Demographic differences in perceived benefits from gamification

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ABSTRACT

In recent years, "gamification" has been proposed as a solution for engaging people in individually and socially sustainable behaviors, such as exercise, sustainable consumption, and education. This paper studies demographic differences in perceived benefits from gamification in the context of exercise. On the basis of data gathered via an online survey ($N = 195$) from an exercise gamification service Fitocracy, we examine the effects of gender, age, and time using the service on social, hedonic, and utilitarian benefits and facilitating features of gamifying exercise. The results indicate that perceived enjoyment and usefulness of the gamification decline with use, suggesting that users might experience novelty effects from the service. The findings show that women report greater social benefits from the use of gamification. Further, ease of use of gamification is shown to decline with age. The implications of the findings are discussed.

1. Introduction

The question of how we understand gamer demographics and gaming behaviors, along with use cultures of different demographic groups, has loomed over the last decade as games became one of the main veins of entertainment and consumer culture (Yi, 2004). The deeply established perception of games being a field of entertainment dominated by young males has been challenged. Nowadays, digital gaming is a mainstream activity with broad demographics. The gender divide has been diminishing, the age span has been widening, and the average age is higher than stereotypically assumed (Greenberg, Sherry, Lachlan, Lucas, & Holmstrom, 2010; Griffiths, Davies, & Chappell, 2003, 2004; Hartmann & Klimmt, 2006; Williams, Yee, & Caplan, 2008; Yee, 2006). An illustrative study commissioned by PopCap (Information Solutions Group, 2011) reveals that it is actually women in their 30s and 40s who play the popular social games on social networking services (see e.g. Hamari & Järvinen, 2011; Paavilainen, Hamari, Stenros, & Kinnunen, 2013) most – outplaying men and younger people. It is clear that age and gender perspectives on gaming activities and motivations require further scrutiny.

The expansion of the game industry and the increased competition within the field has also led to two parallel developments: (1) using game design as marketing (Hamari & Lehdonvirta, 2010) and (2) gamification – going beyond what traditionally are regarded as games and implementing game design there (Deterding, Dixon,

Khaled, & Nacke, 2011; Hamari, 2013; Huotari & Hamari, 2012; McGonigal, 2011). Today, gamification is being applied in several areas (Hamari, Koivisto, & Sarsa, 2014), often for the benefit of users. For example, services such as Mindbloom, Fitocracy, Zombies, Run!, and Nike+ are aimed at assisting the user toward beneficial behavior related to lifestyle and health choices.

However, it is unclear whether we can see age and gender discrepancies in use of gamified services similar to those in other digital gaming contexts. The main difference between games and gamification is that gamification is commonly used to advance goals outside the game – e.g., supporting healthier lifestyles, greener consumption, and better financial decision-making – whereas playing games is considered purely autotelic or intrinsically motivated. Therefore, the motivations and the perceived benefits from gamification require further examination. No data exist on user demographics for gamification services, which further justifies the current undertaking.

This paper contributes to the growing body of literature on age and gender in gaming by investigating age and gender differences in perceived benefits from use of gamification. The study presents empirical data on the effects of gender, age, and time using the service on the social, hedonic, and utilitarian benefits from gamifying exercise, along with the facilitating factors in a gamification service with social features.

2. Background

2.1. Gamification

The phenomenon of creating gameful experiences has most notably been termed gamification: the aim of gamification is to

support and motivate the users to perform tasks promoted by the services (Deterding et al., 2011; Huotari & Hamari, 2012). This goal is pursued by providing affordances for gameful experiences and thus making the target activities more engaging. Gameful experiences similar to those created by games, such as flow, a feeling of mastery, and intrinsic motivations (Csíkszentmihályi, 1990; Deci & Ryan, 1985; Ryan, Rigby, & Przybylski, 2006), have been at the core of the discussion of gamification (Deterding et al., 2011; Hamari, 2013; Huotari & Hamari, 2012) as a means to motivate behavioral and psychological outcomes. For instance, in the case of gamified exercise applications, the services at their core aim at increasing exercise, thus serving a utilitarian purpose. In addition to the core service, the gamification features implemented are aimed at motivating and supporting the user for increased exercise by adding a hedonic element to the activity: providing, for example, feedback, achievable goals, progress, and encouragement. The engaging elements of gameplay are employed to create more enjoyable exercise experiences.

Many service providers have also implemented social features and layers in their services. For example, the user community of the service might serve the function of supporting the gamification elements and itself providing essential functions of the gameful experience – e.g., other users' recognition of one's achievements and updates. Early results on the effects of social factors in gamified services show that when a gamification implementation incorporates social features, the size of the community committed to the same goals is an important prerequisite for the gamification service's effectiveness (Hamari, 2013; Hamari & Koivisto, 2013). The size of the community also positively influences the perceived benefits from social influence, recognition, and reciprocity. It should also be noted that in the gamified services the social, utilitarian, and hedonic elements are often more or less intertwined (Lin & Bhattacherjee, 2008) (e.g., social factors contribute also to perceived usefulness and enjoyment of the service).

2.2. Demographic differences in adoption and use of digital technologies and digital gaming, and effects of time using the service

Demographic differences are a pertinent question also in research of technology adoption and use (Venkatesh, Morris, & Ackerman, 2000). Differences regarding, for example, perceptions, motivations and information processing in technology adoption processes and use intentions may have significant consequences, for example, in organizational contexts, where large sums are invested into IT (Morris, Venkatesh, & Ackerman, 2005; Sun & Zhang, 2006; Venkatesh et al., 2000). Yet, for example, both age and gender have not received great attention as moderating variables of these processes in the information technology literature (Gefen & Straub, 1997; Sun & Zhang, 2006). Furthermore, relevant to the context of gamification, both age and gender represent perspectives on games and gameplay wherein variation and preferences have been long disregarded by the industry and to some degree also by academics (Greenberg et al., 2010; Griffiths et al., 2003; Williams et al., 2008). The current body of literature on effects of age and gender in technology adoption and use, however, suggests that differences do exist.

