Berkeley
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BERKELEY ROUNDTABLE ON
THE INTERNATIONAL ECONOMY

BRIE Working Paper
2021-12

The Little Engines That Could: Game industry platforms and the new drivers of digitalization

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Acknowledgements: This report has been written as a part of BRIE-ETLA 2019–2022 research project funded by Business Finland. The authors would like to thank Monika Underwood for her constructive comments.

Key words: Game Engine, Virtual Reality, Metaverse, Platform, Platform Business Group (PBG) Strategy, System of Systems, Digitalization

JEL: L8, L82, O3, O33

Abstract

In a recent trend in digitalization, many platform incumbents have steered their focus towards creating collectively shared persistent virtual frameworks known as 'metaverses'. Due to the emergence of digital platforms in the game industry over the last decade, the industry is now challenging the digital platform incumbents in metaverse development. Will the development unlock new data-driven markets, how will the landscape of digital platforms be reconfigured, and what are the strategic and policy implications for Finland and the European Union?

Digital platforms – A game- changer for the game industry

In the past decade, discussion has been vibrant regarding a new development in digitalization, a so-called 'data economy'. In the discussion on the digital platform economy, however, it has long since been recognized that, at its core, digitalization has more to do with *interactions* than data itself. While data can certainly be valuable, mostly its value derives from enabling more productive interactions between parties, or better-informed decisions regarding those interactions, in one form or another. In this respect, few others have harnessed data to facilitate interactions as prominently as digital platforms in the platform economy (Still et al., 2017).

In the past decade or so, the game industry has undergone a significant transformation in how games are played, developed, and distributed due to the onset of digital platforms. During this time, distribution platforms, such as Google Play, Apple Store, and Steam have opened up an entirely new array of game industry markets. By offering significantly larger developer revenue shares than the former industry standards before platforms, and by enabling access to vastly larger target audiences, the platform giants have enabled smaller game studios to become more empowered in game content creation.

At the same time, platformization has also started taking hold of the game industry in other layers of the technology stack. With creations such as Quake Engine by id Software, Unreal Engine by Epic Games, and RenderWare by Criterion Software, game houses started developing game engines independently from the game content already in the late 1990s. In this transformation, content creation—such as graphics, storyline and characters, and the game-specific rules and objectives—was separated from building the basic game infrastructure—such as the game physics, collision detection, graphics rendering, and networking. By licensing these infrastructural frameworks, or *game engines*, to other game studios as the foundation for new games, some studios were able to tap into an additional

lucrative business-to-business revenue stream, while providing other studios with more versatility in game design, lower development costs in development and lower barriers of entry into the game industry markets.

