Selecting Effective Influence Principles for Tailoring Gamification-Based Strategies to Player Roles

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Abstract. *Gamification is a term that refers to the use of game elements in non-game contexts with the goal of engaging people in a variety of tasks. Gamification can be an effective persuasive tool for motivating learners and lately we have witnessed a growing interest in gamified learning systems. However, the efforts of the research community in the last years have shown the weakness of one-size-fits-all and design-by-intuition approaches. Thus, there is room for improvement. Persuasion profiling is a promising technique to fill such a gap. This paper discusses how gamification design can benefit from persuasion profiling. To measure users' susceptibility to influence principles, we employed the Br-STPS. We conducted a study on 149 subjects which examined the persuasiveness of six influence principles on five player types. The results suggest that player types indeed has a role to play in term of the perceive persuasiveness of users. Moreover, we present a list of persuasive strategies and how they can either enhance or halt user's motivation. Thus, evidence suggest that gamification design could benefit of influence principles, although tailored solutions are necessary to minimize the risks of selecting counter-tailored and ill-defined persuasive strategies.*

1. General Information

Gamification consists of using game design elements (GDE) in non-game contexts, such as social networks, e-health, e-commerce, and educational systems, to motivate, persuade, and/or engage people towards an attitude or behavior [Kapp 2012, Deterding et al. 2011]. Gamification can be an effective persuasive tool for motivating learners [Hamari et al. 2014b], and lately we have witnessed a growing interest in gamified learning systems [Borges et al. 2014]. In intelligent learning environments, gamification

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have been used to increase students' engagement and to reduce the feeling of obligation towards executing pedagogical tasks [Challco et al. 2016].

However, simply inserting game elements in a system and hoping for the best will not improve the user experience [Koivisto and Hamari 2014, Andrade et al. 2016b]. The same applies to gamification efforts that only rely on distributing points and badges (e.g., *pointfication*, *exploitationware*, shallow gamification) [Walz and Deterding 2014]. Therefore, building sound educational systems that capitalize on gamification techniques require careful analysis of the most suitable game design elements that will help to achieve the desired learning outcomes [Kapp 2012]. As pointed out by [Kaptein et al. 2009], a reliable use of persuasion strategies involves delivering the right message in a specific way at the precise moment. Yet, trying to figure out what is *the right message* for a student and how to deliver it at the *right time* are still difficult tasks. In addition, as shown in [Gram-Hansen et al. 2012], the design and implementation of persuasive systems (e.g., persuasive learning systems) are complex tasks since it is hard to estimate the effectiveness of those strategies regarding each learner. One promising way to improve the effectiveness of technology-based persuasive interventions relies on the design of personalized persuasive strategies (i.e., backed up by social psychology theories) and tailored to fit user's personality traits. Thus, we can design the *right message*, and deliver it at the *right time* to the *right user* [Kaptein et al. 2012, Orji et al. 2014, Kaptein et al. 2015]. Persuasion profiling relies primarily on measuring user's susceptibility to persuasive strategies [Kaptein et al. 2015], thus addressing the challenge of enabling the personalization of persuasive attempts. Secondly, delivering personalized content based on user's profile [Borges et al. 2016].

Research has already shown that tailored persuasive approaches can improve user's motivation towards targeted behaviors and attitudes [Hamari et al. 2014a, Orji et al. 2014]. In this paper, we present a design approach for tailoring influence principles (*Reciprocity, Commitment, Consensus, Scarcity, Liking and Authority*) to different player roles (*Achiever, Conqueror, Creator, Explorer, and Humanist*). Our guidelines are based on a quantitative study with 152 participants. Hence, is this paper we present the study we conduct to explore the relationships between player roles and influence principles. The paper is organized as follows. In Section 2, we present the related work. Section 3 describes the experiment we carried out. Section 4 further analyzes the results by describing the investigated topics and also elaborates on their practical implications. Section 5 comment about potential threats to validity. Finally, Section 6 presents concluding remarks and future work.

