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# THE ROLE OF INDUSTRY – UNIVERSITY COLLABORATION IN THE TRANSFORMATION OF CONSTRUCTION

TRANSFORMING CONSTRUCTION NETWORK PLUS

DIGEST SERIES, NUMBER 4

# 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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### RECOMMENDED CITATION

Jones, K., Mosca, L., Whyte, J., Davies, A., Glass, J., 2021, The Role of Industry – University Collaboration in the Transformation of Construction, Transforming Construction Network Plus, Digest Series, No.4

# INTRODUCTION

Industry and universities can work together – there are so many ways in which they can collaborate, whether this means developing ideas together or exploring problems to find a way forward – collaborating on research in areas of mutual interest, however, is both important and timely for the industry at the moment.

It is fair to say that most universities and many construction industry players share common objectives around the creation and sharing of knowledge and ideas. For example, they share the notion that investment in Research and Development (R&D) helps them to stay ahead of their competitors, whoever they may be. R&D helps firms to obtain new knowledge, create new technologies, products and services – and likewise, universities flourish because of the research that they do<sup>1</sup>.

The UK Government's recent spending review signals a clear ambition to grow research and innovation in the UK, and the 2020 Research and Development Roadmap<sup>2</sup> highlighted the need to connect researchers and firms. The recently launched Construction Playbook<sup>3</sup> provides many opportunities for them to work together to advance industry transformation.

**Importantly, construction firms can grow and thrive if they can build on research undertaken in universities – so it is in everyone's interests to make this relationship even more successful.**

In this digest, we explore how industry and universities can and do work together to develop and increase the stock of knowledge and ideas, and in doing so, support the ongoing transformation of the construction sector and firms in it. We focus on connections between **industry** and **the academic research community** (rather than industry's links to students on taught programmes, via sponsorship and placements, etc.).

We begin by highlighting the benefits, and the practical ways that industry and university academics work together to provide thought leadership, co-produce novel managerial and theoretical insights, before exploring some ideas around research collaboration between industry and universities. The digest then provides some suggestions on how these relationships might be further enhanced to support the rapid sharing of knowledge to address the key transformational challenges that we face.



## WHO BENEFITS FROM RESEARCH, AND HOW?

There are many benefits of collaboration between industry and academia, but each party may value these slightly differently<sup>4</sup>.

Typically, academics working in universities will value most the intellectual ideas and outcomes from their research, as well as the benefit (sometimes called impact) that their work has, say, for the general public, industry, or government.

Academics are interested in the opportunity to gain access and insights from firms, projects and practitioners to develop new knowledge, or new perspectives on their area of research demonstrating thought leadership. Academics describe this as ‘data collection’. It gives them the chance to write scientific articles (journal papers) – these are a key motivator for many academics because their publication is regarded by peers as a mark of success – they may also write books or reports.

Firms, on the other hand, may place more value on the enhanced production and innovation opportunities that arise from R&D – the commercial benefit. Yet they could also benefit from access to the latest thinking, an impartial challenge to assumptions, new resources, capabilities and knowledge – if they worked with academics more routinely.

Working with universities offers input from skilled researchers, opportunities to co-create and shape new knowledge, and develop new R&D projects, patents and licenses. In some instances, streams of funding for research projects may only be accessible to industry when firms pair up with universities, to get the best from both worlds.

Given these potential benefits, are there ways in which industry and academics can work together productively, for instance, to create, share and implement new knowledge?

### Knowledge production

Table 1 highlights some of the many ways academics, policymakers and practitioners can collaborate to produce new knowledge. The interactions show that collaborations can take place over a range of time periods – from a few days (for ad hoc advice or consultancy) to many years (for major programmes of R&D). Importantly, this can be determined based on

organisational needs, for instance, the collaboration might narrowly define the new knowledge to be created, or it may be much more open and exploratory. For more substantial, or long-term projects, firms should be aware that universities can employ additional staff members – called researchers, or research fellows – giving a dedicated, skilled resource to the collaboration.