2.2.1. Age
Research regarding effects of age in technology adoption and use has indicated that younger technology users value usefulness of the technology more than older users when deciding on use intentions (Venkatesh, Morris, Davis, & Davis, 2003). Furthermore, older users are considered to be more affected by social influence than young ones (Morris & Venkatesh, 2000; Venkatesh et al., 2003; Wang, Wu, & Wang, 2009) in their technology adoption processes, potentially due to higher affiliation needs (Morris &

Venkatesh, 2000; Sun & Zhang, 2006; Venkatesh et al., 2003). This could be especially pertinent to organizational contexts where younger employees may seek to be more autonomous (Morris et al., 2005) than older ones. However, in an organizational context the effect of age on social influence in IT adoption has been reported to diminish in the long term (Morris & Venkatesh, 2000). The lesser effect of social influence on younger users may be a result of the fact that younger users have been exposed to digital technologies at a younger age (Morris & Venkatesh, 2000). This so called digital divide between generations (Ijsselsteijn, Nap, de Kort, & Poels, 2007; Morris & Venkatesh, 2000; Pfeil, Arjan, & Zaphiris, 2009) has developed as younger generations become exposed to digital technologies earlier and earlier.

Consequently, older generations tend to experience lower self-efficacy and more computer anxiety than younger people and so perceive their skills in using digital technologies as lower (Chung, Park, Wang, Fulk, & McLaughlin, 2010; Czaja et al., 2006; Ellis & Allaire, 1999; Harrison & Rainer, 1992). Furthermore, it has been shown that technology acceptance (Arning & Ziefle, 2007; Czaja et al., 2006) and perceived usability (Ijsselsteijn et al., 2007), which are affected by age (Arning & Ziefle, 2007; Czaja et al., 2006), play a major part in technology adoption and digital gaming. Older technology-users emphasize ease of use more when assessing the usefulness of a given system (Arning & Ziefle, 2007). As learning to use new devices or services may become a more time-consuming process with age, the tradeoff between perceived ease of use and perceived benefits of the device or service becomes relevant (Melenhorst, Rogers, & Caylor, 2001). Findings of age having no effect on perceptions of ease of use or usefulness of, for example, online communities have also been published (Chung et al., 2010), which prompts examination of the effects of the services' content and affordances from an age perspective (Ijsselsteijn et al., 2007).

2.2.2. Gender
With regards to gender, prior research has indicated that genders differ in their decision making processes (Venkatesh & Morris, 2000), for example, in terms of information processing (Sun & Zhang, 2006; Venkatesh & Morris, 2000). Correspondingly, results from studies on technology adoption processes and IT use have found support for differences between genders. For instance, research on sex and gender roles and behavior has indicated that men display more instrumental behavior (Spence & Helmreich, 1980; Venkatesh et al., 2000), and in general, are more task- and achievement-oriented than women (Hoffman, 1972; Minton & Schneider, 1980). This finding has been supported in the context of IT as studies have shown men to be more affected by the usefulness of the technology (Venkatesh & Morris, 2000), thus highlighting the instrumentality of the system. In contrast, research has shown that for women affiliation needs are a more influential motivator (Hoffman, 1972), and women are more interpersonally-oriented than men (Minton & Schneider, 1980; Spence & Helmreich, 1980). These perspectives would suggest that women are more concerned with social relations and, for example, more prone to social influence (Venkatesh et al., 2000). In accordance, women's IT adoption decisions have been reported to be affected more by social factors, such as subjective norm, especially during initial adoption (Venkatesh & Morris, 2000; Venkatesh et al., 2000). Similarly, in the currently hugely popular online contexts with social features (e.g., social networks), women have been indicated to be more socially motivated users of the services, while men concentrate more on pragmatic uses (Haferkamp, Eimler, Papadakis, & Kruck, 2012; Muscanell & Guadagno, 2012). However, in some contexts, such as mobile learning, men instead of women have been reported to be influenced by social factors (Wang et al., 2009).

On a general level, women have been considered to be less likely to enjoy and use computers and information technology (Ahuja & Thatcher, 2005). This phenomenon has been explained by women's lower perceptions of self-efficacy and computer aptitude, and higher perceptions of computer anxiety (Ahuja & Thatcher, 2005; Venkatesh & Morris, 2000; Whitley, 1997), which may be partially due to cultural considerations of IT being a male-dominated field (Gefen & Straub, 1997). In accordance with these perceptions, ease of use has been reported to have a greater influence in women's technology use and adoption processes, especially in organizational contexts (Venkatesh & Morris, 2000). However, as Nysveen, Pedersen, and Thorbjørnsen (2005) point out, the context of the technology in question is potentially influential for the relationship between gender and ease of use. In their study on mobile chat services, such relationship was not found. They explain the results with the context of the study, and the fact that different mobile services are already largely used by both genders (Nysveen et al., 2005).

In the context of digital gaming, results from prior research have indicated that gender differences do exist with regard to gender (Greenberg et al., 2010; Hartmann & Klimmt, 2006; Lucas & Sherry, 2004; Williams et al., 2008). Digital gaming has been connected to beneficial effects such as better computer-literacy and increased technological skills. Thus, the gender divide in gaming has been feared to create a more general gender gap with regard to technology use (Cassell & Jenkins, 1998; Lucas & Sherry, 2004). Motivational aspects have been raised as a potential source of gender differences in gaming. Researchers have considered gender roles and identities (Eagly, 1987; Lucas & Sherry, 2004; Poels, De Cock, & Malliet, 2012; Williams, Consalvo, Caplan, & Yee, 2009), self-efficacy or competence (Carr, 2005; Hartmann & Klimmt, 2006), etc. and have examined motivational effects of contentual (sexualized) representations of (female) gender (Beasley & Collins Standley, 2002; Dietz, 1998; Kafai, 1998), violent themes and competitiveness (Dietz, 1998; Lucas & Sherry, 2004), and lack of meaningful social content (Hartmann & Klimmt, 2006). Though the conceptions of the age and gender divides are persistent, in some game environments – e.g., massively multiplayer online (MMO) games – older players and women have been noted to spend more time playing than younger players and men (Williams et al., 2008, 2009). The game environment, however, seems important, since findings to the contrary have been reported too (Greenberg et al., 2010).

In accordance with the findings relating to IT adoption and use in general, Williams et al. (2008) and (2009) show that in the MMO game context, women are motivated by social factors and immersion. Men have been noted to express more achievement-oriented motivations (Williams et al., 2008, 2009) and more competitiveness and need for winning than women do (Hartmann & Klimmt, 2006). However, because female players might not receive as much gratification through the social interactions related to and included in the games as male players (e.g., social gratification from interacting with friends via games, social status, and peer support related to gameplay), lower social motivations of female players have been reported also (Funk & Buchman, 1996; Jansz, Avis, & Vosmeer, 2010; Lucas & Sherry, 2004). However, it should be noted that great variety in motivations most likely exists also within genders (Carr, 2005; Kafai, 1998).

