDT argues that people have three innate needs (autonomy, competence and relatedness) that are able to enhance intrinsic motivation once they are satisfied (Ryan & Deci, 2000). Activities that promote the ability to fulfil one or more of these needs will thus be more intrinsically motivating (Werbach & Hunter, 2012). It has been shown that gamification can move people to act and motivate them (e.g. Hew et al., 2016). However, whether gamification is intrinsically or extrinsically motivating, depends on the fulfilment of the human needs. When people perform a specific behaviour in a gamified context to attain one of the gaming elements, such as for example points, they will be extrinsically motivated. However, gaming elements can also be markers of competence or respond to the needs of autonomy and relatedness (Werbach & Hunter, 2012). Rewarding users with a badge after completing a specific task or performing a specific behaviour, for example, may signify them of their competence. In this manner the gamification will enhance the intrinsic motivation.

2.4 The technology acceptance model

This study investigates whether different levels of gamification influence the intention of people to use a new technology, or more specifically a financial overview application, differently. Therefore, the technology acceptance model (TAM), which explains the acceptance of new technologies, will be discussed now.

The TAM, which was introduced first by Davis (1986), is a widely accepted model to predict, explain and understand why people use information technologies. It is based on the theory of

reasoned action (TRA) (Fishbein & Azjen, 1975) which posits that a person's intention to perform a particular behaviour is driven by attitude and subjective norms. The behavioural intention in turn determines a person's actual behaviour. Whereas the TRA is used to explain actual behaviour in general, the TAM is tailored for understanding the actual usage of information technologies (Davis, 1989; Davis et al., 1989). Instead of subjective norm and attitude, Davis (1989) posits that the actual usage of an information technology is determined by people's perceived ease of use and perceived usefulness. This relationship is mediated by the intention to use the technology (Davis et al., 1989). Perceived ease of use refers to 'the degree to which a person believes that using a particular system would be free of effort' (Davis, 1989, p. 320). Perceived usefulness is defined as 'the degree to which a person believes that using a particular system would enhance his or her ... performance' (Davis, 1989, p.320). When testing the relationships of the TAM for the acceptance of computer systems in an organization, it was found that perceived usefulness has the strongest influence on people's intention to use a computer, followed by perceived ease of use (Davis, 1989; Davis et al. 1989).

2.4.1 Extensions of the technology acceptance model

There are many researchers who proposed extensions of the original TAM (Yousafzai et al., 2008). Venkatesh & Davis (2000) extended the TAM by determining the determinants of perceived usefulness. They called this model TAM2 and found that cognitive instrumental processes (job relevance, output quality, result demonstrability and perceived ease of use) and social influence processes (subjective norm, voluntariness and image) have a significant influence on perceived usefulness. In related work, Venkatesh (2000) identified determinants of perceived ease of use. General beliefs about technologies and technology systems (anchors) were found to influence the perceived ease of use. Also beliefs shaped during the direct experience with a technology (adjustments), perceived enjoyment and objective usability, were

found to influence the perceived ease of use. The determinants of perceived ease of use and perceived usefulness as found by Venkatesh (2000) and Venkatesh & Davis (2000) have been integrated in one model by Venkatesh & Bala (2008), called TAM3.

Contrary to Venkatesh (2000), who included perceived enjoyment only as a determinant of perceived ease of use, several other authors extended the TAM by including perceived enjoyment as a direct determinant of the intention to use a technology as well as the actual usage. When explaining the acceptance and usage of websites, van der Heijden (2003) found that perceived enjoyment has a significant positive effect on the intention to use websites. Also Liao et al. (2008) found that in the context of multimedia on demand, perceived enjoyment has a direct effect on usage intentions. Igarria (1996) found that perceived enjoyment has a significant influence on usage of microcomputers.

2.4.2 The technology acceptance model and gamified applications

Hamari & Koivisto (2015) used the technology acceptance model to explain why people use gamified applications. The authors gamified an online exercising service and found that perceived ease of use, perceived usefulness and perceived enjoyment influence the intention to use the gamified exercising application. Rodrigues et al. (2016) researched the factors that influence the acceptance of a gamified mutual fund application. In line with Hamari & Koivisto (2015), the authors also found that perceived ease of use, perceived usefulness and perceived enjoyment significantly explain the intention to use the gamified application. Perceived ease of use, perceived usefulness and perceived enjoyment are thus relevant variables to consider when investigating the adoption of gamified applications.

3. Hypotheses

Gamification can be applied by using several different gaming elements in a non-game context. During this research, the effects of applying three different levels of gamification elements in a financial overview application were tested. The first version of the financial overview application is not gamified, the second version is gamified by using badges and the third version is gamified by using badges, a progress bar and levels. The hypotheses about gamification are therefore tailored towards these gaming elements.

3.1 Gamification and perceived enjoyment

Products and services can be divided into utilitarian and hedonic categories. Utilitarian products or services are primarily functional, effective, practical, helpful and necessary (Voss et al., 2003). Gamification can be applied to such utilitarian products or services. However, video games, on which gamification is based, have been categorized as primarily hedonic. Hedonic products or services are primarily enjoyable, delightful, thrilling, exiting and fun (Voss et al., 2003). As gamification involves the application of gaming elements to non-gaming contexts, such as a utilitarian context, it has been argued that it is an attempt to make primarily utilitarian services more hedonic (Hamari, 2013). Koivisto & Hamari (2014) argue that, due to its hedonic nature, gamification is being used to make non-gaming contexts more enjoyable. Denny (2013) showed that in a gamified educational context, participants enjoyed to earn badges. Participants of an ERP training indicated that they perceive a system that was gamified by using performance stars, avatars, badges, a leaderboard, missions, achievements, points, levels and a progress bar as significantly more enjoyable than a system without those elements (Alcivar & Abad, 2016). As an application that provides a financial overview is a primarily utilitarian service, it can be argued that implementing badges to this service is an attempt to make the service more hedonic. As hedonic products are products that are primarily enjoyable and fun,

it is expected that a financial overview application, gamified by using badges, will be perceived as more enjoyable than a non-gamified financial overview application. The addition of a progress bar and levels as further gaming elements in a financial overview application will render the utilitarian service even more hedonic than badges alone, as more hedonic components will be included in the utilitarian service. Therefore, the following hypotheses are derived:

H1a: Gamification, in the form of badges, has a positive effect on the perceived enjoyment of a financial overview application.

H1b: A financial overview application gamified with badges, a progress bar and levels, will be perceived as more enjoyable than a financial overview application gamified with badges only or a non-gamified financial overview application.

3.2 Gamification and perceived ease of use

The major goal of a financial overview application is to provide people with one complete overview of all their personal finance. However, to get a complete overview, people have to view and use all the functions of such an application.

Implementing badges in an app is one form of applying gamification. Badges are visual representations of achievements (Werbach & Hunter, 2012) and can be earned by users by performing particular tasks. In order to teach users what is required to earn a particular badge, every badge needs to have a description of the task that needs to be completed (Hamari & Eranti, 2011). By providing a task description, badges thus represent goals that need to be accomplished by the users. Developers of applications can relate such goals to the behaviour they want to stimulate (Werbach & Hunter, 2012), turning badges into a guidance mechanism. The badges and their descriptions can explain the users what is expected of them and how a

service should be used, which makes it easier for them to use the service (Hamari, 2013). Accordingly, it is expected that the implementation of badges in a financial overview application will make the application easier to use, as the badge descriptions will provide the users with an explanation of how to use the app. A progress bar and levels do not provide additional information to users of how to use a particular technology. Therefore, no stronger positive effect of gamification on perceived ease of use is expected, when including these gaming elements in addition to badges. Hence, the following hypotheses are formulated:

H2a: Gamification, in the form of badges, has a positive effect on the perceived ease of use of a financial overview application.

H2b: Gamification, in the form of badges, a progress bar and levels, has a positive effect on the perceived ease of use of a financial overview application.

H2c: The perceived ease of use of a financial overview application that is gamified with badges will be equal to the perceived ease of use of a financial overview application that is gamified with badges, a progress bar and levels.

3.3 Gamification, perceived ease of use and age

Elderly people have lower cognitive capabilities than younger adults (Rushton & Ankney, 1996). Hence, elderly people may find it more difficult to learn to use new technologies. Extant literature indicates that age is negatively associated with perceived ease of use of technologies (e.g. Arning & Ziefle, 2007). Porter & Donthu (2006) found for example that age has a negative effect on the perceived ease of use of the internet. Accordingly, it is expected that age will negatively influence the perceived ease of use of a financial overview application.

H3: Age has a negative influence on the perceived ease of use of a financial overview application.

Research furthermore pointed out that elderly people have a lower self-efficacy in the use of technologies (Czaja et al., 2006). Self-efficacy is a person's judgement of his or her capabilities to perform a particular task (Yi & Hwang, 2003). Since gamification elements, such as badges, can function as guidance mechanisms, it is expected that these can enable older people to perform tasks they think they are otherwise less capable of. Gaming elements implemented in a technology can explain people, for example, how to use that technology. As older people thus also find it more difficult to use new technologies (Arning & Ziefle, 2007; Porter & Donthu, 2006), the implementation of gaming elements in these technologies will thus enable these people to use them. Accordingly, it is expected that gamification can make a financial overview application, which is also a new technology, easier to use for older people. Since younger people, in contrast, already perceive less difficulties in using new technologies, (Arning & Ziefle, 2007; Porter & Donthu, 2006), it is expected that:

H4a: The positive effect of gamification, in the form of badges, on perceived ease of use will be stronger for elderly people.

H4b: The positive effect of gamification, in the form of badges, a progress bar and levels, on perceived ease of use will be stronger for elderly people.

3.4 Gamification and perceived usefulness

A financial overview application aims to make people more aware of their financial situation. Therefore, it needs to provide all relevant financial data to people to make them aware of their financial situation and thus to be perceived as useful. By applying gamification to a financial overview application, people will be rewarded for looking at particular financial information in the application. However, no additional utilitarian features will be added by applying gamification. Therefore, no effect of gamification on perceived usefulness is expected.

3.5 Perceived usefulness, perceived ease of use and intention to use

As discussed in the literature review, perceived usefulness is one of the determinants of usage intention in the original TAM (Davis, 1989). Many other prior studies also found a positive effect of perceived usefulness on the usage intention of a technology (e.g. van der Heijden, 2003; Gefen et al., 2003; Liao et al., 2008). Accordingly, it is expected that people who perceive a financial overview application as more useful have higher intentions to use such an application than people who perceive it as less useful. This results in the following hypothesis:

H5: Perceived usefulness has a positive effect on the behavioural intention to use a financial overview application.

The initial model of the TAM also posits perceived ease of use as an important variable that positively influences the intention to use a technology (Davis, 1989). This relationship has been confirmed by several other scholars. (e.g. Gefen et al., 2003; Saadé & Bahli, 2005; Wallace & Sheetz, 2014). Hence, people express higher usage intentions for applications that are perceived to be easier to use than other applications. Therefore, it is also expected that perceived ease of use influences the usage intention for a financial overview application.

H6: Perceived ease of use has a positive effect on the behavioural intention to use a financial overview application.

3.6 Perceived ease of use and perceived usefulness

The original TAM also posits perceived ease of use as a determinant of perceived usefulness (Davis et al. 1989). This positive relationship is supported by several other researchers (e.g. Davis et al., 1993; Venkatesh & Davis, 2000). For a financial overview application, it is

expected that the easier the application is to use, the better one can get an overview of his or her personal finance. Accordingly, the following hypothesis is derived:

H7: Perceived ease of use has a positive effect on the perceived usefulness of a financial overview application.

3.7 Perceived enjoyment and intention to use

Perceived enjoyment was not initially included in the technology acceptance model (Davis, 1989). Davis et al. (1992) were the first who extended the TAM with perceived enjoyment. Perceived enjoyment is defined as ‘the extent to which the activity ... is perceived to be enjoyable in it’s own right, apart from any performance consequences that may be anticipated’ (Davis et al., 1992, p.1113). For both a word-processing software and a business graphic program, the authors found that perceived enjoyment has a positive effect on usage intentions (Davis et al., 1992). Several other researchers also incorporated this factor in their extension of the technology acceptance model and found that it positively influences the usage intention (e.g. van der Heijden, 2003; Liao et al., 2008). Therefore, it is also expected that for a financial overview application perceived enjoyment will have a positive effect on its usage intention.

H8: Perceived enjoyment has a positive effect on the behavioural intention to use a financial overview application.

3.8 Intention to use and age

Younger people have higher intentions to adopt new technologies than older people (Gilly & Zeithaml, 1985; Morris & Venkatesh, 2000). Chung et al. (2010) found, for example, that older people have lower intentions to participate in online communities. As a financial overview

application is also a new technology, it is expected that older people will posit lower intentions to use such an application than younger people. Hence, the following hypothesis is derived:

H9: Age has a negative effect on the behavioural intention to use a financial overview application.

3.9 Research model

The abovementioned hypotheses are summarized in the research model in Figure 1.

