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# PLATFORM THINKING FOR CONSTRUCTION

TRANSFORMING CONSTRUCTION NETWORK PLUS  
DIGEST SERIES, NUMBER 2

# RESEARCH PROGRAMME

## TRANSFORMING CONSTRUCTION NETWORK PLUS

The Transforming Construction Network Plus (N+) mobilises a new movement in the construction community, bringing together experts from a range of disciplines to tackle the most pressing problems across the digital, energy, construction, and manufacturing space.

The N+ is funded by UK Research and Innovation, an investment supported by the Industrial Strategy Challenge Fund. The N+ is a joint project between The Bartlett, UCL Faculty of the Built Environment, Imperial College London and WMG, University of Warwick.

The N+ research team is working to contribute to the body of knowledge that informs future construction practice and policy. As well as the digest series, the team will be developing academic papers and case studies exploring business model and industry change. We hope you find this digest useful, and welcome any questions or feedback you may have. You can reach the team at [enquiries.tcnetworkplus@ucl.ac.uk](mailto:enquiries.tcnetworkplus@ucl.ac.uk).

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# INTRODUCTION

## WHY PLATFORMS?

Platforms are big business. In 2017, between 60% and 70% of start-ups with current valuations of \$1 billion or more were platform businesses<sup>a</sup>. Platforms underpin many of the world's most valuable companies<sup>b</sup>.

Perhaps as a result, platforms are appearing everywhere: Google and Apple have technological platforms, mobile devices are advertising platforms, consoles are games platforms, and manufacturers use product platforms. Given that platform thinking has the potential to create value and enhance productivity, it is understandable that it is increasingly being discussed within the construction sector.

However, there are many different concepts within platform thinking: Wikipedia - another platform itself - lists over 20 distinct uses for the word platform.

This digest aims to clarify the ongoing conversation around platform thinking in construction, and organise how we consider the benefits of adopting a platform strategy. It begins by exploring the main categories of 'platforms' that are adopted by businesses. It describes how platforms are categorised in management research, synthesising insights from several key authors and considering how each concept is, and can be, applied to construction.



<sup>a</sup> Crunchbase Unicorn Leaderboard

<sup>b</sup> Bloomberg, the world's most valuable brands 2018

# WHAT ARE PLATFORMS?

The term *platform* has been applied at a variety of scales including products, product systems, industry supply chains, markets, industries, and even across groups consisting of multiple industries.

Irrespective of scale and context, platforms share some common features:

- + A set of low variety core assets (i.e. components, processes, knowledge, people and relationships). The core assets are replicated multiple times, enabling platform owners and participants to gain competitive advantage by enhancing production or delivery efficiency.
- + A complementary set of peripheral components that exhibit high variety. The use of interchangeable peripheral components results in a diversity that creates distinctive offerings to the market<sup>1</sup>.
- + A stable interface that acts as a bridge between the stable core and variable peripherals, permitting innovation in both core and peripherals.

Thinking about organisations, their structure, products, parts and processes as platforms permits a new perspective on each as platform, peripheral, or interface. This enables organisations to act as a platform owner, generating opportunities to create and capture additional value.

We now describe four types of platform: **platform organisations, product platforms, platform ecosystems and market intermediaries**, exploring how each helps businesses to create value.

# TYPES OF PLATFORMS

## Platform Organisations

Platform-based organisations are structured so that they can combine an interdependent set of assets and capabilities, allowing them to transform and shape their structures quickly. This enables them to adapt to rapidly changing markets, or to withdraw from a market when the opportunities recede. Where the underlying market demand is relatively static the need for such dynamic organisational capabilities is reduced.

As an early example, in the 1980s, Olivetti adopted an organisational platform strategy to address the rapidly-changing computer industry by consciously separating the development of its platform standards and technologies from the development of products<sup>2</sup>. This allowed them to adopt 'at the last minute' technologies that could be bundled quickly into products to satisfy emergent market demand, or to respond promptly to their competitors' moves.

## Product Platforms

Product platforms require a shift in focus from a construction mind-set to a manufacturing mind-set. They allow organisations to develop product families based on a stable central technical architecture and a range of peripheral components. Organisations adopting product family strategies can develop distinct product offers, and so target multiple market segments over time by adding features to, or removing them from, a core model.

