UNIVERSITY OF CAMBRIDGE
Department of Engineering

CONSTRUCTION ENGINEERING MASTERS DISSERTATION ABSTRACT

Unlocking Engineering Design Team Innovation in Construction

Innovation potential is a function of the number of people engaged in innovation, well-managed diversity, the flow of ideas, and cross-functional working (Bassett-Jones, 2005; Lowe & Dominiquini, 2006; Szulanski, 1996). Consequently, division between Technicians and Engineers within design teams (i.e. vertical fragmentation) may be detrimental to innovation performance. Such fragmentation was suspected based on a review of the literature and informal field observations. An inductive methodology, informed by grounded theory methods and supplemented by techniques from the ethnographic tradition, was designed to explore this thesis from the perspective of Technicians and identify potential opportunities to enhance design team innovation. Semi-structured interviews were conducted with 16 informants with first-hand experience of the technician role from two UK-based market-leading engineering consultancies specialising in the built environment. These included Apprentices performing technician roles and Engineers who had previously worked as Technicians whilst studying part time. The interviews provided insight into vertical fragmentation from the perspective of Technicians. This was subsequently analysed using extant literature on the relationship between workplace experience and innovation.

The findings indicate that vertical fragmentation between Technicians and Engineers is experienced by Technicians, but that the extent varies considerably between teams. In light of the literature, this vertical fragmentation may be having an adverse effect on design team innovation and increasing Technician-Engineer (TE) integration may be advantageous. It is proposed that TE integration is reflected by role overlap, working relationships between Technicians and Engineers, and the level of involvement of Technicians in projects beyond their allocated tasks. Emergent themes suggesting low TE integration include limited role overlap and project involvement, stigma associated with being a Technician/Apprentice, and Engineers appearing not to understand specific challenges faced by Technicians/Apprentices. Conversely, themes suggesting high TE integration include Engineers undertaking modelling tasks and positive initiatives such as a TE role swap programme, Technicians training Engineers in the use of modelling software and Engineers mentoring Degree Apprentices.

It is recommended that design teams and organisations consider their current level of TE integration and whether this may present opportunities to enhance innovation. The case for increasing integration is strengthened by synergies with technological advancement and Degree Apprenticeships identified through this research. The research provides a starting point to assess team-specific TE integration by providing insights into the wider experiences of Technicians and Apprentices across different companies and teams. A model is proposed which focusses on Technician role enlargement, explaining why it might be advantageous and how it might be achieved. Critical elements include promoting self-efficacy amongst Technicians and Apprentices to mitigate the potentially detrimental effects of increasing role overlap with Engineers, and the need to address shortfalls in the resourcing of technician work. It is suggested that a complementary expansion of the Engineer's role would minimise resourcing issues and support TE integration; however, the practicalities of this need to be assessed through further research.

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