Gamification of Online Surveys: Conceptual Foundations and a Design Process based on the MDA Framework

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ABSTRACT

Gamification has been employed to make online surveys more engaging to fill. Related work has evaluated the psychological and behavioral outcome of gamified surveys, but has been unclear about design methods and best practices. This work discusses foundations, relevant design dimensions (game elements, survey areas and the design process), and critical issues concerning validity. It then proposes a structured process for survey gamification based on the MDA (mechanics, dynamics, aesthetics) framework. An evaluation of the proposed process within a case study is briefly presented along with preliminary, but promising results. The gamification process is put forth in the CHI community for further discussion, evaluation, and application.

Author Keywords

Gamification; Online Survey; Questionnaire; Design Method

ACM Classification Keywords

H.5.2 User Interfaces: Theory and methods

INTRODUCTION

Gamification of online surveys has been proposed to make questionnaire filling a less boring and more enjoyable experience. This is an important goal because online surveys have been criticized for their dullness resulting in negative respondent behavior such as speeding, random responding, premature termination, and lack of attention [7, 21]. In contrast to these negative effects, evaluations of gamified surveys have reported diverse psychological and behavioral benefits regarding user experience, motivation, participation, amount and quality of data [3, 6, 7, 21], see [3, 7] for detailed discussions of related work. These studies confirm the usefulness of gamified surveys but remain unclear about suitable design methods and best practices. To better support designers wishing to employ gamification in survey design, this work first investigates conceptual foundations and critical issues and then proposes a structured process based on the MDA (mechanics, dynamics, aesthetics) framework [12].
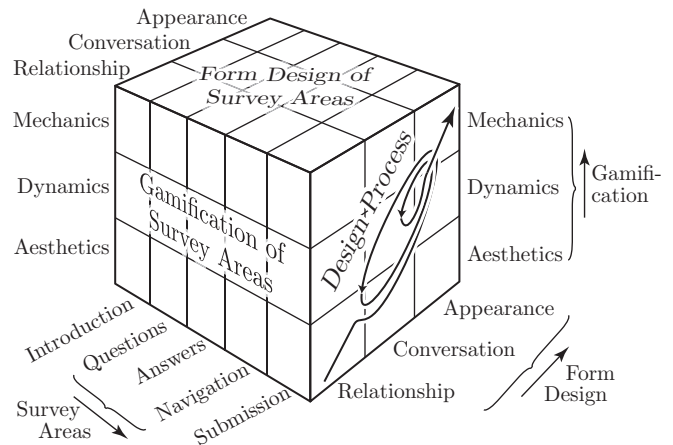
Figure 1. Three design dimensions in the gamification of online surveys: gamification (MDA game elements [12]), form design (Jarret's three layers of form design [15]), and the survey areas to be gamified.

CONCEPTUAL FOUNDATIONS

Since gamified online surveys have been designed in various ways [3, 6, 7, 21], it is important to shed light on possible designs and on the underlying design dimensions. Related work has classified survey designs based on the style of presentation [7]: text-only, decoratively visual, functionally visual, and fully gamified. In contrast, the three design dimensions discussed in this work (see Figure 1) do not represent qualities of gamified surveys but relate to three important methodological questions to be considered when designing gamified surveys. Firstly, concerning gamification: how can game elements be used in a survey to produce psychological and behavioral benefits? Secondly, concerning form design: which aspects relevant to form design need to be considered? And thirdly, concerning the survey's structure: which survey areas can gamification be applied to? These questions are discussed as "design dimensions" in this work, spanning up a design space of possible survey gamifications, see Figure 1 for a visualization. Although other aspects (e.g., software engineering or market research) are arguably also important, this work highlights three dimensions considered important from a design perspective. The intention in describing the design dimensions is to clarify conceptual foundations and to provide structure and vocabulary for discussing survey gamification in the CHI community. The design dimensions further provide premises for proposing a novel, structured process for survey gamification in this paper.

Gamification and Game Elements

Gamification has been defined as "the use of design elements characteristic for games in non-game contexts" [5] to produce desired psychological and behavioral outcomes [10], see Figure 2. Related work has described the historical background of gamification [5, 19], other attempts at defining gamification [13, 14], and related terms such as serious games [24] and playfulness [4]. In the above definition, "non-game contexts" include commerce, education, health, many more listed in [10], and online surveys [3, 6, 7, 21]. "Design elements characteristic for games", more shortly termed game elements, have been collected in related work. E.g., see the "gamification toolkit" in [25], "ingredients of great games" [22], game mechanics listed in [1], "motivational game design patterns" [17], "game flow criteria" [23], and elements suited for gamified surveys [21]. Resulting user experiences have also been listed, see the "playful experiences" in [16] and the aesthethics in [12]. The *MDA framework* provides a way to understand the above game elements as game mechanics, dynamics, aesthetics [12]. Mechanics describe the data representations, algorithms and rules that make up a game. Dynamics refer to the resulting run-time behavior over time. Aesthetics characterize the player's emotional response. Although the MDA framework was originally intended for game design, it has also been proposed for gamification [25] and is suggested for survey gamification in this work, compare the 'gamification' dimension in Figure 1. Gamification has commonly been seen as adding game elements into a non-game context [14], but rather than simple addition, it has been argued that gamification should be seen as a holistic, creative, and structured process [14]. Amongst various design approaches, the MDA framework [12] provides a structured approach for combining game elements (MDAs), allowing designers to create intended aesthetics by composing a game of suited dynamics and mechanics.