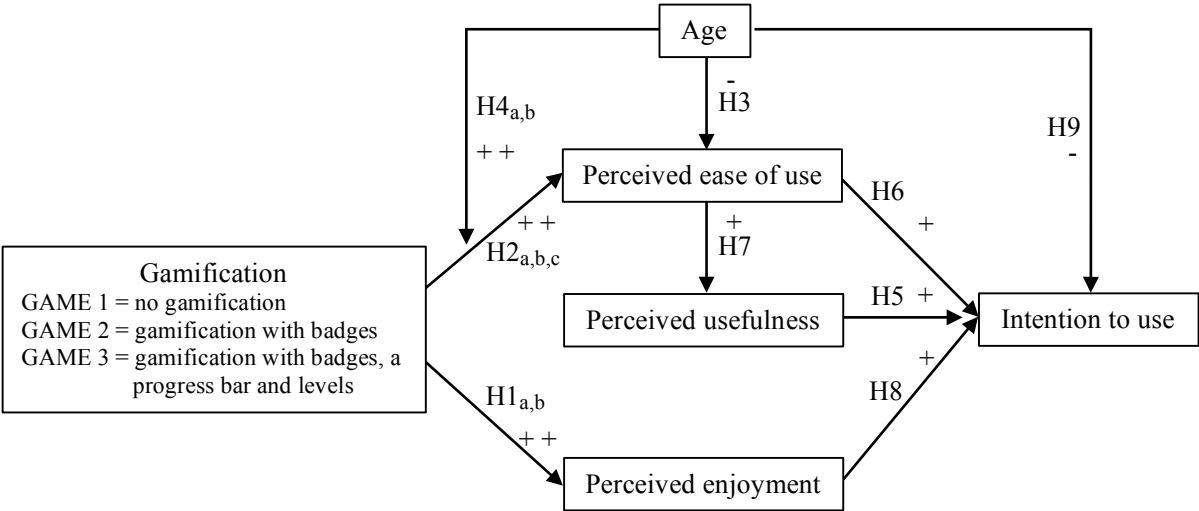


Figure 1 Research model

4. Research Design

This study uses a post-test-only control group design to test the aforementioned hypotheses. A single factor, gamification, is manipulated at three levels in a financial overview application. The first level is the control group (GAME 1), the second level is the application gamified by using badges (GAME 2) and the third level is the application gamified by using badges, a progress bar and levels (GAME 3). The advantage of using a post-test-only control group is that it allows the elimination of testing effects (Malhorta, 2010). An online questionnaire is used to collect the data (Appendix A).

4.1 Research procedure and manipulation of gamification levels

During this study, the data is obtained by using an online panel. Members of the panel received an email with a link to the online questionnaire, which they could fill in voluntarily. For completing the questionnaire, participants earned points which were redeemable for a gift card. The online questionnaire started with an introduction explaining the purpose of the study. The introduction explained that the study is a pre-test for a financial overview application. After reading the introduction, participants had to download an app (Ionic View) in which they could test the financial overview application 'Financieel Paspoort'. The financial overview application was developed together with the foundation 'Financieel Paspoort'. After downloading the app 'Ionic View', participants had to open it and fill in two codes to be able to test the 'Financieel Paspoort' app. The first code was required to open the 'Financieel Paspoort' app. This code was the same for every participant. The second code enabled starting one of the three versions of the app (GAME 1, GAME 2 or GAME 3), with a different code (Appendix B) for each version of the app (Appendix C). Participants randomly received one of these three codes. People in the control group received a code that gave access to the app without gamification elements included (GAME 1). The participants who received the code for

the version of the app that was gamified with badges (GAME 2) had access to the same functionalities and buttons in the app as the people in the control group. However, in contrast to the people in the control group, these people received a badge when clicking on specific buttons in the app. Furthermore, a button 'Financieel Bewustzijn' was added in the menu. When clicking on this button, people could see the tasks they had to perform to earn badges, and which tasks they had already performed. The people who received a code for the version of the app that was gamified with badges, a progress bar and levels (GAME 3) also had access to the same functionalities and buttons in the app as the people in the control group. However, in contrast to the people in the control group, these people could also earn badges by clicking on specific buttons in the app. The button 'Financieel Bewustzijn' was also added in the menu. In contrast to the version that is gamified with badges, people in this version could only earn badges by performing tasks in a particular sequence. By clicking on the button 'Financieel Bewustzijn' people were able to see which tasks they had to perform and in which order to earn the badges, which tasks they had to perform to reach a specific level, and which tasks they had already performed. Furthermore, in this version of the app, the button 'Financieel Bewustzijn' functioned as a progress bar which reflected the number of badges people had earned. After testing their version of the app, participants had to fill in the questionnaire. The first question of the questionnaire was a verification question to confirm that participants actually downloaded and looked at the app. This question asked people which amount was mentioned under 'Income and Expenses' in the 'Financieel Paspoort' app. People who answered this question wrongly were excluded from the questionnaire.

4.2 Measurements

Dependent variables During this study, the effects of different levels of gamification on perceived ease of use, perceived usefulness, perceived enjoyment and behavioural intention

were investigated. To achieve accurate measurements, it is important that the scales used are reliable and valid (Malhorta, 2010). Therefore, in this research, validated items from previous studies were adapted and used. To measure *Perceived Usefulness*, a 5-item, 7-point Likert Scale ranging from Strongly Disagree (1) to Strongly Agree (7) was used. This scale was initially developed by Davis (1989), but for the purpose of this study it was adapted to make it applicable for the context of a financial overview application. The construct *Perceived Ease of Use* was measured by using a 5-item, 7-point Likert Scale (1 = Strongly Disagree to 7 = Strongly Agree), also initially developed by Davis (1989), but adapted for this study measure the the perceived ease of use of the financial overview application. The *Perceived Enjoyment* construct was measured by a 7-point Likert Scale, developed by Davis et al. (1993) and comprised of 3 items. The scale ranges from Strongly Disagree (1) to Strongly Agree (7) and was adapted for the purpose of this study. Finally, to measure the *Behavioural Intention* of participants to use the financial overview application the scale of Venkatesh & Bala (2008) was used. This is a 3 item, 7-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (7).

The items of all constructs were translated into Dutch by the researcher, as they were initially developed in English. To ensure the validity of the scales, all the translated items were back-translated by a translator who was unfamiliar with the original items of the questionnaire (Del Greco et al., 1987). The items that were back-translated were then compared with the original ones. In case of large discrepancies, items were rewritten.

Control variables In addition to the dependent variables, control variables such as *Gender*, *Income* and *Education* were also measured in the questionnaire. These variables can potentially influence the relationships that were investigated during this study. For example, men might indicate a higher perceived enjoyment and usage intention as they are, in general, more likely to enjoy and use information technologies (Ahuja & Thatcher, 2005). Participants were also asked to indicate which *Device* they used, as there is a little difference in the layout of the app

for smartphones and tablets. Furthermore, *Risk Attitude* was included as a control variable. People who are less willing to take risks might find the application more useful and have higher intentions to use it because the application can show them to what extent they are in control in relation to their personal finance. In order to measure risk attitude, a one-item scale, developed by Dohmen et al. (2011), was used. This scale measures the general risk attitude by using a 11-point Likert Scale ranging from Not at all willing to take risks (1) to Very willing to take risks (11). *Propensity to Plan* (Lynch et al., 2010) was also included as a control variable. People with a higher propensity to plan might indicate a higher perceived usefulness and a higher usage intention as a financial overview application can help them to plan. The construct was measured by a 6-item, 7-point Likert Scale (1= Strongly Disagree to 7= Strongly Agree).

4.3 Sample

The target population for this study involves every person with a Dutch social security number of 18 years and older who owns a smartphone or tablet, as the ‘Financieel Paspoort’ application will only be available for people fulfilling those prerequisites. A smartphone or tablet is required to access and use the app.

The questionnaire was sent to 1500 randomly chosen members of an online panel (Flycatcher), who comply with the characteristics of the target population. In total, 985 people responded to the questionnaire (response rate = 65.7%). However, 612 respondents were excluded from the dataset because they indicated that they did not download or test the app, answered the verification question wrong or did not complete the questionnaire. Furthermore, thirteen respondents were excluded from the dataset because of straightlining their responses, unrealistic response times, or conspicuous answers. Hence, the final dataset consists of $n = 360$ respondents (GAME 1 $n = 118$, GAME 2 $n = 113$, GAME 3 $n = 129$), of which 47.5% are female. The mean age of the respondents is 44.2 years ($SD = 16.12$). The youngest respondents

are 18 years old, the oldest respondent is 80 years old. Appendix D shows a table with the sample description.

4.4 Scale reliability

In order to assess the reliability of the scales used for this study, first the validity and unidimensionality of the items on the scales were assessed. A factor analysis was conducted based on principal axis factoring (PAF) and a promax rotation (Appendix E). The extraction was based on a fixed number of factors (5), as validated items of five constructs from previous studies were used. Prior to performing PAF, the suitability of the data for factor analysis was assessed. Many coefficients in the correlation matrix are above $r = .3$. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) is .931, which is higher than the minimum value for a good factor analysis of .600 (Tabachnick & Fidell, as cited in Pallant, 2013). Furthermore, Bartlett's test of sphericity is significant. Hence, the data is suitable for factor analysis. The pattern matrix indicates that the items load highly on the predetermined theoretical constructs. Furthermore, the items that load highly on one factor have low cross-loadings with other factors, indicating unidimensionality, convergent validity and discriminant validity. As the items on the scales proved to be valid and unidimensional, the reliability of the scales was assessed by determining the Cronbach's alpha coefficients. Table 2 shows that the coefficients are all above .7, which indicates internal consistency reliability of the scales (Field, 2009).

Table 2 *Scale reliability*

Construct	Cronbach's alpha	n of items
Perceived Ease of Use (PEU)	.947	5
Perceived Usefulness (PU)	.939	5
Perceived Enjoyment (ENJ)	.917	3
Behavioural Intention (BI)	.976	3
Propensity to Plan (FPLAN)	.911	6

5. Results

In this chapter the results of the study are analysed and discussed. The descriptive statistics of the constructs are described. Furthermore, the hypotheses that were formulated in chapter 3 are tested by analysing the data from the questionnaire. Control variables are included in these analyses to control for possible confounding effects. Hypotheses H1a and H1b are tested by conducting an ANCOVA. The other hypotheses (H2a, H2b, H2c, H3, H4a, H4b, H5, H6, H7, H8 and H9) are tested by conducting hierarchical multiple regressions, as this method allows to statistically control for the control variables by including them in the first block of the analysis. The variables gender, income, education, device, propensity to plan and risk attitude are included as control variables. The statistical software SPSS 22 is used for conducting the analyses.

All the variables in a regression analysis and the control variables in an ANCOVA have to be continuous or categorical with only two categories (0 and 1) (Field, 2009). However, some of the control variables in this study are categorical with categories 1 and 2 (gender and device) or ordinal (income and education). Therefore, dummy variables are created for these variables.

5.1 Descriptive statistics for the constructs

Table 3 shows the descriptive statistics of the constructs measured during this study. The mean values for perceived ease of use, perceived usefulness, perceived enjoyment and behavioural intention are further specified for the different levels of gamification. The overall mean value of perceived ease of use ($M = 5.01$, $SD = 1.13$) shows that on average participants perceive the application as relatively easy to use. Furthermore, participants are moderately positive with respect to perceived usefulness ($M = 4.62$, $SD = 1.18$) and perceived enjoyment ($M = 4.40$, $SD = 1.30$). However, the mean value for behavioural intention ($M = 4.00$, $SD = 1.65$) indicates that participants are indifferent about their intentions whether or not to use the application.

Table 3 *Descriptive statistics*

Descriptive Statistics		
	Mean	Std. Deviation
Perceived Ease of Use (PEU)	5.01	1.13
<i>GAME 1</i>	5.13	1.10
<i>GAME 2</i>	5.03	1.13
<i>GAME 3</i>	4.89	1.14
Perceived Usefulness (PU)	4.62	1.18
<i>GAME 1</i>	4.71	1.11
<i>GAME 2</i>	4.58	1.11
<i>GAME 3</i>	4.57	1.30
Perceived Enjoyment (ENJ)	4.40	1.30
<i>GAME 1</i>	4.45	1.32
<i>GAME 2</i>	4.33	1.29
<i>GAME 3</i>	4.41	1.31
Behavioural Intention (BI)	4.00	1.65
<i>GAME 1</i>	4.13	1.59
<i>GAME 2</i>	3.86	1.67
<i>GAME 3</i>	4.01	1.69
Age	44.19	16.12
Propensity to Plan	4.68	1.36
Risk Attitude	5.22	2.34

5.2 Preliminary analyses

Before testing the hypotheses, preliminary analyses were conducted to assess if the assumptions for ANCOVA and regression are not violated. The results of these analyses will be discussed now.

5.2.1 Preliminary analyses ANCOVA

Preliminary analyses were conducted to ensure that the assumptions of normality, linearity, homogeneity of variances, absence of strong correlations among the covariates, reliable measurement of the covariates and homogeneity of the regression slopes are not violated. The values of skewness and kurtosis, the histograms and the normal probability plots were inspected to check for normality. There were no indications for major deviations from normality. Furthermore, as the sample size is larger than $n = 30$, the sample distribution will tend to be normal (Field, 2009; Pallant, 2013). Hence, normality was assumed. Levene's test of equality of error variances is not significant ($p > .05$), indicating homogeneity of variances. The

assumption of linearity is not violated as the scatterplot shows linear relationships between the dependent variable and the covariates. The correlation matrix shows no strong correlations between the covariates. Furthermore, the covariates are measured reliably as reliable measures from previous studies were used and the Cronbach alpha value for propensity to plan was higher than .8 (Pallant, 2013). To assess the assumption of homogeneity of the regression slopes, it was checked whether statistically significant ($p < .05$) interactions between the treatments and covariates can be indicated. As there is a significant interaction effect between the treatment groups and the control variable propensity to plan ($p < .05$), the assumption of homogeneity of the regression slopes is violated. However, Hamilton (1977) argues that ANCOVA is robust against this violation when the sample sizes of the treatment groups are equal. In this study the treatment groups are almost equal (GAME 1 $n = 118$, GAME 2 $n = 113$, GAME 3 $n = 129$). Therefore, no further action was taken.

