

ABSORPTIVE CAPACITY AS A BASIS FOR CONSTRUCTION INNOVATION: FROM A CAPABILITIES TO A ROUTINES PERSPECTIVE

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Construction has been described as a sector with weak levels of Absorptive Capacity. At a time when the performance of the UK construction sector, in terms of levels of exports and future financial sustainability, is being widely discussed by policy makers, are the actual levels of Absorptive Capacity a 'real and present' risk to future sector performance? High levels of Absorptive Capacity have been positively linked with innovation success and organisational performance, including financial growth and increased productivity levels. The dynamic nature of Absorptive Capacity, rooted in the routines of individuals or organisations, ultimately strengthen an organisations capability to discover and benefit from new knowledge and novel technologies. For a UK construction sector (which is regularly impacted by turbulent external environments), ensuring that at individual, firm and sector level, dynamic capabilities are not allowed to 'stagnate', is of uppermost importance. Since, stagnation can result in low levels of Absorptive Capacity (Pentland *et al.*, 2012). Therefore, rather than examining Absorptive Capacity from a relatively static capabilities viewpoint and by drawing on the contemporary scholarship of Absorptive Capacity Routines, are there opportunities to evaluate the impact of Absorptive Capacity levels across the diverse and complex sector? And beyond the life of project?

Keywords: Absorptive Capacity, Absorptive Capacity Routines, dynamic capabilities, microfoundations

INTRODUCTION

The Absorptive Capacity of a firm plays a crucial role in determining the firm's innovation performance (e.g. Foss *et al.*, 2010, and; Allas, 2014). Absorptive Capacity, as Allas (2014) explained, is the ability of a firm to recognise the value of, assimilate and commercially exploit new, external information and is a strong indicator of a firm's ability to innovate. This capacity is "a function of the relationship between capabilities, structures, routines and policies particular to a firm" (Allas, 2014, 12). Indeed, Absorptive Capacity, first coined by Cohen and Levinthal (1990), has stimulated a number of studies to unpack innovation performance in the construction context (e.g. Gann, 2001; Blayse and Manley, 2004; and Reichstein *et al.*, 2005). In these studies, the accepted wisdom is that the construction industry's innovation performance is hampered by its relatively weak Absorptive Capacity when

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compared with other industries (see Gann, 2001; Winch, 2003; Blayse and Manley, 2004; Reichstein *et al.*, 2005; Allas, 2014).

Prevailing scholarship, on explaining the impacts of Absorptive Capacity on innovation in construction, have often focussed on the structural conditions of how input measures of firm's ability to engage in learning new external knowledge, can impact on output measures, through such proxies as the number of patents and R&D investment. Yet, as a growing line of scholars (e.g. Reichstein *et al.*, 2008; Flatten *et al.*, 2011; Jiménez-Barrionuevo *et al.*, 2011; and Bygballe and Ingemansson, 2014) argue, such measures often do not fully account for the multidimensional complexities of Absorptive Capacity, or the innovativeness of complex and multidisciplinary sectors such as construction. The purpose of this conceptual paper is, therefore, to go beyond these structural accounts of how Absorptive Capacity can influence innovation performance, to raise the question as to how we might better understand the dynamics of the impacts of Absorptive Capacity. The construction sector has often been characterised as project-based, configured through temporary coalitions of different professional and occupational groups (see Winch, 1998). As a consequence, the transient nature of construction work has often been blamed for the industry's relative weakness in absorbing new, external knowledge, which in turn stymies the industry's ability to innovate.

Our point of departure with this dominant view, is motivated by the possibilities found in the literature that proposes a countervailing view that the construction industry has the capacity to learn from project to project. For instance, the (London 2012) Olympic Delivery Authority's (ODAs) programme-wide approach to systems delivery was informed by lessons learned from the BAA Heathrow T5 project 'construction to operation' transition process (Davies *et al.*, 2009; Brady and Davies, 2014). Lessons learnt from Heathrow T5 and London 2012 have also been exploited in the subsequent Crossrail programme (Davies *et al.*, 2014). Thus, we argue in this paper for the need to move beyond 'headline' measures such as the number of patents registered, or the number of R&D Staff employed etc., to reflect more thoroughly on the dynamics of Absorptive Capacity and how these can serve to improve the sector's innovation performance. Moreover, simply measuring Absorptive Capacity capabilities through these static proxy measures would prevent us from capturing broader tacit and 'intangible resources' associated with Absorptive Capacity (Flatten *et al.*, 2011).