**Table 1 – Industry / academia knowledge co-creation pathways<sup>5</sup>**

KNOWLEDGE DEVELOPMENT	FORMS OF ENGAGEMENT	DURATION	
	Use of facilities or IP	As required	
	Incubation & Acceleration	As required	
	Consultancy	3 months +	
	Industry sponsorship	+ Masters sponsorship + Doctoral sponsorship + Academic research projects + Research partnerships	1-2 years 3-7 years 1+ years 2+ years
	Knowledge co-creation	+ Industry led + Academia led	1 year + 6m+

**In an engineering-based industry like construction, there is a tendency to focus research activity on the delivery of solutions to construction problems.**

As a result, many in the industry view the role of the academic as an **'academic intellectual'**, undertaking the basic research that, along with engineering, feeds industrial application and development.

Less well known is the influence of those who we can describe as **'engaged academics'**. They often undertake collaborative research projects which influence the construction industry more widely, for example through the implementation of technical solutions, their input to policy, and their knowledge of industrial or organisational strategy (Box 1).

Such work may not always have a visible, immediate, 'bottom line' effect, but the good ideas from an engaged academic can spread through the thinking of a firm or a sector, e.g. through its management practices.

#### BOX 1: ENGAGED ACADEMICS – ACADEMIC INPUT GUIDING INDUSTRY STRUCTURE.

The i3P is an industry-wide innovation platform enabling organisations in the sector to collaborate, develop new ideas and implement innovations to improve the performance of infrastructure projects for the future. It is based on the model developed for the infrastructure industry's first major infrastructure project-based innovation programme, Crossrail's innovation programme – Innovate18.

Innovate18 began with 12 members of the Crossrail supply chain. By the end of the programme, 18 organisations had joined the programme. Capitalising on the success of Innovate18 – which led to over £750,000 of investment – the Knowledge Transfer Network, Tideway and Crossrail developed the i3P platform, connecting industry partners and enabling industry collaboration on innovation to continue.

The roots of the i3P as an innovation platform build on the ideas and collaborations between academics from Imperial College and University College London who played a key role in formalising and designing that early innovation programme. Acting as neutral brokers, they were able to ensure that the programme benefitted from the latest thinking on innovation and megaproject management<sup>4</sup>. The project also provided a context for research for the academics, and this was match funded by Imperial College Business School<sup>6</sup>.

Sometimes this happens when it is spotted by people like management consultants who apply the ideas within their projects (Box 2).

Universities also provide funding and space for entrepreneurial scholars to develop and market-test technologies and start-up ideas in incubators. For example, the AEC Delta Mobility project<sup>3</sup>, which aims to tackle improve productivity, performance and quality in the construction sector, began life in 2015 as part of a research project at UCL.

Many university academics have access to funding that can mitigate the costs of knowledge creation and knowledge exchange – in both directions. Firms, practitioners and policymakers can often engage in this process, influence the direction of the work, and gaining access to any early results.

#### Asking questions – *what, how, and why*

**Academics and research staff bring rigour, neutrality, and a degree of constructive challenge to their activities in a way that others simply cannot. They often use simple questions to do so.**

Many start with the simple question of *what* – describing what's going on in a particular situation, group, or around a particular event, for instance. Beyond this, many academics who study construction want to find out and understand *'how'* and *'why'* things happen.

For example, **organisational and project management academics** focus on exploring the underlying characteristics of shifts in industry best practice, distilling their findings to develop new perspectives,

positions, and theories (Box 1). Answering these really important *'why'* type questions take time and input from a lot of different perspectives. That is why academics who study management often use interviews and case studies, rather than simple closed questions (these tell you how much (%) something is happening, and not *why* it is happening).

The long-term impact that can be achieved through collaborations between engaged academics and industrial researchers can be exemplary and highly influential. Box 2 describes work on Project 13, which began as a university-based consultancy project. It is now in the language of the industry, helping large infrastructure projects to be organised effectively.