5.2.2 Preliminary analyses hierarchical multiple regression

To ensure that the assumptions of normality, linearity, homoscedasticity and independence of residuals, absence of multicollinearity and singularity and absence of outliers are not violated, preliminary analyses were conducted. To check for outliers, the standardised residual values were analysed. Cases with a standardized residual of more than 3.3 or less than -3.3 are defined as outliers (Pallant, 2013). A few outliers are indicated. However, according to Pallant (2013) it is not necessary to take action, because there are only a few outliers, a not uncommon finding with large samples. Furthermore, the maximum value's for Cook's Distance are < 1 , suggesting no major problems with outliers. The normal probability plots of the regression standardised residual show no major deviations from normality. Furthermore, the scatterplots of the standardized residuals are roughly rectangular distributed. Hence, the assumptions of linearity, homoscedasticity and independence of residuals are not violated. The correlation matrixes,

tolerance values and variance inflation factors (VIF) were inspected to check for multicollinearity and singularity. This assumption was not violated, unless otherwise indicated during the analyses of the hypotheses.

5.3 Hypothesis testing

5.3.1 Hypotheses H1a and H1b

An ANCOVA was conducted to test for the effect of the level of gamification on perceived enjoyment when controlling for gender, income, education, device, propensity to plan and risk attitude. Table 4 shows that the effect of the level of gamification is not significant ($F(2, 345) = .098, p = .906, \text{Partial Eta Squared} = .001$). Participants in the GAME 1 group ($M = 4.373, SD = .117$), GAME 2 group ($M = 4.377, SD = .119$) and GAME 3 group ($M = 4.436, SD = .110$) do not significantly differ from each other with respect to perceived enjoyment after controlling for the control variables. Hence, hypotheses H1a and H1b are rejected. Although no significant effect was found, the results show that the mean score for perceived enjoyment tends to increase very slightly for higher levels of gamification (Figure 2). The covariates propensity to plan ($F(1, 345) = 26.843, p < .001$), dummy for middle education ($F(1, 345) = 9.976, p < .01$) and dummy for high education ($F(1, 345) = 8.312, p < .01$) are significant. They explain 7.2%, 2.8% and 2.4%, respectively, of the variance in perceived enjoyment.

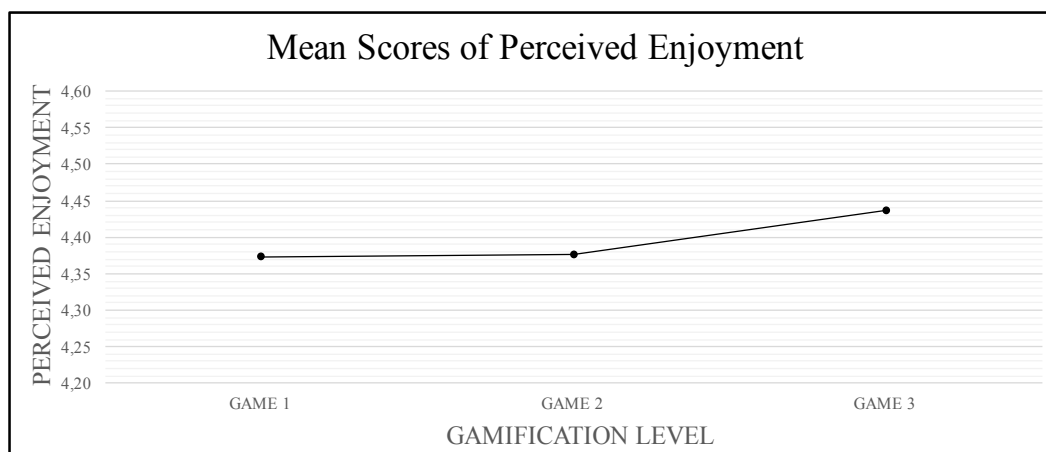


Figure 2 Mean scores of perceived enjoyment for varying levels of gamification

Table 4 ANCOVA output - H1a and H1b

Tests of Between-Subjects Effects						
Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	71,022 ^a	14	5,073	3,259	,000	,117
Intercept	134,378	1	134,378	86,340	,000	,200
Propensity to Plan	41,778	1	41,778	26,843	,000	,072
Risk Attitude	5,492	1	5,492	3,529	,061	,010
Dummy Tablet	5,563	1	5,563	3,574	,060	,010
Dummy Income 10-19	,215	1	,215	,138	,710	,000
Dummy Income 20-29	2,474	1	2,474	1,590	,208	,005
Dummy Income 30-39	,108	1	,108	,069	,793	,000
Dummy Income 40-49	,278	1	,278	,179	,673	,001
Dummy Income 50-59	,268	1	,268	,172	,678	,000
Dummy Income 60	,506	1	,506	,325	,569	,001
Dummy Education Middle	15,527	1	15,527	9,976	,002	,028
Dummy Education High	12,937	1	12,937	8,312	,004	,024
Dummy Female	,002	1	,002	,001	,970	,000
Gamification Levels	,306	2	,153	,098	,906	,001
Error	536,953	345	1,556			
Total	7568,778	360				
Corrected Total	607,975	359				

Dependent Variable: Perceived Enjoyment
a. R Squared = ,117 (Adjusted R Squared = ,081)

5.3.2 Hypotheses H2a, H2b, H2c, H3, H4a and H4b

A hierarchical multiple regression analysis, with perceived ease of use as dependent variable, was used to test hypotheses H2a, H2b, H2c, H3, H4a and H4b (Table 5). The level of gamification, age and their interaction term were included as independent variables. However, in a regression analysis only continuous variables or categorical variables with two levels (0 and 1) can be included (Field, 2009). As the level of gamification is a categorical variable with three levels, two dummy variables were created for this variable (one for GAME 2 and one for GAME 3). These were included in the model. As a result, also two interaction terms had to be included (GAME 2*age and GAME 3*age). The variables gender, income, education, device, propensity to plan and risk attitude were included as control variables in the model.

When checking the correlations of the variables, high correlations between the dummy variables for level of gamification and the interaction terms were found ($r > .9$). This is an indication of multicollinearity (Pallant, 2013). The dummy variables and interaction terms have tolerance values $< .10$ and variance inflation factors > 10 , which are also indicators for multicollinearity (Pallant, 2013). The two interaction terms in this model are a function of two other independent variables which were also included in the model and this causes the

multicollinearity. When multicollinearity is caused by an interaction term, it does not have a strong impact on the analysis (Echambadi & Hess, 2007). Hence, no further action was taken. The control variables and independent variables were added in blocks to the hierarchical regression analysis. The control variables were included in the first block. They explain 7.0% ($F(12, 347) = 2.161, p < .05$) of the variance in perceived ease of use. In the second block, the independent variables were included. The total model explains 8.0% ($F(27, 342) = 1.751, p < 0.05$) of the variance in perceived ease of use. However, the R^2 change of including the independent variables in addition to the control variables was not significant (R^2 change = .011, F change (5, 342) = .783, $p = .562$). The independent variables do not explain a significant amount of the variance in perceived ease of use. The the dummy variables for GAME 2 ($\beta = .084, p = .647$) and GAME 3 ($\beta = -.210, p = .259$) are not significant. Hence, participants who used GAME 2 or GAME 3 do not significantly differ from participants who used GAME 1 with respect to perceived ease of use. As a result, hypothesis H2a and H2b are rejected. The effect of age on perceived ease of use is also not significant ($\beta = -.041, p = .711$), resulting in the rejection of hypothesis H3. The interaction terms, GAME 2*age ($\beta = -.102, p = .586$) and GAME 3*age ($\beta = .155, p = .421$), are not significant too. Therefore, hypothesis H4a and H4b are also rejected. In the total model, the control variables propensity to plan ($\beta = .155, p < .01$), tablet dummy ($\beta = .126, p < .05$) and female dummy ($\beta = .127, p < .05$) are significant. The abovementioned hierarchical multiple regression analysis was conducted again to test hypothesis H2c. However, in this analysis, dummy variables for GAME 1 and GAME 2 were included to test for the effect of the level of gamification. As a result, GAME 3 serves as the baseline. The results in Table 5 show that the dummy variable for GAME 2 ($\beta = .288, p < .10$) is positive and significant. This indicates that participants in the GAME 2 and GAME 3 condition differ significantly from each other with respect to their perceived ease of use, resulting in the rejection of hypothesis H2c (Figure 3).

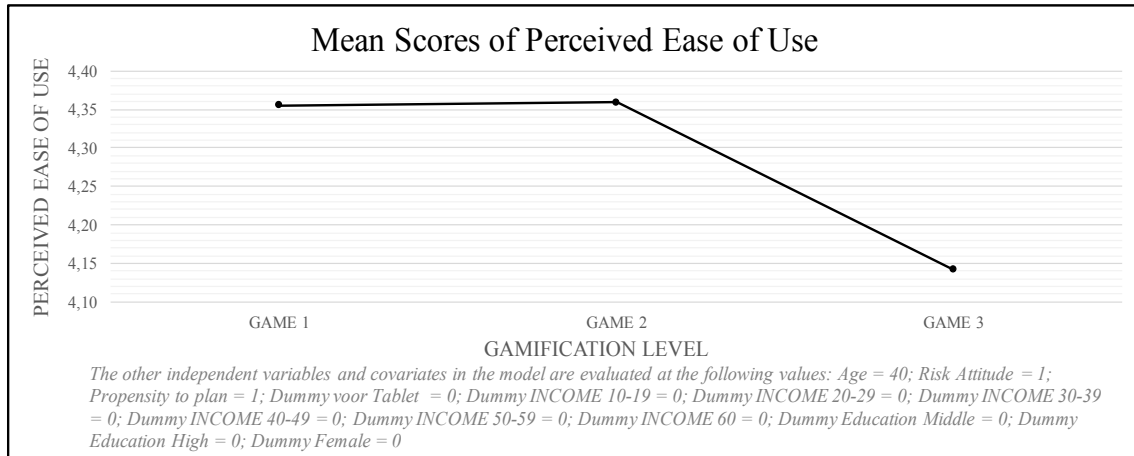


Figure 3 Mean scores of perceived ease of use for varying levels of gamification

Table 5 Hierarchical multiple regression output - H2a, H2b, H2c, H3, H4a and H4b

Model		Coefficients ^a					Correlations			Collinearity Statistics	
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
		B	Std. Error	Beta							
GAME 1 is the baseline	(Constant)	4,326	,493		8,774	,000					
	Propensity to Plan	,128	,044	,155	2,904	,004	,173	,155	,151	,945	1,058
	Risk Attitude	,021	,026	,043	,808	,420	,031	,044	,042	,958	1,044
	Dummy Tablet	,355	,156	,126	2,280	,023	,086	,122	,118	,877	1,141
	Dummy Income 10 - 19	,005	,209	,002	,024	,981	,007	,001	,001	,514	1,945
	Dummy Income 20 - 29	-.248	,209	-.086	-1,185	,237	-.104	-.064	-.061	,506	1,975
	Dummy Income 30 - 39	,051	,208	,019	,244	,807	,026	,013	,013	,449	2,225
	Dummy Income 40 - 49	,118	,265	,030	,447	,655	,010	,024	,023	,600	1,667
	Dummy Income 50 - 59	,157	,288	,036	,545	,586	,008	,029	,028	,614	1,628
	Dummy Income 60	,267	,296	,063	,900	,369	,045	,049	,047	,541	1,847
	Dummy Education Middle	-.115	,155	-.051	-.743	,458	-.057	-.040	-.039	,572	1,749
	Dummy Education High	,026	,181	,011	,143	,887	,059	,008	,007	,490	2,042
	Dummy Female	,286	,132	,127	2,159	,032	,109	,116	,112	,780	1,282
	Dummy Gamification 2 Badges	,204	,444	,084	,459	,647	,011	,025	,024	,080	12,489
	Dummy Gamification 3 Badges Progress Levels	-.493	,437	-.210	-1,130	,259	-.079	-.061	-.059	,078	12,886
	Age	-.003	,008	-.041	-.371	,711	-.028	-.020	-.019	,223	4,480
Game 2 * Age	-.005	,009	-.102	-.545	,586	-.016	-.029	-.028	,077	13,021	
Game 3 * Age	,007	,009	,155	,806	,421	-.061	,044	,042	,073	13,685	
GAME 3 is the baseline	(Constant)	3,832	,442		8,680	,000					
	Propensity to Plan	,128	,044	,155	2,904	,004	,173	,155	,151	,945	1,058
	Risk Attitude	,021	,026	,043	,808	,420	,031	,044	,042	,958	1,044
	Dummy Tablet	,355	,156	,126	2,280	,023	,086	,122	,118	,877	1,141
	Dummy Income 10 - 19	,005	,209	,002	,024	,981	,007	,001	,001	,514	1,945
	Dummy Income 20 - 29	-.248	,209	-.086	-1,185	,237	-.104	-.064	-.061	,506	1,975
	Dummy Income 30 - 39	,051	,208	,019	,244	,807	,026	,013	,013	,449	2,225
	Dummy Income 40 - 49	,118	,265	,030	,447	,655	,010	,024	,023	,600	1,667
	Dummy Income 50 - 59	,157	,288	,036	,545	,586	,008	,029	,028	,614	1,628
	Dummy Income 60	,267	,296	,063	,900	,369	,045	,049	,047	,541	1,847
	Dummy Education Middle	-.115	,155	-.051	-.743	,458	-.057	-.040	-.039	,572	1,749
	Dummy Education High	,026	,181	,011	,143	,887	,059	,008	,007	,490	2,042
	Dummy Female	,286	,132	,127	2,159	,032	,109	,116	,112	,780	1,282
	Dummy Gamification 1 No	,493	,437	,206	1,130	,259	,070	,061	,059	,081	12,348
	Dummy Gamification 2 Badges	,697	,405	,288	1,723	,086	,011	,093	,089	,097	10,360
	Age	,005	,007	,066	,705	,482	-.028	,038	,037	,303	3,295
Game 1 * Age	-.007	,009	-.152	-.806	,421	,059	-.044	-.042	,076	13,177	
Game 2 * Age	-.013	,009	-.250	-1,455	,147	-.016	-.078	-.075	,091	10,987	

a. Dependent Variable: Perceived Ease of Use

5.3.3 Hypotheses H5, H6, H8 and H9

A hierarchical multiple regression analysis was used to assess the ability of perceived usefulness, perceived ease of use, perceived enjoyment and age to predict the behavioural

intention to use a financial overview application, after controlling for the influence of gender, income, education, device, propensity to plan and risk attitude (Table 6). The control variables, which were included in the first step of the analysis, explain 9.2% ($F(12, 347) = 2.930, p < .01$) of the variance in behavioural intention. The independent variables were included in the second step of the analysis. The total model explains 63.3% ($F(16, 343) = 36.931, p < .001$) of the variance in behavioural intention. The independent variables explain an additional 54.1% ($R^2 \text{ change} = .541, F \text{ change}(4, 343) = 126.243, p < .001$) of the variance in behavioural intention, after controlling for the control variables. In the final model, the control variable risk attitude ($\beta = .074, p < .05$) is positive and significant. Two of the independent variables are also significant, with perceived enjoyment ($\beta = .503, p < .001$) having a higher beta value than perceived usefulness ($\beta = .347, p < .001$). These findings support hypotheses H5 and H8. Hypothesis H9 states that age has a negative effect on the behavioural intention. However, the results indicate that age ($\beta = .086, p < .05$) has a significant, but in contrast to the hypothesis, positive effect on behavioural intention. Therefore, hypothesis H9 is rejected. The effect of perceived ease of use on behavioural intention is also not significant ($\beta = -.007, p = .876$). Hence, hypothesis H6 is rejected, too.