In this paper, we draw inspiration from contemporary scholarship of organisational routines (see e.g. Parmigiani and Howard-Grenville, 2011) to open up questions as to how we might move away from examining Absorptive Capacity from a relatively static capabilities viewpoint, to one that acknowledges the dynamics of Absorptive Capacity practices and routines. This paper is structured as follows, initially we discuss Absorptive Capacity and Absorptive Capacity Routines. We then reflect on contemporary arguments in relations to routines and microfoundations and academic literature to date on Absorptive Capacity Routines within a construction context. We then suggest further areas of research, which would extend our understanding of the dynamics of the impacts of Absorptive Capacity, citing examples from practice. We conclude by considering how acknowledging the dynamics of Absorptive Capacity practices and routines provides opportunities for the construction sector to openly promote accurate levels of Absorptive Capacity, not just across the diverse and complex sector, but also, beyond the bounds of a project.

Absorptive Capacity and Absorptive Capacity Routines

To better understand the levels of Absorptive Capacity within the UK construction sector, we commence with Zahra and George (2002) reconceptualization of the Absorptive Capacity concept into its constituent routines and processes. In their reconceptualization of Cohen and Levinthal's Absorptive Capacity concept, Zahra and George (2002) described Absorptive Capacity in terms of a "dynamic capability embedded in a firm's routines and processes" (2002, 186). The concept of Dynamic Capability had been defined by Teece *et al.*, (1997) as an ability which allowed a firm to adapt to changing environments through the integration and reshaping of both internal and external routines. When reviewing how organisations were able to develop dynamic capabilities, Zollo and Winter (2002) recognised that whilst Teece *et al.*, (1997) had suggested what dynamic capabilities were for and how they might work, there were unanswered questions in relation to their genesis. Hence, Zollo and Winter (2002) proposed that dynamic capabilities were created through the continued interaction and mutual adjustment of 'learning mechanisms' (i.e. experience accumulation, knowledge articulation and codification) and developed a definition for Dynamic Capabilities which described the systematic creation and transformation of operating routines. The fluidity of the 'from' – 'to' nature of dynamic capabilities was also addressed in Zahra and George's (2002) model of Absorptive Capacity in terms of 'potential' (knowledge acquisition and assimilation) and 'realised' (knowledge transformation and exploitation) capabilities. Todorova and Durisin (2007) further refined Zahra and George (2002) reconceptualization through the introduction of a feedback loop to capture the dynamic aspects of the model.

Foss *et al.*, (2010) highlighted the need for research on feedback loops as a gap in previous empirical studies of Absorptive Capacity and also argued that "discussing Absorptive Capacity merely as a capacity without discussing the actual processes that link it to outcomes variables such as patents, innovation and performance cannot be regarded as an integrated approach" (2010, 939). Foss *et al.*, (2010) subsequently developed an integrative Absorptive Capacity framework which considered the moderating effect of environmental conditions on the relationships between the microfoundations of Absorptive Capacity (including managerial/intra/inter-organisational antecedents and prior knowledge); its process dimension (acquisition, assimilation, transformation and exploitation) and tangible (for example, innovation, R&D and firm performance) and intangible (for example, intra-organisation transfer of knowledge, knowledge search and inter-organisational learning) outcomes.

The construct of Absorptive Capacity was further operationalised through Lewin *et al.*'s (2011) "Internal and External Absorptive Capacity Metaroutines" framework, which expressed meta (higher order) Absorptive Capacity Routines (such as codified or tacit norms, standards, habits and rules, formed through formal reflection, trial and error and past experience) which were "firm specific, idiosyncratic and observable" (2011, 85). Lewin *et al.*'s (2011) framework split the Absorptive Capacity Metaroutines in to internal routines (associated with variation, selection and replication processes) and external routines (which facilitated external search and exploration to inform organisations innovation processes).

