Users As Game Designers: Analyzing Gamification Concepts in a "Bottom-Up" Setting

Full Paper

Pascal Lessel, Maximilian Altmeyer, Antonio Krüger
German Research Center for Artificial Intelligence (DFKI)
Saarland Informatics Campus, Germany
firstName.lastName@dfki.de

ABSTRACT

Allowing users to fully gamify a system on their own during runtime has been shown to be appreciated and to have an impact on their behavior. In these so-called "bottom-up" approaches, users are becoming designers of their game experience. In this paper, we report on an online study where participants (n=140) described a gamification concept, without restricting them to a set of game elements to select from. This was done to analyze how they perform in such a task. The concepts were qualitatively evaluated for which game elements were proposed, showing that participants suggested many diverse concepts with a broad range of elements. The results provide further support for "bottom-up" approaches. Additionally, the suggested game elements were compared to every participant's *Hexad* user type and *Big Five* personality. Our data hints that both seem not to be dominant factors influencing which elements participants use in such a design task.

CCS CONCEPTS

• **Human-centered computing → Empirical studies in HCI**;

KEYWORDS

Customization, user-led design, player types, personality

ACM Reference Format:
Pascal Lessel, Maximilian Altmeyer, Antonio Krüger. 2018. Users As Game Designers: Analyzing Gamification Concepts in a "Bottom-Up" Setting: Full Paper. In *Academic Mindtrek 2018 (Mindtrek 2018), October 10–11, 2018, Tampere, Finland.* ACM, New York, NY, USA, 10 pages. https://doi.org/10.1145/3275116.3275118

1 INTRODUCTION

Gamification approaches have appeared that increase users' agency by allowing them to alter every gamification aspect a system offers at its runtime, i.e., users can decide which system aspects they want to gamify and how (e.g., by receiving a toolbox of possible game elements). This was termed "bottom-up" gamification in [25]. Here, users are becoming designers of their own game experiences. Thus, "bottom-up" gamification is a form of tailoring, adding to the ongoing efforts of overcoming "one-size-fits-all" gamification solutions. These have been shown to be suboptimal as individual differences have a significant impact on the perception of gamified interventions [4, 31]. Research has shown that "bottom-up" gamification is appreciated by users [25] and led to positive behavioral effects (e.g., more effort was expended compared to a fixed gamification setup [26]). An open question is what these positive effects can be attributed to. For example, maybe users are designing particularly suitable gamification concepts for themselves [14]; or the choice to create one's own setups alone already has positive effects, as shown in other contexts [23, 43]; or that it is the fact that they could identify with *their* work [8]; or a combination of these aspects. In this paper, we looked at the gamification concepts people create in an "unrestricted bottom-up" setting: we conducted an online study in which participants were asked to describe a game concept that would motivate them in a specific scenario. We did not restrict participants to a pre-defined set of game elements, as was done in previous work [25, 26]. Instead, we allowed them to describe what they wanted and saw fit to use. The concepts were qualitatively evaluated for which game elements and mechanics were proposed.

This paper contributes the participants' concepts and further insights for "bottom-up" settings: first, participants were able to create reasonable game concepts. As they were not restricted to specific game elements, this advances the understanding of "bottom-up" gamification in general. Second, we found that a broad range of game elements were suggested, indicating that the set of offered game elements in "bottom-up" scenarios should be larger than provided before. Consequently, users need to be supported in such systems lest they encounter choice overload [16]. Third, although originating from self-reported data and thus needing to be treated with caution (e.g. [35]), participants claimed uniformly that they were satisfied with their self-developed concepts and that they thought that these would motivate them and others. Fourth, each user's chosen game elements were set in relation to every participant's player type (measured with the *Gamification User Types Hexad Scale* [42]) and their personality (by using the *Five Factor* model [11]). Our data hints that both seem not to be dominant factors influencing which elements participants suggested in such a design task. Thus, it seems less likely that users are motivated in "bottom-up" settings because they selected game elements suitable for themselves (at least from a personality/player type perspective) and that other explanations, such as having "a choice" or being able to identify with the self-created setup, might be more likely explanations that should be investigated in future work.

Mindtrek 2018, October 10–11, 2018, Tampere, Finland

2 RELATED WORK

It was already shown that a "one-size-fits-all" approach in gamification has drawbacks [2, 20, 21], as different factors (e.g., personality traits, player types, culture, age and gender [20, 41]) influence how well a user perceives it. One goal of recent efforts is to find relationships between these factors and game elements/mechanics: Oyibo et al. [34], for example, found relationships between age and gender for the game elements reward, social competition, social learning and social comparison (e.g., males perceive competition better than females). Other researchers explored the relationship between player types and game elements (e.g., [7, 10]), between the *Big Five* personality traits and game elements (e.g., [17, 31]), or player types and personality in relation to game elements (e.g., [27, 40, 42]). The results obtained in these approaches revealed that relationships exist that moderate the perception of certain game elements. In these studies, participants were provided with a fixed set of game elements that they needed to rate or use. In our work, in contrast, we will investigate these relations, when participants are unrestricted and free to use elements as they see fit.

That tailoring gamification is beneficial was, for example, discussed in the work of Orji et al. [33]. They showed that personalization (i.e., the system adapts to the user) and customization (i.e., the user is able to adapt the system) of interventions are both perceived positively by participants [32]. They also found that participants see issues in customization, i.e., that it might divert attention, or is time consuming and difficult. It will be interesting to see whether our participants will have issues in developing gamification concepts by themselves. Lee et al. [24] state that every user has unique goals that are hard for experts to account and also suggest enabling users to adapt systems by themselves via self-experimentation. They propose two support strategies to help users customize (to reduce the aforementioned problems) and reported positive effects overall. That users should be able to customize gamification was also highlighted by the work of Nicholson [30]. He stated that providing users with the option to customize it to their needs is important to achieve "meaningful" gamification setups. Further support for this comes from the self-determination theory [5, 37], where more (perceived) autonomy in an activity (e.g., being able to alter system components) should increase the chance for users to develop an intrinsic motivation. Both led to the investigation of "bottom-up" gamification, in which users can decide at runtime whether and how they want to use gamification: Lessel et al. [25] conducted a study with a "bottom-up" task management application in which every task could be gamified through a simple toolbox. They found that participants appreciate the freedom and their self-reports show positive effects of the intervention. It was also shown that users that used their gamification choices in a crowdsourcing "bottom-up" context solved more microtasks from a quantitative point of view [26]. But as stated, it is an open question what these positive effects can be attributed to and how users behave when they are unrestricted in the selection of game elements.

