INSPIRING SUSTAINABLE PROCESS INNOVATION WITH TIER 2 AND 3 SUBCONTRACTORS

Some of the best ideas in construction come from the small companies that are directly responsible for site production. Yet, many industry productivity initiatives are driven top down, by large contractors, and valuable solutions from the site-level supply chain are missed or overlooked. The 'Innovation Driven Procurement' (IDP) programme sought to tackle this challenge with a focus on improving profits, relationships, and projects for all parties involved. Innovation, the Sustainable Development Goals (SDGs) and a High Performance Work System (HPWS) connect to form the conceptual framework for the discussion in this paper. Ethnographic Action Research (EAR), which involved a series of workshops with three Tier 2/3 supply chain firms in the UK, offers the methodology for the empirical work. This provided an opportunity to generate new knowledge in situ whilst at the same time shaping practice. The research brought to fore people and social sustainability related interest for change and the importance of organisational citizenship type behaviours, which these arose in stark contrast to otherwise product invention oriented mindset.

Keywords: innovation, process, collaboration.

INTRODUCTION

Construction project organisation structure is a temporarily formed complex supply chain made up of a network of multiple actors that is established in response to client requirements. In such a network, subcontractors and suppliers are often classified in tiers: Tier 1 normally refers to larger contractors who typically act as integrators of the supply chain to deliver the project for a client by employing other firms to carry out site-based work and outsource design and management activities. Tier 2 subcontractors and suppliers are the companies that have a contract with the Tier 1 contractor. Tier 3 subcontractors and suppliers are then those firms who have a contract with the Tier 2 companies. The actors in Tiers 2 and 3 can include many micro, small and medium sized companies (SMEs) who carry out different trades, disciplines and specialisms, as well as consultants and contracting organisations of different sizes and various professions. Conceptual terms attached to describing and understanding this type of organisation structure include a loosely coupled system (Dubois and Gadde, 2002) and hollowed out firm (Atkinson, 1984; Dainty et al, 2007; Green, 2011). This setting often generates a competitive environment where friction and conflict between the actors are commonplace. Yet, paradoxically, the interdependency of the supply chain is a key characteristic of the construction industry with many heterogenous actors needed for construction goods to be obtained (Squicciarini and Asikainen, 2011) and for the building process to take place. Maximum visibility into the supply chain is important to minimize risks that may realise further down in Tiers 2 or 3 (or beyond), where they may not be immediately

apparent (Toikka, 2025). Risk areas include operational risks such as delays, shortages, and quality control issues; governance issues like lack of compliance with laws and regulations; commercial and contractual risks like low margins and unfair contract terms; environmental concerns, including CO2 emissions and waste; and social issues, e.g. poor working conditions, and low pay, to name a few (ibid). The allocation of risk in this supply chain structure has implications for the role of innovation. Passing risk down the supply chain can effectively turn off innovation (BIS, 2013) and those towards the bottom tend to bear the most risk (Green, 2016). Consequently, the perspective and experiences of those in the supply chain can be contingent on where they are placed in relation to the hierarchal structure of the industry with those at the lower levels of the supply chain being excluded from many attempts to bring about change (Briscoe and Dainty, 2002).

Innovation Driven Procurement (IDP) programme

A three-year 'Innovation Driven Procurement' (IDP) programme, run by Nottingham Trent University (NTU) and Morgan Sindall Construction, and funded by the Construction Industry Training Board (CITB), sought to tackle the challenge of engaging SMEs throughout the supply chain in innovation with focus on improving profits, relationships and projects for all parties involved. The programme aims were to strengthen the working relationships between the parties, and to help develop an enabling environment for the supply chain to develop better processes and solutions for improved productivity.

