Deriving a Gamified Learning-Design Framework Towards Sustainable Community Engagement and Mashable Innovations in Smart Cities: Preliminary Findings

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ABSTRACT

Science, technology, engineering and mathematics (STEM) and the inclusion of art and design into STEM (STEAM) as a mediator are increasingly emphasized in innovation and entrepreneurial blueprints across countries due to smart cities. Knowledge creation/construction towards a thriving ecosystem however, is not a given. This exploratory study aims to derive design factors for community engagement and possible mashable opportunities/innovations in smart city communities. We present a meta-analysis of two gamified media-model maker opportunities carried out among Malaysian high school students. These are designed based on computational thinking and different design theories which take into account: a) deriving design factors/requirements (success factors) and barriers to gamified learning; b) mapping and intertwining of different models as genetic blueprint for gamified learning; c) refinement of the authors’ socio-cognitive-HCI framework; d) possibilities for personalized inclusive design.

KEYWORDS
Computational Thinking, Design Thinking, Gamification, Mashable Product/Service Innovations, Media-Models, Smart Cities

1. INTRODUCTION

E-commerce provides the foundation, context and motivation to develop creativity and new opportunities to differentiate products or services from competitors. Due to the diverse dimensions of e-commerce, information systems address e-commerce’s technological requirements, user needs and experiences in view of risks and uncertainty. Betis (2015) and many service providers such as Huawei (Wong, 2015) envision these challenges to be greater in IEEE Smart Cities (SC) and propose to address these challenges by advancing sustainable futures. Such sustainable futures include not

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only green living, efficiency and community-based services, but also participatory design/citizenship and entrepreneurial innovations.

As participatory design matures into participatory citizenship, Ikeda and Bernstein (2016) hypothesize that crowdsourcing may become a pro-social, long-term sustainable career option for crowd workers. Shaping the future of crowd work would thus require more investigations into human-computer interaction, interaction design, incentives and development of motivation to learn (whether formally or informally), in order to drive meaningful and sustainable outcomes. Such investigations and outcomes would be helpful especially first in the face of advancement in distributed systems resulting in seamless strategic local/global partnerships; second, economic downturn (due to globalization or due to technological convergences, which makes it more important to maintain a progressive economy and contain social ills) and, third, in view of an increasingly aging population. We propose extending the knowledge management-e-learning framework to include incentives, not necessarily financial as Ikeda and Bernstein’s (2016) study has concluded, but what appeals. Based on our prior studies (Lee & Wong, 2015; 2016; 2017), this may involve different degrees or forms of gamification including the curiosity and desire to learn interdisciplinary but relevant knowledge and skills.

The need for such interdisciplinarity is supported by parallels to evolutions in e-commerce, i.e., in e-learning. Figure 1 highlights three paradigm shifts, which supports extensions to elearning3.0, where learning is informal and unstructured. The three paradigm shifts reflect a progression from a consumer-passive orientation to a social-participative-reflective-evidential orientation to a social co-design/co-creation thrust (Greller, 2011). In Figure 1, co-creation is emphasized with looser institutional boundaries and sense of ownership. These paradigm shifts create greater opportunities for knowledge building, deeper purposeful learning, in search of structure and meaning, especially in view of mashable product/service innovation and management.

Mashable product/service innovation and management gains significance as variations in design and implementation are often due to the choice of mode(s) as well as the people, process, methods, and tools needed. These in turn are a function of domain, situation, resource, and readiness (Griss, 2003). Areas investigated are commonly: a) people, process, and tools; b) domain engineering; c) component mining and d) open source vs. systematic reuse. These in turn can be assessed in terms of three primary modes of reuse, involving the following by itself, or in combination: a) facilitated, b) managed and c) designed reuse. These influence maturity models.

1.1. Aims

The above is a long-term view of how design thinking, and computational thinking can help in the development of sustainable futures. In Asian countries such as Malaysia, we note that there is still much room for knowledge building discourse and crowd-sourced user-generated content. Hence, we
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