

A ROADMAP TO A SHARED VISION FOR PLATFORMS: THE MOTIVATIONS AND ROLES OF STAKEHOLDERS IN THE TRANSFORMATION FROM PROJECTS TO PLATFORMS

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Abstract

In recent years, 'platform' has emerged as a buzzword for business. Despite widespread usage, there remains ambiguity in its meaning. Strategically, platforms capitalize on the advantages of commonality and have been successfully applied across multiple industries to deliver mass-customized products, increasing customer choice while maintaining efficient and effective production methods. It is known that the early involvement of stakeholders enables the platform logic, however that requires redefining their roles and motivations in the platform ecosystem. This paper aims to envisage redefined roles for each stakeholder in the construction value chain to create a shared vision roadmap by understanding their motivations for moving towards a platform ecosystem and how their engagement model will be changed. Four enterprises in Australia, that represent key stakeholders of the construction value chain, were selected for knowledge elicitation through individual discussions. The perspective pitches for the primary stakeholders comprise developers, general and specialized contractors, designers and engineers, while the rest of the value chain is grouped under associated stakeholders. In an attempt to define the new roles for the different stakeholders of the platform ecosystem, there emerged a shared vision that might enable a shift towards the platform approach. The intent for moving value-adding products and services upstream, expanding contribution to the value chain, continuous improvement through data-driven insights, seamless collaboration in a partnering environment and early prototyping were shared across stakeholder groups. A changed nature of engagement was observed where the general contractor ceased to be the single point of engagement with the associated supply chain actors; this role was most likely to be taken up by the developer or the platform consultant. For a longer study, the value chain actors in terms of financiers (upstream) and asset managers (downstream) are required to be included in the value chain and their motivations and roles explored.

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Peer-review under responsibility of the scientific committee of the Creative Construction Conference 2023.

Keywords: construction, platform, roadmap, stakeholders, ecosystem.

1. Introduction

Platforms represent a collection of assets that are shared by a set of products; comprising components, processes knowledge and people [1]. While platforms originated with manufacturers using product platforms, today, technological platforms underpin many of the world's most valuable companies and it is increasingly being considered that platforms have the potential to create value in the construction sector [2]. Platforms establish commonality with the strategic intent of achieving revenue benefits through finding and serving niche requirements, cost reduction by leveraging economies of scale and risk reduction through increased quality and reduced susceptibility to changing environments [3]. While academia and industry have focussed on the efficiency and productivity of platforms, it is now being demonstrated that platform-thinking also enables new

possibilities to effectively deliver design value to end-users [4]. Design for Manufacture and Assembly (DfMA) is the predecessor of the platform approach in construction; however, when baked together they unlock the true potential of digital design and simulation using computational design processes to create standardisation at component level but retain design flexibility at the asset level [5]. Given this, there is a need to investigate the implications of the emergence of platform ecosystems for each stakeholder in the construction value chain. The emergence of platform ecosystems necessitates construction businesses to consider how they can participate in a larger ecosystem as opposed to focusing solely on internal operations [6].

This paper aims to envisage redefined roles for each stakeholder in the construction value chain to create a shared vision roadmap by understanding their motivations for moving towards a platform ecosystem and how their engagement model will be changed. Four enterprises in Australia, that represent key stakeholders of the construction value chain, were selected for knowledge elicitation through individual discussions. The perspective pitches for the primary stakeholders comprise developers, general and specialized contractors, designers and engineers, while the rest of the value chain is grouped under associated stakeholders. In an attempt to define the new roles for the different stakeholders of the platform ecosystem, there emerged a shared vision that might enable a shift towards the platform approach.