2.2.3. Time using the service

In addition to age and gender, the effects of time using the service should be examined. The length of the involvement with the service and in the social community are likely to affect the perceptions of the benefits received. For example, in a gamification context, Farzan et al. (2008) found that the effects of motivational system elements may diminish with time. The discussion of the novelty effects of gamification suggests that at first users might feel excited about the new gameful features, but the interest declines with time.

3. Methods and data

3.1. Data

The data were gathered via an online survey of users of Fitocracy, one of the world's largest exercise gamification services. The service enables exercise-tracking and social networking. Features related to these core functions of the service are gamified. The gamification elements include badges (see Hamari & Eranti, 2011 on badges), levels, and points. Points and levels are awarded for the tracked exercises. Achievements are rewarded through badges, for example, for completing certain exercises or repeating them a given number of times or within a certain timeframe. Furthermore, the service includes elements related to social interaction, which are commonly implemented within social network services (Baker & White, 2010; Boyd & Ellison, 2008; Lin & Lu, 2011), such as status updating, "liking," and commenting. Users can create and join groups focusing on some general or exercise-related topic. Achievement badges are also rewarded for social activities, such as posting comments and receiving "likes" within the service. At the time of the data gathering, the service could be accessed via a browser or an iPhone application. An application for the Android operating system was released as the data gathering neared completion.

A link to the online survey was posted on the discussion forums of the service and further promoted through posts within a few groups clustered around a special interest or topic. The service requires registration, so the respondents had to have been registered users of the service to find the link to the survey. In the timeframe of the survey (10/2012–2/2013), 195 valid responses were gathered, making the study's sample size N = 195.

The descriptive statistics of the data (see Table 1) present those of the 195 respondents. The gender distribution of the sample is equal. The service had been available for approximately 20 months before the survey was launched. The times using the service reported by the respondents are distributed evenly across the time period of the service being available. The respondents' estimates of hours of exercise as well as how many exercise session they have during a normal week are also reported in Table 1. Furthermore, respondents were asked to report how they use the service: on a mobile device and/or on a computer. Of the 195 respondents, 181 (92%) stated that they used the service on a computer. The options were not mutually exclusive, and the respondents could choose both mobile and browser options. In fact, of the 181 browser-users, 66 (36%) reported also using the application on a mobile device. Therefore, no effects of the devices used are examined.

Given that Fitocracy belongs to a rather recent class of technologies, we can assume that users of Fitocracy in general are above the average in technology-awareness and technology adoption readiness. Furthermore, given that the service is targeted for health-conscious people, we can assume that the users are more health oriented than average internet users. Generally co-existing with such characteristics is also a higher than average education.

3.2. Validity and reliability of the measurement instrument

The survey instrument consisted of constructs for facilitating factors and social, hedonic, and utilitarian benefits. All of the constructs were adapted from previously published sources. The definitions, items, and sources of the constructs are provided in the Appendix. The facilitating factors consist of two constructs:

Table 1
Frequencies and percentages of gender, age, time using the service, and country of residence reported by the respondents. The "Country of residence" category "Others" comprises 20 countries with under 10 respondents each.

		Frequency	Percent		Frequency	Percent
Gender				Time using the service		
Female		98	50.3	Less than 1 month	23	11.8
Male		97	49.7	1–3 months	38	19.5
				3–6 months	28	14.4
Age, by gender (mean = 29.62, median = 28)				6–9 months	25	12.8
−19	Female	4		9–12 months	32	16.4
	Male	5		12–15 months	37	19.0
	Total	9	4.6	More than 15 months	12	6.2
20–29	Female	58				
	Male	43		*Country of residence*		
	Total	101	51.8	United States	106	54.4
30–39	Female	25		United Kingdom	18	9.2
	Male	37		Canada	16	8.2
	Total	62	31.8	Others	55	28.2
40–49	Female	10				
	Male	9		*Exercise sessions per week (mean = 5.2, median = 5)*		
	Total	19	9.7	1–4	81	41.5
50–59	Female	1		5–9	104	53.3
	Male	3		10–14	6	3.1
	Total	4	2.1	15 or more	4	2.1
Age mean	Female	28.67		*Hours of exercise per week (mean = 7.1, median = 6)*		
	Male	30.58		1–4	51	26.2
Age median	Female	26		5–9	96	49.2
	Male	30		10–14	38	19.5
				15 or more	10	5.1

network exposure and ease of use. The social dimension is operationalized as social influence, reciprocal benefit, and recognition. On the hedonic dimension are playfulness and enjoyment. The utilitarian construct is usefulness. As a behavioral outcome, continued exercise intentions were measured. Most of the constructs consisted of four items, one construct of five items, and one of eight items. All items were measured on a seven-point Likert scale (strongly disagree – strongly agree).

Convergent validity and reliability (see Table 2) was assessed with three metrics: average variance extracted (AVE), composite reliability (CR), and Cronbach's alpha (Alpha). All of the metrics exceeded the thresholds in relevant literature (AVE should be greater than 0.5, CR greater than 0.6 and Cronbach's alpha above 0.7 (Fornell & Larcker, 1981; Nunnally, 1978)). Furthermore, all items loaded with their corresponding constructs above .650 level. Only one item ('curious' of the playfulness construct) was deemed loading too poorly with its corresponding construct, and therefore, was omitted from the final construct structure. Furthermore, omitting the item ensured convergent validity of the construct (AVE above .5). We can conclude that the convergent validity and reliability requirements are met.

Discriminant validity (see Table 3) was assessed, firstly, through comparison of the square root of the AVE of each construct to all of the correlation between it and other constructs (see Fornell & Larcker, 1981), where all of the square root of the AVEs should

be greater than any of the correlations between the corresponding construct and another construct. Secondly, in accordance with the work of Pavlou, Liang, and Xue (2007), we determined that no inter-correlation between constructs was higher than 0.9. Thirdly, we assessed discriminant validity by confirming that all items had the highest loading with its corresponding construct. All three tests indicate that the discriminant validity and reliability are acceptable.