#### BOX 2: ENGAGED ACADEMICS – PROJECT 13 CONSULTANCY DELIVERS IMPACT

Project 13 is an industry-led initiative that presents a series of principles for good infrastructure project governance. The 2016 Project 13 report 'From Transactions to Enterprises', encourages firms to adopt a project delivery model based around long-term enterprise collaboration. It lays out the learning from surveys and interviews with participants from projects across three major infrastructure clients. Even though Project 13 was led by industry, the study underpinning the report was originally commissioned as a consultancy project, drawing expertise from researchers from the Bartlett School of Construction & Project Management, in UCL.

This collaboration between industry and academics led to a report which had a significant impact, being cited in the UK's Industrial Strategy, Construction Sector Deal, and the Government's Construction Playbook. Project 13 has been adopted and promoted by industry consultants.

This project represents an excellent example of research collaboration and shows that academic researchers deliver robust, rigorous outcomes with significant impact.

<sup>4</sup> <https://gtr.ukri.org/projects?ref=104799>

### Knowledge Exchange

Table 2, below, shows some of the ways that academics typically go about sharing or exchanging the knowledge that they have gained through research – they can be collectively called **knowledge exchange pathways**. Across all the fields that relate to construction, academics are playing a key role in educating and developing people. They design taught courses using industry policy, case studies from business, and related research to ensure that they address the emerging needs of the construction industry. They also provide course participants with the knowledge required by professional bodies (e.g. CIOB, RICS, RIBA, CIAT, ICE, etc.). Courses are often delivered with the support of practitioners, so that future leaders and managers are well equipped to work in a transforming industry. Speakers are welcomed to universities to deliver lectures on industry issues with research staff and students alike.

Another way in which academics help to develop the workforce, is **short courses and continuing professional development (CPD)** – these may be standalone events, customised to a particular group or profession, or offered in collaboration with one of the professional bodies. CPD is a way for the latest ideas to reach industry practitioners in a timely manner, and also enables new ideas for future research to be sparked

through the interaction between participants. There are other pathways through which academics share and discuss knowledge.

The government-backed **Knowledge Transfer Partnership** scheme places academics and researchers in firms to bring rigour and insight to a specific industrial challenge, guided by the firm and the host university. The firm benefits from having additional, focused research capability for a challenge they face, while the academics and researchers gain valuable insight into research in practice. The costs are supported by **Innovate UK**.

Other knowledge exchange initiatives can place an academic in a practice environment, typically for a shorter period, but could equally place someone from industry into an academic context to support research teams to better understand the problems being explored. Academics are often invited to join industry steering groups and advisory boards. In these roles academics are able to provide an unbiased challenge to practitioners, leveraging the latest thinking in the field, and supporting the exchange of ideas. Informal knowledge exchange and application is also strongly sustained at events, networking and through communities of practice, which provide informal spaces for conversations between academics and practitioners<sup>7</sup>.

**Table 2 – Knowledge exchange pathways between academia, industry, and policy**

	FORMS OF ENGAGEMENT	DURATION	
KNOWLEDGE TRANSFER	Knowledge Transfer Secondments	1m+	
	Knowledge Transfer Partnerships	1-3 years	
	Executive training	CPD courses	As needed
	Bespoke short courses	Educating the future work force	
ADVOCACY	Steering groups	Industry leadership	As needed
	Expert panels		