2. Emergence Of Product Platforms

The earliest definitions of product platforms were "... *the collection of assets that are shared by a set of products*" [1] and "...a set of common components, modules, or parts from which a stream of derivative products can be efficiently created and launched" [7]. Product design was traditionally viewed as a singular, isolated activity in manufacturing. According to Meyer and Lehnerd [7], this traditional approach understated the potential for "commonality, compatibility, standardisation, or modularisation among different products and product lines." Manufacturers developed product platforms to enable the creation of simple product lines that could share elements of a common family structure in response to this challenge. Utilising a product platform allows for the efficient development of differentiated products through the sharing of physical components and production processes [8]. By summing up their definition as "a collection of basic assets that are reused to produce a competitive advantage," Kristjansson, et al. [9] highlighted that "reuse" was a prevalent theme across product platform definitions. The product platform concept ultimately enables organizations to effectively adjust to shifting market conditions and needs for mass customization, all while enhancing manufacturing and design efficiency via a mind-set centered on constant process improvements [8].

The construction sector has three primary 'domains': the client domain, the project domain and the product domain; Each domain plays a crucial role in the construction of the built environment but the way they interact frequently leads to inefficiencies that may be solved by the emergence of product platforms in some circumstances [2]. Sweden is one of the world's leading producers of industrially built housing and Swedish success stories are dominant in literature about product platforms in construction [8]. Literature also cites Japan as a country where product platforms have been utilised in construction. The steady development of the sector in Japan was a consequence of "a combination of continuous incremental and disruptive innovations and a unique socio-economic and socio-cultural environment" [10]. However, prominent examples in literature always start with Boklok. Swedish multinational contractor Skanska collaborated with IKEA to develop Boklok, a low-cost housing delivery system using a product platform aimed at critical workers with restricted wages. Using the IKEA brand, Boklok established a strong and consistent market identity that aims to serve the general public with high-quality, well-designed housing [11].

3. Emergence of Platform Ecosystems

Platform as a concept is evolving in current applications; there has been a shift from viewing platforms as purely internal company structures as was the case of product platforms to considering them on a more industry-wide scale [8]. These platforms erode the traditional line of demarcation between businesses (companies) and the marketplace [6]. In such cases, a foundational platform created by a company allows other companies to build

upon it; thus, here the platform is neither a market nor a business (company), but something entirely novel [12]. The concept of ‘platform ecosystems’ is derived from ‘business ecosystems’ which is no means is new; business and economics theorist Moore [13] proposed that, ‘... a company be viewed not as a member of a single industry but as part of a business ecosystem that crosses a variety of industries. In a business ecosystem, companies co-evolve capabilities around a new innovation: they work cooperatively and competitively to support new products, satisfy customer needs, and eventually incorporate the next round of innovations.’ In the context of platforms, such an integrative framework was seen in the work of Gawer [14] where platforms are classified into internal platforms, supply chain platforms and industry platforms. Internal platforms are managed through hierarchy and have closed interfaces and specifications are shared within the firm, but not disclosed externally. Supply chain platforms are managed through contractual relations between supply chain member organisations; therefore, interfaces are selectively opened and specifications are exclusively shared across the supply chain. Industry platforms are managed through governance mechanisms (which sometimes can be pricing) and have open interfaces that allow sharing specifications with complementors.

4. Research Approach

This section will explain the selection criteria, data collection and analysis protocols of the knowledge elicitation through individual discussions conducted in this paper.

4.1 Selection criteria

Four enterprises in Australia were selected for knowledge elicitation through individual discussions each representing a stakeholder group in the construction value chain. The first company (CS1) has around 1,000 employees, operates throughout Australia, and provides specialist building services. The second company (CS2) has around 15,000 employees, operates throughout 18 countries, the company is the biggest manufacturer in Australia and is a top supplier globally, specializing in producing steel products and providing solutions for building and construction markets. The third company (CS3) has around 1,000 employees, operates throughout Australia, and it is a leader in technology implementation, product development and quality control, with a world-class manufacturing capacity and environmental standards that underpin a commitment to sustainably grown timber production and supply in Australia. The last company (CS4) has around 5,000 employees, operates throughout Australia and Asia, the company is a global leader in residential construction, building materials and property development. As nominated by the companies, one or two representatives of each company were interviewed. The interviewee details, experiences, and stakeholder groups are shown in **Table 1**.