The analyses of demographic differences in perceived benefits by age, gender, and time using the service were performed via standard multiple regression analyses (Tabachnick & Fidell, 2013). In the analyses, the ratio-scale variable of age was used, not the ordinal scale presented in Table 1. The ordinal scale of time using the service presented in Table 1 was utilized for time using the service. The independent variables were centered prior to performing the analyses and the interaction terms were created from the centered variables (Tabachnick & Fidell, 2013). Before the analyses, the independent variables and the interactions terms were tested for multicollinearity. No multicollinearity between the variables existed.

4. Results

Regression analyses on the dependent variables were performed with age, gender, and time using the service as independent variables as well as with the interactions of the independent variables. The results of these analyses are reported in Table 4.

When examining the significant main effects of the independent variables on facilitating factors, network exposure was predicted by gender ($\beta = -.146^{**}$) and time using the service ($\beta = .173^{**}$). Ease of use was negatively influenced by age ($\beta = -.135^*$) and gender ($\beta = -.120^*$). Women reported perceiving more social benefits from gamification: reciprocal benefits ($\beta = -.156^{**}$) and recognition ($\beta = -.257^{***}$). However, social influence was only negatively affected by time using the service ($\beta = -.158^{**}$). Of the hedonic aspects, playfulness was predicted by gender ($\beta = -.136^*$) and, additionally, negatively affected by time using the service ($\beta = -.119^*$). Time using the service also

Table 2
Validity and reliability.

	AVE	CR	Alpha
Network exposure (NE)	.855	.959	.944
Ease of use (EOU)	.752	.923	.887
Social influence (SOI)	.735	.917	.879
Reciprocal benefit (RB)	.700	.903	.857
Recognition (REC)	.804	.943	.919
Playfulness (PLAY)	.529	.899	.870
Enjoyment (ENJ)	.779	.934	.905
Usefulness (USE)	.713	.925	.899
Continued exercise intention (CEI)	.548	.827	.722

Table 3
Correlation matrix. Square roots of AVEs are reported in bold in the diagonal.

	NE	EOU	SOI	RB	REC	PLAY	ENJ	USE	CEI
Network exposure (NE)	**.925**								
Ease of use (EOU)	.244	**.867**							
Social influence (SOI)	.383	.375	**.856**						
Reciprocal benefit (RB)	.448	.425	.570	**.837**					
Recognition (REC)	.464	.363	.446	.636	**.896**				
Playfulness (PLAY)	.226	.250	.392	.356	.233	**.727**			
Enjoyment (ENJ)	.334	.596	.558	.633	.561	.384	**.882**		
Usefulness (USE)	.222	.460	.621	.655	.437	.419	.714	**.844**	
Continued exercise intention (CEI)	.236	.252	.414	.420	.322	.368	.441	.469	**.740**

had a negative effect on enjoyment ($\beta = -.167^{**}$). Usefulness was negatively predicted by time using the service ($\beta = -.167^{**}$). Continued exercise intention was predicted by gender ($\beta = -.179^{**}$).

Furthermore, some statistically significant interactions between the independent variables were detected. A two-way interaction between age and time using the service was significant for network exposure ($\beta = .145^{**}$), recognition ($\beta = .117^*$), and playfulness ($\beta = -.127^*$). A three-way interaction between age, gender, and time using the service was significant for continued exercise intentions, showing a negative effect ($\beta = -.161^{**}$).

5. Discussion

5.1. Theoretical contributions

This paper has examined the effects of age, gender, and time using the service on perceived benefits from gamifying exercise by participating in a gamification service. Perceptions of facilitating factors and social, hedonic, and utilitarian benefits were measured.

The results indicate that age does not affect most of the benefits significantly directly. Of the dependent variables, only ease of use diminishes with the main effect of age. The more mature the users are, the less they seem to experience ease of use. This finding holds similarities with considerations of the digital divide (Ijsselsteijn et al., 2007; Morris & Venkatesh, 2000; Pfeil et al., 2009) between younger and older generations regarding use of digital technologies. However, through interaction, age with time using the service had an effect on network exposure, recognition, and playfulness.

Gender differences in perceived benefits could be established for all aspects, except the utilitarian. The results indicate that women perceive the social benefits as greater than men do. Women reported more positive perceptions of the recognition received; they see themselves as gaining greater benefit from the reciprocity between users and, in general, see their network of friends in the service as larger than men do. Thus, the findings imply that women value the social aspects of gamification more than men do and potentially view the associated social community more positively. These findings are in line with the findings from, for example, organizational contexts (Venkatesh & Morris, 2000; Venkatesh et al., 2000), online contexts such as social networking sites (Haferkamp et al., 2012; Muscanell & Guadagno, 2012) as well as gaming contexts (Williams et al., 2008, 2009), where it has been found that female users perceive social benefits more positively and are shown to be more motivated by the social factors.

No indication of men perceiving more utilitarian benefits was found. This finding was inconsistent with prior research showing that men value and are more motivated by the usefulness of technology (Venkatesh & Morris, 2000). Women, however, reported greater perceived ease of use in the service, suggesting that, similarly to findings from previous research, women value the ease of use of technology more than men (Venkatesh & Morris, 2000),

and perceive its benefits as higher. Further, the findings suggest that women perceive the gamified exercise as more playful.

Consistently with prior research on gamification (Farzan et al., 2008; Hamari, 2013), the results show that perceived usefulness, enjoyment, and playfulness tend to diminish with time using the service, suggesting that gamification could have some novelty value causing perceptions of usefulness and enjoyment to be higher in the beginning and to fade the longer the user continues using the service. The interaction effects between age and time using the service further show that the novelty effects (regarding perceived playfulness) are stronger the younger the user is. This finding is consistent with the general belief that younger people, while being more susceptible to playful interactions, might also get bored more quickly than more mature users. This finding could imply that younger users might have more active service switching behavior as well.

Time using the service and thus being connected with the community within the service, expectedly, affects the amount of network exposure: the longer users spend time with the service, the more likely they are to acquire new contacts. Furthermore, the longer a user has been using the service, the greater the perceived exposure to the community will be. There was also a positive interaction effect between age and time using the service on network exposure. This finding could potentially suggest that older users value the existence of the network higher due to higher affiliation needs (Morris & Venkatesh, 2000; Sun & Zhang, 2006; Venkatesh et al., 2003), and as a response, perceive the benefits from the network higher. Furthermore, although neither the length of experience or age had a main effect on perceived received recognition, a statistically significant positive interaction effect existed between them. This interaction suggests that the older the user is, the more recognition they perceive to be receiving, the longer their experience with the service is. This finding could also be explained with the connection of age and affiliation needs and the satisfaction received from fulfilling such needs (Morris & Venkatesh, 2000; Venkatesh et al., 2003). However, it is possible that the interaction effect could be partly due to the correlation between network exposure and recognition, implying that network exposure might be in this case mediating the effect between time using the service and recognition. On the other hand, the results did not show significant main effects between recognition and age or time using the service. This could be considered as defense for the interpretation that there really is an interaction effect between age and time on perceived recognition that is not caused by a confounding factor discoverable within this dataset.