An Ethnographic Action Research (EAR) methodology, which consisted of four once weekly workshops on site as the central mechanism for delivery, engaged research participants from Tier 2 and 3 organisations in activities and discussion about behaviours and interpersonal skills relevant for innovation. Morgan Sindall Construction were the Tier 1 contractor for the IDP programme. They have well-established and long-standing relationships with several of their Tier 2 and 3 subcontractors and suppliers. The IDP programme and EAR methodology were based on a 'theory of change' approach (Rogers, 2014): for changes to occur in the construction supply chain, those that face the daily challenges of productivity on site must have a part in that change, rather than having change imposed on them top down.

The aim of this paper is to present an overview of the IDP programme findings in relation to *inspiring sustainable process innovation with tier 2 and 3 subcontractors*. 'Inspiring' was specifically the focus during week four in the series of workshops, and we will outline the conceptual framing for this segment of the overall programme, discuss the methodology employed, and highlight the key findings.

This paper is structured as follows: firstly, relevant literature is examined thematically, including a background to construction industry and innovation, the United Nations (UN) Sustainable Development Goals (SDGs) and a High Performance Work System (HPWS). Secondly, the research methodology and methods are explained. Thirdly, findings from the workshop four are presented before the conclusion brings the discussion to close.

LITERATURE

The construction industry and innovation

Some of the best ideas in construction come from the small companies that are directly responsible for site production (Ewart, 2019). Yet, many valued industry productivity initiatives are driven top down, by large contractors, and important

solutions from the site-level supply chain are missed or overlooked. Wright (2020: 3-4) argues that the explanations behind what makes one company more innovative than another go beyond organisational size and leadership (and technology); it is the culture that is created and reinforced every day that will drive rapid and long-lasting innovation. Research on innovation in construction is rich and diverse, including considerations of culture (see for example Lijauco et al, 2019; Hartmann, 2006), classification (see for example Sage et al, 2021), risk and investment (see for example Rutten et al, 2014), technology and BIM (see for example Harty, 2008; Shibeika and Harty, 2015), and collaboration (see for example Poirier et al, 2016).

Sustainable innovation is emerging as a key concern (Bossink, 2011), in part fuelled by the global commitment to the SDGs (Opoku, 2024). This is broadening the view on value of innovation beyond economic competitive advantage and firm survival to include considerations of building long-term relationships with others, to reduce the environmental impact of a project/ process, to enhance the well-being of people on site and their pride in their contribution and work, developing meaningful jobs, etc. These are themes central to the UN SDGs, which we discuss next.

Sustainable Development Goals (SDGs)

The SDGs provide schematic vision for the built environment to transform following key themes of People, Planet, Prosperity, Peace, and Partnerships (Gorse, 2024).

Figure 1: United Nations (UN) Sustainable Development Goals (SDGs)

The built environment provides an essential context to observe the global transition; offering an important physical baseline against which progress can and must be monitored and measured (Gorse, 2024). The SDGs offer a universal call to action and as such offer a useful framework to connecting local issues to global agenda. They tend to lack the specificity of organisational context however, and thus may appear elusive or impractical for guiding action. Therefore, within the IDP programme the SDG framework was used together with the HPWS, which helps locate the connections between people, organisations, and wider systems as discussed next.

High Performance Work System (HPWS)

The HPWS explains the connections between organisational practices and operating systems, how they influence people's performance, and the outcomes (see Figure 2). Within the HPWS sits the Ability, Motivation, and Opportunity (AMO) bundle, which argues that *"people perform well when:*