The benefits of product platforms include time and costs savings, flexibility, responsiveness, and better opportunities for learning across different products<sup>1</sup>.

## Platform organisations in construction

The structure of some tier one contractors might already be considered to be an extreme version of the platform organisation. These companies have a very lean administrative and managerial core, plus well-established contractual relationships with suppliers; together they deliver products and services that are recombined to meet a wide range of market demands. This model can be effective when interfaces are well defined, but the *ad hoc* nature of projects and problematic interactions between main contractors and their supply chains results in multiple inefficiencies, so limiting the possible gains from being a platform-based organisation. In this scenario, a comprehensive specification of expected outcomes might improve the interfaces and ultimately help to overcome such inefficiencies.

Three types of product platform: scalable, modular and generational are described overleaf. While modular and scalable platforms seek to deliver product variety at a moment in time, generational product platforms aim to leverage platform stability over time.

**Types of product platform****SCALABLE PRODUCT PLATFORMS**

- + These retain a core product, but are able to scale the product by varying one or more of its design parameters.
- + For example, Black & Decker designed a drill motor platform that could be scaled along its length to generate a wide variety of power outputs for different markets, allowing them to exploit scale in production.

**MODULAR PRODUCT PLATFORMS**

- + A core of features or components in a product family to which interchangeable peripheral modules are added to create the distinctive products.
- + A module is a large group of components or sub-assemblies that have standardised interface designs.
- + Modularisation allows products to be varied with little impact on production.
- + Modular platforms have delivered flexibility and cost savings in the automotive sector, allowing organisations to coordinate the global production of components and modules.

**GENERATIONAL PRODUCT PLATFORMS**

- + Products are designed so that changes between generations can be readily accommodated<sup>3</sup>.
- + By examining the likelihood of change in each of the components of a product over time, a decision can be made as to whether to invest in the development of a stable core platform, or to simply develop unique products to meet demand at a moment in time.

Today, companies from multiple industries (e.g., cars, clothes, food and beverage, software) exploit product platform strategies to offer a variety of products and services. Sony was one of the first companies to adopt a product platform strategy in the 1980s; by rearranging existing features and cosmetic redesigns it was able to offer 20 new models every year. Similarly, in 2015, Tesla adopted a platform approach to its battery production by introducing Powerwall, a line of batteries for use in energy storage systems in homes and businesses.

Digital technology has enhanced the use and potential of product platforms. For example, Applanix, a navigation software company, offers an 'autonomy development

platform' for vehicles, targeted at automotive manufacturers. It includes an adaptable Navigation solutions kit with multiple sensors, including cameras, radar and ultrasonic sensors, suitable for all vehicle types at all stages in development and commercialisation.

**Product platforms in construction**

Modular product platforms have not been widely adopted in construction, but the potential shown in the platform-based production of cars is recognised by many people in the construction industry.

In 2018, Bryden Wood worked with the Centre for Digital Built Britain (CDBB) to develop the idea of product platforms for delivering the UK Government estate<sup>4</sup>. The study identified three structural grids that would be suitable as a core for all governmental buildings. Bryden Wood then went on to develop the open source 'Platform 2', a standardised, fast-assembly superstructure, suitable for use with schools and

**Platform Ecosystems**

The idea of a platform ecosystem is an interesting new idea which is gaining traction. It is a network of organisations linked to, or operated around, a focal firm or platform. Annabelle Gawer<sup>5</sup> describes how this platform acts as a central point of control within a wider business or trading system. In other words, the platform in an ecosystem acts as a hub of value exchanges, coordinating buyers and sellers through complementary assets, services, and technologies.

Platform ecosystems can leverage digital technologies to create positive feedback loops to increase the value of the platforms for each new participant<sup>6</sup>. For example, Microsoft's Outlook has transformed its e-mail product into a platform that connects users to a multitude of third-party services such as Uber, Yelp, and Evernote – this development enables Microsoft to compete directly with Google's Gmail and iPhone's email app.