Moreover, the negative impact of time using the service on social influence suggests that a longer time using the service reduces the impacts of social pressure or peer opinion of the service and its use. As users gain personal experience of the service, they may potentially rely more on their own opinions, instead of those adopted from the community. However, this finding further underlines the importance of the social interaction and community for

Table 4
Standard multiple regression analyses – the standardized β-coefficients, t-values and p-values are reported.

		Facilitators		Social			Hedonic		Utilitarian	Use
		NE	EOU	SOI	RB	REC	PLAY	ENJ	USE	CEI
Age	β	.043	−**.135**	−.099	−.019	−.060	.078	−.074	−.088	.048
	t	.599	−**1.869**	−1.358	−.255	−.858	1.086	−1.026	−1.218	.674
	p	.550	**.063**[*]	.176	.799	.392	.279	.306	.225	.501
Gender[a]	β	−**.146**	−**.120**	−.074	−**.156**	−**.257**	−**.136**	−.072	−.065	−**.179**
	t	−**2.044**	−**1.664**	−1.017	−**2.137**	−**3.679**	−**1.890**	−.990	−.911	−**2.516**
	p	**.042**[**]	**.098**[*]	.310	**.034**[**]	**.000**[***]	**.060**[*]	.323	.363	**.013**[**]
Time	β	**.173**	−.020	−**.158**	−.076	−.092	−**.119**	−**.167**	−**.167**	−.081
	t	**2.414**	−.277	−**2.177**	−1.041	−1.307	−**1.653**	−**2.295**	−**2.324**	−1.140
	p	**.017**[**]	.782	**.031**[**]	.299	.193	**.100**[*]	**.023**[**]	**.021**[**]	.256
Age × Gender	β	−.030	.033	.037	.003	.051	.028	.055	.099	.009
	t	−.416	.465	.513	.042	.732	.397	.759	1.386	.123
	p	.678	.642	.608	.966	.465	.692	.449	.167	.902
Age × Time	β	**.145**	.065	.015	.008	**.117**	−**.127**	−.059	−.055	−.069
	t	**1.999**	.891	.208	.115	1.658	−**1.735**	−.800	−.761	−.958
	p	**.047**[**]	.374	.835	.909	**.099**[*]	**.084**[*]	.425	.448	.339
Gender × Time	β	−.006	.031	−.002	.001	−.086	.058	.037	.113	.106
	t	−.083	.433	−.032	.008	−1.222	.804	.508	1.566	1.492
	p	.934	.666	.975	.993	.223	.422	.612	.119	.137
Age × Gender × Time	β	−.047	.114	.010	−.015	.065	−.067	.096	.040	−**.161**
	t	−.659	1.568	.140	−.202	.924	−.923	1.313	.560	−**2.244**
	p	.511	.119	.889	.840	.356	.357	.191	.576	**.026**[**]

Network exposure (NE), Ease of use (EOU), Social influence (SOI), Reciprocal benefit (RB), Recognition (REC), Playfulness (PLAY), Enjoyment (ENJ), Usefulness (USE), Continued exercise intention (CEI).
[a] Females were coded with the lower variable value.
[*] Statistical significances are boldfaced and reported as [*]$p < 0.1$.
[**] Statistical significances are boldfaced and reported as [**]$p < 0.05$.
[***] Statistical significances are boldfaced and reported as [***]$p < 0.01$.

gamification endeavors: social influence plays an important role in engaging new users.

The continued exercise intentions as a behavioral outcome of gamifying exercise suggest that women are more motivated to keep exercising. Furthermore, an interaction effect between age, gender and time using the service affected the continued exercise intentions. However, these results should be considered with caution, since there are evidently factors not examined here that affect one's exercise intentions. Nevertheless, the potential of gamification in supporting and encouraging continued exercise is still worthy of note.

5.2. Practical implications for design of gamification and gamified services

From an industry perspective, the results suggest that design of gamification implementations might benefit from considering the following perspectives. Firstly, employing social features in the service is beneficial for creating sustainable and engaging gamification. The results suggest in particular that women might become more engaged in the social activity than men and, therefore, the social features might be essential especially when one seeks to acquire female users. The community of like-minded people also supports the core activity that is being gamified (Hamari & Koivisto, 2013). Furthermore, gamification service developers could benefit from efforts aimed at integrating new users to the social network of the service at an early stage.

With regard to the demographics of users of gamification services, a few key issues emerged. Since gamification implications rely on a variety of game mechanics, the implementations do not necessarily share the culture and, for example, visual and narrative representations often associated with video games, so they can potentially be created to be more gender-neutral. For widening the potential demographic base of the users, gamification offers possibilities for creating services that engage users also of more advanced ages. Implementations inducing mental and physical activity, increasing chances of social connectedness, and offering instant feedback and support while also increasing one's sense of self-efficacy could afford motivations for technology use among older generations (Arning & Ziefle, 2007; Czaja et al., 2006; Ijsselsteijn et al., 2007).

5.3. Limitations

Some limitations should be acknowledged in relation to the results of the study. The responses gathered by the online survey are, obviously, self-reported and the respondents self-selected, which is commonplace with the Web-based-survey methodology used. Use of self-reported data is likely to affect the results as the users responding are most probably actively engaged with the service, and eager to participate in activities related to it. Thus, the results potentially represent perceptions and intentions of active users of the service and disregard less active and unengaged users. The perceptions of less active users could be addressed in future studies as well as reasons for not being/becoming involved in the service. Furthermore, the respondents in the sample most likely differ in cultural background, which could affect perceptions of the various elements examined in the study – e.g., perceptions as to social benefits. Further studies would benefit from acknowledging the effects of cultural differences in the use and use perceptions of gamified services.