- *they are able to do so (they can do the job because they possess the necessary knowledge and skills);*
- *they have the motivation to do so (they will do the job because they want to and are adequately incentivised);*
- *their work environment provides the necessary support and avenues for expression (for example, functioning technology and opportunity to be heard when problems occur)"* (Boxall and Purcell, 2003: 20; Boxall and Purcell, 2022: 94).
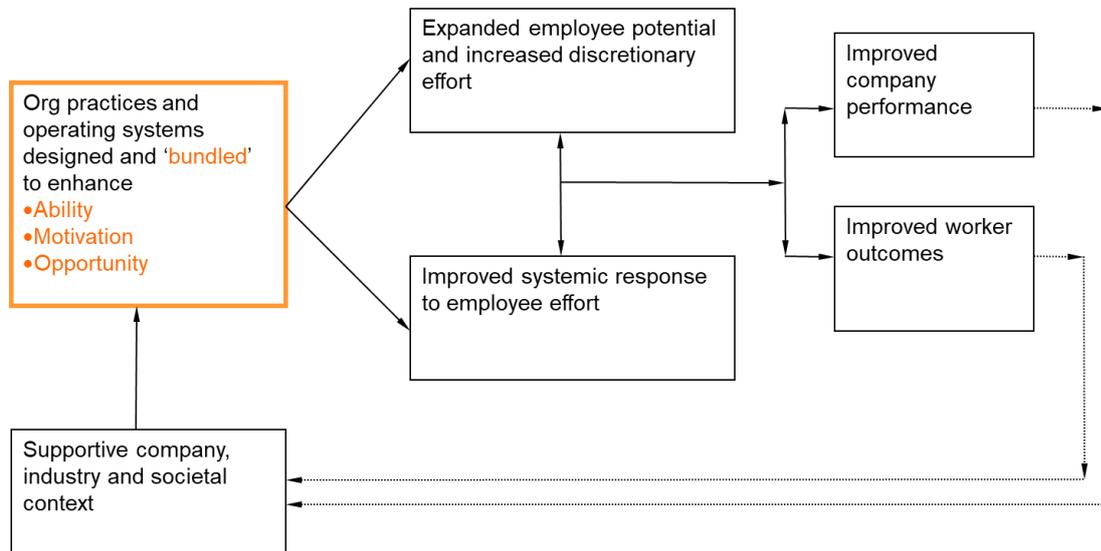

Figure 2: High Performance Work System (HPWS)

The AMO bundle explains that some influences on performance at an individual level are related to the circumstances and characteristics of the person, for example, their ability which may comprise experience, intelligence, and health; and intrinsic motivation. Other contributing factors relate to the situation, such as the organisation or project the individual is working for, and the types of policies and practices that managers operate in that context. The policies and practices will relate to how people are hired and trained to do the work (their ability), and systems of motivation such as pay, supervision, and feedback. Importantly, the AMO bundle also highlights that the work of all individuals is also embedded in a wider set of factors that shape peoples' opportunity to do the work. Contextual constraints and affordances then relate to technologies, tools and the work practices used. The broader context is also deeply social. Boxall and Purcell (2022: 95) argue that *"performance is enhanced when the social context of the firm is supportive: when managers and colleagues are helpful, sharing their know-how and offering assistance when difficulties arise."*
'Organizational citizenship behaviour' (Organ, 1988) is a conceptual term for a range of cooperative and caring behaviours that can be very valuable to collegial relations and teamwork. Research indicates that organisational citizenship behaviour relates positively to innovation (Naqshbandi et al, 2016; 2024). Cooperation is also essential for managing the environmental impact of operations and for how different disciplines and sectors view sustainable development (Levin, 2012). As such, when the AMO bundle is 'right' beneficial outcomes at the level of the individual, e.g. expanded potential and increased discretionary effort, can be realised together with positive outcomes for the organisation, e.g. improved company performance (as shown in Figure 2). In turn, this fuels a virtuous circle of wider supportive context which then enables continuous improvement of the organisational practices and operating

systems. These connections form the conceptual framework for the discussion about inspiring sustainable process innovation within Tier 2 and 3 subcontractors, after the research methodology and methods section next.