Form Design

The 'form' user interface metaphor is typically employed in online surveys to allow for entry of (semi-) structured data. Best practices in form design are captured in guidelines [2] and books [15, 26]. Forms have been criticized for being reminiscent of static paper forms instead of using the interactive possibilities of software [11] and for being dull to fill [7, 21] – hence the motivation for gamification. A usability engineering process for form design has been proposed as 'three layers of form design' in [15]; design activities progress from the relationship layer (definition of users, tasks, context, and form schema) to the conversation (a respondent's interactions seen as conversation with the questionnaire) and appearance (layout and graphical design) layers, compare the 'form design' dimension in Figure 1. More general process models share a similar structure. E.g., the "usability engineering lifecycle" [18] also starts with an analysis of users, tasks and context, followed by iterative and increasingly specific design.

Survey Areas

Online surveys consist of an introduction page, a form-based questionnaire, and a thank-you page to be displayed after submission. Form-based user interfaces have been classified [2]
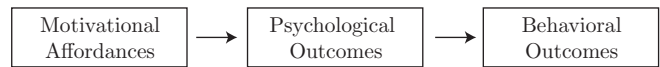

Figure 2. Gamification provides game elements as motivational affordances to produce psychological and behavioral outcomes [10].

into five areas: form content, layout, input types, error handling, and submission. Form filling tasks have been analyzed to consist of understanding questions, answering questions, and navigation between questions [8]. To identify major areas in a survey's structure that each can be gamified, we subsume 'form content' under questions, 'error handling' under answers, and identify 'layout' with the appearance layer of form design, leading to the following five survey areas: introduction, questions, answers, navigation, and submission, see the 'survey areas' dimension in Figure 1.

Potential Benefits

Game elements provided as motivational affordances in gamified systems produce psychological (e.g., user experience, fun) and behavioral (e.g., participation, performance) outcomes [10], see Figure 2. Evaluations of gamified surveys have reported beneficial psychological outcomes such as a better user experience [6, 7] and increased motivation [3]. Beneficial behavioral outcomes have included more participation and engagement [3, 6], more feedback [21], and better data quality [6]. Despite these experienced benefits, not all gamified surveys have produced significantly positive results [7]. Furthermore, a recent literature review has shown benefits to be strongly influenced by users and context [10]. There is also a lack of comparisons of the required effort and subsequent benefits of specific game elements [10]. This calls for future studies to clearly describe the usage context, characteristics of the target user group(s), the users' prior emotional state (e.g., feeling happy, skillfull), the game elements provided as motivational affordances, and the effort that was required for designing and implementing the gamified survey.

Critical Issues

The overall statistical error in survey results is composed of measurement error and representation error, see Figure 3 and compare the "total error framework" [9] for a detailed description of each error component. A survey's gamification may (in comparison to non-gamified surveys) reduce but also increase three error components marked with red arrows in Figure 3. Firstly, ①, gamification influences construct validity if the gamified questions correspond to a higher or lesser degree with the construct to be measured. Secondly ②, measurement error is introduced if gamified questions bias the answers given by respondents, and reduced if gamification succeeds in reducing detrimental user behavior such as speeding, random responding, and lack of attention. Thirdly ③, non-response error is influenced if a different group of people responds (or does not respond) to gamified surveys. The other error components are the same for gamified and non-gamified surveys. Designers of gamified surveys should seek to reduce the above three critical error components. Future research should seek to quantify how gamification and the user's prior emotional state influence the individual error components.
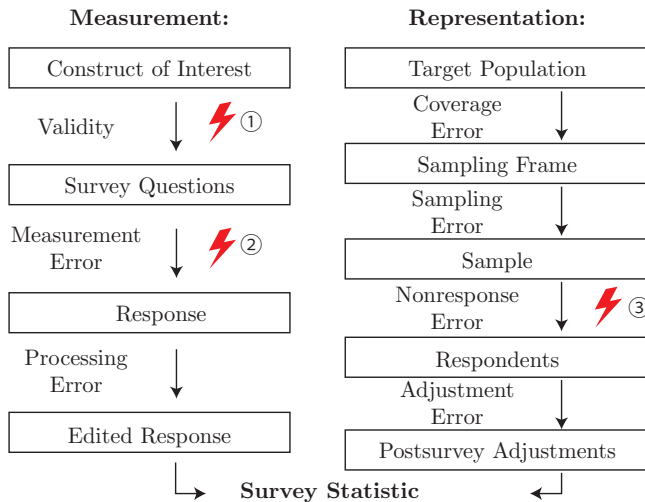
Figure 3. The total error framework [9] allows to identify three critical issues (marked with red arrows) where gamification may influence a survey's validity and reliability by introducing or reducing error.