As is commonplace within the industry, specific details regarding the user base or its size are not public knowledge. Thus, the study is limited with regards to reporting data concerning the general population from which the sample was gathered, that is, the user base of the service. This is a limitation regarding the reliability of the generalizability of the results.

5.4. Further research directions

With the novelty of the gamification phenomenon, many directions for further research should be considered. This study has contributed to the understanding of demographic differences in perceptions of benefits from gamification. However, the relationship of personality traits (McCrae & John, 1992) – and in the field of game studies, player types (Hamari & Tuunanen, 2014; Yee, 2007) – to gamification should be studied as well, for better understanding of the psychological outcomes that gamification produces and that attract users. Furthermore, the question of use motivations for gamification should be investigated on a larger spectrum. The benefits examined in this study were limited, so some motivators, such as competition or mastery, that previous studies have associated more with men (Hartmann & Klimmt, 2006; Williams et al., 2008), were not measured. Drawing from game-studies literature, future research would benefit from widening the range of motivations and benefits explored (Williams et al., 2008; Yee, 2007). In addition, future research should consider the differences in derived benefits from gamification across different contexts. This study was conducted in the context of exercise-related gamification service. In line with Hamari (2013), we suggest that further studies could consider the differences in gamifying utilitarian vs. hedonic systems (van der Heijden, 2004) as well as differences based upon the type of involvement users have with the service (see Zaichkowsky, 1994).

Acknowledgements

Appendix A

Survey constructs, items, and sources

Construct Definition and Sources	Items
Network exposure Measurement of the motivational effect of the size of the network (Lin & Bhattacherjee, 2008)	I have a lot of friends on Fitocracy who follow my activities Many people follow my activities on Fitocracy I follow many people on Fitocracy I have many friends in Fitocracy
Ease of use The degree of belief that using a system would be free of effort (Davis, 1989; Venkatesh, 2000; Venkatesh & Davis, 2000)	Using the Fitocracy interface does not require a lot of mental effort The interaction with Fitocracy is clear and understandable I find Fitocracy easy to use I find it easy to get the interface of Fitocracy to do what I want it to do
Social influence The perceptions of approval for using the system (Ajzen, 1991; Fishbein & Ajzen, 1975; Hernandez, Montaner, Sese, & Urquizu, 2011; Hsu & Lin, 2008)	People who influence my attitudes would recommend Fitocracy People who are important to me would think positively of me using Fitocracy People whom I appreciate would encourage me to use Fitocracy My friends would think using Fitocracy is a good idea
Reciprocal benefit The perceived social usefulness of the service – i.e., contributing and receiving benefit from the social community (Hsu & Lin, 2008; Lin, 2008; Preece, 2001)	I find that participating in the Fitocracy community can be mutually helpful I find that my participation in the Fitocracy community can be advantageous to me and other people I think that participating in the Fitocracy community improves my motivation to exercise The Fitocracy community encourages me to exercise
Recognition Measurement of the social motivation created by the perceptions of being recognized by other users in the forms of "likes" and praise of achievements (Cheung, Chiu, & Lee, 2001; Hamari & Eranti, 2011; Hernandez et al., 2011; Hsu & Lin, 2008; Lin, 2008; Lin & Bhattacherjee, 2010)	I feel good when my achievements in Fitocracy are noticed I like it when other Fitocracy users comment and "like" my exercise I like it when my Fitocracy peers notice my exercise reports

Appendix A (*continued*)

Construct Definition and Sources	Items
	It feels good to notice that another user has browsed my Fitocracy feed
Playfulness A situation-specific characteristic of a person – a trait of playfulness emerging when the person is interacting with the system (Venkatesh, 2000; Webster & Martocchio, 1992)	Uninventive (reversed) Unoriginal (reversed) Unimaginative (reversed) Playful *Curious (omitted)* Creative Flexible Experimenting Spontaneous
Enjoyment Overall perceived enjoyment and contentment with using the service (Davis, 1989; van der Heijden, 2004)	I find the experience of the exercise and the related Fitocracy use enjoyable I find the experience of the exercise and the related Fitocracy use pleasant I find the experience of the exercise and the related Fitocracy use exciting I find the experience of the exercise and the related Fitocracy use interesting
Usefulness The degree of belief that using a system would enhance the performance of the task the system is designed for (Davis, 1989; Venkatesh, 2000; Venkatesh and Davis, 2000)	Using Fitocracy makes it easier for me to start exercising Using Fitocracy is useful for purposes of exercise Using Fitocracy enables me to accomplish more with regard to exercise I feel more effective with regard to exercise when using Fitocracy I find Fitocracy useful
Continued exercise Measurement of the respondents' perceived intentions of continuing exercise (Venkatesh and Davis, 2000)	I intend to keep exercising at least as much as I have exercised lately I predict that I will exercise more frequently within the next three months I think I will keep exercising in the near future at least as much as I have during the last few months I plan to increase the amount of exercise rather than to decrease it

References

Ahuja, M. K., & Thatcher, J. B. (2005). Moving beyond intentions and toward the theory of trying: Effects of work environment and gender on post-adoption information technology use. *MIS Quarterly, 29*(3), 427–459.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211.

Arning, K., & Ziefle, M. (2007). Understanding age differences in PDA acceptance and performance. *Computers in Human Behavior, 23*(6), 2904–2927.

Baker, R. K., & White, K. M. (2010). Predicting adolescents' use of social networking sites from an extended theory of planned behaviour perspective. *Computers in Human Behavior, 26*(6), 1591–1597.

Beasley, B., & Collins Standley, T. (2002). Shirts vs. skins: Clothing as an indicator of gender role stereotyping in video games. *Mass Communication and Society, 5*(3), 279–293.

Boyd, D. M., & Ellison, N. B. (2008). Social network sites: Definition, history, and scholarship. *Journal of Computer-Mediated Communication, 13*(1), 210–230.

Carr, D. (2005). Contexts, gaming pleasures, and gendered preferences. *Simulation and Gaming, 36*(4), 464–482.

Cassell, J., & Jenkins, H. (1998). Chess for girls?: Feminism and computer games. In J. Cassell & H. Jenkins (Eds.), *From Barbie to Mortal Kombat: Gender and computer games* (pp. 2–45). Cambridge, MA: MIT Press.

Cheung, C. M. K., Chiu, P.-Y., & Lee, M. K. O. (2001). Online social networks: Why do students use Facebook? *Computers in Human Behavior, 27*(4), 1337–1343.