Absorptive Capacity Routines and Microfoundations in Construction

Hence, Cohen and Levinthal's (1990) Absorptive Capacity concept has been reconceptualised as a dynamic capability that is open to continuous change and able to move back and forth between knowledge source and competitive advantage and which

can be operationalised through observable routines and microfoundations. In the context of construction, academic discourse on Absorptive Capacity Routines is limited - is this because Absorptive Capacity Routine research in respect of construction is still in its infancy, or due to uncertainty within the research field surrounding the current academic debates over the perceived relevance of microfoundations or the definition of routines?

In terms of the debate on the definition of “routines”, Feldman’s (2000) contemporary view on routines as effortful accomplishments, rather than as mundane and static building blocks (Zollo and Winter, 2002), consider routines as a great source of creativity and continuous change (e.g. Feldman, 2000; Parmigiani and Howard-Grenville, 2011, and; Dionysiou and Tsoukas, 2013). Feldman and Pentland (2003) further argued that routines were able to generate multiple outcomes. ‘Generative’ routines (which occur where variation, selection and replication processes inform the routines) can be stable, but can also change and improve over time, based on reflection and adaptation (Hodgson, 2008; Pentland *et al.*, 2012). Pentland (2011) further argued that this gives rise to more empirical opportunities for engaging with the ‘real’ routines in an organisation. Routines can therefore promote stability and consistency as well as change and growth and they can also be the ‘memory banks’ of organisational knowledge and can be considered the microfoundations of capabilities (Parmigiani and Howard-Grenville, 2011).

In respect of the relevance of “microfoundations”, Felin and Foss (2009) argue that there was a need for microfoundations due to the theoretical drift and a lack of theoretical clarity on the concept of organisational routines and capabilities. Subsequently, Barney and Felin (2013) proposed that there was still little consensus on microfoundations. However, although acknowledging concerns over the gap in organisational routines and capabilities research in relation to the individual rather than the organisation Winter (2013) raised an “irreducibility” argument in respect to the actual need for microfoundations, or expressed another way, “are microfoundations basically an unnecessary meaningless reductionist exercise?” (Devinney, 2013, 81).

The ongoing debates over the perceived relevance of microfoundations, or the definition of routines, are not specific to construction management. The small number of publications associated with Absorptive Capacity Routines within the field of construction, might simply be a result of the embryonic nature of the empirical research into the routines associated with dynamic capabilities (such as Absorptive Capacity) in the construction sector (Chen and Fong, 2012). A Google Scholar search on the 19th May 2016 for ‘Absorptive Capacity Routines’ within ‘Construction Management’; ‘Construction Industry’ or the ‘Construction Sector’, resulted in under 15 publications. Learning routines and mechanisms associated with building Absorptive Capacity capabilities accounted for the highest proportion of articles to date. Publications included the use of learning routines and mechanisms by construction companies: to reconfigure operating routines to support positive firm performance during turbulent business environments (Chen and Fong, 2012); to potentially influence Value for Money on current and future collaboration projects (Chen *et al.*’s, 2013); to underpin collaborative learning capabilities which positively impacts on operating routines and firm performance (Manley and Chen, 2015); to positively impact firm performance (Chen and Fong, 2015); to create a feedback loop in learning cycles (Manley and Chen, 2015b).

More specifically, in assessing the observable learning routines employed at corporate level, across knowledge exploration, transformation and exploitation on collaborative Australian infrastructure projects, Lewis *et al.*, (2014) reported that ‘regularly applying new knowledge to collaborative projects’ was the most often implemented routine and ‘staff incentives to encourage information sharing about collaborative projects’ the least popular routine. In addition to ‘learning routines’, other routines were also harnessed to observe Absorptive Capacity capabilities in the context of construction. For example, Ebers and Maurer’s (2014) survey of German engineering firms, used routines (relating to tie strength and trust, project-level decision-making discretion, process and product innovation, training, ‘potential’ ideas generation and ‘realised’ ideas passed between projects) to conclude that “the whole of Absorptive Capacity is greater than its parts” (2014, 318).

