Platforms - A Novel Paradigm of Construction Collaboration

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Abstract. Business and innovation models based on an idea of a digital platform have revolutionized information technology use in many consumer areas where uptake of IT would have otherwise been slow. Slow is also the uptake of information technology in construction. The hypothesis of this paper is that the delivery mechanism for technology has not been the most suitable one and that this can be improved upon – using the digital platforms. Term platform has been used before. In this paper we define the concept of a digital construction platform. We then analyse their potential in construction processes, focusing on construction design. The paper contributes to the understanding of an emerging new paradigm for the delivery, marketing, and innovation in digital technology in construction. Follow up work will examine the platforms from the structure-function-behaviour perspective and present their architectural foundations.

1. Introduction

In 1999, Nokia was the most valuable company in Europe. Over the next decade, Nokia dominated the global cell phone industry (Moazed and Johnson, 2016). By the beginning of 2014, Nokia’s market share has dwindled. The reason for the downfall is the iPhone. It turned the cell phone industry giants like Nokia and BlackBerry into virtually irrelevant players within just a few short years. It was technically inferior, had a shorter battery life, it transferred a lot of data, and it wasn’t secure (Moazed and Johnson, 2016). Its advantage was that it was not a product but a platform for other people’s products.

Similar pattern can be observed in other industries. Air Bed & Breakfast (Airbnb) started out as a means of extra cash, by two friends who couldn’t afford the rent. Today, Airbnb is a giant enterprise active in 220 countries, where it lists over seven million properties ranging from studio apartments to actual castles and has served over 750 million guests (Airbnb Inc., 2020). Airbnb did all that without owning a single hotel room of its own (Parker, Van Alstyne and Choudary, 2016; Cusumano, Gawer and Yoffie, 2019). It has achieved a scope and value that a traditional hotelier can hope to reach, only after decades of often risky investment and hard work, in just a few years (ibid.). It did so because it was a platform. Airbnb applied the platform model to the hotel business.

Both, iPhone and Airbnb, are just two examples from a list of disruptive platforms that includes Amazon, YouTube, eBay, Wikipedia, Upwork, Twitter, KAYAK, Instagram, Pinterest, Uber, Alibaba, Facebook, and dozens more (Parker, Van Alstyne and Choudary, 2016). Platform transforms industries, changes how value is created and results in creating new opportunities (Parker, Van Alstyne and Choudary, 2016).
1.1. Construction industry

The construction industry, with an estimated expenses of $14 trillion by 2025, has only an average of 1 percent labour-productivity growth per year over the past two decades, compared with a rate of 2.8 percent in the case of the total economy and 3.6 percent in manufacturing (McKinsey Global Institute, 2017). McKinsey Global Institute (2017) has identified infusing digital technology to be one of the ways to tackle the root causes that underline the poor productivity growth of the industry.

However, the construction industry has been slow to adopt process and technology innovations, in fact, it is one of the least digitized industries (Agarwal and Sridhar, 2016; Turk, 2021). This paper argues that the tool to do so could be the digital platform. That the process to achieve more and faster digitalization of construction industry is the process in which the innovation, work, and business would get on a platform. In short – platformization.

1.2. Hypothesis and problem statement

The hypothesis of this paper is that there are sufficient similarities between construction industry and the areas in which platforms have been successful to warrant the restructuring of the industry and its ICT technology towards platforms.

2. Platforms

In a nutshell, all platforms do two things: reduce transaction costs and enable complementary innovation (Moazed and Johnson, 2016). The platform model has been a success in “long tail” areas – where there are not only many different consumers but more importantly a multitude of producers and creators. Apple offered an opportunity to millions of app authors to offer their products, AirBnB to millions of property owners, YouTube to millions of movie producers, Uber to millions of car owners.

Oxford English dictionary (Oxford University Press, 2020) defines platform as a raised level surface on which people or things can stand. For example, the raised area alongside a rail track in a train station that allows passengers a convenient access to trains is called a railway platform (Railway platform - Wikipedia, 2020).

In the context of construction information technology, the term platform meant many things over the last decades. There exists, for example, a European Construction Technology Platform ECTP (Bourdeau, 2009). Platforms were understood as various tools for concurrent engineering (Katranuschov et al., 2003), the integration of the construction processes (Singh et al, 2011), cloud based BIM solutions (Goulding et al., 2014), collaboration environments (Ma, 2018) and also social BIM clouds (Das et al., 2015). It generally meant a place where people, information and technology would loosely come together.