PROPOSED PROCESS FOR SURVEY GAMIFICATION

Based on the above foundations, this work proposes a novel process for gamifying online surveys. Our approach is to unify the MDA framework [12, 25] and the three layers of form design [15], applying them to the various survey areas. The resulting process describes how MDA and the layers of form design can be linked together to form steps of a structured design process. Note that the three layers of form design are still relevant should the gamified survey deviate from traditional survey structures (e.g., by featuring non-linear navigation, or using an avatar for navigation) because many design activities and goals proposed for each layer still apply. Further note that from a statistical perspective [9], the proposed steps should be preceded by definitions of research goal and sampling method and followed by data collection and analysis.

1. Aesthetics and the Relationship Layer

For the 'relationship' layer of survey design, designers should define the intended users (i.e., respondents or target population), tasks (the form schema to be filled), and context, as described in [15]. Based on this knowledge, they can set goals regarding intended aesthetics, i.e., the intended emotional responses and user experiences [12]. We propose to compile a list of MDAs from related work [12, 16] to serve as inspiration in the design process. Designers can then rank and choose aesthetics deemed suitable for the specific survey. For example, they may aim at producing the 'challenge' and 'sensation' aesthetics, but may consider the 'fellowship' aesthetic to be unsuited for the intended single-user experience.

2. Dynamics and the Conversation Layer

Designers can use the MDA framework [12] to produce the intended aesthetics through suitable game dynamics. They can use game dynamics from related literature as inspiration and then consider how the dynamics can be applied to different survey areas. For example, the game dynamic of 'time pressure' has been shown to be suitable for improving free

text entry [21]. Considerations concerning game dynamics will influence the conversation layer of form design, i.e., the interactions a user is going to have with the survey. Designers should aim at designing questions that still represent the construct of interest and should try to avoid biasing answers, see error components ① and ② in Figure 3.

3. Mechanics and the Conversation & Appearance Layers

To produce the intended dynamics and aesthetics, designers can employ suitable game mechanics and playful elements. Again, they can use related literature as inspiration. Since game mechanics are the detailed building blocks and rules [12], this step relates to the conversation and appearance layers of form design. E.g., to implement the 'challenge' aesthetic and the 'time pressure' dynamic, designers can choose to visualize a stopwatch next to an answer field.

4. Prototyping, Evaluation and Iteration

The overall gamification process will typically progress from deliberate vagueness during brainstorming, ideation, and sketching (primarily in steps 1–2) to increasing detail and specifity during prototyping and evaluation (primarily in step 3), as described in [18]. As noted before, design activities cannot be seen as simple choice and subsequent addition of game elements [14]. Instead, as typical for creative design processes, designers should work in a team, explore possible designs, prototype multiple designs in parallel, evaluate prototypes, and iterate steps 1–3. Evaluations should consider both intended outcomes for the user (e.g., subjective experience) and outcomes for those who create the survey (e.g., completion rate). Formative evaluations can be performed with relatively few users, using test observation methods such as 'thinking aloud' [20]. In the authors' experience, paper prototyping and electronic mockups have worked well in early iterations, whereas later iterations have required electronic, interactive prototypes. Three iterations have sufficed to create a pleasant design with good usability.

EVALUATIONS OF THE PROPOSED PROCESS

Evaluating the proposed process for survey gamification is a work in progress, albeit with promising, preliminary results. Two designers (one senior, one student in HCI) employed the process in a formative case study to gamify a survey about electronic vs. paper mail. They provided positive feedback, stating they found the process's structure well applicable. They liked how the pre-compiled list of MDA game elements (suggested, but not provided in this paper due to lack of space) inspired their design. To further investigate the industrial feasibility of the proposed process, we have conducted qualitative interviews with three experts from the survey and gamification industries. They appreciated the process's structure and the proposed design activities. Since gamification requires additional effort, they proposed to apply it to surveys that are otherwise problematic, e.g., because of a specific target group or low response rate. They further suggested to provide pre-packaged, well working combinations of game elements to enable reuse across multiple projects. Lastly, the process is currently being employed in another case study for summative evaluation; more detailed results will be presented in future work.

CONCLUSION AND FUTURE WORK

This paper presented three design dimensions that represent important methodological aspects in the gamification of online surveys: gamification (referring to game mechanics, dynamics and aesthetics, as in the MDA framework [12]), form design (the three layers of form design [15]), and survey areas to be gamified (introduction, questions, answers, navigation, submission). These dimensions have provided structure and vocabulary for discussing foundations of survey gamification, for highlighting critical issues regarding statistical validity, and for unifying existing techniques into a novel design process for survey gamification described in this paper. Future work will provide evaluations of the proposed process by applying it in case studies to further evaluate the psychological and behavioral outcomes of gamified online surveys.

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