Treating users as designers is also relevant for participatory design [22]. Kanstrup [18], for example, reports findings from a participatory design workshop conducted with 17 families that were asked to design IT services supporting everyday living with diabetes. Here, participants reported a broad range of design ideas that revealed that end-users are in general able to derive ideas and are competent designers, even without an IT background. How game design experts perform in comparison to normal users was investigated by Gerling et al. [9] in the context of wheelchair users. Both had to design wheelchair-based games and while both groups were able to design approaches providing valuable insights into the design of such games, the authors found that the non-experts miss important details (e.g., technical constraints, or missing relationships between game mechanics). Gaye and Tanaka [8] described a case study in which young people conceptualized and developed an interactive information pack. The resulting prototypes were positively received by the participants; one reason for this was the strong ownership the participants reported. One difference to "bottom-up" gamification is that these results are group efforts. Overall, these approaches indicate that non-designers are also able to design appealing results, although the results are not perfect from a professional point of view [9].

3 STUDY

Our goal was to investigate which game concepts users create by themselves. In contrast to the previous work in "bottom-up" gamification [25, 26], in which users were able to select from a set of game elements to create their game setup, we did not restrict them and allowed them to describe what they wanted and saw as suitable. The resulting concepts were qualitatively evaluated for which game elements and mechanics were proposed. These were then related to the *Big Five* [11] and to the *Gamification User Types Hexad Scale* [42], to see whether personality traits or player types influence which game elements are suggested in such an open design task. Basically, we had the following questions:

Q1 Can participants create (motivational) gamification concepts when not restricted to a pre-defined set of game elements?

Q2 Can participants select game elements that fit their personality in their self-created gamification concepts?

Q1 was based on the findings reported in [25, 26] in which participants were able to build motivational concepts from a predefined set of game elements. We hypothesized that even more options would lead to better fitting elements and that participants would still not be overwhelmed by the range of possibilities. **Q2** is based on the literature (see previous section) showing that player types or personality traits can be related to particular motivating game elements for users. A difference from our study is that these assessments are typically based on presenting the game elements one by one (e.g., [33, 40, 42]) and participants are asked to rate them. In contrast, we will investigate what happens when users are asked to create motivational gamification concepts. Based on this, if users are able to select "suitable game elements that motivate them", they should suggest those that are predicted by their personality.

3.1 Method

We set up four different online surveys in English. In each survey we stated that it was aimed at players of board/video games and that the goal was to analyze how these *solve a specific problem.* On the following page, participants were presented with five statements regarding their gaming affinity (e.g., "*I would characterize myself as*

Table 1: The scenario descriptions used in the study.

Abbr.	Scenario
En	Imagine you want to save energy at your workplace, e.g., by turning off the lights after work. You have been tasked with developing a concept which has the goal to motivate you to save energy there (or motivate you even more, if you are already motivated).
Ex	You have been tasked with developing a concept which has the goal to motivate you to exercise more often, for example to go for a run multiple times a week.
Pi	Imagine you work for a manufacturer and build furniture by piece work ("*Piece work (or piecework) is any type of employment in which a worker is paid a fixed piece rate for each unit produced or action performed regardless of time*" (with a link to Wikipedia explaining this concept). The work is monotonous and you have been tasked with developing a concept which has the goal to motivate you to do this job more thoroughly/more enjoyably/faster.
Cl	You have been tasked with developing a concept which has the goal to motivate you to clean the kitchen more often and faster.

gaming-affine"). These statements were to be answered on a 5-point scale with the labels *disagree, somewhat disagree, neither agree nor disagree, somewhat agree, agree*. Then, one of four scenarios (being the only difference between the surveys) was presented (see Table 1) with the task to develop a game concept that would motivate them in this scenario. The scenarios were similar to those used in [25], in which participants had to state which game elements from a fixed set would motivate them in the scenarios. To reduce the workload, and based on the finding that individuals do not differ across scenarios in their game element selection [25], participants needed to work on only one scenario. We required participants to write at least 700 characters, emphasized that writing more is appreciated, and provided a "hook" (i.e., some aspects that might be considered in the concepts) as an initial starting point for their concepts [19]: "*This concept should be a game or game-like. It is up to you whether this is a digital (PC game, mobile game, Facebook game, ...) or analogue game (board game, card game, ...). You may decide freely among all aspects, for instance, whether this game is "just for you", a game with friends or players you don't know, etc. How would this game look?*". This was followed by two additional free-text questions ("*Why do you think that your game concept will motivate you?*" and "*Which element of your concept is most important for you?*"). Seven statements (on the same scale as above) assessed the participant's perception of the concept and the given scenario.

Afterward, the *Gamification User Types Hexad Scale* [42] and the *Big Five Inventory* with eleven items as suggested by Rammstedt and John [36] needed to be filled out. To inspect the relationships between the **p**layer **t**ypes or the **p**ersonality **t**raits (which will be abbreviated as PTPT subsequently) and the game elements suggested in the concepts, we calculated correlations between the element usage in the concepts with the results of these scales. To ensure that our sample is comparable with the already reported PTPT relationships in the literature (e.g., [33, 42]), we followed the methodology used there and added twelve **g**ame **e**lement **s**tatements (which will be abbreviated as GES subsequently), e.g., "*Please state for every game element how motivating it is for you in general: Being able to unlock new features and/or content in a game*", that needed to be rated on a 4-point or 5-point scale (*Not motivating, Somewhat motivating, Moderately motivating, Very motivating, Extremely motivating*)[1]. As the *Hexad* is relatively new, we based the GES on Tondello et al.'s research [42] and used their principal elements (or design elements in the case of the *Philanthropist*), to be able to compare the results (using two GES per player type). For **Q2**, we expect that answers to the GES correlate with the PTPT (as shown by Tondello et al.). We hypothesized that there is a connection between answers to the GES and the game elements suggested in the concepts, as both originated from the question "*What would motivate you?*". As we could not anticipate beforehand which game elements would actually be suggested in the concepts, it was to be expected that not every GES eventually would have a corresponding game element (e.g., for the previously given GES example, the game element to be found in the concepts would be Unlockables).

Based on work such as that done by Buhrmester et al. [3], we assessed *Amazon Mechanical Turk* (*AMT*) as suitable to distribute the four questionnaires, restricted the selection to US Turkers and ensured that every Turker could only participate in one questionnaire. We added four test questions (in which they were asked to select a particular answer) to check that participants did not simply rush through the questions [28]. We pre-tested the questionnaire with twelve students and university employees, and on *AMT* with ten participants, to see how long it takes to fill out the questionnaire, to learn about potential issues and to receive a first set of answers to develop an initial code book (see below). On average, filling out the questionnaire took 15 minutes in the pre-test. Thus, we paid $1.50 to meet the minimum wage suggestions of [38].