For those developing platform ecosystems, there are some key challenges to overcome, such as:

- + Understanding how others' complementary assets might enable the platform owner to create value.
- + Establishing governance rules to manage third-party innovation on peripheral components, to ensure the integrity of the coordinating platform is maintained.

residential-style accommodation. The Construction Innovation Hub are using this building chassis, or product platform, as one of the frame options for their open call for platform design<sup>c</sup> exploring interoperability in construction. Some construction product manufacturers are also advancing their own forms of product platforms re-using volumetric, panelised and component level assets across a range of building types.

**Platform ecosystems in construction**

In construction, a growing demand for digitally-enabled project workflows represents an excellent opportunity for technology companies to create platform-based ecosystems, with software tools being the core and interoperability providing the necessary variety. The key examples here are Autodesk, Bentley Systems, Trimble, and as a recent entrant, Kattera's Apollo. These technology products digitally enable the entire project lifecycle, but can be used with other software applications.

External organisations can leverage the platforms and use their own complementary capabilities to create new value propositions. A designer using Revit, for example, creates value for their clients through design, and shares that value with Autodesk through a license fee. Other organisations are delivering digitally-enabled solutions for collaboration and project management solutions (e.g. nPlan, Procore), leveraging the benefits of data and the cloud, creating platform-based ecosystems, albeit at a smaller scale.

<sup>c</sup> [www.constructioninnovationhub.org.uk/platform-design-open-call](http://www.constructioninnovationhub.org.uk/platform-design-open-call)

**Market Intermediary Platforms**

Market intermediary platforms act as a link between two or more markets or groups of producers and users. Here, platform owners facilitate efficient transactions between buyers and sellers, removing bottlenecks and transaction costs, and capturing some of the value created along the way.

While EBay is an obvious example of a market intermediary platform, videogame platforms, such as Nintendo, and Sony PlayStation, also act as intermediary platforms connecting gamers and game developers. A challenge for market intermediary platform owners is that they need to attract buyers (in this case, gamers) to persuade sellers (the game developers) to engage with the platform, and similarly, they need sellers to induce buyers.

**Market intermediary platforms in construction**

Market intermediary platforms are quite common in construction. For example, markets have been made for bricks in the UK (brickhunter.com), steel in China (Zhaogang.com) and there are multiple market platforms for surplus and post-use construction materials to promote a circular economy. While Zhaogang is one of the larger construction market places, the post-use construction materials markets demonstrate all too clearly the ‘chicken and egg’ challenges that market intermediaries face, with many being inactive, and others so far demonstrating low uptake.

