A Design Space For Meaningful Gamification

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Abstract
Gamification design is a complex process. Existing gameful design methods generally focus on high level motivational considerations, and provide little to no support for lower-level design decisions, such as visual and operational aspects. In order to provide designers with the tools to create meaningful and motivating game elements, we propose a design space that encapsulates lower-level design decisions during the design process. We also propose a set of design cards and a board that aim to support the design process for collaborative design sessions.

Author Keywords
Gamification; Meaningful Design; User Motivation; Design Space; Design Cards

ACM Classification Keywords
H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous; H.5.2 [User Interfaces]: User-Centered design; K.8.0 [Personal Computing]: Games

Introduction
Over the past few years, gamification (the use of game elements in non game contexts [4]) is used more and more to provide enjoyable and engaging experiences. Specific domains such as education [2], or health [17] rely more especially on structural gamification, integrating game el-
elements that do not alter the content of the activity [8]. To be effective, the motivational affordances of such gamified systems should be designed with a deep understanding of human motivation [3, 22]. Recent studies emphasise the importance of meaningfulness in the design process [14, 3, 16]. Game elements should make sense to users, creating explicit connections to the given activity, and supporting feelings of competence, autonomy and relatedness, identified as essential in Self-Determination Theory [19, 22, 16]. On the contrary, non-meaningful elements may be ignored or worst may demotivate users [16, 3].

Even if gameful design methods have emerged recently from practitioners and researchers [3, 22], affording engaging experiences in non-game interactive systems remains challenging. Many existing design frameworks provide only high-level guidelines and considerations to assist designers and no guidance on how to identify and fulfill user motivations [3]. Lower-level design decisions, such as interface design patterns [4], are poorly supported although they can also play an important role in improving user experience. Marache-Francisco and Brangier [14] showed for instance that visual aspects of the gamified system play an important role in the perception of gamification.

In practice, during design sessions designers, developers and other stakeholders, who may not have the same level of expertise regarding gamification, have to select relevant game elements and decide how to implement them for a concrete situation. They lack guidance on choosing among a huge number of elements considering their impact on motivational affordances. As a result, they are often confined to use only a subset of predefined well-known elements as pointed out by Tondello et al. [23], reducing creativity in the design process.

This work aims to overcome these limitations by guiding stakeholders during collaborative design sessions to consider lower-level decisions in the design process. We propose to extend the emerging concept of meaningful gamification to operational and visual aspects, bringing together HCI practices and gamification. We present a design space for game elements specification that encapsulates nine design dimensions to consider in the design process. We also present a set of cards designed to facilitate the collaborative exploration of the design space during design workshops and a board used to structure the design process.

**Gamification design approaches**

Different approaches have emerged from practitioners and researchers, either from HCI or gamification, to support and structure the gamification design process. Readers can review state-of-the-art papers for a presentation of existing gamification design processes [3, 22, 15]. Global design processes generally offer guidelines to consider the context and suggest the following steps: define the main objective, understand the user motivation, identify the game mechanics and analyse the effect of gamification [24, 9]. Deterding introduced more operational aspects with the concept of design lenses and skill atoms [3]. However, these approaches offer poor guidance regarding customisation and implementation of elements for a given context. To choose among elements, various lists of game mechanics are proposed [23]. However the high number of elements in these lists make their usage difficult in practical design sessions.

To guide design sessions, Marache-Francisco and Brangier [14] provide designers with a toolbox for gamification that support two design steps: the context analysis and the iterative conception of the gamification experience. Designers can rely on a conception grid and decision-trees consisting of questions which guide element selection. Other works provide design cards, traditionally used in design practice to
foster creativity insuring a common vocabulary and shared understanding among participants [12]. These cards often correspond to design steps (such as [5]) or at fairly high abstract level (such as AddingPlay). At a lower level, cards can help to define the calculation rules (victory condition card for instance) but not the visual aspects.

**Design space for meaningful game elements**

Design spaces are traditionally used in HCI for identifying alternatives and structuring decisions in the design phase [21]. We present a design space that encapsulates nine dimensions to consider regarding operational and visual aspects of elements for meaningful structural gamification (see table 1 for a summary). These dimensions serve to answer 5 questions that designers have to consider [16]: Why is the game element used? What is the focus of the game element? How does the game element work (content)? Who is concerned by the game element? and How is the game element represented (presentation)?

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**How? (Presentation)**

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Table 1: The proposed design space for game elements (second part)

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Dynamic and Mechanic (How - Content?)

For meaningful gamification, designers have to decide which game dynamic and mechanic the game element should implement. Based on the theoretical frameworks MDA [7] and DMC [24] and on well-established game dynamics and mechanics, we list 6 commonly used game dynamics (Rewards, Goals, Time, Self-representation, Social Interaction, Progress), and classify some mechanics within each dynamic. As we focus only on structural gamification, we exclude elements such as Storytelling or Quests that are directly linked to the content.