3.2 Coding process

We conducted a content analysis [15] to learn which game aspects (which will be further described as "elements", independent of their abstraction level [6, 12]) were mentioned in the concepts. All coders were gamification researchers: two independent coders inspected the twelve answers from the first pre-test separately to develop a first code book version. For the code book development, we followed an inclusive approach that did not consider only typical gamification elements, i.e., for example, Communication Tools were also a code that was added. The first code book was used by these two and one additional coder to code the remaining ten answers from the second pre-test. The coding results were discussed, deviations solved and the code book refined accordingly (see Table 2 for the codes and an explanation of them). The coders reported that no situation occurred where they would have liked to discuss something with the participants, indicating that a survey as an instrument appears suitable. Certain codes had relationships, e.g., if Social Competition was coded, Social Comparison was coded as well. With the resulting set of codes, the 140 concepts of the main study were coded by two coders independently. Afterward, they went through their results and solved deviations via discussion. To check the validity of this coding, a third coder coded a random sample of 42 participants (30%) and the inter-rater agreement for every code was calculated, which was on average $\kappa = .86$ (Min=.63; Max=1). This can be considered as "*almost perfect*" [39].

[1] We started with a 4-point scale for *En* but changed this to a 5-point one for the other scenarios to give better discriminative options.

Table 2: Game elements, an explanation and their frequency (in bold when suggested by at least 50% of the participants).

Rank	Game Element	Explanation – The participant mentions ...	Total
01	Goals	... specific (sub-) goals that need to/can be achieved	**106 (76%)**
02	Multiplayer	... a multiplayer component	**87 (62%)**
03	Progression	... progression in the game overall or specific game attributes	**81 (58%)**
04	Social Comparison	... that it is possible to compare one's own performance to others'	**72 (51%)**
05	Social Competition	... competition between human players where one player will be the winner	**70 (50%)**
06	Points	... an entity that can be accumulated in the game	66 (47%)
07	Prizes	... a physical (e.g., cinema tickets) or a personal reward (e.g., to watch TV)	65 (46%)
08	Mobile Game	... a mobile component of the game	63 (45%)
09	Time Pressure	... actions that need to be done within a certain time	49 (35%)
10	Periodicity	... something that is or should be done regularly (e.g., weekly)	42 (30%)
11	Visible Progress	... an indication that shows progress or distance to the next goal	40 (29%)
12	Bonus	... that it is possible to achieve a bonus (e.g., receiving 1000 bonus points)	35 (25%)
13	Surprise	... randomness or other unexpected elements that surprise the player in the game	34 (24%)
14	Surveillance	... a control instance that monitors progress in the game	33 (24%)
15	Friends	... that the game can be played with friends/family	28 (20%)
16	Customization	... that the player is able to adjust components of the game to his/her needs	28 (20%)
17	Achievements	... achievements (e.g., badges, ranks) can be gained	27 (19%)
18	Unlockables	... that new game content or features can be unlocked	26 (19%)
19	Analogy	... an existing game or concept that he/she adapts to his/her concept	26 (19%)
20	Punishment	... penalties (e.g., subtracting points)	24 (17%)
21	Social Recognition	... that progress made is visible to others, with the purpose to show it to them	21 (15%)
22	System Assistance	... an assistance function of the game that eases something for the player	20 (14%)
23	Virtual Character (self)	... one or more virtual characters that represent the player	20 (14%)
24	Real Challenge	... a particularly challenging aspect or beating one's own personal scores	17 (12%)
25	Themed	... that the concept has a specific theme (e.g., Sci-Fi)	17 (12%)
26	Single-Player	... that the concept is (also) usable for a single player	16 (11%)
27	Virtual Items	... virtual items/goods that are available in the game	15 (11%)
28	Knowledge/Skill Improvement	... that the game (or players) conveys knowledge (to others) or that players can improve their skills	15 (11%)
29	Teams	... that players can be grouped into teams or guilds	14 (10%)
30	Notification	... that the game provides a notification when something particular happens	13 (9%)
31	Unspecific Reward	... rewards, but the kind of the reward is not further specified	13 (9%)
32	Appearance	... something that belongs to the look/appearance/sound of the game	12 (9%)
33	Board Game	... that the game is a card or board game	12 (9%)
34	Encouragement	... that the game or other players encourage one to reach goals	11 (8%)
35	Social Collaboration	... that players cooperate to reach a goal	10 (7%)
36	Collecting/Collectibles	... collecting a specific entity explicitly as a motivational factor	10 (7%)
37	Anti-Cheating	... something that prevents cheating in the game	9 (6%)
38	Unspecific Competition	... a competition, whether it is against other players or AI-controlled entities	8 (6%)
39	Exploration	... that features in the game, the game itself or the world can be explored	8 (6%)
40	Lottery/Gambling	... that players can bet in the game or have a raffle	8 (6%)
41	RPG	... role-playing games explicitly	8 (6%)
42	Socialization	... that the game helps to get to know other people (or improve a relationship)	7 (5%)
43	Fairness	... concepts that make the game fair (e.g., goals depending on the fitness level)	7 (5%)
44	Peer Pressure/Accountability	... that other people can see whether or how I do or fail to do something	6 (4%)
45	Personalization	... that the system adapts itself to the player's needs	6 (4%)
46	Virtual Character (other)	... one or more characters that do not represent the player but other entities (e.g., NPCs)	6 (4%)
47	Purpose/Common Welfare	... that the game serves a higher purpose (e.g., saving the world)	6 (4%)
48	Creativity	... that the player needs to be creative (e.g., showing a scene from a movie)	6 (4%)
49	Puzzle	... a riddle or puzzle component	5 (4%)
50	Communication Tools	... that it is possible to communicate with others in the game	4 (3%)
51	Security/Privacy	... security or privacy aspects	3 (2%)
52	Care Taking	... that the player needs to care for others (e.g., virtual pets)	3 (2%)
53	Premium/Freemium	... special features that can be purchased or the availability of specific features for free	3 (2%)
54	Mini Games	... mini games that can be played within the game	3 (2%)
55	Persuading/Manipulating	... specific actions that can persuade/manipulate others so that they adapt their behaviors	2 (1%)
56	Story	... story components	2 (1%)

3.3 Results

We used *AMT* until we received 35 valid responses[2] for every scenario, summing up to 140 participants (79 male, 60 female, one no answer; age: <18: 1, 18–24: 5, 25–31: 41, 32–38: 50, 39–45: 17, 46–52: 12, 53–59: 10, >59: 3, no answer: 1). All participants can be considered as open to games, as they at least answered with a neutral response to one of these questions: "*Do you characterize yourself as gaming-affine?*"; "*Do you frequently play video (board) games?*"; "*Do you have a passion for video (board) games?*". 32 participants (23%) also stated that they had designed a game already; these were distributed across the four scenarios, so we did not expect issues here (10/6/6/10, denoting *En*/*Ex*/*Pi*/*Cl*; see Table 1).