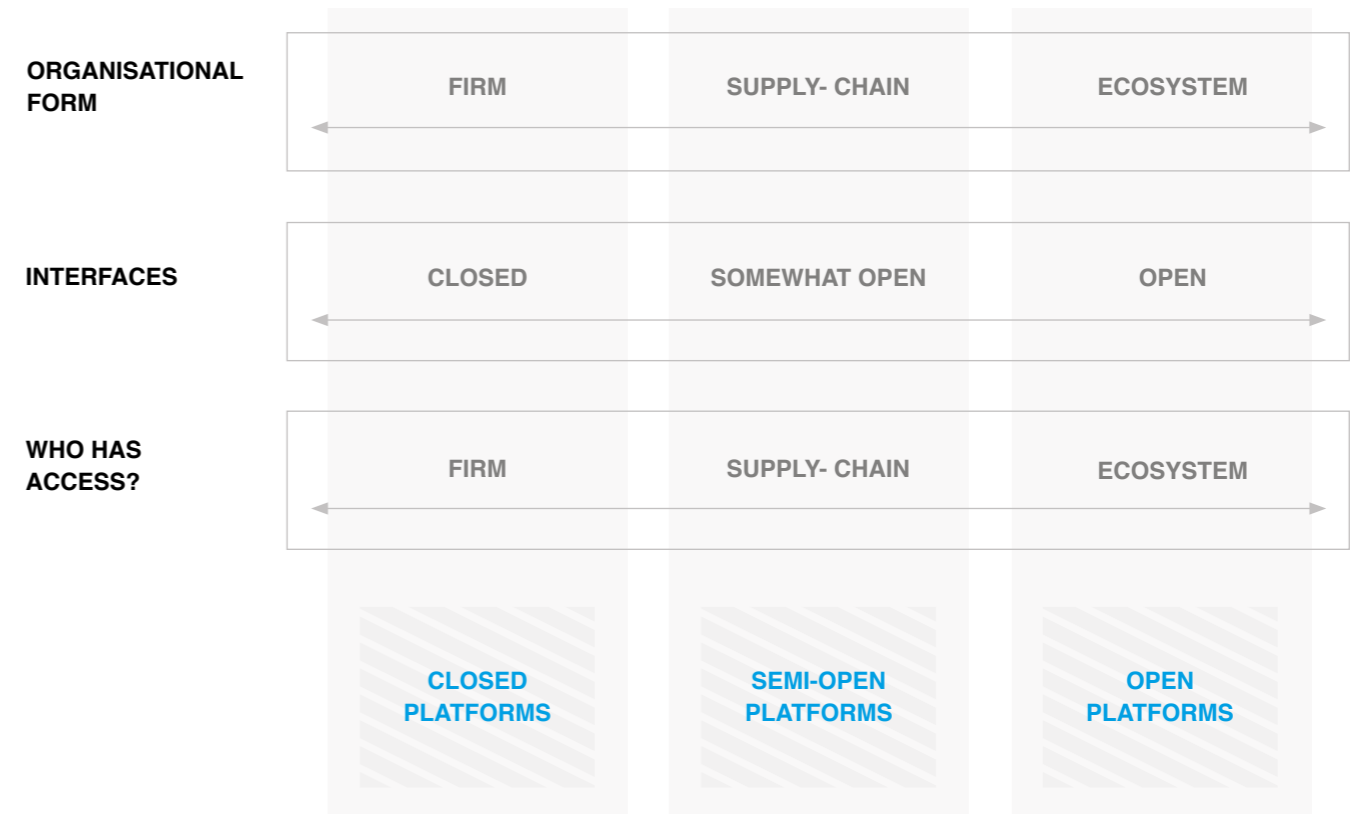
# THE OPENING UP OF PLATFORMS

The four categories of platforms range from predominantly firm-internal or closed platforms (organisational and product platforms) to increasingly complex firm-external (open) platforms (market intermediary platforms and platform ecosystems).

Semi-open, or supply chain, platforms can also be developed where participation is by the invitation of the

platform owner, such as the procurement frameworks that we see in construction<sup>7</sup> (Figure 1). Internal platforms deliver competitive advantage through economies of scope and scale. Industry or ecosystems platforms, however, succeed by dominating a market and gaining power through market leadership.

