Multilevel interaction mechanisms influencing knowledge integration in innovation projects in buyer-supplier dyads

Thomas Matheus *1*, Meera Sarma *2*

1 Northumbria University, Newcastle upon Tyne, United Kingdom
2 University of Liverpool, Liverpool, United Kingdom

ABSTRACT

This study investigates how interaction mechanisms at multiple levels of analysis and their cross-level effects influence knowledge integration within innovation projects in Complex Products and Systems (CoPSs) industry buyer-supplier dyads. Adopting a knowledge-as-practice perspective, we provide a possible choice to much of the existing discussion, emphasizing a knowledge-as-possession perspective. We collected data from two case-study Original Equipment Manufacturers and two associated suppliers and analysed these utilizing Template Analysis and cross-case analysis. Our results show how different interaction mechanisms, forming part of structural, processual and behavioural types of interaction mechanisms and their cross-level effects, influence knowledge integration. The theoretical framework proposed in this article adds to the existing evidence base in that different theoretical phenomena - that were unrelated, or hardly related, to knowledge integration - were identified to have generative influences on knowledge integration at various levels. Our suggested permeation of the structural and processual interaction mechanisms by the behavioural interaction mechanisms also offers a base for conceptual integration between interaction mechanisms and knowledge integration across different analysis levels, increasing the scope of analysis of interaction mechanisms and their impact on knowledge integration.

INTRODUCTION

Recent research suggests that innovation (Gupta et al., 2007), knowledge integration (Newell et al., 2005; Berggren et al., 2013), buyer-supplier dyads (Carter et al., 2015) and interaction mechanisms (Borg and Young, 2014) are multilevel phenomena because they exist and

operate at different levels of analysis (Hitt et al., 2007). Cross-level effects, i.e. the influence of specific mechanisms (or variables) at one level of analysis on other levels of analyses (Rousseau, 1985) impact these phenomena. From a practical perspective, the development of the Airbus A380 highlights the complexities and challenges associated with managing product innovations across multiple levels.

Based on the way innovation tends to occur, stakeholders at multiple levels (e.g., customers, suppliers, teams, senior management, individuals from different functional backgrounds) interact along and thus, influence the innovation process. Consequently, knowledge integration, i.e. the application and combination of knowledge, efforts, and skills of a diverse range of individuals to develop solutions to complex problems (Brown and Eisenhardt, 1998) along the innovation process is necessary. Studies examining knowledge integration, transfer or sharing in buyer-supplier relationships (Winkelbach and Walter, 2015) have normally adopted a knowledge-as-possession view (Nonaka, 1994). This has been criticized for side-lining the contextual and socially mediated nature of knowledge existing in firms (Newell et al., 2009) and in buyer-supplier relationships (Flint et al., 2012). To address this criticism this paper focuses on knowledge integration from a knowledge-as-practice perspective, which emphasizes knowing, arguing it is a social and organizational activity (Newell et al., 2009) as well as being intimately concerned with interaction (Cook and Brown, 1999, p. 393). As such, this study specifically examines interaction mechanisms, defined as approaches used by trading partners to work together (Claycomb and Frankwick, 2010) in relation to innovation and knowledge integration in buyer-supplier relationships.

Despite clear indications in the literature regarding the connectedness between the phenomena introduced above (Newell et al., 2009) and their multilevel nature, few studies have considered their intertwinement from a multilevel perspective (Zhao and Anand, 2009),

a recent call (Carter et al., 2015) indicating the need for such research. In doing so the paper aims to answer the following research questions:

(1)   How do the interaction mechanisms at multiple levels of analysis influence knowledge integration in innovation projects in buyer-supplier dyads?

(2)   What are the cross-level effects of interaction mechanisms influencing knowledge integration in innovation projects in buyer-supplier dyads?

METHODOLOGY

CONTEXT

This study focused on a single industry, the aerospace industry, because the ways innovations are accomplished as well as the drivers and impediments to innovation are linked to industry-specific characteristics and the development of industries (Bygballe and Ingemansson, 2014). Data were collected from two Original Equipment Manufacturers (OEMs) of different aerospace innovations and two related suppliers offering manufacturing/design services. Dyad 1 is comprised of Aerocomp A, a large civil and military aircraft manufacturer and Aerosup A, a supplier to Aerocomp A, offering design and manufacturing services in aero-structures and ice-protection based in Europe and the USA. Dyad 2 is comprised of Aerocomp B, which provides power solutions to land, sea and air products as well as aftermarket services. The focus of this investigation is Aerocomp B's civil and defence air products, i.e., engines for civil and military aeroplanes. The second organisation of this case study is Aerosup B providing 30 components to one of Aerocomp B's large innovation projects.

In each dyad, each organisation was involved in successful joint innovation projects developing aerospace equipment. Being selected from Complex Products and Systems (CoPS) industry (Appio and Lacoste, 2018) in which any one organisation is unlikely to hold all the knowledge necessary for new product development (Jordan and Lowe, 2004), and

concentrating on innovations across internal and external boundaries, together these offered a theoretical sample (Miles et al., 2013).

DATA COLLECTION AND ANALYSIS

In total 46 semi-structured interviews (23 interviews per buyer-supplier dyad) were conducted with individuals from different functional backgrounds, who were engaged in innovation projects and associated buyer-supplier interactions in the case organisations. Noticing the problem of accessing concealed populations like buyer-supplier relationships, interviewees were selected via snowball sampling (Swan and Scarbrough, 2005). Interviewees offered insights concerning the contexts, reasons, deployment of different interaction mechanisms, decision-making-situations, conflict situations and knowledge integration processes.