Table 6 Hierarchical multiple regression output - H5, H6, H8 and H9

Model	Coefficients ^a									
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
(Constant)	-1,664	,423		-3,936	,000					
Propensity to Plan	-,032	,042	-,027	-,766	,444	,194	-,041	-,025	,888	1,126
Risk Attitude	,052	,024	,074	2,206	,028	,133	,118	,072	,949	1,054
Dummy Tablet	-,234	,143	-,057	-1,634	,103	-,010	-,088	-,053	,887	1,127
Dummy Income 10 - 19	,301	,193	,071	1,563	,119	,090	,084	,051	,517	1,934
Dummy Income 20 - 29	-,231	,194	-,055	-1,189	,235	-,128	-,064	-,039	,506	1,977
Dummy Income 30 - 39	,101	,192	,026	,525	,600	,072	,028	,017	,447	2,235
Dummy Income 40 - 49	-,115	,244	-,020	-,471	,638	-,052	-,025	-,015	,602	1,660
Dummy Income 50 - 59	,065	,267	,010	,243	,808	-,009	,013	,008	,610	1,638
Dummy Income 60	-,091	,272	-,015	-,335	,738	,004	-,018	-,011	,550	1,819
Dummy Education Middle	,109	,144	,033	,759	,449	-,073	,041	,025	,566	1,768
Dummy Education High	,178	,168	,050	1,059	,290	,002	,057	,035	,489	2,046
Dummy Female	,151	,123	,046	1,226	,221	,048	,066	,040	,774	1,292
Perceived Usefulness	,486	,064	,347	7,546	,000	,684	,377	,247	,506	1,975
Perceived Ease of Use	-,010	,064	-,007	-,157	,876	,480	-,008	-,005	,565	1,771
Perceived Enjoyment	,639	,067	,503	9,478	,000	,737	,456	,310	,380	2,632
Age	,009	,004	,086	2,070	,039	,072	,111	,068	,617	1,622

a. Dependent Variable: Behavioural Intention

5.3.4 Hypothesis H7

To assess the ability of perceived ease of use to predict perceived usefulness, after controlling for the influence of gender, income, education, device, propensity to plan and risk attitude, a hierarchical multiple regression analysis was used (Table 7). The control variables, which were included in the first step of the analysis, explain 9.2% ($F(12, 347) = 2.935, p < .01$) of the variance in perceived usefulness. The total model explains 28.5% ($F(13, 346) = 10.632, p < .001$) of the variance in perceived usefulness. Perceived ease of use explains an additional 19.3% (R^2 change = .193, F change (1, 346) = 93.600, $p < .001$) of the variance in perceived usefulness, after controlling for the control variables. The control variables propensity to plan ($\beta = .162, p < .01$) and risk attitude ($\beta = .096, p < .05$) are statistically significant in the final model. The independent variable perceived ease of use is also significant and positively influences perceived usefulness ($\beta = .456, p < .001$). These findings support hypothesis H7.

Table 7 Hierarchical multiple regression output - H7

Model		Coefficients ^a									
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
(Constant)	1,585	,354		4,481	,000						
Propensity to Plan	,140	,041	,162	3,454	,001	,237	,183	,157	,939	1,065	
Risk Attitude	,048	,023	,096	2,077	,039	,099	,111	,094	,970	1,031	
Dummy Tablet	-,118	,137	-,040	-,861	,390	-,006	-,046	-,039	,951	1,051	
Dummy Income 10 - 19	-,160	,186	-,053	-,859	,391	-,010	-,046	-,039	,546	1,832	
Dummy Income 20 - 29	-,154	,186	-,051	-,826	,410	-,071	-,044	-,038	,539	1,855	
Dummy Income 30 - 39	,065	,183	,023	,357	,721	,102	,019	,016	,486	2,059	
Dummy Income 40 - 49	-,199	,235	-,048	-,848	,397	-,024	-,046	-,039	,640	1,562	
Dummy Income 50 - 59	-,483	,251	-,106	-1,928	,055	-,068	-,103	-,088	,680	1,471	
Dummy Income 60	-,239	,255	-,054	-,935	,351	-,008	-,050	-,042	,612	1,633	
Dummy Education Middle	-,152	,136	-,064	-1,113	,267	-,076	-,060	-,051	,622	1,607	
Dummy Education High	-,056	,154	-,022	-,362	,717	,049	-,019	-,016	,570	1,755	
Dummy Female	-,091	,119	-,038	-,763	,446	,053	-,041	-,035	,813	1,230	
Perceived Ease of Use	,477	,049	,456	9,675	,000	,483	,461	,440	,930	1,075	

a. Dependent Variable: Perceived Usefulness

5.4 Additional analyses

When checking the assumptions for the ANCOVA, the results showed a significant interaction effect between one or more of the gamification levels and propensity to plan. Therefore, a hierarchical multiple regression analysis with perceived enjoyment as dependent variable, the dummy variables for the gamification levels GAME 2 and GAME 3, propensity to plan and

their interaction terms as independent variables and gender, income, education, device and risk attitude as control variables was conducted to further examine this interaction (Table 8). The results show a positive significant interaction effect between the gamification level GAME 2 and propensity to plan ($\beta = .466, p < .05$), a negative significant main effect of gamification level GAME 2 ($\beta = -.446, p < .05$) and a positive significant main effect of propensity to plan ($\beta = .181, p < .10$) on perceived enjoyment. The main effect of GAME 3 ($\beta = .036, p = .871$) and the interaction effect of GAME 3 and propensity to plan ($\beta = -.023, p = .916$) are not significant. An additional hierarchical multiple regression analysis with GAME 3 as the baseline also showed a positive significant interaction effect between the gamification level GAME 2 and propensity to plan ($\beta = .488, p < .05$), a negative significant main effect of gamification level GAME 2 ($\beta = -.481, p < .05$) and a positive significant main effect of propensity to plan ($\beta = .167, p < .05$) on perceived enjoyment. The main effect of GAME 1 ($\beta = -.035, p = .871$) and the interaction effect of GAME 1 and propensity to plan ($\beta = .024, p = .916$) are not significant. Hence, GAME 2 is perceived as significantly less enjoyable than GAME 1 and GAME 3, but only by people who are less inclined to plan their finances (Figure 4). In addition, people with a higher propensity to plan their finances perceive all three versions of the app as more enjoyable than people with a lower propensity to do so.

Figure 4 Perceived enjoyment - interaction gamification levels and propensity to plan

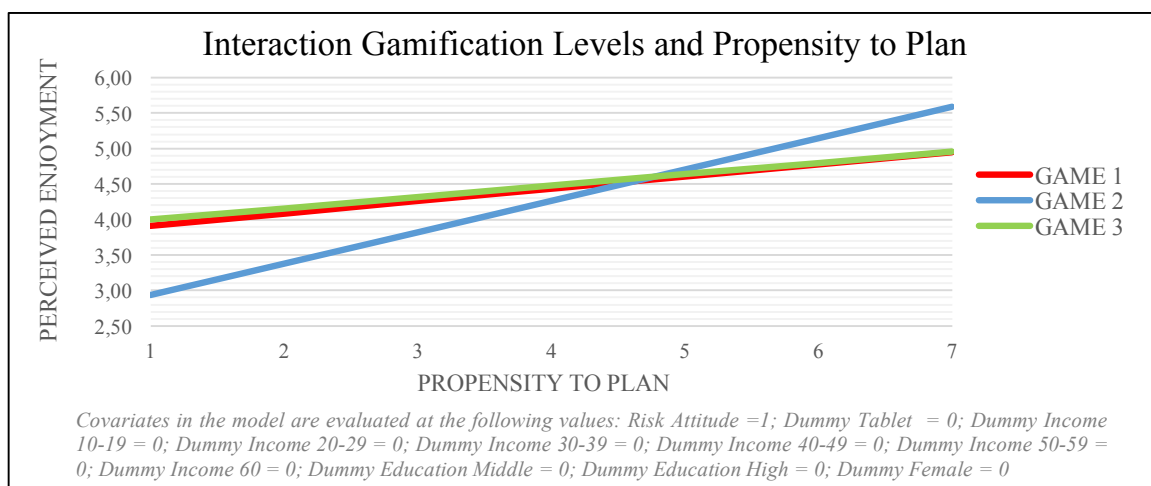


Table 8 Hierarchical multiple regression output - interaction gamification levels and propensity to plan

Model		Coefficients ^a											
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics			
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF		
GAME 1	(Constant)	3,683	,517		7,129	,000							
is the baseline	Risk Attitude	,057	,029	,102	1,981	,048	,062	,106	,100		,961	1,041	
	Dummy Tablet	,299	,167	,092	1,783	,075	,079	,096	,090		,950	1,053	
	Dummy Income 10 - 19	-,038	,228	-,011	-,167	,868	,030	-,009	-,008		,540	1,852	
	Dummy Income 20 - 29	-,251	,227	-,076	-,103	,271	-,071	-,059	-,055		,537	1,861	
	Dummy Income 30 - 39	,000	,224	,000	-,002	,999	,033	,000	,000		,481	2,079	
	Dummy Income 40 - 49	-,087	,288	-,019	-,301	,763	-,020	-,016	-,015		,634	1,578	
	Dummy Income 50 - 59	-,068	,307	-,014	-,222	,825	-,014	-,012	-,011		,676	1,480	
	Dummy Income 60	,257	,315	,053	,814	,416	,023	,044	,041		,597	1,674	
	Dummy Education Middle	-,550	,166	-,211	-3,303	,001	-,093	-,176	-,166		,621	1,611	
	Dummy Education High	-,552	,189	-,195	-2,925	,004	-,046	-,156	-,147		,567	1,762	
	Dummy Female	,021	,144	,008	,146	,884	,017	,008	,007		,822	1,216	
	Propensity to Plan	,173	,090	,181	1,917	,056	,255	,103	,096		,284	3,516	
	Dummy Gamification 2 Badges	-1,249	,610	-,446	-2,049	,041	-,036	-,110	-,103		,053	18,788	
	Dummy Gamification 3 Badges Progress Levels	,097	,593	,036	,163	,871	,005	,009	,008		,053	18,964	
Game 2 * Propensity to Plan	,269	,124	,466	2,173	,030	,052	,117	,109		,055	18,201		
Game 3 * Propensity to Plan	-,013	,120	-,023	-,106	,916	,040	-,006	-,005		,054	18,602		
GAME 3	(Constant)	3,779	,464		8,151	,000							
is the baseline	Risk Attitude	,057	,029	,102	1,981	,048	,062	,106	,100		,961	1,041	
	Dummy Tablet	,299	,167	,092	1,783	,075	,079	,096	,090		,950	1,053	
	Dummy Income 10 - 19	-,038	,228	-,011	-,167	,868	,030	-,009	-,008		,540	1,852	
	Dummy Income 20 - 29	-,251	,227	-,076	-,103	,271	-,071	-,059	-,055		,537	1,861	
	Dummy Income 30 - 39	,000	,224	,000	-,002	,999	,033	,000	,000		,481	2,079	
	Dummy Income 40 - 49	-,087	,288	-,019	-,301	,763	-,020	-,016	-,015		,634	1,578	
	Dummy Income 50 - 59	-,068	,307	-,014	-,222	,825	-,014	-,012	-,011		,676	1,480	
	Dummy Income 60	,257	,315	,053	,814	,416	,023	,044	,041		,597	1,674	
	Dummy Education Middle	-,550	,166	-,211	-3,303	,001	-,093	-,176	-,166		,621	1,611	
	Dummy Education High	-,552	,189	-,195	-2,925	,004	-,046	-,156	-,147		,567	1,762	
	Dummy Female	,021	,144	,008	,146	,884	,017	,008	,007		,822	1,216	
	Propensity to Plan	,160	,080	,167	1,990	,047	,255	,107	,100		,357	2,798	
	Dummy Gamification 1 No	-,097	,593	-,035	-,163	,871	,031	-,009	-,008		,055	18,173	
	Dummy Gamification 2 Badges	-1,346	,556	-,481	-2,418	,016	-,036	-,129	-,121		,064	15,649	
Game 1 * Propensity to Plan	,013	,120	,024	,106	,916	,056	,006	,005		,051	19,744		
Game 2 * Propensity to Plan	,282	,117	,488	2,416	,016	,052	,129	,121		,062	16,156		

a. Dependent Variable: Perceived Enjoyment

Analyses of the hypotheses H5, H6, H7, H8 and H9 indicated that perceived ease of use does not have a direct significant effect on behavioural intention. It only affects behavioural intention through perceived usefulness. To test whether perceived usefulness alone fully mediates the effect of perceived ease of use on behavioural intention, a Sobel-test for mediation was conducted. The SPSS Macro for Simple Mediation developed by Preacher & Hayes (2004), with perceived ease of use as independent variable, behavioural intention as dependent variable and perceived usefulness as mediator, was used to conduct this test. The results indicate that, indeed, perceived ease of use has a significant effect on perceived usefulness ($b = .505$, $SE = .048$, $p < .001$) and that perceived usefulness has a significant effect on behavioural intention ($b = .827$, $SE = .060$, $p < .001$). However, only a partial mediation effect was found, as the effect of perceived ease of use on behavioural intention is also still significant ($b = .285$, $SE = .063$, p