**Figure 1: Organisational and governance configurations in platform**

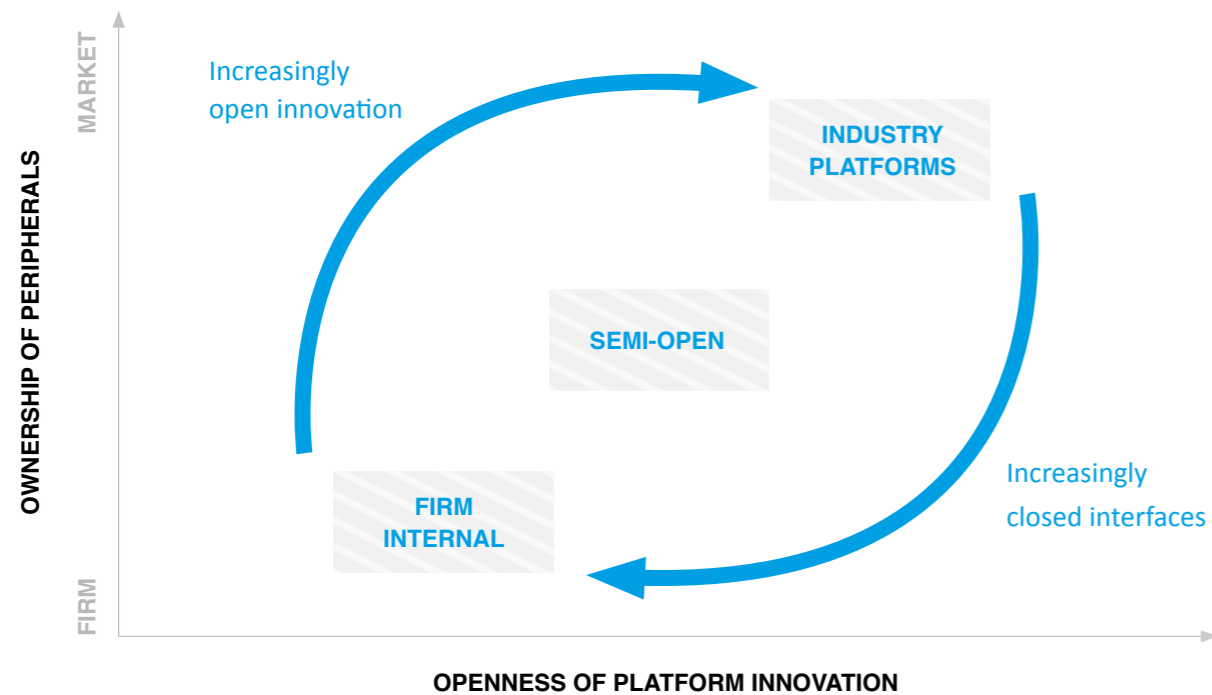


Adapted from Gawer<sup>7</sup>

Interfaces that are open, stable and versatile are key to the stability and variety in a platform. These interfaces facilitate and govern the interactions between the platform and its complementary components<sup>8</sup>, and may be the only aspects that remain truly stable over long periods of time. The specification of the interfaces is important because they allow innovation to take place

independently on each side of the interface. In this way, value and competitive advantage can be created by both core and/or peripherals producers, helping platforms to become enduring by evolving over time to meet changing market demand<sup>d</sup> (Figure 2).

**Figure 2: The opening up of platforms**



Adapted from Gawer<sup>7</sup>

A key challenge for owners of platforms with external interfaces is to ensure that external participants, such as complementors and customers, meet the platform's participation, performance and interface requirements. Governance of these requirements and relationship strategies may be undertaken by the platform owner (as is the case with Apple and Google), or handed to

third party verification services (such as the BBA or similar body, in the case of construction products). In construction the rules governing participation, performance and assurance are particularly important due to the potentially catastrophic impact of failure.

<sup>d</sup> Therefore, as well as being descriptive of the nature of the platform, the terms open and closed also refer to the forms of innovation that take place to evolve platforms.

## DIGITALLY ENABLING PLATFORMS – THE MOVE TO 'PLATFORM DESIGN'

Many platforms' workflows are enabled and made more efficient by the availability of digital technologies, driven by data. Electronic data can be shared, accessed remotely, is searchable, and readily updatable, enabling reduced transaction costs, faster decision-making, and more efficient communications<sup>9</sup>. Combining digital platforms with digital workflows can significantly increase the efficiency of organisational value creation.

Industries that rely on data processing, for example, finance and online marketplaces like Moneysupermarket and Etsy, have been quick to adopt digital technologies and workflows. Construction, however, has not yet widely exploited the opportunities offered by digitalisation and the adoption of product platforms<sup>1,10</sup>. One view is that construction relies on physical products, so there is a limit to the industry's ability to further digitalise, whereas others contend that the growing use of digital design tools will boost the efficiency of design and construction workflows.

At the centre of this debate, the concept of platform design has been emerging – it is described as '*... a digital process where a designer seeks to provide an optimum functional and aesthetic solution whilst being cognisant of and [...] adhering to the rule set of an appropriate construction platform*'<sup>4</sup>. In their call for evidence relating to a 'Platform Approach to Design for Manufacture and Assembly (P-DfMA)'<sup>11</sup>, the IPA elaborate on this description, proposing the use of: '*a set of digitally designed components across multiple types of built asset*', and note that the designer should '*apply those components wherever possible, thereby minimising the need to design bespoke components for different types of asset*'<sup>e</sup>. Note that the IPA description does not refer to a stable core of assets; rather, it offers a more open interpretation of the word platform than we have explored so far. It also advances the idea of a common product platform raising the question of how we might achieve commonality in an industry accustomed to variety.

<sup>e</sup> At the time of writing, the IPA have yet to publish the results of the call for evidence.



## SO WHAT DOES ALL THIS MEAN FOR CONSTRUCTION?

Platform design requires a library of digital components that reflects physical components which links to other digital workflows. The digital library reflects the physical components. Both physical and digital components are described so that they can be recombined efficiently. Put another way, the efficiency of the design and delivery process can be improved through the use of a pre-defined digital kit-of-parts that represents a physical counterpart.