2. Related Work

2.1. Persuasion Profiling

Persuasion profiles were introduced in the context of Human-Computer Interaction (HCI) in 2009 [Kaptein et al. 2009], and later, the benefits of their application have been examined in several studies [Kaptein et al. 2012, Hamari et al. 2014a, Orji et al. 2014, Kaptein et al. 2015]. The design of effective persuasion profiles demands the capacity to measure user's susceptibility to persuasive strategies (e.g., influence principles). Thus, researchers have perceived the need of developing psychometric instruments capable to measure user's responsiveness to persuasive strategies in a more systematic way

[Busch et al. 2013, Kaptein et al. 2012, Modic and Anderson 2014]. Among the solutions, [Kaptein et al. 2012] have developed and validated a 26-Item questionnaire called Susceptibility to Persuasion Scale [Kaptein et al. 2012]. STPS is based on the six social influence strategies compiled by Cialdini [Cialdini 1993]. Recently, [Borges et al. 2017] have translated and adapted a version of the STPS that can be used by Brazilian Portuguese speakers.

2.2. Gamification for Education

Inspired mainly by successful uses of gamification in other domains, there has been a growing interest in applying gamification to education [Borges et al. 2014]. Gamification is important because research has already shown that motivation plays a fundamental role in education [Ryan 2012]. Still, few efforts have tried to combine knowledge of design, technology and social science to improve learner's motivation and, eventually, learning outcomes in systematic ways [Hamari et al. 2014b]. One of the reasons for such deficiency is the difficulty of creating computational models of learner's psychological aspects (e.g., psychological needs, motivation, susceptibility to persuasion, learner and player roles) to support the creation of more efficient gamification-based persuasive strategies and to personalize them to different player types [Borges et al. 2014, Challco et al. 2016, Borges et al. 2016, Andrade et al. 2016a].

2.3. From Player Types to Player Roles

The concept of player types is based on the assumption that different persons have different reactions given a certain game element [Fullerton 2008], and research shows that although and individual tends to manifest a more dominant player characteristic, at the end, it is no fruitful trying to fit players in monolithic psychological archetypes [Yee 2006, Yee 2017], and that is better to understand how individuals tend to react to different persuasive strategies in different situations [Orji et al. 2014]. Based on motivations to play theory [Yee 2006], and combining information from Self-Determination Theory (SDT) [Ryan and Deci 2000] and gamification literature, [Borges et al. 2016] proposed a more flexible approach, where students can assume different player roles (*Achiever, Conqueror, Creator, Explorer, and Humanist*) according to the undertaken educational task.

In the next sections, we will describe the material and methods used in the study, data analysis, and validation.

3. Study Design and Method

We conduct the study with 152 (N=152) students at the Universidade do Estado de Minas Gerais (N=120) and Instituto Federal Sul de Minas Gerais (N=32), both at Passos city, state of Minas Gerais, Brazil. Data was collected in during three days from 21 to 23, November 2016. Average time spent to answer the questionnaires was about 30 minutes. Besides the main questionnaires (i.e., Br-STPS and QPJ-Br), we also collected student's demographic information. After eliminating invalid questionnaires we started to process a final sample comprising information on 149 participants (N=149) as shown in Table 1. All participants declared they already are familiar, at some extent, with playing video games (e.g., computer, consoles, and/or smartphones). For simplification purpose [Chin 1998], in this study participants were classified in one of the five player roles investigated. Although a player can score in multiple player roles (i.e., according to their

motivations to play theory [Yee 2006]), usually, a single player role can emerge as the dominant one.

Tabela 1. Students demographic information.

	Participants N = 149
Age	Male 18-25 (105), 26-48 (28) Female 18-25 (13), 26-48 (3)
Gender	Male (133), Female (16)
Academic Year	First (59), Second (38), Third (26), Fourth (26)
player role (Dominant)	Achievers (72), Explorers (22), Conquerors (8), Humanists (38), Creators (9)

