



Review article

Publication trends in gamification: A systematic mapping study

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HIGHLIGHTS

- This study presents four big trends and the core literature in gamification.
- This publication provides a meta-review of several other literature reviews.
- This publication identifies the most common publication venues on gamification.
- The study concludes that the most pressing research issue currently is to collect evidence on the practical applications of gamification.
- Most common theme in gamification studies currently is education.

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ABSTRACT

The term gamification and gamified systems are a trending area of research. However, gamification can indicate several different things, such as applying the game-like elements into the design of the user interface of a software, but not all gamification is necessarily associated with software products. Overall, it is unclear what different aspects are studied under the umbrella of 'gamification', and what is the current state of the art in the gamification research. In this paper, 1164 gamification studies are analyzed and classified based on their focus areas and the research topics to establish what the research trends in gamification are. Based on the results, e-learning and proof-of-concept studies in the ecological lifestyle and sustainability, assisting computer science studies and improving motivation are the trendiest areas of gamification research. Currently, the most common types of research are the proof-of-concept studies, and theoretical works on the different concepts and elements of gamification.

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Nomenclature

SMS	Systematic Mapping Study
SLR	Systematic Literature Review
MOOC	Massive Online Open Course

1. Introduction

Gamification is a topic, which has been considered one of the significant new trends in the development of services and applications in the software industry. Fundamentally, gamification means that some system applies game-like elements to enhance the user participation, the motivation to keep using the said system or the retention rate to keep the existing customers. These benefits are important, since for example in the mobile games industry, a retention rate of 14.5 percent would be considered normal, with as low as five percent of the customers paying money for the service [1]. Simplified explanation also could be that gamification is a design concept for user interface design, drawing its roots from the 80's and the studies on 'enjoyable user interfaces' [2], or first impressions [3]. However, the motivational context of using the services is not a novel concept, and has been studied for example in the context of computer science education [4].

Within the context of gamification, there are several contexts, which are considered sort of major application domains. These domains are computational fields or business domains, where the motivational aspects, the increased retention rate and the enhanced participation are very useful, such as in the serious games including games for health [5], crowdsourcing [6], and in online education [7]. Overall, it seems that the gamification domain is huge, and new areas of application are discovered continuously.

In this paper, the objective is to assess the entire domain of gamification and its applications by the means of a systematic mapping study and literature review, conducted with two engineering-oriented research search engines and with two general research search engines. The study systematically codifies 1164 items collected from ACM Digital library, IEEE Xplore, Web of Science and Google Scholar, and overall identifies over 1100 different items from approximately 2800 authors. Out of the identified documents, over 900 papers were classified and categorized to understand the focus and the current themes of the gamification research. The research questions of this paper are "What are the current trends in the gamification research?" and "Where is the effort in the gamification research focused?"

Based on the observations, the two most prominent types of research domains in gamification are the applications of gamification in the online education, especially in the development of massive online open courses (MOOCs), and in the development of prototype tools and systems, which apply some form of gamification. Third large topic of published research is the studies of applicability of the different gamification approaches, the general theory regarding the topic. Out of the prototyping disciplines, computer science education, ecological sustainability and general motivation enhancement tools are the most common areas of applied gamification. Overall, the different research publications of gamification research form six major categories, from which the educational topics are significantly larger than the others, with the software development related solutions and crowdsourcing applications trending upwards.

The rest of this paper is structured as follows: In Section 2, the terminology and research work related to this study is defined. Section 3 defines the research approach and the classification method, whereas Section 4 introduces the results. Section 5 discusses the limitations and implications of this work, and Section 6 closes the paper with the conclusions.

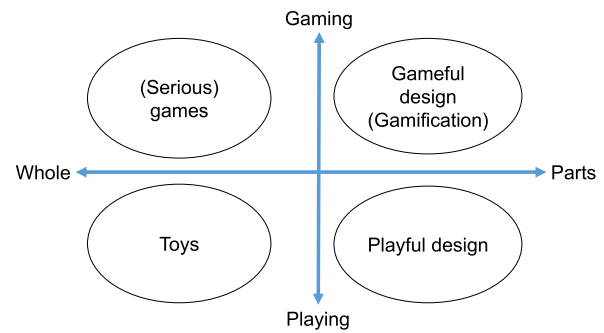


Fig. 1. The axis of different gamification-related concepts as defined by Deterding et al. [2].

2. Related research

Gamification is a vague term, since there are several similar concepts such as playful design, serious gaming and even games for health, which all have conceptually similar definitions and effects to the objectives of gamified design. The most important aspect of understanding gamification is to understand how the gamification differs from the concepts of playful design and serious games. For this purpose, for example Deterding et al. [2] offer a classification of the different terms based on the extensity and method of their use. Their definitions propose a following solution:

- Gameful design (Gamification) implies that the software product is designed with the game-like components forming a part of the system design, but the product itself has a functional non-game purpose and elements, which are not game-like.
- Serious Games (and other games) are products, which are fully built from the game components and game-like elements. If the product has a "real" purpose, it can be classified as a Serious Game, otherwise normal – entertainment-game.
- Playful design implies a system, which has playful elements in its design, but also has components which are not playful and the system has a non-playful, real-life, purpose.
- Toys are products which are fully designed for enabling use in play, and do not have an intended non-play purpose beyond entertainment.

In essence, this model divides the field into the vectors of the entertainment purpose of the product, and the extent of the effect in the product design. It is worth observing, that the "traditional" software products are not visible in this model, since they are not designed for gaming or playing, and they only have the functional, non-gamified purpose. In addition of Deterding's model (2011), there is also a definition by Huotari and Hamari [8] from the perspective of service marketing, where the gamification is defined as "Gamification is a form of service packaging where a core service is enhanced by a rules-based service system that provides feedback and interaction mechanisms to the user with an aim to facilitate and support the users' overall value creation" [9]. In the context of the ludification culture, there also exists an extended model by Deterding et al. [2], but for the purposes of this literature review this simplified model can be applied; between the different areas of gamified design, the divisions are illustrated in Fig. 1.

Gamified design has also some areas of application with relatively common, recurring themes such as the crowdsourcing, Games for Health and MOOCs. For example, a definition for crowdsourcing by Estelles-Arolas and Gonzalez-Ladron-de Guevara [6] dictates that the crowdsourcing is a type of participative online

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