Diverse gamification concepts were suggested

We analyzed the character count of the created concepts in the scenarios (1102/939/1072/925; Kruskal-Wallis test p=.11), and between participants claiming to have developed a game (Mean M=1112) and those who had not (M=973), but no significant effects were found (t-test p=.14). By inspecting the concepts[3], we found that diverse ones were suggested, based on the identified codes. The following examples[4] are taken from *Ex*:

"*The player would be rewarded for exercising by getting points they can accumulate and add up during the day. These determine how many cards they can pick from the reward deck and which deck they are allowed to choose. The cards in each deck will be written by the player and could be anything they would enjoy doing. Let's say you exercise for 30 minutes; you could either pick two cards from the first or one from the second deck. If they exercise for one hour the cards double. The rewards in the second deck will be more exciting, but you only get one. Deck one might have a card that says "social media access for 20 minutes, 30 minutes TV viewing, 20 minutes of music videos". Deck two will have more exciting stuff like "video gaming/Netflix for one hour". The game is a board game style meant for one player and personalized by themselves.*"

Codes: Goals, Periodicity, Single-Player, Points, Bonus, Prizes, Collecting/Collectibles, Customization, Surprise, Board Game

"*The game that got me outside the fastest and the most was Pokémon Go. There could be some real changes that would get me out and running. However, it'd be difficult to come up with a knockoff that didn't feel like a knockoff. Maybe something with a similar theme (augmented reality) but different content (Pokémon). Something educational might be neat. There was a step app I used a while back, I can't remember the name, but it would count my steps along a path to somewhere (like a trip around Rome). Every x00 steps I would get a notification that I had reached a landmark and I could click on it and view the information about the landmark on my trip. Maybe you could build something in Google Maps/Street View so that one could walk around and look at the phone and virtually walk around a city in another country.*"

Codes: Visible Progress, Progression, Surveillance, System Assistance, Notification, Knowledge/Skill Improvement, Exploration, Mobile Game, Analogy

[2]This number was an economical compromise for being able to code in a reasonable time frame and still offer enough expressiveness.
[3]All concepts can be found as supplementary material.
[4]Shortened and grammatically corrected for presentation reasons.

The 140 participants suggested 1348 elements (see Table 2), with 9.6 elements on average (standard deviation SD=3.2, minimum Min=3, maximum Max=19), with no significant difference between the scenarios (9.9/10.3/9.1/9.1; Kruskal-Wallis test, p=.36). Participants reported being satisfied with their concepts (M=4.5, 95% confidence interval CI [4.43, 4.64], SD=.6, Median Mdn=5), that they were easy to develop (M=4.2, 95% CI [4.02, 4.31], SD=.9, Mdn=4) and that they would be motivating for themselves (M=4.6, 95% CI [4.52, 4.75], SD=.7, Mdn=5) and others (M=4.6, 95% CI [4.51, 4.69], SD=.5, Mdn=5). They stated that they could imagine the scenarios (M=4.4, 95% CI [4.26, 4.52], SD=.8, Mdn=5) and that these were relevant for them (M=4.2, 95% CI [4.11, 4.44], SD=1, Mdn=5). We analyzed whether the number of game elements suggested differ between those who had or had not designed a game already; the responses to the five gaming affinity questions; and the answers to the concept/scenario questions above, but no significant differences were found (always p>.05).

No set of game elements was proposed twice in the concepts. When relaxing this to sets which deviate by just one element, we still found no overlap (two different elements: 4 sets (3%), three: 16 (11%), four: 36 (26%)). Table 2 shows that only five of the 56 elements (9%) were mentioned by at least 50% of our participants, showing the participants' diversity when the system does not restrict them. By considering the ten most often mentioned elements, we see that many participants defined a Goal (rank 01) and Progression (03) in their concepts. Interestingly, even though we biased (through the formulation of the "hook") Single-Player (26) and Multiplayer (02) games, the latter appeared to be more relevant for participants. If the game had a multiplayer component, we also learned that most participants suggested a competitive element (04, 05) instead of a collaborative one (35). A Mobile Game (08) was also much more frequently selected than, for example, a Board Game (33), although both were part of the "hook". Points (06) and Prizes (07) were the most often mentioned reward types and many participants considered a timing component (09, 10). Overall, the number of elements suggested, the variety of the concepts and the self-reports contribute towards **Q1**.

We found 23 significantly different game element usages in the concepts between the scenarios (see Table 3). While Time Pressure seems to be explainable by the scenario framing (as in *Cl* and *Pi*, doing it faster was highlighted), the other differences appear to arise from the scenario itself. In *Ex*, participants seem to want systems that monitor what they (or others) do and they want to have the option to customize systems. In *En* collaborative aspects were dominant, and a higher "purpose" was highlighted. In *Cl*, friends/family were more often mentioned, most likely because the kitchen area is a private room where friends and family might have access. Finally, *Pi* revealed that participants want to use more personal challenges here. This shows that the context had a moderating effect on which game elements were more likely to be suggested.

PTPT seem not to be a dominant factor in this task

In this section, we present complex tables. Before we derive the corresponding results from these, we will give an explanation on how to read and interpret the data.

Table 3: Significantly different element suggestions (Kruskal-Wallis tests with pairwise comparisons (Bonferroni-corrected), all p<.05) between scenarios. Superscripts denote pairwise-comparison results (only shown once per relationship), e.g., Surveillance was suggested significantly more often in *Ex* than in *Pi*.

Game Element	En	Ex	Cl	Pi
Time Pressure	1	9	**21**$^{\text{Ex, En}}$	**18**$^{\text{En}}$
Surveillance	9	**14**$^{\text{Pi}}$	7	3
Friends	3	7	**14**$^{\text{En, Pi}}$	4
Customization	4	**14**$^{\text{En, Pi}}$	7	3
Achievements	3	**13**$^{\text{En, Pi}}$	8	3
Analogy	4	**12**$^{\text{Cl}}$	3	7
Real Challenge	2	2	3	**10**$^{\text{Ex, En}}$
Teams	**9**$^{\text{Ex, Cl, Pi}}$	2	1	2
Notification	**8**$^{\text{Pi}}$	3	2	0
Social Collaboration	**7**$^{\text{Ex, Cl}}$	1	0	2
Exploration	1	**6**$^{\text{Cl}}$	0	1
Purpose/Common Welfare	**6**$^{\text{Ex, Cl, Pi}}$	0	0	0

How to read Table 4: Nine GES also had a **r**elated **e**lement (abbreviated with RE subsequently) in the concepts, i.e., we found a game element in the concepts that also was represented in the GES. We had twelve GES, but only found corresponding elements for nine (with two GES having two REs); only these are presented and shown in the first column of Table 4. For example, the GES in the first row is "*Being confronted with challenges that push me to my limits"* with the RE Real Challenge. Based on the previous result that the scenarios appeared to have an influence, the subsequent considerations are done scenario-wise. The second column thus indicates the scenario and the number of participants who used the RE here. For the above example, in *En* and *Ex* two, in *Cl* three and in *Pi* ten participants used the game element Real Challenge in their gamification concepts. The third column contains the mean values to the answers to the GES per scenario (5-point scale for *Ex, Cl, Pi* and 4-point scale for *En*). 35 participants per scenario answered the GES. We differentiate the means of those who did not use the corresponding RE in their concepts ($M_{!Used}$) from those who did use it (M_{Used}). We also show the p-value of the Mann-Whitney U test where we compared $M_{!Used}$ with M_{Used}. Considering the above example for *Pi* only, we see that the ten participants (of the 35 participants per scenario) who used the element Real Challenge in their concepts had answered the GES with a mean value of 4.4 on the 5-point scale, while the remaining 25 participants, who did not use Real Challenge in their concept, had a mean value of 3.8. The p-value for the comparison of both means was p=.05.