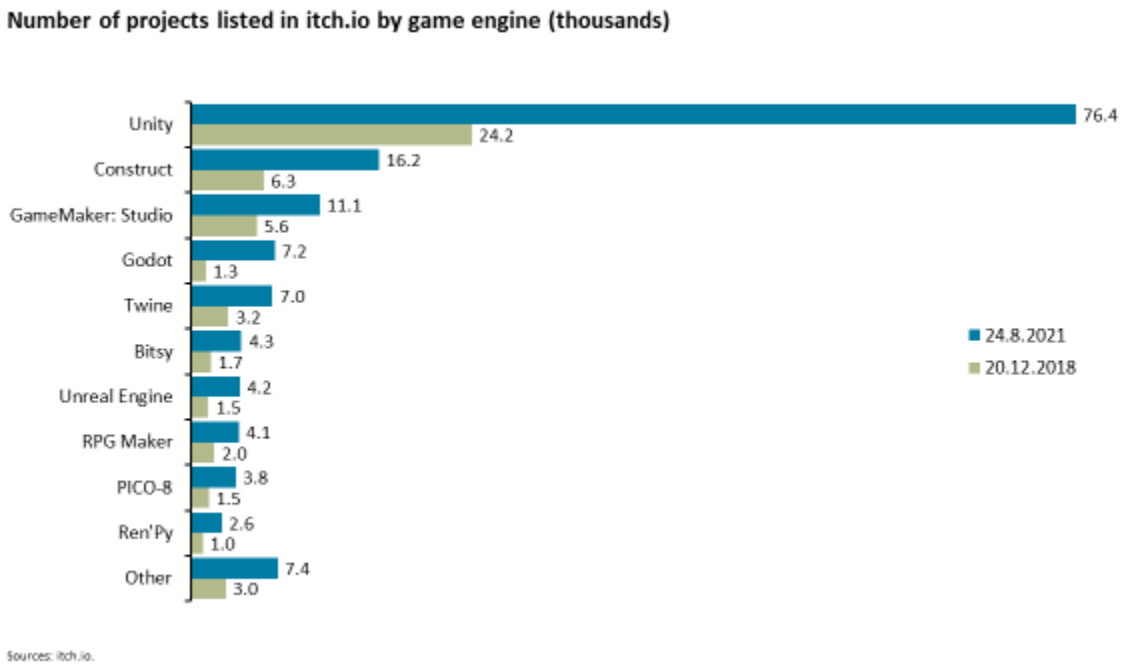
When the engine becomes the driver

Today, modern game engines can comprise some of the most elaborate and complex software ever written. Game engine developers are also targeting an increasingly vast range of hardware platforms and higher-level programming languages, further increasing the decoupling of the different layers of the game industry technology stack. As a consequence, from the perspective of digitalization, the facilitation of the interactions is becoming more and more concentrated in the platform domain.

The game industry is not the first example of a setting where this kind of a decoupling and rebundling of the technology stack has occurred as a result of digital platforms. A decade ago in the mobile phone business, for example, the platformization of the smart phone operating systems transformed the entire industry, leading to a significant change in the bottlenecks and the gate-keeping control points in the value chain. In only a few years, the operating system went from being the most important competitive differentiator between mobile phone manufacturers to becoming almost a commoditized part of the industry's technology stack (Kenney & Pon, 2011; Pon, Seppälä, & Kenney, 2014).

Similarly, just as smart phone devices today are embedded into operating systems instead of *vice versa*, games are now being increasingly embedded into engines instead of engines being embedded into games. In fact, today the majority of game development takes place on top of the few most popular game engine platforms. According to Unity, for example, more than 50 percent of all games across mobile, PC and console domains now utilize the company's game engine, and over 70 percent of the top 1000 mobile games are made on top of the Unity game engine (see Figures 1 and 2).[1] On the game distribution platform Steam, which accounts for 75 % of the global market share of PC games, the two most popular game engines alone account for 39 % of the top 250 most popular games (see Figure 3). The figure is by no means insignificant, considering that one half of Steam's global revenue can be attributed to the top 100 games alone (Zuckerman, 2020).

Figure 1



1 https://unity.com/our-company

Figure 2

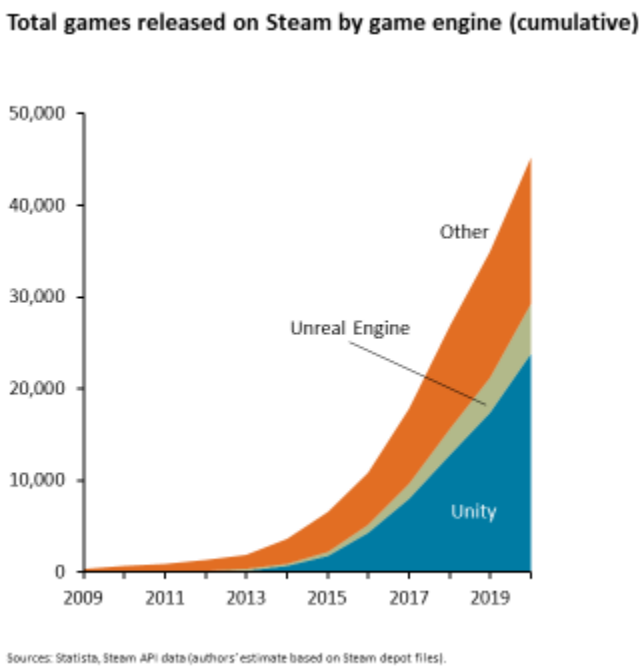
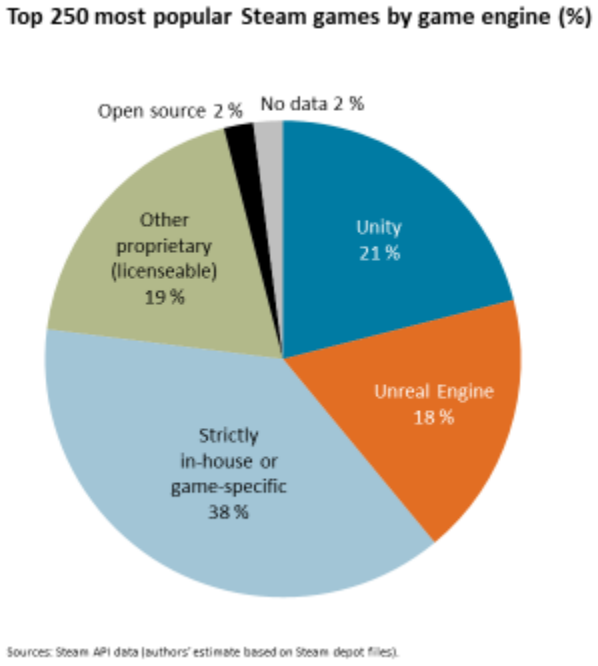