Chung, J. E., Park, N., Wang, H., Fulk, J., & McLaughlin, M. (2010). Age differences in perceptions of online community participation among non-users: An extension of the technology acceptance model. *Computers in Human Behavior, 26*(6), 1674–1684.

Csíkszentmihályi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper and Row.

Czaja, S. J., Charness, N., Fisk, A. D., Hertzog, C., Nair, S. N., Rogers, W. A., et al. (2006). Factors predicting the use of technology: Findings from the Center for Research and Education on Aging and Technology Enhancement (CREATE). *Psychology and Aging, 21*(2), 333–352.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum Publishing Co.

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining gamification. In *Proceedings of the 15th international Academic MindTrek Conference: Envisioning Future Media Environments* (pp. 9–15), Tampere, Finland, September 28–30.

Dietz, T. L. (1998). An examination of violence and gender role portrayals in video games: Implications for gender socialization and aggressive behavior. *Sex Roles, 38*(5–6), 425–442.

Eagly, A. H. (1987). *Sex differences in social behavior: A social-role interpretation*. Mahwah, NJ: Lawrence Erlbaum Associates.

Ellis, R. D., & Allaire, J. (1999). Modeling computer interest in older adults: The role of age, education, computer knowledge, and computer anxiety. *Human Factors, 41*(3), 345–355.

Farzan, R., DiMicco, J. M., Millen, D. R., Dugan, C., Geyer, W. & Brownholtz, E. A. (2008). Results from deploying a participation incentive mechanism within the enterprise. In *Proceedings of CHI* (pp. 563–572), Florence, Italy, April 5–10, 2008.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to the theory and research*. Reading, MA: Addison-Wesley.

Fornell, C., & Larcker, D. (1981). Structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50.

Funk, J. B., & Buchman, D. D. (1996). Children's perceptions of gender differences in social approval for playing electronic games. *Sex Roles, 35*(3–4), 219–232.

Gefen, D., & Straub, D. W. (1997). Gender difference in the perception and use of E-Mail: An extension to the technology acceptance model. *MIS Quarterly, 21*(4), 389–400.

Greenberg, B. S., Sherry, J., Lachlan, K., Lucas, K., & Holmstrom, A. (2010). Orientations to video games among gender and age groups. *Simulation and Gaming, 41*(2), 238–259.

Griffiths, M. D., Davies, M. N. O., & Chappell, D. (2003). Breaking the stereotype: The case of online gaming. *CyberPsychology and Behavior, 6*(1), 81–91.

Griffiths, M. D., Davies, M. N. O., & Chappell, D. (2004). Demographic factors and playing variables in online computer gaming. *Cyberpsychology and Behavior, 7*(4), 479–487.

Haferkamp, N., Eimler, S. C., Papadakis, A.-M., & Kruck, J. V. (2012). Men are from mars, women are from venus? Examining gender differences in self-presentation on social networking sites. *Cyberpsychology, Behavior and Social Networking, 15*(2), 91–98.

Hamari, J. (2013). Transforming homo economicus into homo ludens: A field experiment on gamification in a utilitarian peer-to-peer trading service. *Electronic Commerce Research and Application, 12*(4), 236–245.

Hamari, J., & Eranti, V. (2011). Framework for designing and evaluating game achievements. In *Proceedings of the DiGRA 2011 Conference: Think Design Play*, Hilversum, The Netherlands, September 14–17, 2011.

Hamari, J., & Koivisto, J. (2013). Social motivations to use gamification: An empirical study of gamifying exercise. In *Proceedings of the 21st European Conference on Information Systems*, Utrecht, The Netherlands, June 5–8, 2013.

Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does Gamification Work? – A Literature Review of Empirical Studies on Gamification. In *Proceedings of the 47th Hawaii International Conference on System Sciences*, Hawaii, USA, January 6–9, 2014.

Hamari, J., & Järvinen, A. (2011). Building customer relationship through game mechanics in social games. In M. Cruz-Cunha, V. Carvalho, & P. Tavares (Eds.), *Business, technological and social dimensions of computer games: Multidisciplinary developments* (pp. 348–365). Hershey, PA: IGI Global.

Hamari, J., & Lehdonvirta, V. (2010). Game design as marketing: How game mechanics create demand for virtual goods. *International Journal of Business Science and Applied Management, 5*(1), 14–29.

Hamari, J., & Tuunanen, J. (2014). Player types: A meta-synthesis. *Transactions of the Digital Games Research Association, 1*(2).

Harrison, A. W., & Rainer, R. K. (1992). The influence of individual differences on skill in end-user computing. *Journal of Management Information Systems, 9*(1), 93–111.

Hartmann, T., & Klimmt, C. (2006). Gender and computer games: Exploring females' dislikes. *Journal of Computer-Mediated Communication, 11*(4), 910–931.

Hernandez, B., Montaner, T., Sese, F. J., & Urquizu, P. (2011). The role of social motivations in e-learning: How do they affect usage and success of ICT interactive tools? *Computers in Human Behavior, 27*(6), 2224–2232.

Hoffman, L. W. (1972). Early childhood experiences and women's achievement motives. *Journal of Social Issues, 28*(2), 129–155.

Hsu, C.-L., & Lin, J. C.-C. (2008). Acceptance of blog usage: The roles of technology acceptance, social influence and knowledge sharing motivation. *Information and Management, 45*(1), 65–74.

Huotari, K., & Hamari, J. (2012). Defining gamification – a service marketing perspective. In *Proceedings of the 16th International Academic MindTrek Conference* (pp. 17–22), Tampere, Finland, 3–5 October, 2012.

Ijsselsteijn, W., Nap, H. H., de Kort, Y., & Poels, K. (2007). Digital game design for elderly users. In *Proceedings of the 2007 conference on Future Play* (pp. 17–22), Toronto, Canada, November 15–17, 2007.

Information Solutions Group (2011). PopCap games social gaming research. <http://www.infosolutionsgroup.com/pdfs/2011_PopCap_Social_Gaming_Research_Results.pdf> [Accessed 20.02.13].

Jansz, J., Avis, C., & Vosmeer, M. (2010). Playing The Sims2: An exploration of gender differences in players' motivations and patterns of play. *New Media Society, 12*(2), 235–251.

Kafai, Y. B. (1998). Video game designs by girls and boys: Variability and consistency of gender differences. In J. Cassell & H. Jenkins (Eds.), *From Barbie to Mortal Kombat: Gender and computer games* (pp. 90–117). Cambridge, MA: MIT Press.