Digital assets can be at different scales – components, sub-assemblies, through to building volumes and buildings. In practice, many companies already use and re-use their digital assets in design to enhance their design workflows, within and across projects. By doing so, their experience from design and production is gradually refined and captured in the library for future use<sup>12</sup>. Yet the extent to which digitised assets can be reused on subsequent projects depends upon whether those projects share common components, and whether the digital asset is associated with a specific physical counterpart that will be re-used.

Platform design is also evident within configuration tools: these parametric design tools, such as Prism (prism-app.io) and Seismic (seismic-school-app.io), support the design for manufacture of apartment blocks and schools. They embed many of the common design rules and regulations that shape design, and enable a large amount of design work to be performed efficiently and at scale<sup>13</sup>.

For example, Project Frog<sup>f</sup>, a US industrialised construction organisation, have developed a scalable digitised market offer. Working with Autodesk's platform, they have combined the role of market intermediary platform with platform design, allowing designers to use a configuration tool to design buildings using parametric software. The designs are then linked to a semi-open market place in which pre-approved merchants can price and manufacture the product parts required to deliver the project.

## SHIFTING TO PLATFORMS

This digest has identified a number of cases of platform use in construction and in other sectors.

The benefits of platform adoption are evident; there is potential to improve both productivity and cost-effectiveness of the building design and production process.

So, how might organisations re-structure their offering to take advantage of these benefits? This digest opened with the statement that five of the world's most valuable companies are platform companies.

### Approaches to designing a platform

#### A TOP-DOWN APPROACH

- + A top-down approach is quite common. Here, platforms are conceived and designed from scratch before implementation. Yet in practice, organisations already have an existing and complex product portfolio, organisational structure, and route(s) to market(s).
- + Top-down may only work for newly-formed organisations or operating units, oriented entirely to work via a platform model.

#### A BOTTOM-UP APPROACH

- + In a bottom-up approach, existing structures are analysed with a view to understanding what is – or might be – common or core to the organisation's structure or offer, what needs to be varied (in order to deliver on the market's expectations of variety), and how the interfaces operate.
- + Bottom-up platform development may only work for existing organisations that are willing to change, perhaps radically, to adopt a platform model.

In either case, the adoption of a platform model requires engagement with the detail of an organisation, network, and the market – successful adoption is a significant act that affects how companies create and capture value, and therefore, is deeply intertwined with an organisation's business model. From the perspective of the platform's external participants,

Many didn't start out as platforms. Amazon, for example, launched as a retailer; Google began with the idea of search. As digitisation of the construction industry becomes more prevalent, a critical challenge will be to develop a deeper understanding of how organisations can deliver digital and physical platform strategies. This requires an exploration of both the changing nature of demand and competition in the market, from the sale of standalone products to platform-based, interconnected products and services<sup>14</sup>.

they will also need to consider the extent to which they cooperate or compete with other platform owners. We further explore how organisations in the construction industry can (re)design their business models to create and capture value in our first digest, available on the Transforming Construction Network Plus website<sup>15</sup>.

<sup>f</sup> www.projectfrog.com

# CONCLUSION

## PLATFORM THINKING FOR CONSTRUCTION

Our understanding of this subject is still emerging, and over the coming years we expect to see multiple, novel platforms launching across the construction industry.

Platforms present us with a new way of thinking about products, organisations and service delivery, drawing attention to a clear distinction between the stable core, variable peripherals and the interface between them.

While platforms share some common features, they vary significantly in size and scope. Platforms can be physical or virtual, some are both. They can be contained within a single firm, or across a supply chain, while others are spread over ecosystems consisting of thousands or tens of thousands of firms. They provide organisations with the opportunity to create value by enabling them to meet market demand for variety, while still benefitting from economies of scale and scope.

However, it is important to be clear about the distinctions between key platform types, including:

- + platform organisations
- + product platforms
- + platform ecosystems
- + market intermediary platforms

Being able to distinguish between these types of platforms is helpful, but in the longer term, if we are to exploit the benefits of platforms, we need to understand who the platform owner is, and identify the opportunities for organisational competitive advantage, value creation and capture.

We also need to articulate how platform design and digitalisation can work hand in hand to improve productivity and contribute to value-based delivery of construction projects.

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