< .001). This contradicts the findings of the hierarchical multiple regression to test hypotheses H5, H6, H8 and H9, where no significant effect of perceived ease of use ($\beta = -.007, p = .876$) on behavioural intention was found. Hence, another mediator for the relationship between perceived ease of use and behavioural intention, in addition to perceived usefulness has to be assumed. To investigate this, the independent variables perceived usefulness, perceived ease of use, perceived enjoyment and age were included in separate blocks to the hierarchical multiple regression with the control variables included in the first block and behavioural intention included as a dependent variable. The results show that perceived ease of use ($\beta = .191, p < .01$) has a significant effect on behavioural intention when only the control variables, perceived usefulness, perceived ease of use and age are included in the model. However, when adding perceived enjoyment to the model, perceived ease of use becomes insignificant ($\beta = -.007, p = .876$). This suggests that the effect of perceived ease of use on behavioural intention is also mediated by perceived enjoyment. The PROCESS Procedure for SPSS by Hayes (2013) was used to test whether perceived ease of use is mediated by both perceived usefulness and perceived enjoyment, when controlling for gender, income, education, device, risk attitude and propensity to plan. The results indicate a positive significant effect of perceived ease of use on perceived usefulness ($b = .477, SE = .049, p < .001$) and perceived enjoyment ($b = .697, SE = .048, p < .001$). Perceived usefulness ($b = .469, SE = .064, p < .001$) and perceived enjoyment ($b = .664, SE = .067, p < .001$) have a positive significant effect on behavioural intention. However, the relationship between perceived ease of use and behavioural intention is not significant ($b = -.022, SE = .064, p = .736$). Hence, the relationship between perceived ease of use and behavioural intention is fully mediated by perceived usefulness and perceived enjoyment.

Although not based on a specific hypothesis, additional analyses were conducted to test whether the level of gamification has a direct effect on perceived usefulness and behavioural intention.

Two separate hierarchical multiple regression analyses, with perceived usefulness and behavioural intention as dependent variables, were conducted. In addition to the control variables and the independent variables that were added earlier to the analysis of these dependent variables, two dummy variables for the level of gamification were included (one for GAME 2 and one for GAME 3). The results show no significant difference between GAME 1 and GAME 2, and GAME 1 and GAME 3 with respect to perceived usefulness as the dummy variables for both GAME 2 ($\beta = -.031, p = .570$) and GAME 3 ($\beta = .003, p = .952$) are insignificant (Table 9). In addition, as the beta values for GAME 2 and GAME 3 point in different directions, an additional hierarchical multiple regression was conducted with GAME 3 as the baseline. However, also no significant difference between GAME 2 and GAME 3 could be obtained with respect to perceived usefulness, as the dummy variable for GAME 2 ($\beta = -.034, p = .517$) is insignificant. The output of the hierarchical multiple regression analysis with behavioural intention as dependent variable also shows no support for an effect of the different levels of gamification on behavioural intention (Table 10). Both dummy variables GAME 2 ($\beta = -.050, p = .195$) and GAME 3 ($\beta = -.001, p = .971$) are insignificant.

Table 9 Hierarchical multiple regression output - gamification levels and perceived usefulness

Model		Coefficients ^a											
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics			
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF		
GAME 1 is the baseline	(Constant)	1,610	,376		4,279	,000							
	Propensity to Plan	,138	,041	,160	3,369	,001	,237	,179	,153	,924	1,082		
	Risk Attitude	,049	,023	,098	2,103	,036	,099	,113	,096	,964	1,037		
	Dummy Tablet	-,126	,138	-,043	-,910	,363	-,006	-,049	-,041	,944	1,059		
	Dummy Income 10 - 19	-,164	,187	-,054	-,876	,381	-,010	-,047	-,040	,544	1,840		
	Dummy Income 20 - 29	-,161	,187	-,054	-,863	,389	-,071	-,046	-,039	,537	1,863		
	Dummy Income 30 - 39	,065	,183	,023	,355	,723	,102	,019	,016	,486	2,059		
	Dummy Income 40 - 49	-,212	,236	-,051	-,897	,371	-,024	-,048	-,041	,636	1,572		
	Dummy Income 50 - 59	-,487	,251	-,107	-,938	,053	-,068	-,104	-,088	,679	1,473		
	Dummy Income 60	-,256	,258	-,058	-,991	,322	-,008	-,053	-,045	,602	1,661		
	Dummy Education Middle	-,148	,137	-,063	-,1083	,280	-,076	-,058	-,049	,621	1,610		
	Dummy Education High	-,051	,155	-,020	-,330	,741	,049	-,018	-,015	,569	1,759		
	Dummy Female	-,091	,119	-,038	-,762	,446	,053	-,041	-,035	,813	1,230		
	Perceived Ease of Use	,478	,050	,457	9,655	,000	,483	,462	,440	,926	1,080		
Dummy Gamification 2 Badges	-,078	,137	-,031	-,569	,570	-,021	-,031	-,026	,710	1,409			
Dummy Gamification 3 Badges Progress Levels	,008	,132	,003	,061	,952	-,031	,003	,003	,721	1,387			
GAME 3 is the baseline	(Constant)	1,618	,358		4,523	,000							
	Propensity to Plan	,138	,041	,160	3,369	,001	,237	,179	,153	,924	1,082		
	Risk Attitude	,049	,023	,098	2,103	,036	,099	,113	,096	,964	1,037		
	Dummy Tablet	-,126	,138	-,043	-,910	,363	-,006	-,049	-,041	,944	1,059		
	Dummy Income 10 - 19	-,164	,187	-,054	-,876	,381	-,010	-,047	-,040	,544	1,840		
	Dummy Income 20 - 29	-,161	,187	-,054	-,863	,389	-,071	-,046	-,039	,537	1,863		
	Dummy Income 30 - 39	,065	,183	,023	,355	,723	,102	,019	,016	,486	2,059		
	Dummy Income 40 - 49	-,212	,236	-,051	-,897	,371	-,024	-,048	-,041	,636	1,572		
	Dummy Income 50 - 59	-,487	,251	-,107	-,938	,053	-,068	-,104	-,088	,679	1,473		
	Dummy Income 60	-,256	,258	-,058	-,991	,322	-,008	-,053	-,045	,602	1,661		
	Dummy Education Middle	-,148	,137	-,063	-,1083	,280	-,076	-,058	-,049	,621	1,610		
	Dummy Education High	-,051	,155	-,020	-,330	,741	,049	-,018	-,015	,569	1,759		
	Dummy Female	-,091	,119	-,038	-,762	,446	,053	-,041	-,035	,813	1,230		
	Perceived Ease of Use	,478	,050	,457	9,655	,000	,483	,462	,440	,926	1,080		
Dummy Gamification 1 No	-,008	,132	-,003	-,061	,952	,053	-,003	-,003	,753	1,329			
Dummy Gamification 2 Badges	-,086	,133	-,034	-,648	,517	-,021	-,035	-,030	,759	1,318			

a. Dependent Variable: Perceived Usefulness

Table 10 Hierarchical multiple regression output - gamification levels and behavioural intention

Model		Coefficients ^a											
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics			
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF		
	(Constant)	-1,604	,444		-3,612	,000							
	Propensity to Plan	-,037	,042	-,030	-,864	,388	,194	-,047	-,028	,874	1,145		
	Risk Attitude	,054	,024	,077	2,278	,023	,133	,122	,075	,942	1,062		
	Dummy Tablet	-,254	,144	-,062	-,1764	,079	-,010	-,095	-,058	,879	1,138		
	Dummy Income 10 - 19	,287	,193	,068	1,487	,138	,090	,080	,049	,515	1,942		
	Dummy Income 20 - 29	-,252	,194	-,060	-,1297	,196	-,128	-,070	-,042	,503	1,988		
	Dummy Income 30 - 39	,097	,192	,025	,502	,616	,072	,027	,016	,447	2,236		
	Dummy Income 40 - 49	-,147	,245	-,025	-,601	,549	-,052	-,033	-,020	,598	1,673		
	Dummy Income 50 - 59	,049	,267	,008	,183	,855	-,009	,010	,006	,609	1,641		
	Dummy Income 60	-,139	,274	-,022	-,506	,613	,004	-,027	-,017	,540	1,850		
	Dummy Education Middle	,118	,144	,036	,819	,413	-,073	,044	,027	,564	1,772		
	Dummy Education High	,191	,168	,053	1,138	,256	,002	,062	,037	,487	2,052		
	Dummy Female	,151	,123	,046	1,233	,218	,048	,067	,040	,774	1,292		
	Perceived Ease of Use	-,005	,064	-,004	-,083	,934	,480	-,004	-,003	,558	1,792		
	Perceived Usefulness	,485	,064	,346	7,515	,000	,684	,377	,246	,505	1,980		
	Age	,009	,004	,089	2,141	,033	,072	,115	,070	,613	1,630		
	Perceived Enjoyment	,636	,068	,501	9,395	,000	,737	,453	,307	,376	2,658		
	Dummy Gamification 2 Badges	-,179	,138	-,050	-,1299	,195	-,056	-,070	-,042	,708	1,412		
	Dummy Gamification 3 Badges Progress Levels	-,005	,133	-,001	-,036	,971	,002	-,002	-,001	,714	1,401		

a. Dependent Variable: Behavioural Intention

6. Discussion

This study investigated the effect of applying different levels of gamification to a financial overview application. The effect of different levels of gamification on participants' perceived ease of use, perceived usefulness, perceived enjoyment and behavioural intention was assessed. In addition, the influence of age was analysed. The TAM (Davis, 1989) has been used as a basis to study the intention of people to use a financial overview application that is gamified on different levels. The results obtained in the previous chapter will be discussed now.

The study revealed no significant main effect of the level of gamification on perceived enjoyment. Hence, higher levels of gamification do not significantly increase participants' perceived enjoyment with respect to the financial overview application. Consequently, hypothesis H1a and H1b were rejected. This result contradicts the statement made in the gamification literature, that gamification is a tool to make non-game contexts more enjoyable (Koivisto & Hamari, 2014). In the context of a financial overview application this relationship could not be established. However, an inspection of the mean scores showed a tendency for slightly higher mean scores of perceived enjoyment for higher levels of gamification. It is possible that the levels of gamification tested during this study are simply too low to induce an effect of gamification on perceived enjoyment. In the study of Alcivar & Abad (2016), where a significant effect of gamification on perceived enjoyment was found, the level of gamification was higher than the highest level of gamification tested during this study. The researchers tested the effect of gamification with performance stars, avatars, badges, a leaderboard, missions, achievements, points, levels and a progress bar, whereas the highest level of gamification tested in this study included only three gaming elements (badges, a progress bar and levels). Hence, higher levels of gamification than those tested here might induce an effect on perceived enjoyment. Another potential reason for the lack of a significant effect is the way in which the study is conducted. The literature about games states that people need to be concentrated on a

game to perceive it as enjoyable (Sweetser & Wyeth, 2005). Although there was not a full game implemented in the financial overview application, elements of games were included. The inclusion of these elements was expected to make the application more enjoyable. During this study, participants could test the financial overview application without supervision. Hence, it is unknown whether the participants were fully concentrated on the application while they were testing it. The nonsignificant effect could also be related to the degree of challenge of the tasks provided by the implementation of the badges, progress bar and levels in the gamified applications. Sweetser & Wyeth (2005) argue that the tasks in a game have to be sufficiently challenging to perceive it as enjoyable. In the version of the app that was gamified with badges, participants could earn badges by clicking on specific buttons in the application. In the version of the app that was gamified with badges, a progress bar and levels participants had to click on the specific buttons in a particular sequence to earn the same badges. Furthermore, participants could reach higher levels in the latter version for collecting more badges. However, the tasks to earn badges and reach levels in the gamified applications may not have been sufficiently challenging to perceive the application as more enjoyable than a non-gamified one.

Although no significant main effect could be obtained between the gamification levels and perceived enjoyment, a positive significant interaction effect was found between the gamification level with badges and propensity to plan with respect to perceived enjoyment. The inclusion of this interaction term in the additional analysis also revealed a significant negative main effect of the gamification level with badges and a significant positive main effect of propensity to plan. Hence, a financial overview application that is gamified with badges only is perceived as significantly less enjoyable than both a non-gamified application and an application that is gamified with badges, a progress bar and levels, but only by people who are less inclined to plan their finances. Furthermore, all versions of the application are perceived

as more enjoyable by people who are more inclined to plan as compared to those who are less inclined to do so.