Figura 1. Dominant player roles measured in the study N = 149

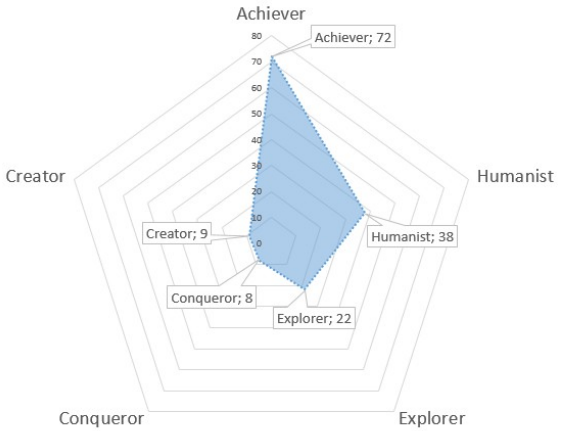
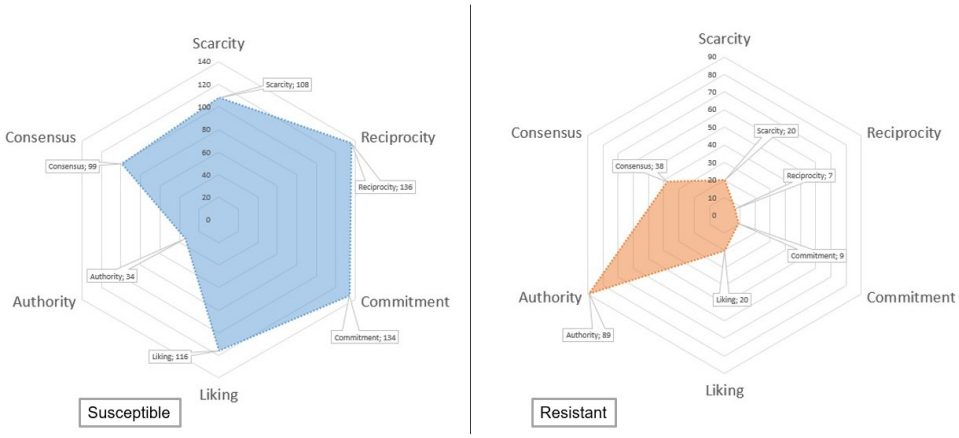


Figure 2 shows estimations of the number of students susceptible for each influence principle. The majority of students manifested some degree of influence to consensus, scarcity, reciprocity, commitment, and liking.

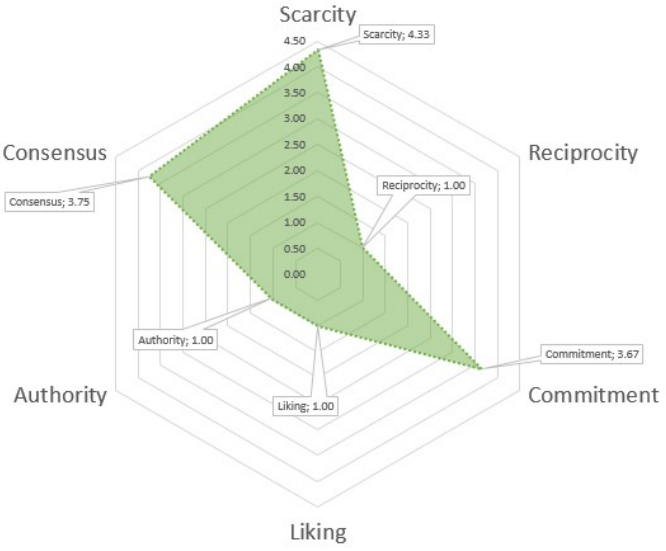
Figura 2. Number of individuals estimated as influenced (left) and resistant (right) to the six influence principles N = 149



Authority was the principle with the lower number of individuals influenced, only 34 individuals were estimated as susceptible to authority, while 89 scored high in resistance against it. The estimations presented in Figure 2 are consolidated values for all

influence principles, therefore there is an overlap of individuals. In Figure 3, we present an example of persuasion profile of one random subject. The higher values indicate the estimated effect of the respective influence principle, while a lower value the estimated resistance.

Figura 3. Example of one persuasive profile (User_144), the higher scores indicate the estimated persuasiveness, while lower scores, estimated resistance



T-tests were used to investigate gender differences while correlations were used to investigate age differences among the students of the same gender. Table 2 shows the results. The reported differences between gender are significant at at least $p < .05$. Measure of the effect size of the gender differences (t-tests) indicates an approximation of the overall variance in the player role that can be explained by gender alone [Field et al. 2012]. By looking at Table 2, we can see that male players scored higher as achiever, humanists, explorers and conquerors, while female players were the majority of creators. Among males, the category with the higher measure of the effect size was conqueror, what is in consensus with research conducted by several other authors since male players tend to be more driven by *zero-sum* games [Juul 2009]. Older achievers and humanists, both male and female, are slightly unlikely young players. Young male explorers and conquerors seems to be more driven towards exploration and zero-sum activities. Young and older female creators did not show significantly differences, while it seems that older male players are less driven to customizations.