Result interpretation of Table 4: We expected relationships between the GES and the RE as both were asked in the context of "*What motivates you?*". Considering Table 4, though, we found no significant differences (all p≥.05) between the mean of the GES answers of those who did or did not suggest the element, i.e., participants who suggested it did not provide a higher rating for the corresponding GES. In the 366 cases in which participants suggested a RE, 64 corresponding GES ratings (17%) were below 4 on the 5-point scale (3 for *En* on the 4-point scale), i.e., they did not rate the element as very motivating but used it in their concepts. In the 1174 cases in which participants did not suggest a RE, 334 GES ratings (28%) were above 3 (2 for *En*), i.e., the element was rated as motivational but was not used in the concept. Although hypothesized differently, both hint that there is no clear relationship.

How to read Table 5: We repeat the GES and the RE in the first column and the RE usage numbers per scenario in the second. The following columns show the *Hexad* user types correlated (Kendall's τ) with the answers to the GES and the usage of the RE in the concepts. A cell entry is only shown if at least one pair has a significant correlation at the p<.05 level. If a significant correlation between a player type and the GES (RE) exists, the value of τ is shown in bold to the left (right) of "/". Furthermore, significant correlations are colored green (red) if the correlation is positive (negative). The cell is highlighted in blue if both correlations are significant and have the same direction. If only one significant correlation is found, we show τ for the other non-significant correlation non-bold and in black. Considering the ongoing example, we found five significant correlations for *Pi* and the player types: four between the player types and the GES (*Achiever*, *Free Spirit*, *Philanthropist*, *Player*) and one for the player types and the RE (*Achiever*). The *Achiever* cell is highlighted, as the GES and the RE both correlated significantly with the *Achiever* and had the same direction. As a significant correlation between *Free Spirit*, *Philanthropist* and *Player* and the RE was not found, but significant ones were found with the GES, we denote their τ value to the right of the "/". For the player types *Disruptor* and *Socialiser*, no significant correlations were found for either the GES or the RE and player types. Thus, the cells are empty. The *Big Five* columns can be read analogously.

Result interpretation of Table 5: By considering the table columns, as expected (based on the literature reporting correlations between game elements and PTPT [33, 42]), we found 145 significant correlations between the GES and PTPT in the different scenarios, indicating a general relationship. Although the GES were the same in every scenario (i.e., they did not depend on it), not all correlations were found in every scenario consistently: this only happened in 20 of the 145 cases, indicating that the scenarios might have a stronger effect. Comparing our correlations between GES and the player types with the correlations reported in [42], we see, although some overlap exists, that we differ in the size and amount of the correlations (compare Table 6). One notable example here is that we found several relationships to the *Philanthropist*, while Tondello et al. [42] reported only a few weak ones. We also considered the significant correlations between the PTPT and the RE, but only 22 were found, of which only nine are in line with the significant correlations found with the GES. One issue here is the low usage count of many elements in the concepts. But even when considering the 15 cases in which elements (i.e., Goals, Social Competition, Points, Achievements and Unlockables) were suggested ≥ 10 times per scenario, the number of the same correlations between PTPT and GES and PTPT and RE is low. This hints that neither player types nor personality traits seem to be a dominant factor for which elements are suggested in such an open design task. This contributes to the second question (**Q2**).

Table 4: Comparisons (Mann-Whitney U) of the GES mean answers of those who did (not) use the element in their concept.

Game element statement (GES) **and related element (RE)**	**Scenario and # of RE mentions**		**Answers to GES** $M_{!Used}$	M_{Used}	p
Being confronted with challenges that push me to my limits	En	2	3.3	3.5	.76
	Ex	2	4.1	3.5	.34
	Cl	3	4	4.3	.72
Real Challenge	Pi	10	3.8	4.4	.05
Having quests/tasks/missions I can solve	En	21	3.7	3.8	.65
	Ex	28	4.6	4.5	.95
	Cl	28	4.6	4.3	.67
Goals	Pi	29	3.8	4.4	.12
Being able to unlock new features and/or content in a game	En	6	3.7	3.3	.31
	Ex	12	3.2	4.5	.33
	Cl	4	4	4.8	.18
Unlockables	Pi	4	4.3	4	.53
Having tasks that allow me to explore aspects and features in a game	En	1	3.6	3	.46
	Ex	6	4.1	3.7	.31
	Cl	0	3.9	-	-
Exploration	Pi	1	4	2	.11
Having the possibility to share my knowledge with others	En	6	3	3.3	.38
	Ex	3	3.2	4	.26
	Cl	3	3.2	3	.72
Knowledge/Skill Improvement	Pi	3	3.4	2.3	.16
Receiving badges/achievements	En	3	3.4	3.7	.56
	Ex	13	3.6	4.4	.11
	Cl	8	3.5	4.3	.05
Achievements	Pi	3	3.7	4.7	.16
Receiving points. I can compare with others on a leaderboard	En	21	3.1	3.5	.14
	Ex	12	3.9	4.1	.88
	Cl	18	3.8	3.7	.96
Points	Pi	15	3.9	3.7	.63
Receiving points. I can compare with others on a leaderboard	En	17	3.2	3.5	.25
	Ex	13	3.9	4	.91
	Cl	20	3.5	4.1	.30
Social Competition	Pi	20	3.7	3.9	.66
Having the option to build guilds/teams to solve tasks together	En	9	2.9	3.1	.67
	Ex	2	3.4	2	.27
	Cl	1	2.7	3	.80
Teams	Pi	2	3.1	3	.97
Having the option to build guilds/teams to solve tasks together	En	7	2.9	3	.95
	Ex	1	3.3	1	.17
	Cl	0	2.7	-	-
Social Collaboration	Pi	2	3.1	3	.97
Having features that help me to get to know other people	En	1	2.7	4	.17
	Ex	3	2.7	3.7	.34
	Cl	2	2.8	2.5	.81
Socialization	Pi	1	2.7	3	.80

3.4 Discussion

The study shows several aspects that add to "bottom-up" gamification: first, the study revealed that participants are able to describe gamification concepts without guidance in a task where they have a lot of freedom, i.e., participants seem not to be overwhelmed by this (adding to **Q1**). Second, participants utilize a broad range of game elements in their concepts. As no set of elements was suggested twice, the game element overlap in the configurations is comparatively low. Only five elements were mentioned by at least 50% of the participants, showing the diversity in this task. For "bottom-up" settings providing a set of game elements to select from, this means that a broad range should be offered (in particular, more than was offered in the previous studies [25, 26]) to account for the different user preferences. Our presented ranking of game elements can be

Table 5: Correlations (Kendall's τ, colored if p<.05) between GES and RE with *Hexad* user types and the *Big Five* personality traits (cell empty if both correlations are p>.05 or highlighted when in the same direction).