## COLLABORATIONS BETWEEN UNIVERSITIES AND STAKEHOLDERS

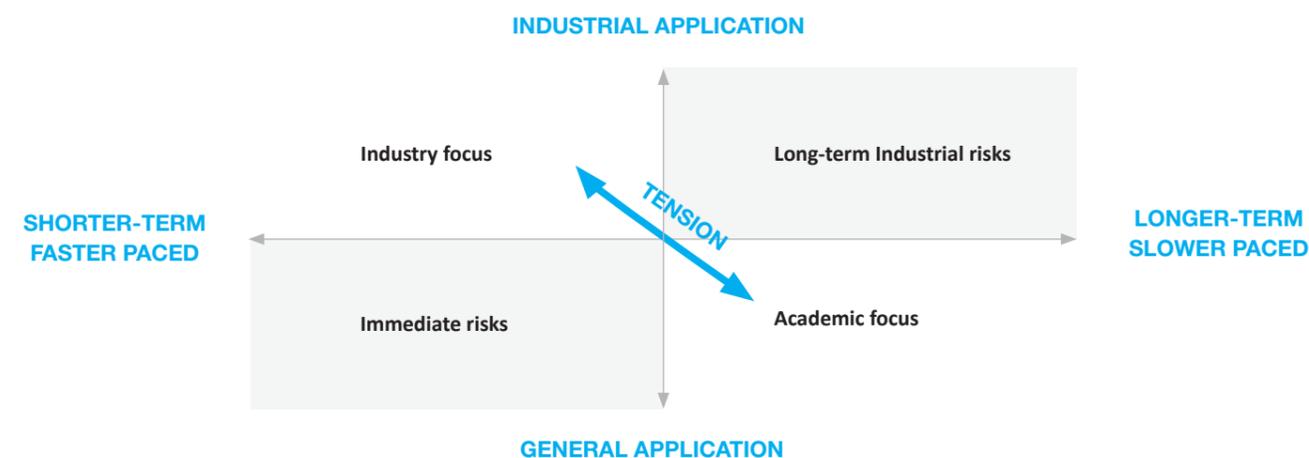
**There are many ways that academics and industry can work together. However, this flexibility may introduce tension into collaborations, as illustrated in Figure 1.**

Firms looking to gain a competitive advantage are more likely to want to address their own short-term challenges, typically very quickly. Research focusing on these challenges – delivered, for example, through a direct consultancy contract – may be less likely to generate the kind of knowledge that academics can use to publish in academics journals, not least due to the need for commercial confidentiality.

On the face of it, this could make consultancy less attractive to some academics, but there are a few strategies to overcome this barrier, for example, by:

- + using income from shorter-term projects to fund other research opportunities, providing academics with the freedom to explore their own scholarly interests;
- + using the opportunity to learn about the industrial context in which research is taking place – particularly of interest to engaged and entrepreneurial academics; and/or,
- + appreciating that these opportunities provide moments for academics to deliver impact from their research.

**Figure 1- The differing perspectives of industry and academia**



**One of the most common ways to deliver impact is through knowledge transfer processes adopted by academics.** Usually, this is done through publication in academic journals relevant to their academic discipline (such as ‘Cement and Concrete Research’, or ‘Project Management Journal’). Construction, as a domain, draws knowledge from across these disciplines, so keeping on top of emerging thinking can be a challenge. As a result, knowledge transfer from academia to the industry can often look rather haphazard.

Yet, three distinct ways of organising technology and knowledge transfer have been developed – Technology Transfer Offices, Academic Incubators and Research Centres. These are a means to formalising and improving academic collaborations with stakeholders, including industry and government bodies. They align universities with the industry by encouraging ongoing interactions and dialogues, supported by the government to foster economic and social development.

**Technology Transfer Offices (TTOs):** the office at a university that manages the intellectual property and licensing rights for academics and students. TTOs also help academics to understand industry needs, and access critical resources, expertise and support in the commercialisation process.

**Academic Incubators:** university initiatives aiming to spark strategic partnerships between academia and industry. Academic incubators provide resources, and the social and physical environments needed to foster collaboration between academics, investors and industries.

**Research Centres with industrial participation:** these are groups of academics working together on collaborative research, whose collaborative efforts provide added value. They are in partnership with other organisations (e.g. firms) and often interdisciplinary in nature. They address significant international challenges and often create very significant impacts and influence.

In the UK, the UKRI funded **Catapult Network<sup>b</sup>** also provides facilities for the development and exchange of skills and knowledge in several disciplinary areas.

In addition, other organisations such as The Construction Leadership Council, Construction Industry Council and the National Centre for Universities and Business (NCUB) provide leadership and coordination to develop and support university-business collaboration across the UK.