Lin, H.-F. (2008). Determinants of successful virtual communities: Contributions from system characteristics and social factors. *Information and Management, 45*(8), 522–527.

Lin, C.-P., & Bhattacherjee, A. (2008). Elucidating individual intention to use interactive information technologies: The role of network externalities. *International Journal of Electronic Commerce, 13*(1), 85–108.

Lin, C.-P., & Bhattacherjee, A. (2010). Extending technology usage models to interactive hedonic technologies: A theoretical model and empirical test. *Information Systems Journal, 20*(2), 163–181.

Lin, K.-Y., & Lu, H.-P. (2011). Why people use social networking sites: An empirical study integrating network externalities and motivation theory. *Computers in Human Behavior, 27*(3), 1152–1161.

Lucas, K., & Sherry, J. L. (2004). Sex differences in video game play: A communication-based explanation. *Communication Research, 31*(5), 499–523.

McCrae, R., & John, O. (1992). An introduction to the five-factor model and its applications. *Journal of Personality, 60*(2), 175–215.

McGonigal, J. (2011). *Reality is broken: Why games make us better and how they can change the world*. London: Jonathan Cape.

Melenhorst, A.-S., Rogers, W. A., & Caylor, E. C. (2001). The use of communication technologies by older adults: Exploring the benefits from the user's perspective. In *Proceedings of the Human Factors and Ergonomics Society 45th Annual Meeting* (pp. 221–225), Minneapolis, MN, October 8–12, 2001.

Minton, H. L., & Schneider, F. W. (1980). *Differential psychology*. Prospect Heights, IL: Waveland Press.

Morris, M. G., & Venkatesh, V. (2000). Age differences in technology adoption decisions: Implications for a changing work force. *Personnel Psychology, 53*(2), 375–403.

Morris, M. G., Venkatesh, V., & Ackerman, P. L. (2005). Gender and age differences in employee decisions about new technology: An extension to the theory of planned behavior. *IEEE Transactions on Engineering Management, 52*(1), 69–84.

Muscanell, N. L., & Guadagno, R. E. (2012). Make new friends or keep the old: Gender and personality differences in social networking use. *Computers in Human Behavior, 28*(1), 107–112.

Nunnally, J. C. (1978). *Psychometric theory*. New York: McGraw-Hill.

Nysveen, H., Pedersen, P. E., & Thorbjørnsen, H. (2005). Explaining intention to use mobile chat services: Moderating effects of gender. *Journal of Consumer Marketing, 22*(5), 247–256.

Paavilainen, J., Hamari, J., Stenros, J., & Kinnunen, J. (2013). Social games on Facebook: Players' perspective. *Simulation and Gaming, 44*(6), 794–820.

Pavlou, P. A., Liang, H. G., & Xue, Y. J. (2007). Understanding and mitigating uncertainty in online exchange relationships: A principal-agent perspective. *MIS Quarterly, 31*(1), 105–136.

Pfeil, U., Arjan, R., & Zaphiris, P. (2009). Age differences in online social networking: A study of user profiles and the social capital divide among teenagers and older users in MySpace. *Computers in Human Behavior, 25*(3), 643–654.

Poels, K., De Cock, N., & Malliet, S. (2012). The female player does not exist: Gender identity relates to differences in player motivations and play styles. *Cyberpsychology, Behavior, and Social Networking, 15*(11), 634–638.

Preece, J. (2001). Sociability and usability in online communities: Determining and measuring success. *Behaviour and Information Technology, 20*(5), 347–356.

Ryan, R. M., Rigby, C. S., & Przybylski, A. (2006). The motivational pull of video games: A self-determination theory approach. *Motivation and Emotion, 30*(4), 344–360.

Spence, J. T., & Helmreich, R. L. (1980). Masculine instrumentality and feminine expressiveness: Their relationship with sex role attitudes and behavior. *Psychology of Women Quarterly, 5*, 147–163.

Sun, H., & Zhang, P. (2006). The role of moderating factors in user technology acceptance. *International Journal of Human–Computer Studies, 64*(2), 53–78.

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Boston: Pearson Education.

van der Heijden, H. (2004). User acceptance of hedonic information systems. *MIS Quarterly, 28*(4), 695–704.

Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research, 11*(4), 342–365.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186–204.

Venkatesh, V., & Morris, M. G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS Quarterly, 24*(1), 115–139.

Venkatesh, V., Morris, M. G., & Ackerman, P. L. (2000). A longitudinal field investigation of gender differences in individual technology adoption decision-making processes. *Organizational Behavior and Human Decision Processes, 83*(1), 33–60.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425–478.

Wang, Y.-S., Wu, M.-C., & Wang, H.-Y. (2009). Investigating the determinants and age and gender differences in the acceptance of mobile learning. *British Journal of Educational Technology, 40*(1), 92–118.

Webster, J., & Martocchio, J. J. (1992). Microcomputer playfulness: Development of a measure with workplace implications. *MIS Quarterly, 16*(2), 201–226.

Whitley, B. E. Jr., (1997). Gender differences in computer-related attitudes and behavior: A meta-analysis. *Computers in Human Behavior, 13*(1), 1–22.

Williams, D., Consalvo, M., Caplan, S., & Yee, N. (2009). Looking for gender: Gender roles and behaviors among online gamers. *Journal of Communication, 59*(4), 700–725.

Williams, D., Yee, N., & Caplan, S. E. (2008). Who plays, how much, and why? Debunking the stereotypical gamer profile. *Journal of Computer-Mediated Communication, 13*(4), 993–1018.

Yee, N. (2006). The demographics, motivations and derived experiences of users of massively-multiuser online graphical environments. *PRESENCE: Teleoperators and Virtual Environments, 15*, 309–329.

Yee, N. (2007). Motivations for play in online games. *CyberPsychology and Behavior, 9*(6), 772–775.

Yi, M. (2004). They got game: Stacks of new releases for hungry video enthusiasts mean it's boom time for an industry now even bigger than Hollywood. <http://www.sfgate.com/news/article/THEY-GOT-GAME-Stacks-of-new-releases-for-hungry-2663371.php> [accessed 20.02.13].

Zaichkowsky, J. (1994). The personal involvement inventory: Reduction, revision, and application to advertising. *Journal of Advertising, 23*(4), 59–70.