Kozica *et al.*, (2014) refined Lewin *et al.*’s (2011) Metaroutine Framework, to take account of the “permeable and fluid” boundaries associated with the use of Freelancers (e.g. independent contractors) when dealing with acquiring external knowledge and proposed that Absorptive Capacity “itself is a construct that can be interpreted as a capacity that reaches across the boundary of an organisation” (2014, 429). Manley *et al.*’s. (2014) Australian road construction industry survey of routines associated with, amongst others, reciprocity, common language, communication, responsibility and application (utilising Jiménez-Barrionuevo *et al.*, (2011) 18 ‘measures’ of obtaining and exchanging new and novel information and knowledge to support a firms activities), concluded that “organisations do build capacity differentially within each of the four phases defined by Zahra and George (2002), and that these differences can be observed between phases within each sector of the Australian road infrastructure supply chain, and between the sectors” (2014, 13-14).

Finally, Cooper and Molla (2016) operationalised Information System (IS) environmental Absorptive Capacity through developing associated knowledge routines. They found that an ‘IS departments’ ability to acquire external sustainability knowledge from relationships with stakeholders such as customers and suppliers’ was the most widely developed routine and an ‘IS departments’ ability to acquire new external knowledge by sending IS personnel to complete green IT training’ was the least widely developed environmental Absorptive Capacity routine. From the examples cited we propose that the evidence from the literature, of the use of Absorptive Capacity Routines within construction, is still relatively minimal, with a focus on ‘learning routines’ and geographically centred around Australian case studies. How might further research into dynamic capabilities, routines and microfoundations support performance improvements within the construction sector?

Future areas for research.

Through observing the impacts of underperforming Absorptive Capacity Routines (whether at project, individual, firm or sector levels), actions can be taken to address contemporary performance concerns raised by policy makers and sector bodies. Reviewing contemporary UK Government and policy objectives and measures, three examples are suggested to support the argument for further research into the use of routines, to not only operationalise the levels of Absorptive Capacity capabilities within the UK construction sector, but also to support the delivery of performance improvements in practice.

Firstly, Absorptive Capacity is often considered weak in construction. Yet, there is growing evidence that suggests that the levels of Absorptive Capacity differ across the

diverse professions within the construction sector and as such a 'broad brush' approach to Absorptive Capacity does not accurately reflect levels within the sector. Our first example contrasts findings in respect of Absorptive Capacity levels across professions from a practice and theoretical perspective. BIS (2013) reported that "Research shows that firms which export generally tend to be larger, more productive, have higher Absorptive Capacity ('know how') and be more likely to engage in research and development or wider innovation activity than those that do not export" (2013, 9). In terms of UK construction exports, BIS (2013) reported that the levels of exports vary across differing activities. The BIS (2013) report highlighted that the UK showed strong export performance in respect of architecture and surveying services; improving performance in respect to construction contracting; but performed less well in respect of UK construction trade/suppliers exports. Manley *et al.*'s (2014) use of Absorptive Capacity Routines to investigate the levels of Absorptive Capacity across the professions involved in the Australian road construction industry, reported higher levels of Absorptive Capacity for suppliers and contractors across all four (acquisition, assimilation, transformation and exploitation) stages than for consultants, with suppliers also outperforming contractors in assimilation and transformation stages.

If Manley *et al.*'s (2014) findings were reinterpreted in the context of UK construction export performance, then you could suppose that trade/suppliers would outperform architects in terms of export performance. However, this is not the case, BIS (2013) actually reported the opposite outcome. Not excluding the possibility that there may be commercial differences to consider between Australia and the UK, the use by Manley *et al.* (2014) of routines to investigate the capabilities of the sector, as opposed to using analogous proxies, could also explain the mismatch. In questioning if the conventional Absorptive Capacity proxies are too 'broad' to fully represent the realities across the diverse professions involved in construction, we propose there is further scope, through the use of observable Absorptive Capacity Routines, to better understand the impacts of Absorptive Capacity on sector performance outcomes (for example, export performance).

