EDITORIAL

Shift from game-as-a-product to game-as-a-service research trends

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1 Introduction

Over last two decades of development, digital games have beyond doubt come to be a major and prosperous industry. According to the statistics and estimation done by Statista company, the global gaming market will amount to 268.8 billion U.S. dollars annually in 2025, up from 178 billion U.S. dollars in 2021 [1]. The definition of games constantly evolves [2] and undergoes changes, not least due to the introduction of new enabling technologies. Historically the activity of play has been considered to be unproductive [3] as games redistribute assets of some kind between the players, as in gambling games, but the activity of play as such does not generate any new goods of any kind. This aspect of play and games has been disputed by Juul [4] amongst others. Digital games can produce in-game digital assets that in turn can be sold or traded among players which in turn has been banned by some game companies, considered to be cheating by players etc. [5]. In order to endow games with other purposes rather than pure entertainment, the concepts of serious games, simulation games, gamification, etc. have emerged for knowledge acquisition [6–8], and they have been widely applied in education, well-being, training, advertisement, interpersonal communication, health care and other fields [9]. Games can also produce well-being and satisfaction for the players which are important factors in their own right. Hence, games are undoubtedly productive now.

Driven by multiple factors [10], the deliverables of games shifts from content to content plus service. Accordingly, the view of games has been transformed from traditional Game-as-a-Product (GaaP) to Game-as-a-Service (GaaS). So far the debate about whether GaaS is a strategy or business model remains [11], and there is no unified definition of GaaS either. However, this does not impede that GaaS has become the mainstream, and brought a profound impact on the game industry such as the framework of the game industry. Frame or framework theory is a sociological theory that is focused on factors that affect what happens between people in a social encounter of some kind [12]. Mager [13] defines service design as an activity focused on the client's point of view, without forgetting supplier demands and requirements. This definition confirms the role of this activity in organizations that are moving towards a service-dominant logic [14] and the design of experiences or, more precisely, experience-centric services [15]. A key characteristic of experience-centric services is that they are designed to engage customers, enabling connection with the service in a personal, memorable way [16, 17]. This transition implies a cultural shift toward customer-centricity that challenges existing values and norms for media organizations [18, 19].

GaaS is a way to provide games online to prolong the lifespan of a game as new content can be added after the initial and content-wise limited release. It's also a powerful method for game companies to increase their revenue from games. As such GaaS has opened up new kinds of games and also a new kind of relationship between the players and game contents, and how the players actually use the game (when, where, how long etc.). With the advancements of new and emergent technologies, game developers have found new ways of producing, distributing and creating games based on the evolution of technical infrastructure [20]. Specialized distribution platforms, as well as game creation tools and game engines, have added to the expansion of the game industry [21]. While the technical infrastructure is important, the available contents are also vital. In 2021 and 2022, a number of large-scale acquisitions have been made by platform holders, where one example is Microsoft acquiring Activision Blizzard to have the rights to a library of game IPs for Xbox and Windows ecosystems [22].

2 Outlook of shift from GaaP to GaaS trends

This article presents the shift from GaaP to GaaS trends in terms of the evolution of game development and publishing,

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business model innovations and diverse game applications enabled by emerging technologies.

(1) *Evolution of Game Development and Publishing*

Readily available specialized game development tools and game engines, as well as the possibility for game developers to interact with the players, have created a major shift in how games are produced, distributed and played [21]. Regarding the development structure, GaaS marks a departure from the studio-centric model focused on releasing new titles towards a player-centric model based on iterations, recurring revenues, and player retention [10]. It follows a different developing pipeline than the old and outdated standard game "box" production. GaaS emphasizes post-launch activities and game development processes continue after the release of the game. Thus, the shifting of structure and pipeline defines new ways of distribution. The idea of "launching a game" has been changed when games are turned into a service. The logic of production is switched from "inside-out" to a looping and iteration "outside-in". Game development and distribution immerged and intersected to service better content. Besides games and franchises, the game platform as a content provider amplifies the service feature, spotlighting more and more GaaS in the future. When we turn our attention to game developers, the framework shifting impacts their professional identity as well. Dubois points out that the changed labor process of GaaS has changed how video game developers do their work and how they conceive of their work and themselves as developers [10]. Individual efforts to reconcile internal identity with social identity are known as identity work [23], challenging most creative workers. Since the impact of servitization on worker identity manifests in different developer profiles, growing internal misunderstandings, deeper external relationships, redefined performance criteria and shifting reputational drivers. They are coping with the new trend with a new identity to "separating disparate roles that under is conflicting identities" and by calling upon different roles "explicitly in a different phase of the creative process" [24]. Unfortunately, not everyone can survive, and the new model is unclear now. The player centric model and its effects on game production and distribution need further research.

(2) *Business Model Innovations*

The now digitally distributed game industry also has made different business models possible, with microtransactions, free-to-play models and downloadable content as prime examples [25]. Several of the large hardware platform holders, such as Microsoft, Apple,

Sony and Google have also ventured into subscription-based business models, where both online playing, as well as a library of content, is available through a recurring fee. Another perspective is a trend where stakeholders from other media forms venture into the game business. Further, companies not formerly associated with games such as Netflix and Amazon have started up on game distribution [26, 27]. Further research on the effects of new platforms and actors on business models is needed.

(3) *Diverse Game Applications Enabled by Emerging Technologies*

Benefitting from the advancement of technologies in terms of Mobile and Wireless Communications (MWC), Internet of Things (IoT), Artificial Intelligence (AI), Augment Reality (AR) and Virtual Reality (VR), sensors, computers and etc., the game industry is speeded up by boosting its applications in more areas. Among others, building up digital twin (DT) with game engines, such as Unity and Unreal engine, stands out based on their preliminary success stories in automotive industry [28]. Although there was no unified definition of DT yet, it is well-accept that a DT has to be made of a physical entity, a virtual entity and their connections [29, 30]. As a counterpart of a physical entity, a virtual entity could receive real-time running data from a physical entity. By employing data analysis techniques such as machine learning (ML), the information underneath the data is exploited so that the current status of physical entity is presented. Moreover, predicative results could be obtained through simulations to support decision making. As a result, the performance of the physical entity could be not only monitored, but also improved or optimized. Apparently, the bidirectional communication between the physical entity and the virtual entity is essential to implementing a real DT [29]. As a result, a complete DT is proposed to be defined in five dimensions: physical part, virtual part, connection, data, and service [31]. Up to now, the application of game engines for DT, which is applied in driving training [32], autonomous vehicle simulation [33] and smart city [34], focus on sophisticated visualization which is one piece of creating photorealistic virtual part. However, regarding the industry requirements of DT that is defined in terms of modularity, interoperability, interchangeability, flexibility, scalability, reusability and diagnosability [35], there are more issues/opportunities to be addressed so that the industry could benefit more from the full use of powerful game engines. For example, scalable representation of virtual parts, the integration of physical simulation engines.

3 Conclusions

The shift from GaaP to GaaS has fundamentally revolutionized the game industry. The related research on the resultant impacts in different aspects such as game development and publishing, business models and game applications inspire more innovations.

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