Game element stat. (GES) and related element (RE)	Scenario and # RE mentions		Correlations: *Hexad* user types and [GES/RE]						Correlations: *Big Five* traits and [GES/RE]				
			Achiev.	Disrupt.	Free Sp.	Philan.	Player	Sociali.	Open.	Consc.	Neuro.	Extrav.	Agree.
Being confronted with	En	2			.30/-.15				.36/.10		-.35/.00		
challenges that push	Ex	2	.33/.07			.31/.05	.40/-.05	.35/-.06	.32/-.21	.36/.02		.29/-.10	
me to my limits	Cl	3				.31/-.05							
Real Challenge	Pi	10	.55/.31		.53/.22	.42/.19	.47/.06			.33/.40			.05/.30
Having quests/tasks/	En	21			.39/-.04				.42/.17		.17/.39		
missions I can solve	Ex	28	.41/.33		.36/-.04	.44/.05	.58/-.05	.30/-.06	.40/-.21	.49/.02			
	Cl	28			.40/-.04	.31/.19							
Goals	Pi	29	.38/.30		.30/.37	.40/.31	.47/.29			.30/.36			
Being able to unlock	En	6	.32/-.15		.30/-.06		.36/-.05		.46/-.25	.43/-.08			
new features and/or	Ex	12	.34/.02			.34/-.22	.39/-.06	.10/-.35		.50/-.08		-.01/-.30	
content in a game	Cl	4									.30/.26		
Unlockables	Pi	4	.51/-.13		.39/-.06	.57/-.14	.48/-.27						.42/-.10
Having tasks that allow	En	1							.48/-.07		-.31/-.05	.32/.16	.42/.07
me to explore aspects	Ex	6	.32/.10			.44/.05	.28/.05	.30/-.13		.32/.00			
and features in a game	Cl	0			.28/-		.31/-						
Exploration	Pi	1	.52/-.25		.37/-.25	.53/-.24	.45/-.21	.38/-.13					.32/-.15
Having the possibility	En	6				.44/.43		.43/.25				.51/.11	.41/.23
to share my knowledge	Ex	3				.40/.16	.31/-.10	.39/.09					
with others	Cl	3					.39/.02		.10/-.35		-.29/.20	.37/.02	.02/.00
Knowledge/Skill Im.	Pi	3			.39/-.32	.51/-.24		.37/-.23				.29/-.20	.36/-.28
Receiving badges/	En	3		-.40/.09								-.01/.33	
achievements	Ex	13	.34/-.10		-.02/-.35	.33/-.04	.30/-.01						
	Cl	8											
Achievements	Pi	3		-.38/-.17		.47/.09	.27/.04						.29/.12
Receiving points.	En	21					.41/.04				-.31/.01		
I can compare with	Ex	12	.37/-.07			.33/.09	.29/-.05	.41/.14	.24/-.40	.43/-.04		.30/.06	
others on a leaderboard	Cl	18	.41/.07			.30/.07	.34/-.18						.32/.18
Points	Pi	15	.34/-.09			.31/-.32	.41/.09						
Receiving points.	En	17					.41/-.07				-.31/-.49		
I can compare with	Ex	13	.37/-.11			.33/-.28	.29/-.10	.41/-.10		.43/.07		.30/-.04	
others on a leaderboard	Cl	20	.41/.15			.30/-.11	.34/.00						.32/.02
Social Competition	Pi	20	.34/.03			.31/-.19	.41/-.10						
Having the option to	En	9						.34/.11					
build guilds/teams to	Ex	2				.35/.05	.29/-.12	.43/-.10					
solve tasks together	Cl	1					.34/-.20	.57/.07				.44/-.05	.25/-
Teams	Pi	2				.29/-.01		.26/-.11			-.09/.30	.29/-.04	
Having the option to	En	7						.34/.00					
build guilds/teams to	Ex	1				.35/.08	.29/-.08	.43/-.23					
solve tasks together	Cl	0					.34/-	.57/-				.44/-	.25/-
Social Collaboration	Pi	2				.29/-.01		.26/-.11			-.09/.30	.29/-.04	
Having features that	En	1						.49/.24				.30/.25	
help me to get to	Ex	3	.27/.04			.40/.14		.45/.25					
know other people	Cl	2						.35/.03				.47/-.12	
Socialization	Pi	1										.38/.19	

used to guide the selection. Additionally, in this respect, it appears advisable to support users in the selection of game elements to avoid choice overload [16], for example through recommender systems [41]. Third, although originating from self-report data and thus needing to be treated with caution [35], participants claimed nearly uniformly to be satisfied with their concepts, that it was easy for them to develop these and that they think these would be motivating for themselves and others. The latter was integrated to mitigate the effects of potential bias on the self-reports to a certain degree [1]. Although these concepts were not implemented and tested to validate the factual motivational impact, this at least hints that participants seem to be convinced of what they have created on their own (also adding to **Q1**). Fourth, considering the study of Lessel et al. [25], the participants there actually only used a few game elements and combined these only into simple gamification concepts. But when asked, they stated they would have used more complex setups, but had no opportunities to do so because of the short duration of the study. As the participants in our study suggested many elements and complex concepts, this supports this finding further.

We found that some participants who suggested specific elements in their concepts (which had the goal to motivate them) did not rate them as particularly motivating in the GES (and vice versa). This either indicates that specific elements only become motivating for participants in combination with other elements (which would be an issue for related work that investigates game elements individually) or that participants develop concepts with elements that are not particularly motivating, but just, for example, *known* to them or that some game elements are *easier* to use than others in concepts. As we have seen that the context (i.e., the

Table 6: Correlations between *Hexad* user types and elements found in [42] (excerpt). We only show τ if p<.05 and τ >.2.

Game Element	Achiever	Disruptor	Free Spirit	Philanthropist	Player	Socialiser
(Real) Challenge	.46	.21	.41	.21	.32	-
Quests (Goals)	.27	-	.24	-	.25	-
Unlockables	-	-	.23	-	-	-
Exploratory Tasks (Exploration)	-	-	.35	-	-	-
Knowledge Sharing	-	-	-	-	.23	-
Achievements	.21	-	-	-	.27	-
Points	-	-	.20	-	.26	-
Social Competition	-	.32	.25	-	.24	.22
Teams	-	-	-	-	-	-
Social Networks (Socialization)	-	-	-	-	-	-

scenario) also has an impact on the game element selection, this can be another explanation, as the GES questions had a different context (i.e., a general one). We were unable to replicate some of the relationships between player type and the GES reported in [42] and instead found different correlations. An explanation for this is that the formulations/explanations used for the game elements were different (as these were not provided in [42]) or that more research for the *Gamification User Types Hexad Scale* is necessary to come to a consistent relationship, e.g., to develop standardized formulations and rules for how to assess game elements (e.g., in which context these questions should be framed). As the *Big Five* literature also provides contradicting results (e.g., [17] and [31] report contradicting relationships for the competition element), we have not further analyzed the relationships found between our GES and the *Big Five*. Our correlations with the GES were not stable across scenarios. One explanation is the comparatively low user count per scenario (i.e., 35). Another explanation is that the scenario had a priming effect. Even though the GES were formulated without a particular context, participants (potentially subliminally) might still consider these for the scenario they had worked on before. As we found indications that the context affects the game element usage and was shown to be relevant for gamification in general [13], and as personality traits are impacted by context [29], this seems plausible.