This Section aims at defining an explaining the new meaning of the term.

2.1. Platform business models

The main concern of the paper are platforms that support a certain kind of business models. Platform business model is a business model based on connecting individuals and organizations for a common purpose or for sharing a common resource (Cusumano, Gawer and Yoffie, 2019). Parker, Van Alstyne and Choudary (2016) also defined it as a new business model based on enabling value-creating interactions between external producers and consumers.
Platforms deliver products or services by bringing together two or more market actors or “sides” (e.g., buyers and sellers, or an operating system maker with users, application developers, and hardware producers) that would otherwise not interact or easily connect (Cusumano, Gawer and Yoffie, 2019). For this reason, they are often called multisided platforms (Evans and Schmalensee, 2016).

Platforms usually act as intermediaries, developing and managing an aggregation platform for goods and services of the same type (Ruggieri et al., 2018). The role of platform business model is to provide a space and a set of standards and protocols that facilitate interactions across a large number of participants (Kim and Yoo, 2019).

We can distinguish at least between three kinds of platforms. Transaction platforms serve as an intermediary for direct exchanges among market actors. Innovation platforms serve as a technological foundation upon which actors engage in complementary innovation – innovation performed by external complementors (Tsai, 2018). The third and most successful one is a combination of both – a hybrid platform (Cusumano, Gawer and Yoffie, 2019).

2.2. Where to apply Platform Business Model?

The reduction of substantial friction is a necessary but not sufficient condition for a multisided platform to succeed (Evans and Schmalensee, 2016). Parker, Van Alstyne and Choudary et al. (2016) identify the characteristics of industries ready for a platform revolution:

- **Information-intensive industry**: how does the business generate value, using physical asset or information asset?
- **Industries with non-scalable gatekeepers**: How is the business transaction characterized? Does it depend on gatekeepers? Are the gatekeepers scalable or non-scalable? Gatekeepers manage the flow of the business value. A good example is a receptionist. Receptionists are first in line in managing hotels’ business transaction, i.e. the use of rooms by customers. A human receptionist can only accommodate one customer at a time, thus non-scalable. However, a virtual receptionist can accommodate as many customers as they are online, simultaneously, thus scalable.
- **Highly fragmented industries**: Is it possible to increase the efficiency?
- **Industries characterized by extreme information asymmetries**: Does one party have information advantage compared to other one?

2.3. Platform success factors

The success of a platform is determined by the connection, gravity and flow of the platform (Choudary and Bonchek, 2013).

- **Connection**: Does the platform focus on specific transaction? Is it easy to use? When Facebook started it focused on a simple core transaction. It was simple by design, unlike its’ earlier competitors, who had many more feature (Moazed and Johnson, 2016).
- **Gravity**: Does the platform have a positive or a negative network effect? Network effect refers to the impact that the number of users of a platform has on the value created for each user (Parker, Van Alstyne and Choudary, 2016). A Positive network effect is characterized with the increase of significant value whereas Negative being with the reduction in the value produced for each user (Parker, Van Alstyne and Choudary, 2016). When they are positive, the results are nonlinear increases in utility and value, which enabled Facebook to grow from two users to over 2 billion users in just a few years (Cusumano, Gawer and Yoffie, 2019).
- **Flow**: Does the platform have the right core transaction? The core transaction is the set of actions consumers and producers must complete in order to exchange value (Moazed and Johnson, 2016). Getting the core transaction right is the most important piece of platform design (Moazed and Johnson, 2016).
3. Analysis of construction from platform perspective

The construction sector is one of the largest in the world economy, with about $10 trillion spent on construction-related goods and services every year (McKinsey Global Institute, 2017). It is suitable for the disruption though platforms.

3.1. Construction is Information Intensive

Many (Sommerville and Craig, 2006; Hua, 2013; Christodoulou, 2017; Perera et al., 2017) have characterized the construction industry as information intensive, where huge number of documents are generated and exchanged between the individual parties contractually bound to the project (Sommerville and Craig, 2006; Hua, 2013). Successful and timely project completion depends on the accuracy and timeliness of information (Christodoulou, 2017).

The introduction of Building Information Modelling (BIM) presents the construction sector’s moment of digitalization (EUBIM Task Group, 2016). A Building Information Model (BIM) is a comprehensive digital representation of a built facility with great information depth (Borrmann et al., 2014).