Tabela 2. Gender and age Differences in player roles N male=133, N female=16

	Gender Differences	***r***	**Age Correlation Coefficients (M / F)**
Achiever	Male >Female	0.08	-0.18 / -0.17
Humanist	Male >Female	0.29	-0.21 / -0.13
Explorer	Male >Female	0.57	-0.22 / 0.12
Conqueror	Male >Female	0.62	-0.13 / 0.30
Creator	Female >Male	-	-0.21 / 0.00

Based on [Yee 2006].

Next, we employed Partial Least Square (PLS) Structural Equation Modeling (SEM) to investigate possible relationships between players types and influence principles. We chose PLS-SEM mostly because it is a less strict approach than others, when concerning the size and distribution of sample [Hair 2013]. We performed the analysis exploring several models on SmartPLS 3.0. First, we tested the adequacy of the sample to determine whether it was worthwhile to proceed or not with PLS-SEM. Reliability (Cronbach's α) was 0.75. We conduct FA using R with the package Psych, and dropped items with a threshold of 0.3 to assure convergent and discriminate validity. When investigating hypothetical relationship between variables using SEM, there are at least two important measures to determine: path coefficient (β) and its respective level of significance (p). Thus, we calculated both for each model designed. Path coefficients are important to observe the influence of a variable on another one [Chin 1998], the results of our measurements are summarized in Table 3.

Tabela 3. Standardized path coefficients of each model for player roles and influence principles. The reported values are significant at p $<$ 0.05 while suppressed values are not.

	Gender	Humanist	Conqueror	Achiever	Creator	Explorer
Scarcety	M	-	0.47	0.29	0.31	0.43
	F	-	-	0.28	0.30	0.48
Reciprocity	M	0.38	-	0.38	0.26	-
	F	0.36	-	0.39	-	-
Commitment	M	-	0.31	0.36	0.26	0.37
	F	-	0.29	0.31	0.24	0.34
Liking	M	0.29	0.35	-	-	-
	F	0.26	0.31	-	-	-
Authority	M	-0.22	-	-	-0.27	-0.27
	F	-	-	-	-	-0.24
Consensus	M	0.41	0.42	-	0.48	-
	F	0.39	0.37	-	0.49	-

4. Discussion

In order to observe differences and similarities on students' predisposition to influence principles, we tested one model for each player role. The results show that the five player roles (Humanist, Conqueror, Achiever, Creator, and Explorer) are slightly different in terms of the influence of each principle. By analyzing Table 3, we can also observe similarities and differences between male and female participants regards the susceptibility of each player role.

Scarcity: the model we analyzed proposes to investigate whether each player role presents the same reaction to the scarcity principle. Surprisingly, the higher coefficient observed came from *conquerors* and *explorers*, while achievers has the lowest level observed (except for humanist which was not significant at p $<$ 0.05). Explorers are always looking for opportunities to expand their knowledge about the system (i.e., game, virtual world, LMS). It seems that applying the scarcity principle in order to unlock new experiences (i.e., maps, paths, content) can influence explorers towards acting.

Reciprocity: significant coefficients were observed in *humanists* and *achievers*. Humanist coefficient is consistent with our expectations since they are people-oriented, so the principle of given and taken indeed influences these individuals. Achievers are goal-

oriented, their results seem to indicate that in order to reach their objectives they are prone to do something in exchange, provided they will receive the expected reward.

Commitment: we were able to observe values significant at $p < 0.05$ for all player roles (*conqueror, achiever, creator*, and *explorer*) except for humanists. The other player roles shown moderated influence of commitment in their perceived susceptibility. Although male explores presented the higher coefficient (0.37), none of values are extremely higher then the overall observations. So, using commitment in a system may be a good choice for one-size-fits-all approaches (except for humanists which we were unable to observe the perceived susceptibility), since it has the power to moderately influence all other player roles.

Liking: as expected, *conquerors* and *humanists* coefficients shown they are moderately influenced by the liking principle. This is consistent with the observed nature of each one (i.e., people-oriented). Surprisingly however was that male conquerors exhibit the higher coefficient (0.35). We cannot elaborate further based only in these coefficients, but in the literature, male conquerors are highly driven by interacting *on* other players. So, it seems that providing ways for (not harmful) interaction in a system indeed can influence male conquerors towards acting.