Considering the PTPT and the elements suggested in the concepts, we found fewer correlations than found with the GES. One explanation is that some of the elements were suggested too infrequently in comparison to the GES being answered by every participant. But even those that were suggested often matched the GES only infrequently. This suggests that the PTPT seem not to be a dominant factor in the element selection in such a design task (adding to **Q2**). Other factors seem to be more relevant here. One factor we have found in our study is (again) the context. This contrasts with the findings of the online study in [25] where individuals stayed nearly consistent with their game selections across the four scenarios. Here, instead, we found evidence that the scenario impacts the game element selection. One explanation for this is that the approaches were different (free choice vs. selecting from a set). Another one is that the common game elements used in the online study in [25] are less likely affected by the context. Conducting further work on this seems relevant. Overall, these findings suggest that it seems less likely that users are motivated in "bottom-up" settings because they selected suitable game elements, at least from a personality/player type perspective. Other explanations, such as having "a choice", being able to identify with the self-created setup, or that certain elements might be easier to employ than others in such a task, might be more likely explanations.

This study has limitations: first, as the scenarios had a moderating impact, we considered them separately. This leads to fewer participants for the calculations. But even when considering the correlations of the PTPT and GES/RE of the whole sample, the results remain similar: 76 significant correlations between the GES and PTPT but only 14 between the RE and PTPT were found, of which only five were in line with the significant correlations found with the GES. Second, as no concept was implemented and used by the participant who developed it, we cannot derive whether the implemented gamification concepts would indeed be motivating for them, aside from the motivational questions. In [25, 26], participants were able to realize their ideas without writing them down first, and positive results were found. Given that they mainly used their initial ideas throughout these studies, we assume that the written concepts would also induce positive effects when realized. Third, it also needs to be stated that participants in our study actually had a design task at design time. Although this aspect is also a part of "bottom-up" gamification (whenever the game concept is adjusted by participants), it is unclear how this relates to a real application. This was necessary to provide them with the freedom we wanted to achieve in this paper. Fourth, in the context of self-reports, we also note that participants might have feared a rejection in the *AMT* context (and thus feared not getting paid) if they answered that their concept would not motivate them. We compared their answers to the "motivation" questions to our unpaid student pre-test sample and were not able to find a difference, but to rule this out, a larger unpaid sample needs to be tested.

4 CONCLUSION

We presented an analysis of concepts that users developed when not restricted to a set of game elements they can select from. Previous "bottom-up" gamification studies limited the participants in this respect [25, 26]. Through our study, we provided further insights for "bottom-up" approaches. Besides the fact that participants were able to create the concepts, we learned that they are quite diverse in their element usage, showing that more elements, from which users can select, need to be offered in "bottom-up" systems to account for individual differences. While we could find indicators that the

context influences which game elements were suggested, we were not able to find clear relationships with personality traits or player types: participants used other elements than these would suggest. We see this as a first indication that it is less likely that users in "bottom-up" gamification are motivated because they select optimal game elements (at least from a personality/player type perspective) and that explanations such as having "a choice to select game elements" (albeit not optimal ones) or being able to identify with the resulting game setup might be more likely.

As a next step, an experiment where participants are confronted with their implemented concepts will validate the assumption about motivation we made. Another aspect for future work is to investigate which further factors, besides the context (e.g., the preferences in game genres or prior knowledge), impact the elements users suggest. It might also be helpful to derive "player design types" and contrast these with the player types. If such types exist, this could help to inform "bottom-up" approaches, e.g., by offering a tailored pre-selection of game elements (that is still adjustable) from a larger set. Another perspective is investigating whether the perception of individual game elements changes depending on which other elements are available. Finally, we provided the developed concepts as supplementary material to make further use of them: for example, professional game developers could analyze the concepts as a whole instead of breaking them down into elements, or they could be compared with what experts would develop.

5 ACKNOWLEDGMENTS

We thank Elisa Mekler for her support during the initial phase of the experiment and the coding process.