RESEARCH METHODOLOGY AND METHODS

The research approach for the IDP programme drew inspiration from Alvesson and Sandberg (2014) who discuss the problems with 'boxed-in' research and propose 'box-breaking' research as a strategy forward. The IDP programme was set up to break the 'method box'. Method box refers to a specific technique or research approach being privileged, and a researcher leaning on their specific methodological approach and applying it without much questioning (ibid: 972). Within construction management research community tradition has remained loyal to positivist and quantitative study for decades (Pink et al, 2013: 2). Ethnography has played a key role in the development of research in the field (see Pink et al, 2013; Tutt and Pink, 2019) and the continual evolution of ethnographic research in construction has helped prevent it from becoming boxed-in; see for example research using self-reflexive ethnography, rapid ethnography, autoethnography, and visual ethnography for a showcase the diversity of practice within construction. For some, box-breaking research means aligning ethnography and other forms of research alongside one another in their strategic frameworks to situate their work. The approach taken within the IDP programme aligns with Passos et al (2012) who employed ethnography with participatory action research with a view of mobilising the analytical qualities of ethnographic work together with the action orientation and desire to improve organisational work practices from action research. The 'Plan > Do > Observe & Reflect > Plan' cycle formed the centre of the methodology, which enabled integration of research into the IDP programme's continuous cycle of planning and doing. This way leans on a perspective where different approaches to research, such as participatory action research and critical ethnography, are *"uniquely compatible"* (Hemment, 2007).

Ethnographic Action Research (EAR)

There are four key principles to the EAR methodology (Tacchi, n.d) which were central to our philosophy and development of the empirical research within the IDP programme: (i) development of a research culture through which knowledge and reflection are made integral to ongoing development; (ii) the research aims, methods and analysis arise from, and then feed back into, a rich understanding of the particular place; (iii) drawing on participatory techniques to involve participants and workers both as informants and as fellow researchers; and, (iv) listening carefully to what people know from their own experiences and bringing this local knowledge into the ongoing processes of planning and acting. Implementation was across three stages as follows (for further detail and discussion see Raiden and Manu, 2024).

Stage 1: Plan
The planning stage focused on assessing the baseline situation before an action was implemented so that the changes resulting from the action research process could be evaluated. At this stage the workshop designs were also co-created by the lead partners: NTU and Morgan Sindall Construction.

Stage 2: Do
The action phase involved a structured intervention in the form of four weekly workshops, which were held face-to-face in the site office of a live £57m construction

project in Birmingham, UK. This specific site in was chosen because it was a familiar work environment for the research participants, and as such helped to situate workshop content within in the context where the issues being addressed manifest.

In the programme of workshops, weeks one to three sowed the seeds for behavioural change, motivation, and collaboration. In workshop four, which is the focus in this paper, the SDGs and the HPWS model were first introduced and explained separately and then used together to highlight the connections between individual, organisations, and wider societal context. The aim was to showcase how the Tier 2 and 3 subcontractors' input is a crucial part of a whole system. As shown in Figure 3 below, the SDGs were displayed in place of the 'supportive company, industry and societal context' in the HPWS model to show a visual illustration of how the two frameworks could be understood to link. This was used as a base for developing discussion about ideas for innovation the workshop participants may have.
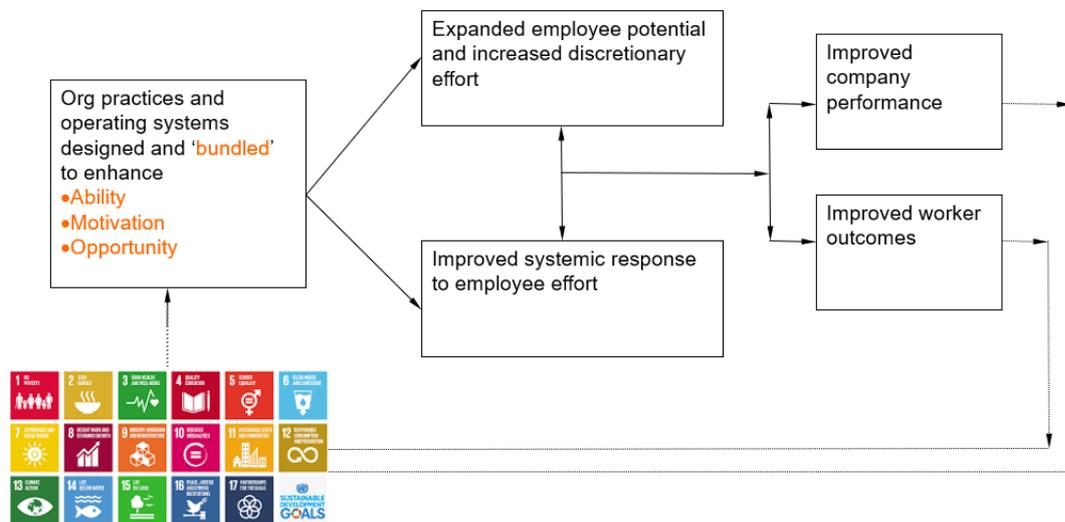