Table 1. The participant details, experiences, and stakeholder groups for knowledge elicitation through individual discussions

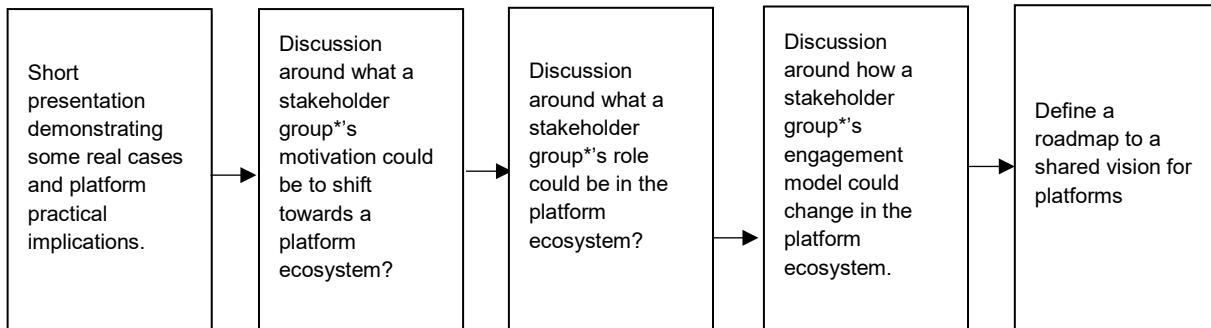
Code	Experience	Area of Experience	Stakeholder group
SDD	20+	Building services-integrated solutions	Specialised Contractor/ Designers and Engineers
GM	15+	Construction management	Developer/
SM	15+	Construction Business Development	Developer/ Material Processing
EM	15+	Engineering management of mega projects	Material Processing/ Component Manufacturers
BDL	20+	Construction Business Development	Material Processing/ Component Manufacturers
ETL	15+	Digital Transformation	Material Processing/ Component Manufacturers

SDD – Strategic Development Director
GM – General Manager
SM – Senior Manager
EM – Engineering Manager
BDL – Business Development Lead
ETL – Enterprise Transformation Leader

The primary stakeholders for the perspective pitches are developers, general contractors, specialized contractors, and designers and engineers. The other stakeholders of the value chain are considered associated stakeholders. The authors acknowledge that there are some blind spots in the value chain actors presented in this paper in terms of financiers (upstream) and asset managers (downstream) who also will play critical roles in the platform ecosystem; however, during the course of this scoping paper, it was not possible to collect primary data from these actors.

4.2 Data collection

Data were collected using semi-structured interviews. The selected organizations who represent key stakeholders of the construction value chain nominated the most suited role to be interviewed. The interviews were conducted online via Zoom™ and recorded. The inspiration behind this shared vision roadmap originated in the thought starters presented in the McKinsey report *'The next normal in construction: How disruption is reshaping the world's largest ecosystem'* by Ribeirinho, et al. [15]. **Fig. 1.** illustrates how knowledge elicitation through individual discussions was conducted for this research.



* Stakeholders groups include developers, specialized contractors, designers and engineers, while the rest of the value chain is grouped under associated stakeholders.

Fig. 1. Method for conducting knowledge elicitation through individual discussions

4.3 Data analysis

The knowledge elicitation discussions were qualitatively analyzed with respect to the research objectives. The verbatim transcripts were de-identified, interpreted, and labelled to be uniquely identifiable for each interview and used as the unit of analysis. The outputs from the knowledge elicitation discussion were utilized to define the motivation, roles and engagement models for the different stakeholder groups in a platform ecosystem. In doing so, there emerged a shared vision that might enable a shift towards the platform approach as explained in the following section.

