Chapter 1
A Primer on Gamification Standardization

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ABSTRACT

Computer science education has always been a challenging topic for both sides of the trench: educators and learners. Nowadays, with the pandemic state that we are facing, these challenges are even greater, leading educators to look for strategies that promote effective virtual learning. One of such strategies includes the use of game mechanics to improve student engagement and motivation. This design strategy is typically called gamification. Nowadays, gamification is being seen as the solution to solve most of the issues related to demotivation, complexity, or tedious tasks. In the latest years, we saw thousands of educational applications being created with gamification in mind. Nevertheless, this has been an unsustainable growth with ad hoc designs and implementations of educational gamified applications, hampering interoperability and the reuse of good practices. This chapter presents a systematic study on gamification standardization aiming to characterize the status of the field, namely describing existing frameworks, languages, services, and platforms.

INTRODUCTION

Nowadays, the games industry is responsible for an important part of the financial market worldwide (Mordor Intelligence, 2020). Several reasons can be identified for this fact from the entertainment of playing a game to its capacity to enhance two typically opposite values such as competition and cooperation. To bring the benefits of the games to non-game contexts, the term gamification appeared and, currently, gamification is applied in several digital applications for several purposes. The most notable examples are to foster the learning of complex domains and to facilitate the integration of workers in companies (on-boarding).

Regardless of the application domain, there is an unsustainable development of gamified applications in terms of specifications, standards and good practices used. Without this type of regulation, the way how gamified apps are created hinders the reuse and interoperability between peers while promoting replication of features which can be error prone and time consuming.

This article focuses on the current state of gamification standardization in the scope of the gamified application development life cycle. As methodology for our systematic study, we will organize all the current contributions for the standardization of gamification in a well-known client-server software architecture pattern called three-tier architecture. In this pattern the three tiers, namely, Data, Business/ Logic and User Interface are mapped with gamification contributions such as languages, services, and platforms, respectively.

This work is organized as follows. Section 2 presents the most popular gamification frameworks and their common features. In section 3, we start by presenting the methodology for this study and then, for each tier, we present the most mature contributions for gamification formalization. In the last section, we analyze the study done by making considerations about trends and listing a set of best practices in the design of a gamified system.

GAMIFICATION FRAMEWORKS

A framework can be defined as a conceptual structure which acts as an abstract (or concrete) guide for the building of a software product. In the field of game/gamification design there are no consensus on the use of frameworks. In fact, (Crawford, 1984) states that game design is an activity too complex to be reducible to a formal procedure. Other authors (Julius & Salo, 2013) conclude that it should be treated as an agile process which does not always follow a specific design framework.

Despite the existence of dozens of frameworks worldwide, several researchers (Seaborn & Fels, 2015) and (Hamari, Koivisto & Sarsa, 2014) claim that gamification as an academic topic is still young and only a few well-established frameworks can be useful. To achieve a more empirical study, a literature review was conducted, between 8 and 15 of December of 2020, based on works indexed in three databases, namely, Google Scholar, SCOPUS, and Web of Knowledge. In this review, the search keywords were gamification, game, design, framework, and models.

The study identified 52 articles which either present or refer a gamification framework. From those articles, 12 frameworks were obtained. Despite the high number of frameworks identified, 5 frameworks were referred more than 75\% of the total of articles. These five frameworks will be compared in the next subsections. The Octalysis framework (Figure1) was created by (Choy, 2015) recognized that there are

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