**Universities are more interested than ever before in the exchange of knowledge, ideas and technology.**

Silicon Valley provides a good example of the innovative structures that can be developed from interactions between academia, industry and governments.

Here, the US Government provides land, flexible financing, stretched tax holidays and fitting guidelines to the IT cluster in California. The universities in the area provide a pipeline of talent to supply firms such as Apple, Alphabet Inc.’s Google, Facebook, and Netflix. University R&D funding is provided by the Government in support of its objectives, and the firms in pursuit of theirs. By breaking down the boundaries and sharing resources and knowledge between institutional spheres<sup>1</sup>, government, industry and academia all profit: taxes are collected on sales of goods; revenue is generated from new products and services; and knowledge is developed inside an appropriately funded research environment.

This model of innovation highlights the importance of leadership in developing, coordinating and integrating advanced innovation within and across regional and sectoral innovation ecosystems<sup>8</sup>.

Governments also play a leading role in encouraging the development of innovations that are relevant to their citizens<sup>8</sup>. For example, in the UK, the government funded Project X is exploring how to improve the delivery of government projects by linking university researchers and industry with the responsible policymakers (Box 3).

#### BOX 3: ENGAGED ACADEMICS – POLICYMAKERS, PRACTITIONERS AND ACADEMICS WORKING TOGETHER

Project X was conceived by the Infrastructure and Projects Authority (IPA) in 2016 to connect research in project and programme management with ‘real-world’ issues in the Government’s Major Project Portfolio (GMPP). It engages policymakers with academia, project professionals and other stakeholders to inform, guide and inspire an excellence approach to programme and project delivery.

Project X is ambitious, promoting and supporting rigorous research that is firmly grounded in clear pathways to impact – with the ultimate ambition of delivering savings for the Treasury and enhancing project management capability across government departments.

<sup>b</sup> <https://catapult.org.uk/>

# WORKING TOGETHER TO SOLVE GRAND CHALLENGES

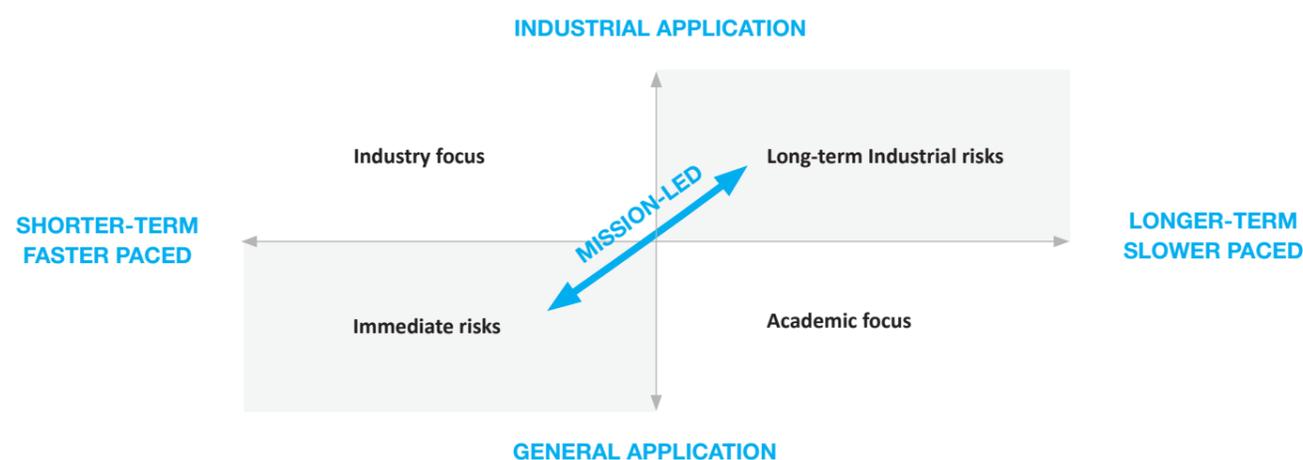
As a society, we are facing a growing number of “grand challenges” such as the current pandemic, climate change, natural resource depletion, racial, gender and financial inequality that are beyond the control of individual organisations.

