Gamification in Transportation and Mobilities: A Preliminary Overview of Scientific Literature

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SUMMATIVE STATEMENT
A systematic literature review on scientific literature was conducted on the objectives of gamification in transportation and mobilities. The computer science field has mainly addressed this rapidly growing research area so far. Nevertheless inputs from human factors and ergonomics (HF/E) are crucial in order to ensure that gamification meets the needs, expectations and constraints of humans in their mobility.

KEYWORDS: Gamification, Transportation, Mobilities, Systematic Review, User Experience.

PROBLEM STATEMENT
Gamification is the use of game-design elements in non-game contexts (Deterding, Dixon, Khaled, & Nacke, 2011). This concept is now implemented in information systems in many areas of human activity, where the aim is to improve motivation and performance, thus optimizing user experience (e.g., enjoyment, engagement, etc.), such as transportation and mobilities (e.g., car driving, walking in the street, using public transportation, etc.).
The concept of gamification is somewhat recent in this area and has been growing rapidly over the last decade. However, it is not clear at this time why and how these activities, and related technology, are or could be gamified, nor which scientific communities have begun to take an interest in this research area, or whether human-centered theories are involved. Given that the end users of gamified systems are human beings, it would be interesting to know whether specialists in human activity and psychological functioning are particularly involved in this research area.

RESEARCH OBJECTIVE/QUESTION
The main objective of the present study is to develop an overview of the scientific literature on the objectives of gamification in transportation and mobilities. The secondary objectives are to identify the scientific fields that have already taken up the topic, and to find out whether and how theoretical models of human activity and psychological functioning (such as in HF/E and psychology) are involved.

METHODOLOGY
A systematic review on scientific literature was conducted. The literature search was conducted in the "Web of Science Core Collection" database (as of May 2020). In order to get a preliminary overview, only articles with titles containing terms related to gamification and transportation/mobilities were searched.

RESULTS
The final database included 42 articles that met the criteria. They were published between 2011 and 2020. These articles are currently being fully analyzed and the findings will be considered for future publication. The present study focused on three specific elements of these articles: the main objective of the gamification system(s) described, the scientific domain of the authors, and the involvement of human-centered theoretical models for the design of gamification elements.

Changing user behavior was the most studied gamification objective (19 articles). Of this, 9 articles focused on behavioral change in driving and 10 articles in general transportation habits. 13 articles focused on gamified mobility itself (5 for driving, 4 for urban transportation, and 4 for walking). The remaining 10 articles dealt with more isolated themes (e.g., management applications, learning in transportation, etc.).

The research fields of the authors of the articles were mostly in computer science (30 articles, 71%), mainly in the areas of telecommunications, systems engineering, artificial intelligence or human-computer interaction. The other 12 articles (29%) were published by authors from different fields of social sciences (e.g., geography, politics, or education), but not explicitly in HF/E or psychology.

A total of 5 articles (12%) explicitly cited a human-centered theoretical background as a basis for designing or studying gamification elements. All of these articles used or cited theories on user motivation.

DISCUSSION

The first interesting finding was that gamification has mainly been used to change user behavior. In these cases, the gamified system was not directly part of the transportation system. It was used before and/or after the activity of transportation or mobility. Gamified transportation activities per se were less studied.

Another interesting finding was the predominance of the computer science field in the reviewed literature. Most of the articles focused on how the system could be technically gamified, that is how to design the program of gamification, the hardware, or interface components, etc. Even if most of these studies showed an interest for end users, some of them presenting user test results, very few of them (2 out of 30 articles, 7%) have based their gamification design on well-established theories of human activity and psychology functioning. The proportion of articles based on HF/E or psychological theory was somewhat higher for articles categorized in social sciences (3 out of 12, 25%), but it remained low.

CONCLUSIONS

The aim of gamification is to develop innovative systems that would be more engaging and entertaining than existing conventional systems. The use of theories about human activity and psychological functioning should be central to the concerns of designers and researchers in order to increase the usefulness and usability of the systems, as well as the user experience.

HF/E researchers should heavily invest in this rapidly growing research area. Gamified systems are designed for people to improve their performance and optimize their experience. This relies in particular on the system's ability to persuade the user to adopt or to change behavior, and on the ability to interact with the user in an engaging and entertaining way. HF/E researchers and designers can bring relevant knowledge and methodologies for studying human activity, which should be regarded when designing such interactive systems.

ACKNOWLEDGEMENTS

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