5. Findings

This section will present redefined roles for each stakeholder in the construction value chain to create a shared vision roadmap for platforms consisting of their motivations and roles. How would their engagement model change? This section is structured into four sub-sections; developers, designers and engineers, specialised contractors, and associated supply chain actors.

5.1 Developers

What could a developer's motivation be?

A developer's primary requirement from a platform is seamless evaluation of prospective sites through automated feasibility analysis. If a platform could help decide whether a site is valuable to acquire and can be turned into a positive business, it would benefit the developer immensely. What a developer wants next is for a platform to enable partnering up with other actors on the engineering, design, and supply side of the value chain. Developers also would be motivated by the idea of accelerating sustainable building methods by focussing on early involvement of supply chain actors through the platform.

A developer is further motivated by the promise of connectivity; a platform can take the feasibility model into production solidifying the financial backbone of the project. Moreover, if these steps occur in a collaborative platform with a partnering environment, it would help run iterations of different scenarios where developers can almost have a platform-based product and then back calculate to identify the lots that fit best with it. In the long

term, large companies could leverage economies of scale through a standardised kit of parts, continuously made efficient by feeding projects involving similar construction types and similar geographies.

What could a developer's role be?

As a key player in the construction industry, a developer's role is multifaceted and critical to the success of any project. One of the most important responsibilities of a developer is to enable the horizontal integration of the supply chain actors towards the platform approach and initiate early prototyping with preconstruction activities integrated into the contractual arrangements of specialised contractors and suppliers. To further support this objective, a developer should enable an end-to-end information flow to support project delivery from feasibility and acquisition through to design and construction. Continuously improving the design (standardised kit of parts) and construction processes through the capture and analysis of operational data is also essential. Finally, a developer should seek to be more circular through design, material, process optimization and automation wherever possible in the project

How would a developer's engagement model change?

A developer might now engage with more supply chain actors than just the main contractor. This interaction might be facilitated by a digital platform (marketplace). The engagement could start earlier to enable prototyping and injecting platform DNAs into existing products and processes.

5.2 Designers and engineers

What could a designer / engineer's motivation be?

The primary motivation of designers and engineers is to better utilize their digital capabilities to streamline the design and delivery process. In a completely BIM and digital engineering enabled setup, designers and engineers have the capacity to contribute to a larger part of the value chain. For example, using parametric design, they can instantly have a fully resolved model that can be manufactured and constructed. This places the designers and engineers in the most suited position to become go-to partners for design-to-manufacture.

Designers and engineers are also well placed to assume an advisory role of the platform consultant that drive the platform approach for a client right from the early prototyping stage to training the specialised contractors for site assembly. This transforms the commercial model for designers and engineers from a typical hourly rate to outcome-based percentage of cost.

Designers and engineers might also be motivated to become technology providers enabling the platform approach. The platform approach benefits from bringing value adding services upstream; given this by becoming technology providers, designers and engineers can license out their proprietary platform technology to gain scale and internationalize. This could create an opportunity for them to build their business around data through advanced analytics.

What could a designer / engineer's role be?

To effectively utilize the platform approach, designers and engineers should develop strong customer relationships or a deep understanding of customer requirements to utilise the platform approach in the best possible way. They should also have a good knowledge and understanding of systemisation, commonality strategy (commonality in processes and enablers, not just physical components). Additionally, they must establish routines to carry digital models through to fabrication and create a dynamic marketplace for diverse supply chain actors to contribute to the platform ecosystem with a low barrier of entry. To support this, train associated supply chain actors based on the knowledge gained from early prototyping is needed, as well as, continuous improvement of by obtaining data-driven insights. Finally, they should embed circularity through design, material, process optimisation and automation.

How would a designer / engineer's engagement model change?

Designers and engineers might now engage with more supply chain actors than just the main contractor. The engagement could start earlier to enable prototyping and injecting platform DNAs into existing products and processes.