Figure 3



An industry aiming for serious growth

Game engines are a vivid example of how the platforms in the game industry can offer new versatile ways of virtual interaction with data, in a significantly more real-world-like manner than before. The platformization of game engines and their enhanced capability to facilitate virtual interactions have led to the rapid broadening of the scope of their applications in recent years. Instead of pure entertainment, game engines are now increasingly being licensed for non-entertainment purposes such as visualization, training, and scientific exploration in industrial, medical, and military contexts in so-called *serious games*.

To name a few examples, in the construction industry, game engines are now being used to design and explore virtual building information models (BIM) in an interactive real-time manner. As one example, in the aftermath of the fire of the Notre Dame cathedral in 2019, Ubisoft's building information models and game engine were utilized to reconstruct the cathedral's lost historic features. In medicine, game engines are used to train surgeons and to visualize molecular data in the development of new medicine (Gardner, 2018). Respectively, in telecommunications, game engines are employed to simulate 5G wave propagation in real-time (Caulfield, 2021). Also, in the film industry, game engines are enabling new techniques of virtual production where special effect can already be seen in real-time during principal photography (Lappalainen, 2021). For example, Disney's new Star Wars series 'Mandalorian' was filmed and rendered by using Unreal Engine in this very manner (Ball, 2020). The list of applications goes on and on.

Recently, the game industry has increasingly steered its focus towards creating something which, if realized, would enable even more versatile digital interactions. While still existing mostly at the level of a vision rather than reality, these so called *metaverses* are generally described as virtual frameworks that are collectively shared, persistent, synchronous, and interoperable. Comprising more than a mere virtual reality, a metaverse should be understood as a much broader concept, something akin to *system of systems*, a comprehensive infrastructure not tied to any one application or any single individual provider (Ball, 2020).

In academia, systems of systems are typically characterized by five key properties, in the so called 'Maier's criteria'. Firstly, the individual systems must be operationally independent, so that if the system of systems is disassembled, the individual systems can still independently perform in a useful manner. Secondly, the individual systems must be managerially independent, meaning that they are mostly acquired and integrated independently. Thirdly, the individual systems are geographically widely distributed, and can typically readily exchange information but not physical things, such as mass or energy. Fourthly, the system of systems must be capable of emergent behaviour, so that as a collective it can perform higher functions which do not reside in any of the individual systems. And lastly, the system of systems exhibits constant evolutionary development where structure, function, and purpose are continuously added, modified, and removed over time (Boardman, Dimario, Sauser, & Verma, 2006; Maier, 1998; Sage & Cuppan, 2001).

One idea behind the concept of a metaverse is that by building it to be physically based, *i.e.* accurately simulating the laws of physics, material properties, and other such aspects of our physical reality, the metaverse framework can be used for virtually an unlimited scope of purposes in a much more interactive way than in earlier applications. By enabling persistent virtual data objects, digital entities can traverse between digital domains and migrate from one application and industry to another. Furthermore, the idea is that through augmented reality, metaverse objects can also be layered on top of our physical world where they can be interacted with just like any natural object (Caulfield, 2021).