**Actor and Range (Who?)**

These two dimensions refer to the actor who uses the element (actor) and who can see the game element (range): an individual user, a group of users, or a community. These design choices are crucial as they impact the type of regulation intended [6]. Individual users can self-regulate their activity individually or by comparison with others to achieve personal goals. Game elements shared by a group of users can help them co-regulate their own activities according to their own personal goals but also support shared regulation that requires interdependency and the complete cooperation of participants toward a common goal.

Visibility (How - Presentation?)

Schön [20] assumed that reflection can occur both during the activity being performed (reflection-in-action) and after the activity, e.g. when mentally reconsidering it (reflection-on-action). The timing in which the game element is shown...
to the user can have an impact on the reflection process. We add a third value "before" since we can also incite users to establish goals and plan strategies.

**Style (How - Presentation?)**

Visual aspects of the gamified system play an important role in the perception of gamification affording an appealing and immersive experience [13]. The Style dimension helps designers decide whether the game element should have a simple literal form (e.g. a basic progress bar) or one more related to the domain (e.g. a heart that fills up when you go to the gym to promote healthy living). Using domain-dependant metaphors can favour explicit connections with the given activity as recommended by Nicholson [16]. However, the choice depends on users' intrinsic motivation for the domain and an independent style can reduce the risk of user' amotivation.

**Format (How - Presentation?)**

Prensky pointed out [18] that having a clear end state (i.e. a "win point") can increase performance. However, for some users "learning stops when goals are achieved" [2]. Therefore we suggest to consider presenting the game element in a relative (e.g. a score that shows four points out of a possible ten) or absolute format (e.g. a score that only shows four points) depending on the motivational context (users' profile or type of activity).

**Precision (How - Presentation?)**

Designers have also to consider the precision of information presented in the game element. For some users, giving precise feedback on the activity performance can be motivating [1]. However for less competitive users, showing exact information can be demotivating [17, 23]. Thus we suggest to consider two possible values: precise (e.g. a leaderboard where the actor is shown to be 6th out of 14 users) and fuzzy (e.g. a leaderboard where actor is shown as in the "Top Half" of users).

**Tools to explore the design space**

The design space presented above allows a systematic consideration of possible choices when designing game elements. This task may remain complex, especially if the different stakeholders involved in collaborative design sessions do not have the same expertise in gamification. To support the design process and to guide designers in the design space exploration, we created a set of design cards. Each card represents a particular dimension and contains the possible values, as well as examples, or explanations of the choices and possible impacts on users’ motivation (for instance figure 1 shows the Visibility card).

The cards are designed to be used with a board structuring the different steps to perform during the definition of a game element. In addition to the properties defined by the design space, the board supports high-level decisions such as users and context considerations of the given activity (also identified in [5, 14]), and lower-levels specifications such as visualisation (element mock-ups) and operational rules. We decided to integrate these aspects only on the board since they are closely linked to the domain to gamify and would probably have too many forms or values to be represented by specific cards. These domain-dependant elements are thus instantiated during design sessions for each context and game element.

**Testing the design tools**

To test the design space and its exploration with cards and board, we conducted a design session in an educational context. We held a workshop with four secondary school teachers, two teaching engineers, and a game design expert working on a project of gamified mathematics exercises (see figure 2). The teachers knew each other and had
previously worked together to create maths exercises. The workshop lasted four hours. After a quick introduction of the materials, roughly 50 minutes were dedicated to context specification: determining the users’ profiles and reviewing the exercises previously created to define actions and operations within the activity. The rest of the session was dedicated to the specification of game elements, in total seven game elements were designed.

We observed that participants took ownership of the design materials, sharing common ground on the gamification process and favouring good communication. As the workshop progressed, the participants were able to converge on design agreements faster. Discussions content aimed both at considering the impacts on students’ motivation and fulfilling the different stakeholders’ interests. Teachers and game designers succeeded in making decisions regarding operational and visual aspects of each game element, so that all of the information required to start the elements development was provided. Regarding creativity, we observed that participants were able to reuse well-known game elements such as points or badges, but also to design unique game elements (see figure 3 for an example).

Further workshops should certainly be held in order to improve the material, and to think upon the integration within a larger gamification process, for example incorporating questions from Deterding’s design lenses [3] or decision trees from [14].

### Conclusion

This work aims to extend the concept of meaningful gamification to operational and visual aspects of game elements. To help designers in these complex considerations, we propose a design space that can be used for a vast variety of contexts (education, health, sustainability, etc.). The design space is accompanied by a set of cards and a board to facilitate its collaborative exploration during the design process. We were able to test our tools during a workshop held with different stakeholders where we gathered valuable feedback for their improvement in the future.

### REFERENCES