3.2. Construction is dependent on Gatekeepers

Gatekeepers are market actors in a pipeline business model, responsible to manage the flow of value from the producer to the consumer (Parker, Van Alstyne and Choudary, 2016). In the construction industry, General Contractor have the role of gatekeeper (Laine et al., 2017).

3.3. Construction is fragmented

The industry is also known for being fragmented (Hua, 2013; McKinsey Global Institute, 2017; Perera et al., 2017). A major research direction is about computer integrated construction (Turk, 2020). The industry is highly fragmented in the sense of, (1) vertical fragmentation (between project phases), (2) horizontal fragmentation (between different specialists of disciplines at a given project phase), where communication and information exchange problems proliferate (Hua, 2013), (3) project fragmentation where each project is unique and starts from scratch, building on previous work only to limited extent and also leaving behind little but the work that was done specifically for this project; and finally (4) construction is fragmented across businesses, many of them being small or medium.

3.4. Construction is prone to information asymmetry

Communication develops the relationships necessary for successful project’s outcomes (Project Management Institute, 2017). However, because of self-interest, the involved parties will not be willing to share all the information all the time (Ceric, 2013). This results in information asymmetry. Schieg (2008) describes information asymmetry as a situation in which one of the two co-operation partners is better informed than the other one.

4. Discussion of construction platformization

The current state of the art technology in construction digitalization is related to building information models (BIM) – creating and managing digital replicas of the future projects and current assets. Some elements of BIM technology are understood as platforms on which others can build. For example, Buildingsmart in its OpenBIM/phone analogy sees the IFC’s as a platform on which others build applications (Buildingsmart, n.d.). However, this is not the entire relationship of BIM technology with platforms.

- **Information intensive**: BIM technology made construction even more information intensive.
• **Gatekeeping.** The BIM manager or the provider of the infrastructure for hosting BIM servers, BIM models, CDE’s etc. are providing gatekeeping function to what information and tools are used when working on a project. Gatekeeping is seen as a feature, not bug, in projects which are considered properly organized.

• **Fragmentation.** While BIM addresses the vertical (1) and horizontal fragmentation (2) it does little or nothing about the fragmentation of the industry into multitude of projects (3) and multitude of companies (4).

• **Information Asymmetry.** While BIM at least theoretically improves the access to information within projects, this is not the case across projects and across the industry. A lot of information and knowledge is locked inside projects and companies without the opportunity to be found valuable across those contexts.

For the success of the construction platforms and as requirements towards its architecture the three success criteria need to be taken into account – connection, gravity and flow:

• **Connection:** The platform should focus on specific transaction such as designing, procurement or operation. It should be accessible and easy to use by all stakeholders, including the SMEs. It should grow out of a simple core that provides infrastructure for information, software tools, and people.

• **Gravity:** The network effect of a construction platform should be possible. Values should be created by users, the more the better. This is only possible if platforms cease to be project platforms (where more participants create more problems) but are industry platforms. Of course, mechanisms should be put in place, and this is the feature of the platform, that allow for intellectual property to be traded.

• **Flow:** The platform needs the right core transaction. This transaction in case of design platforms would be design information creation, at a request of a customer, done by the performer. This is the core element of the exchange of value of such platform and not the delivery of a project from lead designer to the client.

5. Conclusions

It was in the 1990s that Bill Gates quipped “As we look ahead into the next century, leaders will be those who empower others.” (Goodreads, n.d.). Empowerment came in many forms and flavours, including more advanced services and tools. But the step change in this trend were services, digital infrastructures in fact, that allow others to build services and tools on top of it. This was then called digital platform. Providers of services, tools, software, information and content were empowered by the functionality and foundations a platform offered them.

We have argued, theoretically, that construction is suitable for the platform business model and listed some requirements towards success factors. To date, construction practitioners have been empowered by different kinds of software and tools. The industry was seeking optimizations in the use of these technologies withing projects. For example, the usage of BIM is advertised to generate savings of 20-50% (Kim et al., 2017). What has not been explored are the economics of switching of the industry from a project context to a platform context, from trying to save by using IT in a single project towards re-use of data, information, knowledge among projects and collaboration as well as specializations among the stakeholders outside of the project context. This is something that a platform could offer. Future work is needed in several directions – architecture of such a construction platform, core functionality of such a platform, details of the business models, paradigm shifts in the industry and the changes to the overall value chains.
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