Another interesting result was obtained when investigating the effect of the different levels of gamification on perceived ease of use. Although no significant difference was found between the levels GAME 1 and GAME 2, and the levels GAME 1 and GAME 3, and thus rejecting hypothesis H2a and H2b, the results showed a significant difference at the $p < .10$ significance level between the gamification levels GAME 2 and GAME 3. This resulted in the rejection of hypothesis H2c. Participants who used the financial overview application that was gamified with badges, a progress bar and levels indicated significantly lower levels of perceived ease of use than participants who used the financial overview application that was gamified with badges. Hence, participants prefer the implementation of badges over the implementation of badges, a progress bar and levels in a financial overview application with respect to perceived ease of use. However, when choosing between no gamification and gamification with badges, or between no gamification and gamification with badges, a progress bar and levels participants are indifferent with respect to perceived ease of use. In the versions of the app that were gamified with badges or with badges, a progress bar and levels, there were gaming elements, and particularly tasks descriptions that describe how to obtain badges, implemented. This was done to make the app easier to use by explaining the users what they have to do. However, the mean score for perceived ease of use of the non-gamified version was already relatively high. This indicates that participants perceive the application without gaming elements included as relatively easy to use. Participants, therefore, may not need the task descriptions to understand how to use the application. Hence, this might explain the non-significant difference between the participants in the non-gamified version and the gamified versions. The significant difference with respect to perceived ease of use between participants in the two different gamified applications can be explained the way participants can gain badges. In the version of

the app that is gamified with badges, participants can earn badges by clicking on particular buttons, whereas in the version that is gamified with badges, a progress bar and levels, they need to click on the buttons in a particular sequence to obtain the badges. Participants therefore have to remember the sequence in which they have to perform the tasks to obtain the badges, or they constantly have to look back at the list where the tasks and their sequences are listed. Hence, the significant difference with respect to perceived ease of use between the participants who used the app that is gamified with badges and the participants who used the app gamified with badges, a progress bar and levels probably indicates that people have some difficulties doing this.

Contrary to expectations (hypothesis H3), no significant effect was found between age and perceived ease of use. This contradicts the majority of the findings in previous literature, which indicated a negative relationship between age and perceived ease of use (e.g. Arning & Ziefle, 2007). In this study, people of different ages were found to have similar perceptions with respect to the ease of use of the financial overview application. Speculating, the financial overview application that was used during this study might not require advanced cognitive capabilities to be able to learn how to use it.

The moderating effect of age on the relationship between the levels of gamification and perceived ease of use was also found to be not significant, resulting in the rejection of hypothesis H4a and H4b. This indicates that for a financial overview application the effect of implementing badges or badges, a progress bar and levels on the perceived ease of use is not different for people of various ages.

In accordance with hypotheses H5 and H8, a positive significant effect of perceived usefulness and perceived enjoyment on behavioural intention was found. Hence, the more participants perceive a financial overview application as useful and enjoyable, the higher their intentions are to use the application. These results are in line with prior studies which also found a positive

effect of perceived usefulness and perceived enjoyment on behavioural intention (e.g. Liao et al., 2008). The results also showed that perceived enjoyment has a higher beta value, indicating this is a more important predictor for participants' behavioural intention to use a financial overview application than perceived usefulness.

The relationship between age and behavioural intention was found to be significant. However, in contrast to hypothesis H9, a positive relationship was found, indicating that older participants have higher intentions to use the financial overview application. It has to be noted however, that during this study, participants did not see their personal financial information in the app, but only hypothetical financial information. A potential reason for the observed positive relationship might be that the information provided in the application is more relevant for older than for younger people and that, as a consequence, they posit higher behavioural intentions. Another potential explanation for this relationship could be that older people are more interested in their personal finances in general. Keating & Marshall (1980) found for example that age has a positive effect on people's interest in retirement finances.

Another interesting finding was that perceived ease of use did not have a direct significant effect on the behavioural intention to use a financial overview application, resulting in the rejection of hypothesis H6. In support of this finding, a meta-analysis conducted by King and He (2006) showed that the effect of perceived ease of use on behavioural intention is very weak or even insignificant in many TAM studies. They furthermore argued that the relationship between perceived ease of use and behavioural intention is often mediated by perceived usefulness. This is in line with the findings of this study, where the relationship between perceived ease of use and behavioural intention was shown to be fully mediated by both perceived usefulness and perceived enjoyment. Perceived ease of use had a positive effect on the perceived usefulness, supporting hypothesis H7. Accordingly, people perceive a financial overview application that is easier to use also as more useful. In addition, a positive effect of perceived ease of use on

perceived enjoyment was found, which indicates that people who perceive a financial overview application as more easy to use, also perceive it as more enjoyable. As discussed before, perceived usefulness and perceived enjoyment showed to have a positive effect on behavioural intention.

At last, the additional analyses revealed that the level of gamification has no significant direct effect on perceived usefulness and behavioural intention. People do not perceive a financial overview application with higher levels of gamification as more useful, nor do they posit higher behavioural intentions for a financial overview application that has a higher level of gamification.

7. Conclusion

7.1 Theoretical contributions

The results of this study lead to several contributions to the theories of the TAM and gamification.

First, this study is one of the first to extend the TAM with the design characteristic gamification, or more specifically different levels of gamification. The study shows that gamification is a factor that can influence the perceived ease of use of a financial overview technology. Although in this study the gamified applications were not perceived as significantly more or less easy to use than a non-gamified application, the results show that an app that is gamified with badges is perceived as significantly easier to use than an app that is gamified with badges, a progress bar and levels. This study also indicates that different levels of gamification have no significant direct effect on the perceived usefulness and usage intention of a financial overview application.

Second, this study demonstrates that heterogeneity exists among people with respect to gamification. The effect of gamification on perceived enjoyment was found to differ between people that are less and those who are more inclined to plan their finances. The effectiveness of gamification can therefore not be generalized for all people, as it depends on personal factors.

Third, in this study the TAM was applied to a new technology, namely a financial overview application. The results partly corroborate the relationships established in the original TAM, as it was found that perceived ease of use is an antecedent of perceived usefulness and that perceived usefulness is in turn an antecedent of behavioural intention. However, in contrast to the original TAM, no direct effect of perceived ease of use on behavioural intention could be established in the context of a financial overview application.

Fourth, the study at hand supports the extension of the TAM with perceived enjoyment, as perceived enjoyment was found to be an antecedent of behavioural intention. In addition, the data indicated that perceived enjoyment is a more important predictor of behavioural intention

than perceived usefulness in the context of a financial overview application. This suggests that perceived enjoyment is a very important factor to consider when investigating the acceptance of utilitarian financial overview technologies.

Fifth, the gamification literature states that gamification is a way to make non-game contexts more enjoyable. However, this study shows that gamification in the form of badges or in the form of badges, a progress bar and levels in the context a financial overview application is not able to induce this effect. Ruling out the factors that could have caused this, this study suggests that not all levels of gamification are able to induce a positive effect on perceived enjoyment.

7.2 Managerial contributions

The current study offers several implications for managers and developers of financial overview technologies.

First, it helps managers to get an insight into the key drivers for the adoption of a financial overview technology. The study at hand shows that the content of such technology should be useful, as it will determine whether people intend to use it. Furthermore, although a financial overview technology is highly utilitarian, it is important to include some enjoyable content into the technology. This study shows that people are more inclined to use such a technology when they perceive it as enjoyable. In addition, the technology should have an easy interface, as people perceive applications that are easy to use as more useful and enjoyable, and this in turn influences their intention to use the technology.

Second, the results have implications for managers and developers that consider to develop or launch a gamified financial overview technology. Particularly, this study suggests that consumers do not perceive apps that are gamified with either badges or badges, a progress bar and levels as significantly more or less easy to use than non-gamified apps. So with respect to perceived ease of use it does not matter whether to implement gamification or not. As the

development of a gamified technology takes more time and will cost more than developing a non-gamified technology, it might be preferable for practitioners to develop a non-gamified financial overview technology. However, if for other reasons a gamified financial overview technology will be developed, with respect to perceived ease of use, only badges should be implemented instead of badges, a progress bar and levels. Participants perceive an app gamified with badges, a progress bar and levels as less easy to use than an app gamified with badges.

Third, this study shows that gamification is perceived differently by different types of people. People who are less inclined to plan their finances, in contrast to people who are more inclined to do so, perceive a financial overview application that is gamified with badges as less enjoyable than both a financial overview application that is not gamified and an application that is gamified with badges, a progress bar and levels. Hence, practitioners should be aware that not all levels of gamification are perceived similarly by different types of people. When also targeting people who are less inclined to plan, managers should thus, with respect to perceived enjoyment, not gamify a financial overview application or they should gamify it with badges, a progress bar and levels. They should do so because, with respect to perceived enjoyment, a non-gamified app and an app gamified with badges, a progress bar and levels are perceived similarly by different people, whereas a financial overview application gamified with badges is perceived as less enjoyable than those two versions by people who are less inclined to plan.

Fourth, managers of a financial overview technology should not gamify such a technology with either badges or badges, a progress bar and levels if want to increase people's intention to use it. This because these forms of gamification have no direct effect on the intention to use a financial overview application, no positive effect on the antecedents of the usage intention (perceived ease of use, perceived usefulness and perceived enjoyment), and gamification in the form of badges even has, for people who are less inclined to plan, a negative effect on perceived enjoyment. In addition, gamifying an application will cost more and takes more time.

7.3 Limitations and further research

Although some interesting relationships were found in this study, several limitations need to be mentioned. Some of these limitations provide opportunities for further research.

First, due to time restrictions and limited money to invest in the development of the financial overview application, only three versions of the app with varying levels of gamification were developed. Although participants in the different gamification levels overall did not differ significantly with respect to their perceived enjoyment, the results showed that the app with the highest level of gamification (badges, a progress bar and levels) tends to be perceived as slightly more enjoyable. Hence, a financial overview application that has a higher level of gamification than the highest level of gamification tested in this study, might be perceived as significantly more enjoyable than a non-gamified application. Further research should investigate this.

Second, in this study, gamification has only been applied in the form of badges and in the form of badges, a progress bar and levels. However, there are many other gaming elements that can be used to gamify a context. The same levels of gamification, but with different gaming elements might have other effects on the constructs tested during this study. Therefore, future studies should investigate this.

Third, the financial overview application did not contain the personal (financial) information of the participants, but only hypothetical information. As a result, people might have been less interested and motivated than they would have been if their personal information had been provided. Therefore, future studies should test the research model of this study again using a financial overview application that contains participants' personal information.

Fourth, not all the buttons and functionalities in versions of the application that were tested in this study worked, as the app was not finished yet. People could only view financial information, and were, for example, not able to fill in any information themselves. Although people were informed about this, it might have caused less reliable results. For example, the

positive perception with respect to ease of use may be a result of the limited functionalities people could use and the limited buttons they could click on in the test versions. Future studies can avoid this problem by only testing finished apps.

Fifth, the non-gamified financial overview application tested in this study was on average perceived as relatively easy to use. The badge description might therefore not have added relevant information to the users about how to use the application. This could have caused the insignificant effect of the level of gamification on perceived ease of use. Other studies should therefore test the effect of the levels of gamification tested during this study on perceived ease of use in an application that is perceived as difficult to use.

Sixth, in this study people could test the financial overview application in private, where they may have been distracted while they were testing the application. Due to this, participants might not have been concentrated enough on the application and this might have caused the insignificant effect of the higher levels of gamification on perceived enjoyment (Sweetser & Wyeth, 2005). Future studies should therefore be conducted in a laboratory to control for the influence of environmental factors.

Seventh, the foundation Financieel Paspoort does not want to log any usage information of the users of the 'Financieel Paspoort' application. Due to this and to the setting in which the research was conducted, it was not possible to measure factors such as the usage time of the application and the number of buttons people clicked on. These might be other important factors that can be influenced by gamification. Hence, future research should test the effect of gamification on these variables.

At last, the financial overview application 'Financieel Paspoort' is not available yet for people in the Netherlands. As a result, people's intention to use the application is measured rather than their actual usage. Future studies could extend this research by investigating the actual usage behaviour of people once the application has been launched.

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Appendices

Appendix A – The questionnaire

Beste deelnemer,

Bedankt voor uw deelname aan dit onderzoek! Op dit moment zijn wij bezig met een pre-test voor een nieuwe app die u een overzicht biedt van uw financiën. Wij zijn geïnteresseerd in uw mening met betrekking tot het gebruiksgemak en de nuttigheid van deze app. Gedurende dit onderzoek wordt u daarom gevraagd onze app te testen en daarna een aantal vragen te beantwoorden over het gebruik van de app.

Het onderzoek duurt ongeveer 15 minuten. Uw antwoorden zullen vertrouwelijk behandeld worden en uitsluitend voor het doeleinde van dit onderzoek worden gebruikt.

Aangezien de app nog niet volledig af is, is het niet mogelijk om u uw eigen financiële gegevens te tonen. Stelt u zich daarom alstublieft voor dat de gegevens die in de app getoond worden uw eigen gegevens zijn. Daarnaast werkt een aantal knoppen nog niet. U zult hier wel op kunnen klikken, maar er zal dan niets gebeuren.




U kunt deze vragenlijst het beste invullen op een ander apparaat dan waarop u de app gaat downloaden, zodat u de instructies erbij kunt houden en niet hoeft te wisselen tussen de vragenlijst en de app.

Wij willen u nu vragen de app ‘Ionic View’ te downloaden op uw smartphone/tablet. Zoekt u daarom op uw smartphone/tablet in de App Store of Play Store naar de app ‘**Ionic View**’ en download deze. Uiteraard worden uw gegevens uitsluitend gebruikt voor het doeleinde van dit onderzoek.

Is het gelukt om de app te downloaden?

- ja, ik heb de app gedownload
 - nee, ik heb de app niet kunnen / willen downloaden (door naar ‘buiten doelgroep’ pagina)
 - n.v.t., ik heb geen smartphone of tablet (door naar ‘buiten de doelgroep’ pagina)
-

Nu u de app gedownload heeft willen wij u vragen om de volgende instructies op te volgen om zo de app te kunnen testen. Indien u vragen heeft, kunt u contact opnemen met mcn.reijnders@student.maastrichtuniversity.nl

1. Open de app
2. Klik op Log in
Vul bij email en password de volgende gegevens in:
Email: fpaspoort@gmail.com
Password: tester
Klik vervolgens op log in.
3. Klik nu op het tandwiel rechtsboven .
4. Vink het knopje 'SHOW SWIPE INFO'  uit door het naar links te vegen .
5. Klik op het pijltje of kruisje boven in beeld om terug te gaan.
6. Klik op 'PREVIEW APP' of 'PREVIEW A SHARED APP'.
7. Vul bij ENTER APP ID in: **c293358a** en klik op 'VIEW APP' of 'LOAD APP'.