After having transcribed the interviews in each case, they were analysed using template analysis (King and Brooks, 2016). The research questions, the literature reviewed and interview transcripts served as a means to derive initial lower order codes. Utilizing NVivo, these codes were then attached to sections of the transcribed data and, where needed, altered. These codes were subsequently merged to generate higher order codes depicting a template of important themes.

Then, cross-case analysis using meta-matrices (Miles et al., 2013) was carried out to coalesce findings (King and Brooks, 2016). This allowed themes related to interaction mechanisms, levels of analysis and knowledge integration to be compared and contrasted and patterns to develop. Patterns and relationships determined in specific cases were examined and either confirmed or unconfirmed by sections of data from other cases, replication permitting more robust theory (Miles et al., 2013) to develop.

RESULTS AND DISCUSSION

Across case studies our findings suggest the occurrence of structural, processual and behavioural interaction mechanisms at multiple levels of analysis, producing cross-level effects as presented in figure 1.
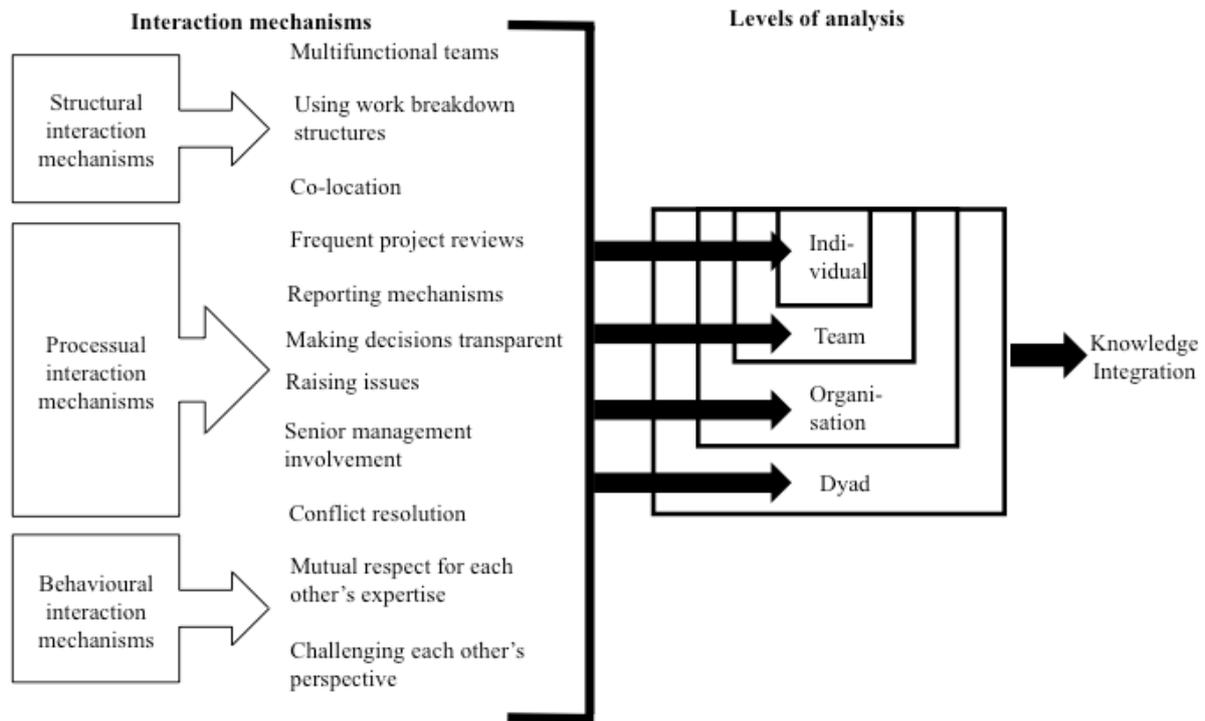

Figure 1: Theoretical framework of the cross-level effects of interaction mechanisms on knowledge integration in buyer-supplier dyads

Our results show how the structural, processual and behavioural interaction mechanisms facilitate knowledge integration across multiple levels of analysis. We highlight these effects using solid black arrows in Figure 1. Within buyer-supplier relationships knowledge integration is mediated by deploying the structural, processual and behavioural interaction mechanisms. Rather than these types of interaction mechanisms operating in isolation and at individual levels of analysis separately, they operate at multiple levels of analysis, this being highlighted by the squared bracket connecting the solid black arrows.

CONCLUSION

Our research showed the facilitative role of different interaction mechanisms within knowledge integration for innovation projects in buyer-supplier dyads and their cross-level effects, thereby also addressing calls for more multilevel theorization in buyer-supplier relationships (Carter et al., 2015), empirical research of innovation enablers in supply chains (Zimmermann et al., 2016) and empirical research of relationship management in CoPS industries (Appio and Lacoste, 2018).

A contribution of the present study is that the theoretical framework proposed in this article adds to the existing evidence base in that different theoretical phenomena - that were prior to this research unrelated, or hardly related, to knowledge integration - were identified to have generative influences on knowledge integration at various levels of analysis (e.g., conflict resolution; mutual respect for each other's expertise; challenging each other's perspective). Another contribution of our article is the permeation of the structural and processual interaction mechanisms by the behavioural interaction mechanisms (e.g., challenging each other's perspective and demonstrating mutual respect for each other's expertise during reviews). Therefore, the theoretical framework developed here offers a base for conceptual integration between interaction mechanisms and knowledge integration across different analysis levels. This feature of the present study also increases the scope of analysis of interaction mechanisms and their impact on knowledge integration at different analysis levels as we avoided a reductionist view of the influence of isolated variables.

Based on industry-specific case-studies, our qualitative research was not intended to provide statistical generalizability. Further multilevel research using a practice-perspective is necessary to investigate the influence and interplay of interaction mechanisms identified regarding knowledge integration within other industries' buyer-supplier relationships.

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