5.3 Specialised Contractors

A specialised contractor is somebody who simply does what is documented; it can be assembling on site, procuring materials or just supplying labour. Specialised contractors can also deliver a turnkey outcome including complete design and construction and be responsible for the safe performance and operation of the asset. In other words, specialised contractors mostly deliver a subcomponent of the superstructure; they are usually downstream in the value chain and typically do not initiate, design or manage projects in their entirety.

What could a specialised contractor's motivation be?

Specialised Contractors are primarily motivated to take advantage of the digitalisation of design, construction and procurement to move upstream in the value chain in order to avoid the old school queueing up and improve their market position. Specialised contractors are also motivated towards the platform approach as it could enable collaboration across different stakeholders through workflows in an aggregator sense but also in a single stream sense (for their continuous improvement). Achieving economies of scale is also a motivation for specialised contractors; when a specialised contractor develops a platform solution, it opens up multitude of opportunities for them to replicate it across the commercial building sector (wherever a platform approach is implemented). As seen in the case of developers, specialised contractors are also looking for a trustful partner environment facilitated by the platform through sharing of Intellectual Property (IP) where all parties work upfront diligently towards project goals. Finally, safety is an important driver for motivating specialised contractors towards the platform approach as most of them play a key role in site assembly.

What could a specialised contractor's role be?

To facilitate prototyping (mock-ups) and enable early involvement in the value chain, specialized contractors should be engaged at an early stage. They also should increase the level of modular designs and offsite production in order to limit time on site and enable upstream integration into the value chain through digital interfaces thereby improving bargaining power over general contractors, distributors and component manufacturers. Achieving operational excellence through continuous improvement of design, logistics and assembly is another important responsibility of specialized contractors. Finally, they should facilitate the reduction of embodied and operational carbon through design optimisation and the use of offsite facilities.

How would a specialised contractor's engagement model change?

The engagement model might not change to a great extent but engagement through digital interfaces might increase. The engagement model might become more balanced through early involvement and equitable partnerships.

5.4 Associated Supply Chain Actors

The associated supply chain actors comprise material processors, component manufacturers, material distributors and logistics players. Such associated supply chain actors typically have a chain of business archetypes upstream to downstream. For example, they might produce a material, add value to it, provide value added products, provide total solutions or provide a channel for the distribution of the material.

What could their motivation be?

These associated supply chain actors are motivated by the notion that a platform approach can enable them to not only optimise their material processing, but also towards contributing to better buildings through product innovation. They typically have numerous disjointed initiatives; the platform approach creates an opportunity to operate or participate in an end-to-end offering. The future ready state from their perspective is not in selling material or products anymore, it is in participating in that whole end-to-end value generation through critical

enablers like digital and strategic marketing. The associated supply chain actors are motivated to shift to a platform approach as it can help them integrate businesses that they have acquired over time in the form of a shared services model. The peak of this integration, however, sits beyond the organizational boundaries in a digital marketplace that is self-serving of their own products. Trusted information sharing among the value chain players could enable better demand forecasting and ultimately enhance the total value of the system. Further, the platform approach comes with the promise that these associated supply chain actors can set a clear decarbonization pathway and contribute to the circular economy which becomes one of their biggest motivations and competitive advantage.

What could their role be?

Companies must develop a capacity to inject platform DNA into an existing suite of products and offer solutions that can integrate with a platform ecosystem in order to strengthen their engineering capabilities in product development through the integration of digital tools towards an end-to-end offering. Improving customer experience is essential, and companies can achieve this by understanding how to address their key challenges through digital interactions. Additionally, they must invest in the upskilling of a platform champion; a person who has the technical skills, theoretical knowledge and the motivation to lead and guide teams towards the platform approach. Finally, companies should advocate for products that embed circularity in the value chain.

How would their engagement model change?

Detailed technical review and consultations between the associated supply chain actors, the developer and platform consultant to evaluate if products from an existing catalogue can be repurposed for the platform approach.