De app die u dient te testen voor dit onderzoek wordt nu geopend

8. Voer de code **5421** (*controle groep – testgroep 1*) / **9167** (*gamification 1 versie – testgroep 2*) / **6984** (*gamification 2 versie – testgroep 3*) in en druk op Start.
9. Klik onderaan het scherm op 'INLOGGEN' (u moet wellicht naar beneden scrollen om deze knop te zien).
10. Klik nu rechts onder weer op 'INLOGGEN'.
11. Maak uzelf nu bekend met de app door op de verschillende functies te klikken en deze te bekijken.

Is het gelukt om de app te testen?

- ja, ik heb de app getest
- nee, ik heb de app niet kunnen / willen testen (door naar 'buiten doelgroep' pagina)

Bedankt voor het testen van de app. De app die u getest heeft heet het Financieel Paspoort. Onderstaande vragen hebben betrekking op uw ervaring met de app het Financieel Paspoort. Let er alstublieft op dat het inlogproces niet tot deze app behoort. Laat uw ervaring met betrekking tot het inlog proces daarom bij het invullen van deze vragenlijst buiten beschouwing. U mag de app bekijken tijdens het invullen van de vragenlijst.

Verificatievraag

1. Welk bedrag staat er bij Inkomsten en Uitgaven bij de persoon waarvan u het overzicht heeft bekeken (Alex)?
 - a. €29.467 (door naar 'fout antwoord' pagina)
 - b. €32.090 (door naar 'fout antwoord' pagina)
 - c. €36.358

Risicoaversie

Ik wil totaal geen risico's nemen **Neutraal** **Ik neem graag risico's**
○ ○ ○ ○ ○ ○ ○ ○ ○ ○

20. Hoe ziet u uzelf: bent u iemand die volledig bereid is om risico's te nemen of probeert u risico's te vermijden?

Neiging om te plannen

Geef alstublieft aan in welke mate u het eens bent met de volgende stellingen.

Volledig mee oneens **Neutraal** **Volledig mee eens**
○ ○ ○ ○ ○ ○ ○

21. Ik stel financiële doelen voor de komende 1-2 maanden voor wat ik wil bereiken met mijn geld.

22. Ik plan hoe mijn geld wordt gebruikt in de komende 1-2 maanden.

23. Ik denk na over welke stappen ik moet nemen om de komende 1-2 maanden binnen mijn budget te blijven.

24. Ik raadpleeg mijn budget af en toe om te zien hoeveel geld ik nog heb voor de komende 1-2 maanden.

25. Ik hou mijn uitgaven in de gaten, om een idee te krijgen wat ik in de komende 1-2 maanden zal uitgeven.

26. Het geeft me een goed gevoel om mijn financiën voor de komende 1-2 maanden gepland te hebben.

Smartphone/Tablet

27. Op welk apparaat heeft u de app getest?

- Smartphone (door naar 27b)
- Tablet (door naar 27c)
- Anders, namelijk:

27b. Welk merk Smartphone heeft u gebruikt?

- Apple (iPhone)
- Alcatel
- LG
- Microsoft
- Samsung
- Sony
- HTC
- Huawei
- Ander merk
- Weet niet

27c. Welk merk Tablet heeft u gebruikt?

- Apple (iPad)
- Lenovo
- Samsung
- Ander merk
- Weet niet

Socio-demografische gegevens

Inkomen

28. Wat is uw bruto jaarinkomen (inclusief vakantiegeld en 13^e maand)?

- Minder dan €10.000
- Tussen €10.000 en €19.999
- Tussen €20.000 en €29.999
- Tussen €30.000 en €39.999
- Tussen €40.000 en €49.999
- Tussen €50.000 en €59.999
- €60.000 of meer

* Leeftijd, geslacht en opleiding van de respondenten zijn reeds bekend bij het panel

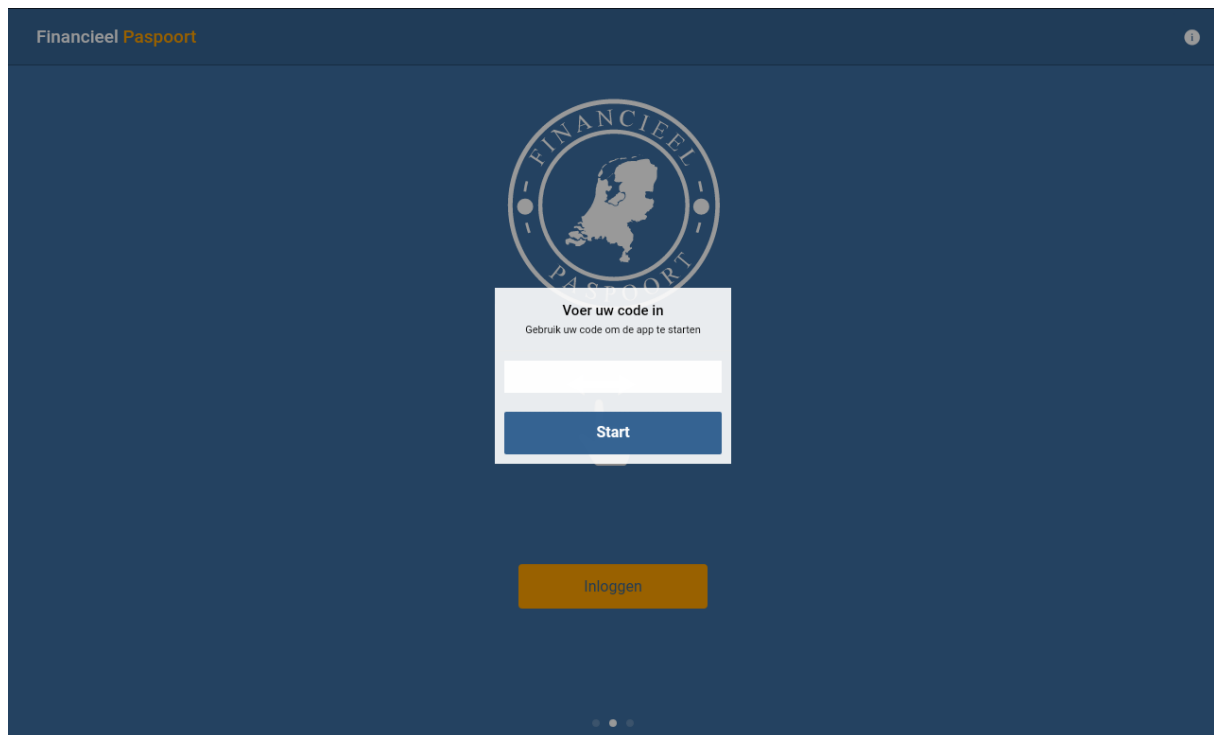
'Buiten de doelgroep' pagina

Helaas kunt u niet deelnemen aan dit onderzoek zonder de app te downloaden en bekijken. Klik op 'Volgende' om de vragenlijst af te sluiten.

'Fout antwoord' pagina

Helaas heeft u niet het juiste antwoord gegeven. U kunt niet deelnemen aan dit onderzoek zonder de app te bekijken. Klik op 'Volgende' om de vragenlijst af te sluiten.

Appendix B – Access to the app with a code

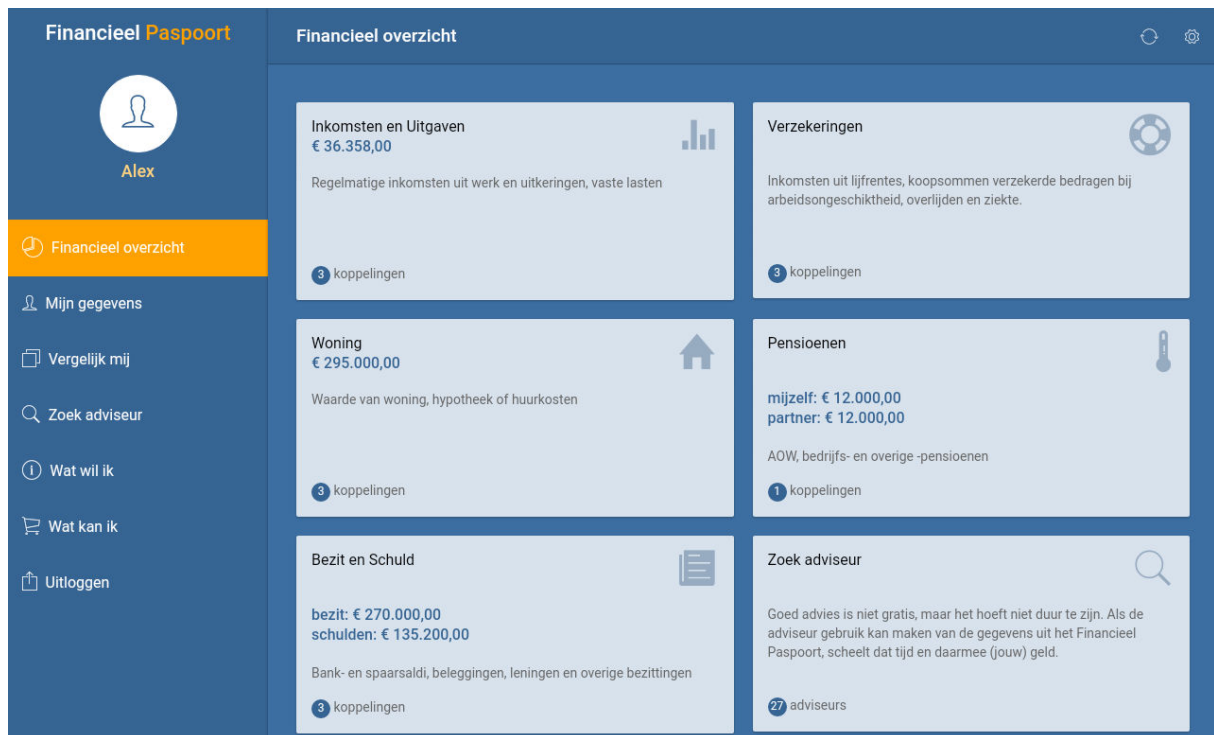


Codes for opening one of the versions of the financial overview application:

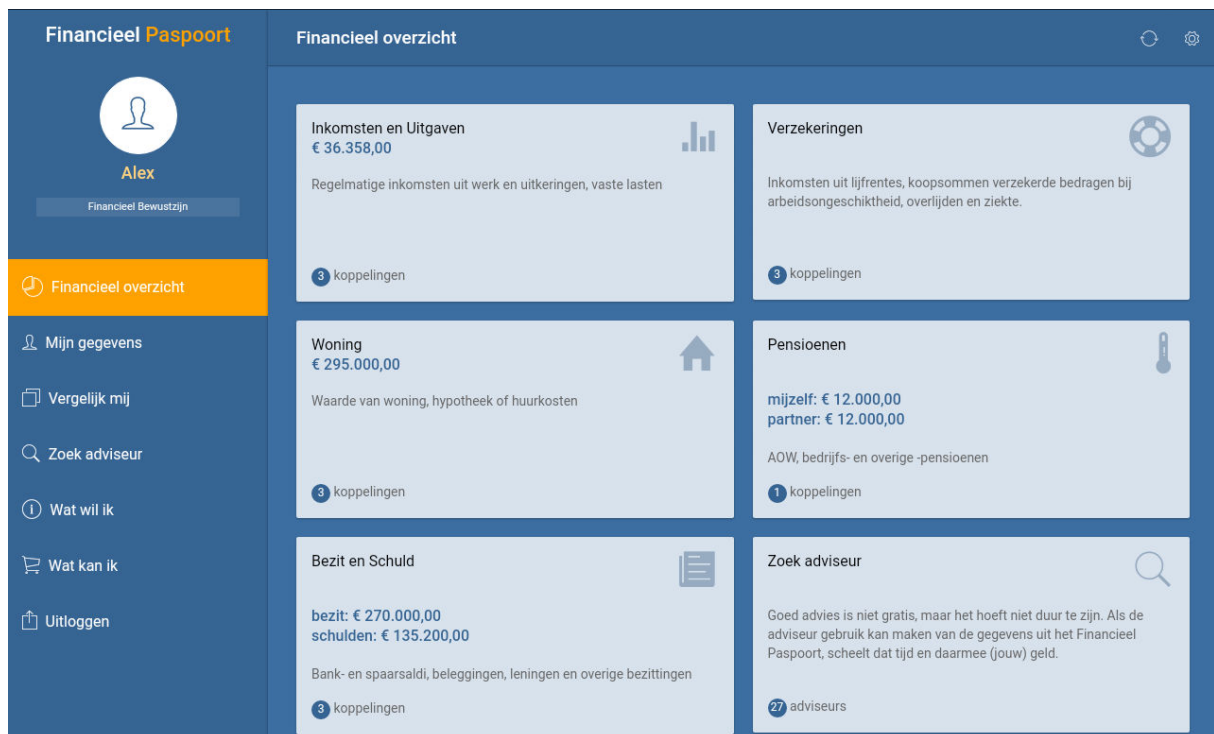
- GAME 1: *5421*
- GAME 2: *9167*
- GAME 3: *6984*