Figure 3: Connecting the HPWS and SDGs

Stage 3: Observe and reflect

A researcher from NTU was embedded in all the workshops as a participant observer who documented conversations and outcomes of activities that took place. All artefacts that were produced were also gathered and analysed. At the end of each workshop, participants reflected on what they had learnt and the direct impact that this could have on their work. They completed post-workshop evaluation and feedback forms. After each workshop, this feedback was reflected upon by the IDP programme team and used to improve the next workshops, hence completing the plan, do, observe, reflect cycle.

Sample

Overall, the IDP programme included 46 organisations. Morgan Sindall Construction was the Tier 1 contractor and provided three Tier 2 and 3 firms from their existing network to participate in the workshops. These firms included a specialist Drylining Contractor, a specialist Mechanical and Electrical Contractor, and a specialist Ceiling and Interiors Contractor. Both managers and workers from each specialist supply chain partner attended the workshops. The other organisations received various different forms of support, for example consultancy advice developed on the basis of the workshop findings.

FINDINGS

The engagements enabled a two-way dialogue and fostered collaboration and mutual respect between different stakeholders, which were important themes in the research findings. The research findings from the workshop four specifically brought to fore people and social sustainability related interest for change and innovation as summarised in Table 1, and these arose in stark contrast to otherwise product invention-oriented mindset.

Table 1: Links between innovation and SDGs from workshop 4

Summary of views from Tier 2 and 3 participants	Type of innovation	Link to SDGs
Better facilities, possible break out spaces to reduce the divide between site and management; Employing people from non-construction backgrounds looking for a career change into the trades; Using social media e.g. WhatsApp for the site; Supervisors taking the time to communicate with an apprentice to pass on knowledge; Employee reward vouchers and awards during the project rather than at the end; Supervisors listening to the workforce for safety innovation and point of use risk assessment; Green card system for good work not just red cards for problems; Integrated rather than segregated facilities for site management and operatives.	Process	SDGs 3, 8, 10, and 17.
Reduction in the size of boards; Rock steady clips; Dust supersession for a broom or vacuum; Twist fixings for dovetail flooring; More efficient Hilti one shot fixings; Reduction in plastic wrapping and packaging; Reusable shower proof covers to protect materials; enough wheelie recycling bins across sites.	Product	SDGs 9 and 13.

The findings reveal how the tendency to focus on product invention and cost considerations present key barriers for process related innovation, yet at the same time can offer favourable advances towards achieving SDG 13 on climate change. This is particularly significant because the workers were used to fixing materials and products on site and their orientation towards product invention as innovation seemed to make them more prepared to engage with innovative products which tackle net-zero if they were engaged on the use of such products as part of innovation improvement initiatives. Taking advantage of such an orientation of the frontline workers towards product invention (whether 'natural' or learnt) can afford opportunities to capitalise upon and deepen the full supply chain's commitment to and collective action on innovation and sustainability. However, the product/ invention orientation also means that the process related innovations need much more effort to embed.