Authority: surprisingly, the authority principle shown negative coefficients for three male player roles (humanists, creators, and explores) and one female player role (explorer). As it seems, these students were not influenced by authority, instead, using authority might have be counter-productive in this cases. Creators and explorers are driven by the need for autonomy therefore to some extent, it may be able to explain the aversion to authority. Although we were unable to observe the coefficients for all player roles, the results of the average number of students susceptible to authority were much lower than the average number observed for the other five principles, as shown in Figure 2.

Consensus: *humanists*, *conquerors*, and *creators* were the player roles with moderate influence to consensus. Humanists and conquerors are people-oriented so it makes sense being influence by consensus (social proof) since individuals susceptible to this principle tends to not only observer other's behavior but also to change their own behavior to be in conformity with the norms of the group. Creators are system-oriented, so it was a surprise the coefficients observed. We can only speculate that maybe the customizations and free-to-chose features they enjoy might also be moderated by the general tendencies exhibit by the whole group. In other words, maybe by observing group tendencies (i.e., fashion trends likewise) it help creators to follow or reject group tendencies.

4.1. Mapping Influence Principles and Game Design Elements

The design of sound persuasive interventions requires not only, careful analysis of appropriate gamified activities (e.g., environment's design) and meaningful rewards (e.g., suitable game elements) but also, the ability to designate appropriate players' roles for each learner. Among other solutions, many researchers and practitioners have been investigating, how to chose appropriate GDE to develop more efficient persuasive systems. Usually this works present compilations of suitable GDE considered appropriated for the majority of the learners (i.e., one-size-fits-all). The intention behind such compilations can be mainly explained by the necessity to support researchers and practitioners, since the high number of GDE, their overlaps and relationships can be overwhelming. Mo-

reover, there is no such thing as a ultimate compilation, or a definitive list of GDE and categories. Said that, it is not our intention explain all possible overlaps and relationships among GDE neither present a definitive list. Moreover, due space restrictions we did not provide a complete description of each item here, however more information is provided at: https://goo.gl/8XyEjr. Table 4 summarizes the best and worst influence principles for each player role. From left to right, the influence principles are listed according to the highest to the lowest value of each path coefficient measured.

1. Identify the target behavior;
2. Determine users' player roles;
3. Identify users' susceptibility to persuasion;
4. Determining the design approach;
5. Chose the appropriate influence principle (Table 4);
6. Map the desired influence principles to the game design elements.

Tabela 4. Best and worst influence principles, from left to right, the principles are listed according to the highest path coefficient measured.

Player Role	**Influence Principle**	
	Best	*Worst*
Achiever	Reciprocity, Commitment, Scarcity	N/A
Creator	Consensus, Scarcity, Commitment,	Authority
Conqueror	Scarcity, Consensus, Liking, Commitment	N/A
Explorer	Scarcity, Commitment	Authority
Humanist	Consensus, Reciprocity, Liking	Authority

5. Threats to Validity

We did not present a definitive list of GDE and their relationship to each and all Cialdini's six influence principles. The GDE listed were extracted from many sources from game and gamification design theory. We mapped some influence principles to GDE as an exploration of potential affinity, but not a definitive one. In addition, we applied the results of the models at a level of the population. As any model, the scheme presented is a simplification of the reality and, as such, it has some drawbacks, as for example, the results apply for the majority of the observed population, however we can not assume that it will work for all population. Last, although the observed models can present some benefits to designers, by any means they represent a better or definitive solution than other game design approaches.

6. Concluding Remarks

In this work, we outlined ways to relate player roles found in game design and gamification literature and possible ways to connect these player roles to persuasive strategies based on Cialdini's six influence principles. The guidelines presented here can be used by designers to plan more effective gamification interventions and also, it can be used to back up the rationale behind the selection of GDE. Nevertheless, it is worth emphasizing the categories we came up with are not exhaustive. That is, they do not cover all the dimensions of the research spectrum of persuasive technology, neither gamification. Regarding current and future work, it is our intention to continue testing and validating the effectiveness of information presented in Table 4 through the development of an application. We are particularly interested in investigate how to avoid the use of so many questionnaires to create students' persuasion profiling.

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