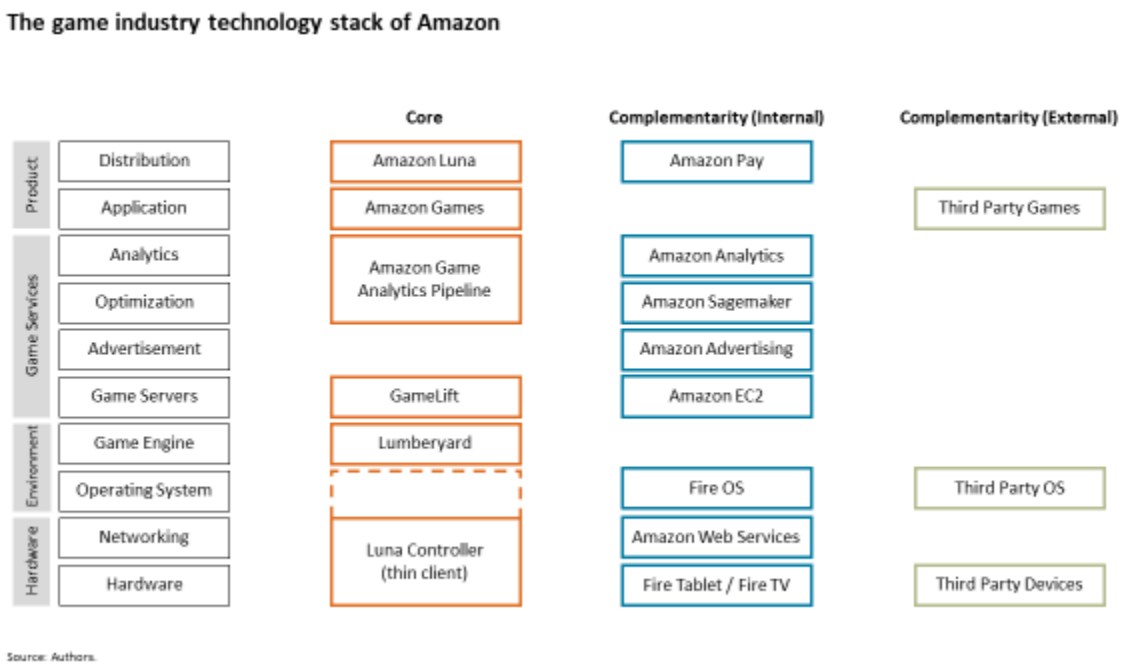
Who weaves the fabric of the new reality?

Should the efforts towards building a system-of-systems-level metaverse platform be successful, the question that naturally follows is who will be the market-makers, the owners of the fabric of this new reality, and how will this affect the value capturing ability across industries and geographies?

Unity, the provider of the most popular game engine at the moment, has recently given indications of its plans to engage in metaverse development (Gabriele, 2020; VentureBeat, 2021; Parisi, 2021). Similarly, Epic Games has also expressed a desire to develop Fortnite, one of the most popular games based on its engine, into a metaverse platform (Ball, 2020). Many others affiliated with the game industry have also expressed similar goals. For example, the graphics hardware manufacturer NVIDIA recently launched a new engine platform named Omniverse, which the company says is "aiming for universal interoperability" (nVidia, 2021). Facebook—more recently known as Meta—has voiced its desire to transform itself from a social network company into a metaverse company, with the help of its Oculus VR and Horizon virtual meeting space technologies (Newton, 2021). Amazon, Microsoft, Epic Games, and Valve have also all been increasing their capabilities and resources along a similar tangent (Ball, 2020).

Additionally, many of the incumbent digital platform giants of today, such as Google, Apple, and Tencent, already possess strong monolithics which they could leverage for market dominance in the wake of the transformation of the game industry. For example, Google's ecosystem already facilitates strong capabilities in streaming, live ops, and artificial intelligence—all of it supported by immense amounts of data. Similarly, Amazon has been systematically increasing its capabilities on all levels of the game industry's technology stack, including the Luna Controller thin client gaming hardware, the Lumberyard game engine, and Amazon Luna—a Netflix-style distribution platform for streaming games over the internet (See Figure 4).

Figure 4



By having a stake of ownership in the most prominent game engine providers, the Chinese platform giants have also been able to tap into the European and American markets through this horizontally expanding platform layer in the game industry. For example, Tencent has formerly acquired 40 % of Epic Games, the provider of Unreal Engines (Kain, 2021).