Many are looking to the United Nations Sustainable Development Goals as well as government policy documents to steer their new strategic projects, for example, achieving ‘net zero’ carbon in the next 30 years.

**To tackle these challenges, we have to *do things differently*, and to *think differently*.**

This means we need to engage with risks that threaten society and industrial sustainability in both the short and long-term, as illustrated in Figure 2. Here, academics, practitioners, professional institutions, and policymakers all have important roles to play, and by working together, they will be better able to respond<sup>9</sup>.

**Figure 2 – Working together to address broader societal challenges**



<sup>9</sup> Adapted from <https://www.systeminnovation.events/blog/day-4-investing-in-systems-innovation>

**The Transforming Construction Challenge (TCC)** has played a significant role in coordinating change, working through the Centre for Digital Built Britain, the Active Building Centre, and the Construction Innovation Hub, which each build on relations between industry and academia.

However, progress might be accelerated by developing a coordinated, mission-led coalition across the sector. In this way, firms, professional bodies and academics can work towards a common goal, playing an active role in developing a new approach to construction: to listen to, to learn from, and work with each other to take steps towards much needed systems change<sup>c</sup>.

**For those in the academic community, however, the challenge for construction remains: how can we ensure the efficient and effective transfer of (discipline-based) academic knowledge to a (multi-disciplinary) industry?**

The Transforming Construction Network Plus (N+) was established in 2018 as part of the Transforming Construction Challenge to help form a bridge between academic, policymaker and practitioner communities. The N+ is an example of a temporary industry-academia collaboration that has led to increased knowledge exchange between construction practitioners and researchers for the benefit of firms, industry and society.

In this role, it echoes the longer-term structures that have been put in place for the transport sector (Transport Research and Innovation Board – TRIB) and the water industry (UKWIR). Here, academics in related fields are brought together to address common problems in each industry, and a collective short and long-term research agenda is developed.

Maintaining the gains achieved from investment in the N+ will involve nurturing and coordinating the emergent communities of interest within the construction sector – perhaps using some of the mechanisms outlined in this Digest.

**By listening to each other and working together, we are more able to bring the strengths of academic, practitioner and policymaker communities to resolve the grand challenges we face.**

### WHAT CAN YOU DO TO CREATE BETTER COLLABORATIONS?

- + Take time to listen and understand common points of interest and ways of working.
- + Discuss appropriate and realistic timescales.
- + Actively support colleagues who show interest and potential in knowledge exchange.
- + Seek strong, collective aims and ambitions that will drive innovations.
- + Work together to benefit from research collaborations and funding streams.



# CONCLUSION

## KEY TAKEAWAYS

As a society, we share many complex, system-wide grand challenges, including a pressing need to move quickly to a 'net zero' emissions economy. In addition, construction faces many of its own challenges and opportunities to develop as an industry.

Practitioners, policymakers and academics will have their own perspectives on how to meet these challenges. But the opportunity exists to develop more rounded, considered solutions through collaboration and the combination of our distinct perspectives and strengths.

In this digest, we have shown how academics and construction firms can work together at the depth and timespans to suit their particular needs. It presents a range of pathways through which academics can support the ongoing transformation of firms, and the wider construction sector, and how industry and policymakers can engage with and influence the work of academics.

We have described different types of academics, with different research interests and often different time-horizons from firms. Yet, we have also shown that firms and academics can both benefit from closer and effective research collaborations, by describing the outcomes of some successful projects.

Addressing the challenges we face may mean that we have to move away from our current ways of working. Doing so in the context of a coordinated, mission-led programme reduces the risks to individual firms, while supporting academic engagement.

The first steps, perhaps, are to ensure we understand each other's perspectives, and organising and investing to ensure the flow of information and knowledge between academics, practitioners and government.

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