In terms of process innovation, the social context of work and an opportunity to perform well arose to the fore in the fourth workshop. Specific ideas put forward included: *"sharing positive feedback, verbally and continually"* and *"having a conversation about 'what is going on' rather than identifying and pointing problems."*

Such comments often arose within a broader theme for discussion about training middle managers, specifically on people skills: how to talk with and listen to people *"instead of barking at people"*, collaborative behaviours, teamwork, and an open-door policy. Management visits on site/ shadowing workers to appreciate and understand everyday issues and challenges that come up were also highlighted as potentially useful ideas to enhance connectivity between the workers and site management teams. Such discussions linked management presence in induction and connecting with workforce on site leading to and showing respect and reduced feeling of 'them and us' between the Tier 1 and Tier 2/3 workers. These are all integral to the organisational

citizenship type behaviours, and the need for supportive and helpful managers and colleagues, caring, and teamwork as highlighted in the discussion on HPWS (Boxall and Purcell, 2022). They contribute to worker well-being (SDG 3) and decent work (SDG 8).

Other ideas, for example, one of events as a recognition of work well done (a BBQ/ fish & chip van/ ice cream van on site on a Friday afternoon) and employee of the week/ month scheme, were also mentioned as potentially relevant and appropriate rewards that would help focus on positive behaviours and meaningful contribution to a project. These relate to motivation and having an opportunity to develop a sense of belonging to the wider team, themes connected to SDGs 3 and 8 again.

With regards to innovation directly, the following quote is representative of much of the discussion: *"Creating a working environment receptive to ideas and improvements, bottom up!"*

One key challenge discussed at some length was that this group, i.e. the subcontracting workers, face an 'earn versus learn' dilemma (see BIS, 2013). Operational risks in particular: delays, materials and/or staffing shortages, and quality control issues, together with social issues related to not feeling valued or listened to, limit the Tier 2/3 subcontractors resource availability and turn off innovation. In the findings, high premium was placed upon informal behaviours and interpersonal skills as key to improvement. An enthusiasm for continuous improvement was evident and there is much potential to work towards SDG 9: innovation, industry and infrastructure. The participating firms' managers were receptive to the ideas and listened to the concerns discussed within the workshops, and key changes were implemented to their site management procedures during and after the IDP programme. As connections between the Tier 1 and Tier 2/3 contractors were also enhanced, an avenue for working towards SDG 17: partnerships for the goals opened.

CONCLUSION

This study has contributed insight into how frontline construction site operatives employed by Tier 2 and 3 subcontracting firms can be engaged in ideas generation for sustainable process improvement. Social aspects of construction production and service system arise as central to successful development of a collaborative environment, which acknowledges all parties in the supply chain as valuable contributors to innovation. By enhancing the capabilities of site management teams and integrating discussions about work and challenges and opportunities for improvement into standard practices, the construction industry can build a culture of collaboration and continuous improvement, empowering frontline site operatives to contribute to better project outcomes. The findings affirm the importance of promoting respect, inclusion, and collaboration. Institutionalising these practices could drive proactive engagement and shared understanding, although further research on these will be required.

Much of the knowledge created was practice-based. There has been a major shift in focus away from employing simple and straightforward solutions that rely on technology to important key stakeholders advocating more relational and holistic methodologies to deal with complex problems. We have also observed a broadened appreciation of value, for example, in the understanding of how important being a good team member is to project success and colleagues' well-being.

The EAR methodology offered many benefits to the IDP programme, specifically, the opportunity to engage directly with the frontline site operatives in their natural work environment and jointly implement change whilst at the same time generating new knowledge. At the same time, one limitation was the context-specificity. Future research may usefully try and replicate the study across diverse work trades, project types and organisational contexts, and perhaps even in different national contexts, to develop further insights into understanding to inspire sustainable process innovation.

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