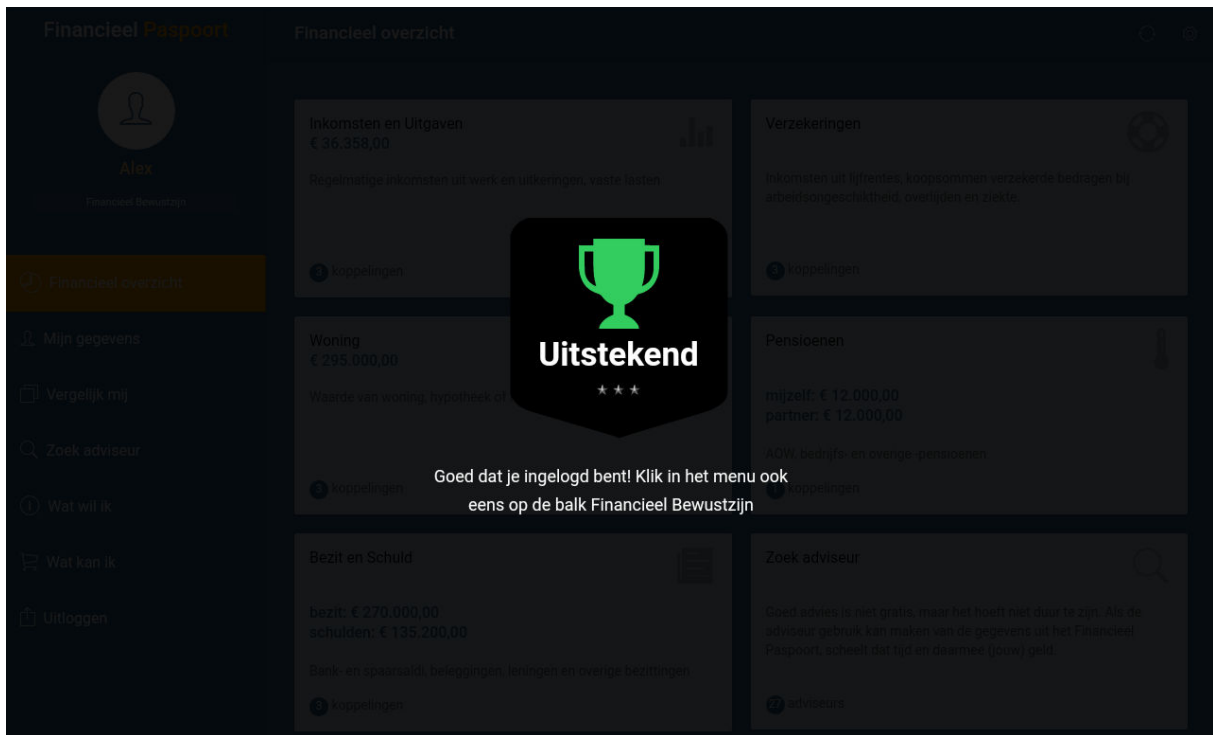
Appendix C – Different versions of the ‘Financieel Paspoort’ app


GAME 1: Non-gamified app



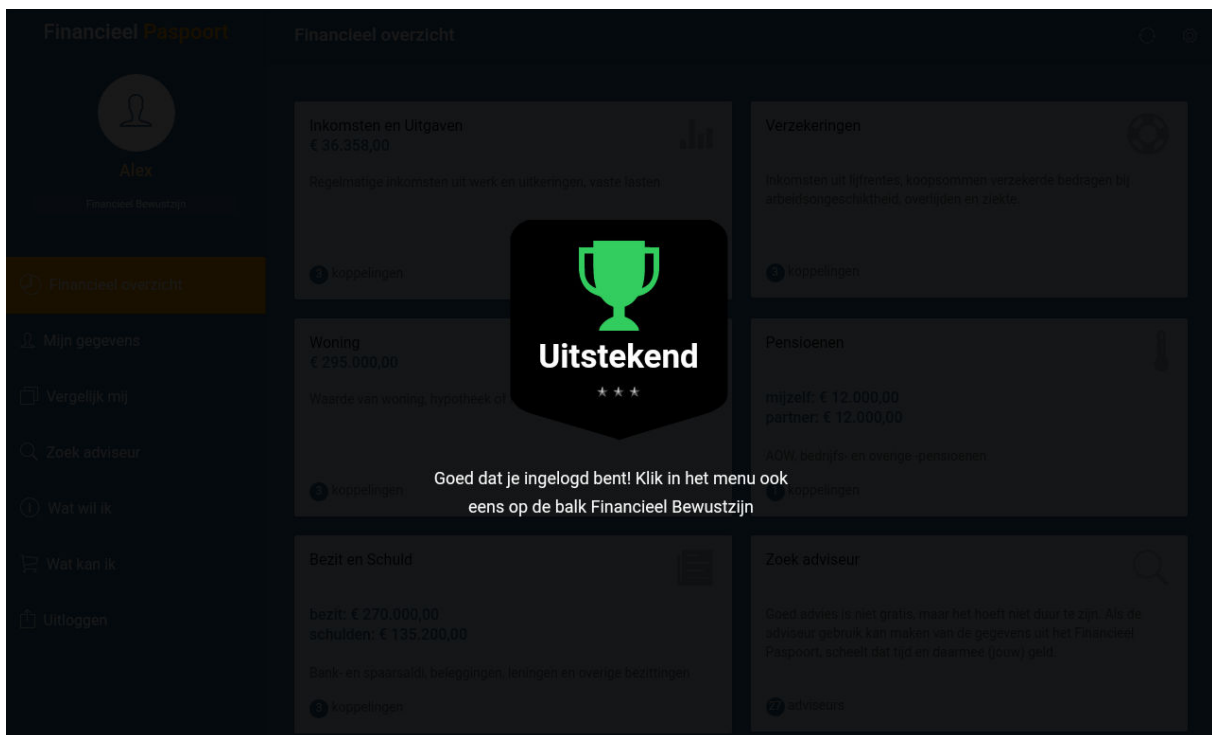
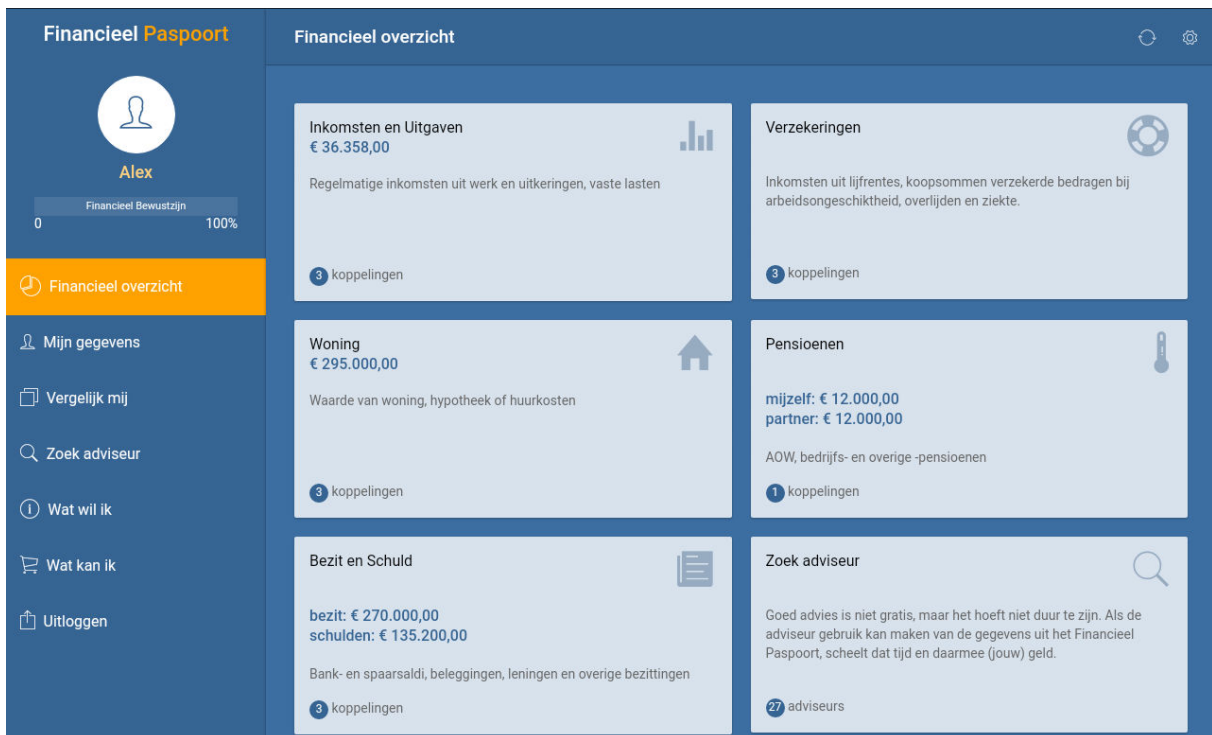
GAME 2: App gamified with badges






Financieel Paspoort		← Financieel Bewustzijn
 Alex Financieel Bewustzijn		Progressie
<ul style="list-style-type: none"> Financieel overzicht Mijn gegevens Vergelijk mij Zoek adviseur Wat wil ik Wat kan ik Uitloggen 	<ol style="list-style-type: none"> Inloggen bij het Financieel Paspoort ✓ Klik op de Balk, Financieel Bewustzijn Bekijk Inkomsten en Uitgaven Bekijk Verzekeringen Bekijk Woning Bekijk Pensioenen Bekijk Bezittingen en Schulden Bekijk Vergelijk mij Bekijk Wat wil ik Bekijk Wat kan ik Zoek een adviseur 	

GAME 3: App gamified with badges, a progress bar and levels



Financieel Paspoort



Alex

Financieel Bewustzijn

0 100%

- 🕒 Financieel overzicht
- 👤 Mijn gegevens
- 📄 Vergelijk mij
- 🔍 Zoek adviseur
- ① Wat wil ik
- 🛒 Wat kan ik
- 🚪 Uitloggen

← Financieel Bewustzijn

Progressie

Voordat je aan de slag gaat!

- 1 Inloggen bij het Financieel Paspoort ✓
- 2 Klik op de Balk, Financieel Bewustzijn

Bekijk alle tegels en wordt beginner

- 4 Bekijk Inkomsten en Uitgaven
- 5 Bekijk Verzekeringen
- 6 Bekijk Woning
- 7 Bekijk Pensioenen
- 8 Bekijk Bezittingen en Schulden


Wordt gevorderde

- 9 Bekijk Vergelijk mij
- 10 Bekijk Wat wil ik
- 11 Bekijk Wat kan ik

Wordt expert

- 12 Zoek een adviseur

Financieel Paspoort



Alex

Financieel Bewustzijn

0 100%

- 🕒 Financieel overzicht
- 👤 Mijn gegevens
- 📄 Vergelijk mij
- 🔍 Zoek adviseur
- ① Wat wil ik
- 🛒 Wat kan ik
- 🚪 Uitloggen

← Financieel Bewustzijn

Progressie

Voordat je aan de slag gaat!

- 1 Inloggen bij het Financieel Paspoort ✓
- 2 Klik op de Balk, Financieel Bewustzijn ✓

Bekijk alle tegels en wordt beginner

- 4 Bekijk Inkomsten en Uitgaven ✓
- 5 Bekijk Verzekeringen ✓
- 6 Bekijk Woning ✓
- 7 Bekijk Pensioenen ✓
- 8 Bekijk Bezittingen en Schulden ✓

Wordt gevorderde

- 9 Bekijk Vergelijk mij
- 10 Bekijk Wat wil ik
- 11 Bekijk Wat kan ik

Wordt expert

- 12 Zoek een adviseur

Appendix D – Sample description (n = 360)

Table 11 *Sample description (n = 360)*

Item	Frequency	Percentage (%)
Gender		
Male	189	52.5
Female	171	47.5
Age		
18-19	11	3.1
20-24	40	11.1
25-29	37	10.3
30-34	36	10.0
35-39	29	8.1
40-44	34	9.4
45-49	35	9.7
50-54	33	9.2
55-59	29	8.1
60-64	23	6.4
≥ 65	53	14.7
Education		
Low	88	24.4
<i>geen of basisonderwijs (lagere school)</i>	5	1.4
<i>vmbo, mavo, mulo of gelijkwaardig</i>	72	20.0
<i>lbo, lts of gelijkwaardig</i>	11	3.1
Middle	163	45.3
<i>havo, vwo, hbs, gymnasium of gelijkwaardig</i>	58	16.1
<i>mbo, mts of gelijkwaardig</i>	105	29.2
High	109	30.3
<i>hbo, hts of gelijkwaardig</i>	46	12.8
<i>wetenschappelijk onderwijs (universiteit)</i>	63	17.5
Income		
< €10.000	57	15.8
€10.000 - €19.999	67	18.6
€20.000 - €29.999	68	18.9
€30.000 - €39.999	82	22.8
€40.000 - €49.999	32	8.9
€50.000 - €59.999	26	7.2
≥ €60.000	28	7.8

Appendix E – Principal axis factoring

Table 12 *Pattern matrix*

Pattern Matrix^a

Scale Item	Factor				
	Perceived Ease of Use (PEU)	Perceived Usefulness (PU)	Propensity to Plan (FPLAN)	Behavioral Intention (BI)	Perceived Enjoyment (ENJ)
	1	2	3	4	5
PEU 4	.928				
PEU 5	.920				
PEU 3	.870				
PEU 1	.865				
PEU 2	.806				
PU 4		1.005			
PU 3		.928			
PU 5		.820			
PU 2		.808			
PU 1		.640			
FPLAN 6			.847		
FPLAN 3			.822		
FPLAN 5			.817		
FPLAN 2			.804		
FPLAN 4			.789		
FPLAN 1			.693		
BI 2				.930	
BI 3				.921	
BI 1				.908	
ENJ 1					.753
ENJ 2					.718
ENJ 3					.622

Extraction Method: Principal Axis Factoring

Rotation Method: Promax with Kaiser Normalization

a. Rotation converged in 5 iterations

Official Statement of Original Thesis

By signing this statement, I hereby acknowledge the submitted thesis (hereafter mentioned as “product”), titled:

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