While Western digital multi-sided platform giants have had the tendency to grow and evolve more vertically across the technology stack, the Chinese platform giants have more experience in building and expanding their platform businesses horizontally across industries, through their so-called *platform business group strategy* (see *e.g.* Jia, Kenney, Mattila, & Seppälä, 2018). Whether the Western platforms will be able to adapt to this horizontal model efficiently remains an open question, and a factor in how the platform landscape may become reconfigured in the wake of the metaverse development.

How should Finland prepare?

Finland has a long history of successful video game development. In recent years, some Finnish game studios have arisen amongst some of the most important companies for the Finnish economy in terms of GDP contribution (Ali-Yrkkö, Seppälä, & Mattila, 2016). In recent international comparisons, Finland has placed amongst the top three game developer countries in Europe by turnover, making it one of the most attractive game industry hubs in the world today (Neogames, 2019). In this regard, the increasing trend of platformization in the game industry and the metaverse development raise several considerations for Finnish business strategy and public innovation policy.

The vision of an interoperable system of systems is not entirely a new one to the industrial sector, of course. A similar idea has been baked into many earlier industrial concepts, such as ‘internet of things’, ‘industrial internet’, ‘digital twin’, and so on (Porter & Heppelmann, 2014). Many problems have been identified in research that stand in the way of this development, as earlier efforts have struggled to establish wide-scale integration. (Tähtinen, 2018). In the light of these prior difficulties, one might ask, what separates the game industry platforms from earlier efforts towards system-of-systems-level interoperability.

Despite the momentum, the concept of the so-called ‘data economy’ has so far remained ambiguous in regard to its significance to most companies and industries, and the Finnish economy in large (Nikander, Mattila, & Seppälä, 2018; Tähtinen, 2018). One of the key considerations is whether the new wave of game industry platforms and the metaverse development can crystalize the concept the so-called ‘data economy’ and its significance to industries through their enhanced interaction and virtual economies. By making the benefits more understandable through the increased capacity for real-world-like interaction, and by providing a complete workspace with a wide range of development tools and interfaces, the development could take a different trajectory from earlier attempts.

Furthermore, one of the key problems with enabling interoperability of industrial data has been the absence of a platform which could conveniently facilitate the incentive structure for providing data monetizing its use. The game industry’s expertise in building virtual

economies puts it in a unique position to establish data product markets, potentially unlocking industrial data interoperability. For example, could the platformization of serious games provide a way for industrial companies to tap into game industry's virtual economies? Can game industry platforms make contractual arrangements regarding data ownership and data governance easier than before? Could such a development provide an incentive for industrial players to defuse their horizontal barriers of data product interoperability?

From the perspective of innovation policy, it is important to understand the general applicability of this new enhanced capability of facilitating interactions which game industry platforms and the metaverse development have to offer. As a consequence, companies and policy makers alike should seek to increase their understanding on which industries will be affected by this development in the near future, in what capacity, and under what kind of a timeframe.

Thirdly, if the game industry platforms and the metaverse development are successful in system-of-systems-level integration across industries, one key consideration is whether the game industry companies can challenge the current digital platform incumbents, such as Google, Amazon, Facebook and Apple, as the providers of the next generation of digital infrastructure. As discussed above, the digital platform incumbents have also been actively bolstering their capabilities in the game industry's technology stack through mergers and acquisitions. From the standpoint of competition policy and antitrust, it is important to pay special attention to these types of acquisitions and consider how these capabilities are being fused into the service offerings of the current incumbent platform giants.

As the game content creation has become increasingly separated from the development of the game engines, smaller game studios have become more and more dependent on the game industry's digital platforms. In order to protect the Finnish game industry and the Finnish national economy from falling victim to predatory innovation in this domain, careful consideration should be exercised on how to keep the next generation of digital infrastructure from slipping through the fingers of the Finnish innovation ecosystem. A key consideration for strategy and policy in this regard is how the resources, the knowledge and the tools already present in the different settings of this problem domain be leveraged against one another. Furthermore, companies and policy makers should seek to understand what kinds of resources, protocols, and regulative frameworks will be required to foster new businesses and industrial growth in these new digital infrastructures in the near future.

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