REFERENCES

[1] Emily Stier Adler and Roger Clark. 2014. *An Invitation to Social Research: How It's Done.* Cengage Learning.
[2] Martin Böckle, Jasminko Novak, and Markus Bick. 2017. Towards Adaptive Gamification: A Synthesis of Current Developments. In *Proc. ECIS '17.* 158–173.
[3] Michael Buhrmester, Tracy Kwang, and Samuel D. Gosling. 2011. Amazon's Mechanical Turk a New Source of Inexpensive, Yet High-Quality, Data? *Perspectives on Psychological Science* 6, 1 (2011), 3–5.
[4] David Codish and Gilad Ravid. 2015. Detecting Playfulness in Educational Gamification Through Behavior Patterns. *IBM Journal of R&D* 59, 6 (2015), 1–13.
[5] Edward L. Deci and Richard M. Ryan. 2011. Self-Determination Theory. *Handbook of Theories of Social Psychology* 1 (2011), 416–433.
[6] Sebastian Deterding, Dan Dixon, Rilla Khaled, and Lennart Nacke. 2011. From Game Design Elements to Gamefulness: Defining "Gamification". In *Proc. AcademicMindtrek '11.* 9–15.
[7] Lauren S. Ferro, Steffen P. Walz, and Stefan Greuter. 2013. Towards Personalised, Gamified Systems: An Investigation into Game Design, Personality and Player Typologies. In *Proc. IF '13.* 7:1–7:6.
[8] Lalya Gaye and Atau Tanaka. 2011. Beyond Participation: Empowerment, Control and Ownership in Youth-led Collaborative Design. In *Proc. C&C '11.* 335–336.
[9] Kathrin M. Gerling, Conor Linehan, Ben Kirman, Michael R. Kalyn, Adam B. Evans, and Kieran C. Hicks. 2016. Creating Wheelchair-controlled Video Games: Challenges and Opportunities when Involving Young People with Mobility Impairments and Game Design Experts. *Journal of Human Computer Studies* 94 (2016), 64–73.
[10] Borja Gil, Iván Cantador, and Andrzej Marczewski. 2015. Validating Gamification Mechanics and Player Types in an E-learning Environment. In *Proc. EC-TEL '15.* 568–572.
[11] Lewis R. Goldberg. 1993. The Structure of Phenotypic Personality Traits. *American Psychologist* 48, 1 (1993), 26.
[12] Carina S. González, Pedro Toledo, and Vanesa Muñoz. 2016. Enhancing the Engagement of Intelligent Tutorial Systems Through Personalization of Gamification. *International Journal of Engineering Education* 32, 1 (2016), 532–541.
[13] Juho Hamari, Jonna Koivisto, and Harri Sarsa. 2014. Does Gamification Work?– A Literature Review of Empirical Studies on Gamification. In *Proc. HICSS '14.* 3025–3034.
[14] Juho Hamari and Janne Tuunanen. 2014. Player Types: A Meta-Synthesis. *Transactions of the Digital Games Research Association* 1, 2 (2014).
[15] Hsiu-Fang Hsieh and Sarah E. Shannon. 2005. Three Approaches to Qualitative Content Analysis. *Qualitative Health Research* 15, 9 (2005), 1277–1288.
[16] Sheena S. Iyengar and Mark R. Lepper. 2000. When Choice is Demotivating: Can One Desire Too Much of a Good Thing? *Journal of Personality and Social Psychology* 79, 6 (2000), 995–1006.
[17] Yuan Jia, Bin Xu, Yamini Karanam, and Stephen Voida. 2016. Personality-targeted Gamification: A Survey Study on Personality Traits and Motivational Affordances. In *Proc. CHI '16.* 2001–2013.
[18] Anne Marie Kanstrup. 2012. A Small Matter of Design: An Analysis of End Users As Designers. In *Proc. PDC '12.* 109–118.
[19] Rilla Khaled and Asimina Vasalou. 2014. Bridging Serious Games and Participatory Design. *Int. Journal of Child-Computer Interaction* 2, 2 (2014), 93–100.
[20] Ana C.T. Klock, Isabela Gasparini, Marcelo S. Pimenta, and José Palazzo M. de Oliveira. 2015. "Everybody is Playing the Game, but Nobody's Rules are the Same": Towards Adaptation of Gamification Based on Users' Characteristics. *Technical Committee on Learning Technology* 17, 4 (2015), 22–25.
[21] Jonna Koivisto and Juho Hamari. 2014. Demographic Differences in Perceived Benefits from Gamification. *Computers in Human Behavior* 35 (2014), 179–188.
[22] Sarah Kuhn and Michael J. Muller. 1993. Participatory Design. *Commun. ACM* 36, 6 (1993), 24–29.
[23] Ellen J. Langer and Judith Rodin. 1976. The Effects of Choice and Enhanced Personal Responsibility for the Aged: A Field Experiment in an Institutional Setting. *Journal of Personality and Social Psychology* 34, 2 (1976), 191.
[24] Jisoo Lee, Erin Walker, Winslow Burleson, Matthew Kay, Matthew Buman, and Eric B. Hekler. 2017. Self-Experimentation for Behavior Change: Design and Formative Evaluation of Two Approaches. In *Proc. CHI '17.* 6837–6849.
[25] Pascal Lessel, Maximilian Altmeyer, Marc Müller, Christian Wolff, and Antonio Krüger. 2016. "Don't Whip Me With Your Games": Investigating "Bottom-Up" Gamification. In *Proc. CHI '16.* 2026–2037.
[26] Pascal Lessel, Maximilian Altmeyer, Marc Müller, Christian Wolff, and Antonio Krüger. 2017. Measuring the Effect of "Bottom-Up" Gamification in a Microtask Setting. In *Proc. AcademicMindtrek '17.* 63–72.
[27] Nicole McMahon, Peta Wyeth, and Daniel Johnson. 2012. Personality and Player Types in Fallout New Vegas. In *Proc. FnG '12.* 113–116.
[28] Adam W. Meade and S. Bartholomew Craig. 2012. Identifying Careless Responses in Survey Data. *Psychological Methods* 17, 3 (2012), 1–19.
[29] Walter Mischel, Yuichi Shoda, and Rodolfo Mendoza-Denton. 2002. Situation-Behavior Profiles as a Locus of Consistency in Personality. *Current Directions in Psychological Science* 11, 2 (2002), 50–54.
[30] Scott Nicholson. 2012. A User-Centered Theoretical Framework for Meaningful Gamification. In *Proc. GLS '12.* 1–7.
[31] Rita Orji, Lennart E. Nacke, and Chrysanne Di Marco. 2017. Towards Personality-driven Persuasive Health Games and Gamified Systems. In *Proc. CHI '17.* 1015–1027.
[32] Rita Orji, Kiemute Oyibo, and Gustavo F. Tondello. 2017. A Comparison of System-Controlled and User-Controlled Personalization Approaches. In *Adjunct Proc. UMAP '17.* 413–418.
[33] Rita Orji, Julita Vassileva, and Regan L. Mandryk. 2014. Modeling the Efficacy of Persuasive Strategies for Different Gamer Types in Serious Games for Health. *User Modeling and User-Adapted Interaction* 24, 5 (2014), 453–498.
[34] Kiemute Oyibo, Rita Orji, and Julita Vassileva. 2017. The Influence of Culture in the Effect of Age and Gender on Social Influence in Persuasive Technology. In *Adjunct Proc. UMAP '17.* 47–52.
[35] Philip M. Podsakoff and Dennis W. Organ. 1986. Self-Reports in Organizational Research: Problems and Prospects. *Journal of Management* 12, 4 (1986), 531–544.
[36] Beatrice Rammstedt and Oliver P. John. 2007. Measuring Personality in One Minute or Less: A 10-Item Short Version of the Big Five Inventory in English and German. *Journal of Research in Personality* 41, 1 (2007), 203–212.
[37] Richard M. Ryan and Edward L. Deci. 2000. Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-being. *American Psychologist* 55, 1 (2000), 68.
[38] Niloufar Salehi, Lilly C. Irani, Michael S. Bernstein, Ali Alkhatib, Eva Ogbe, Kristy Milland, and Clickhappier. 2015. We Are Dynamo: Overcoming Stalling and Friction in Collective Action for Crowd Workers. In *Proc. CHI '15.* 1621–1630.
[39] Steve Stemler. 2001. An Overview of Content Analysis. *Practical Assessment, Research & Evaluation* 7, 17 (2001), 137–146.
[40] Gustavo F. Tondello, Alberto Mora, and Lennart E. Nacke. 2017. Elements of Gameful Design Emerging from User Preferences. In *Proc. CHI PLAY '17.* 129–142.
[41] Gustavo F. Tondello, Rita Orji, and Lennart E. Nacke. 2017. Recommender Systems for Personalized Gamification. In *Adjunct Proc. UMAP '17.* 425–430.
[42] Gustavo F. Tondello, Rina R. Wehbe, Lisa Diamond, Marc Busch, Andrzej Marczewski, and Lennart E. Nacke. 2016. The Gamification User Types Hexad Scale. In *Proc. CHI PLAY '16.* 229–243.
[43] Miron Zuckerman, Joseph Porac, Drew Lathin, and Edward L. Deci. 1978. On the Importance of Self-Determination for Intrinsically-Motivated Behavior. *Personality and Social Psychology Bulletin* 4, 3 (1978), 443–446.