6. Discussion of findings

The redefined roles of the stakeholder groups presented in this research align with the narrative that platform thinking erodes the traditional line of demarcation between businesses (companies) and the marketplace [6] as it necessitates construction businesses to consider how they can participate in a larger ecosystem as opposed to focusing solely on internal operations. To support new products, meet consumer demands, and finally adopt the next round of innovations, they must collaborate and compete [12]. The platform ecosystem provides a framework for understanding how companies can co-evolve capabilities and co-create value to leverage the capabilities of a broader engagement network among the construction value chain stakeholders [5]. Real industry cases also complement the findings of this research. In the much talked about Forge, that has been discussed by platform enthusiasts globally, the aim was to potentially create a dynamic marketplace for diverse supply chain contributors with a low barrier of entry (a positive supply chain competitive environment). Another striking difference in the case of the Forge, while there is a platform consultant (Bryden Wood), a developer (Landsec), a construction management expert (Sir Robert McAlpine and Mace JV) and several key trade contractors and suppliers (J Coffey Construction, N G Bailey, Tata Steel, Schneider Electric), there is no explicit mention of a general contractor. Through a different approach from the Forge, platform-based companies such as the Volumetric Building Companies are playing the role of a general contractor with an end-to-end value chain and companies like Intelligent City, who have originated with an architecture background are also now taking up roles similar to the general contractor. Despite this, the general contractor perhaps has the biggest opportunity in the platform ecosystem but would need to redefine their role based on their motivation and scale.

In an attempt to define the new roles for the different stakeholders of the platform ecosystem, there emerged a shared vision that might enable a shift towards the platform approach. The intent for moving value adding products and services upstream, expanding contribution to the value chain, continuous improvement through data-driven insights, seamless collaboration in a partnering environment and early prototyping were shared across stakeholder groups. A changed nature of engagement was observed where the general contractor ceased to be the single point of engagement with the associated supply chain actors; this role was most likely to be taken up by the developer or the platform consultant.

7. Conclusions And Future Work

The primary contribution of this paper was to develop a shared-vision roadmap for future platform-based building participants when moving from project-based work approaches to a platform-based approach. Prior to this paper, no research had investigated the implications of the emergence of a platform ecosystem for each stakeholder in the construction value chain. The emergence of platform ecosystems necessitates construction businesses to consider how they can participate in a larger ecosystem as opposed to focusing solely on internal operations.

The theoretical contribution of this research was to understand and redefine roles for each stakeholder in the construction value chain to create a shared vision roadmap by understanding their motivations for moving towards a platform ecosystem and how their engagement model will be changed. Four enterprises in Australia, that represent key stakeholders of the construction value chain, were selected for knowledge elicitation through individual discussions. The perspective pitches for the primary stakeholders comprise developers, general and specialized contractors, designers and engineers, while the rest of the value chain is grouped under associated stakeholders. Across stakeholder groups we observed an intent for moving value-adding products and services upstream, expanding contribution to the value chain, continuous improvement through data-driven insights, seamless collaboration in a partnering environment and early prototyping were shared across stakeholder groups.

The practical contribution of this research leads to the progression of companies towards the emergence of integrative frameworks of platform ecosystems as a changed nature of engagement was observed where the general contractor ceased to be the single point of engagement with the associated supply chain actors; this role was most likely to be taken up by the developer or the platform consultant. Despite the relevance of the findings of this paper, there are some blind spots in the value chain actors in terms of financiers (upstream) and asset managers (downstream) who also will play critical roles in the platform ecosystem; however, during the course of this scoping study, it was not possible to collect primary data from these actors. For a longer study, these actors are required to be included in the value chain and their motivations and roles explored.

Acknowledgments

The authors would like to acknowledge that this research is funded by the Building 4.0 CRC, an industry-led research initiative co-funded by the Australian Government.

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