Secondly and associated with the first point above, Absorptive Capacity is often considered through static mechanisms, which are poor proxies of how learning takes place. Therefore, revisiting routines as a great source of creativity and continuous change, or "effortful accomplishments", opens up avenues for examining absorptive capacity. Hence, creating opportunities to implement more effective practices to address sector shortcomings, through observing how individuals create and change routines (to deliver not just personal but project objectives. For example, through developing coordination and collaboration practices, across all levels of the industry, to raise awareness of inefficiencies currently embedded within standard construction practices; or as a result of skills shortages and the challenges created through the increased use of a self-employed workforce. Or, through developing routines to more successfully capture, exploit and disseminate productive research, knowledge and innovation (HM Government, 2013; BIS, 2013).

Finally, construction is often conceived as project-based. Instead of focusing on purely the project-based discourse, however, future research could look at how routines endure beyond the project, which in turn might shed some light as to how the Absorptive Capacity of construction (firms and industry) can be strengthened. Sector performance in terms of project lifecycles (design through to defects) is monitored through the UK construction Key Performance Indicators (KPIs) (Glenigan, 2014). As an example, clients' ratings on the impact of project defects at handover illustrate

that since 2006, satisfaction levels have followed a downward trajectory, and that there is a marked difference between rating and project size. So, for projects between £1m and £5m, the negative impact of defects at hand over stage were significantly higher than for projects with a value over £5m. A second KPI, which in 2014 scored less than at the commencement of the benchmarking programme in 2003, related to the proportion of All Non-Housing projects where design time either achieved or bettered the anticipated design phase programme. In comparison, the same KPI for All Housing projects illustrated little change in performance. In a curious twist, the results for the time predictability combining design and construction, was reversed.

The UK construction benchmarking KPIs have highlighted trends, but can observing dynamic routines associated with say, assimilation (e.g. common language), transformation (e.g. communication, documentation and transmission) and exploitation (e.g. responsibility and application) (Jiménez-Barrionuevo *et al.*, 2011) provide insight on what impact project size might have on levels of project defects at handover stage? Or, could research into the routines associated with the acquisition (e.g. interaction and reciprocity) or transformation of new knowledge, provide insight in to why design programmes are more likely to be adhered to in relation to house building rather than non-house building? In respect of this second question, a simple answer might be that housing tends to be less radical or bespoke, so you might expect less design issues, but if that were to be the case, then the pattern would be reflected in the combined design and construction time predictability KPI, which it is not? So, from a practice perspective, insight into the differences between housing and non-housing design time predictability would be highly beneficial. From a theoretical perspective, the final suggestion on areas for further research, also raises intriguing question on the 'durability' of routines beyond a project and differing levels of absorptive capacity across the lifecycle of a project.

CONCLUSIONS

Allas (2014), positively linked innovation performance, growth and productivity levels with Absorptive Capacity. However, “we still know little about why some organizations possess greater Absorptive Capacity than others” (Ebers and Maurer, 2014, 318) and more specifically, “how the different proposed components of Absorptive Capacity individually, together and through their interactions affect relevant outcomes” (2014, 319). We propose that further investigation in to Absorptive Capacity Routines could provide further insight into how the diverse and complex construction sector could coordinate and collaborate to ensure that “the whole is more than the sum of the parts” (HM Government, 2013, 54). As detailed above, there are many areas where a fuller understanding of the practical application of routines, which are observable and therefore open to monitoring and evaluation, could provide productive guidance for the construction sector to achieve performance improvements. Not just in terms of ‘tangible’ outcomes (e.g. a reduction in project defects), but also in terms of ‘intangible resources’ (e.g. lessons learned through project handover for exploiting in future projects).

As a project based sector, where the workforce regularly move between projects and where companies work within diverse and complex alliances and networks, rather than treating knowledge transfer between individuals, organisations or the sector as a static ‘asset’ to be counted, the observation and monitoring of collaboration and communication routines, that create a conducive environment for knowledge absorption across boundaries (Kozica *et al.*, 2014), should reflect more accurately the

dynamic capabilities embedded within the sector. With the majority of the construction studies to date discussing ‘learning routines’, there is scope to consider creative and dynamic Absorptive Capacity Routines associated with capabilities, such as communication and collaboration, or prior related knowledge, internalisation or incentives etc.

Finally, Manley *et al.*, (2014) reported that construction clients exhibit low assimilation and exploitation capacities and only moderate levels of acquisition and transformation capabilities. There is a pleasing circular flow evident in this final example of the dynamic possibilities of Absorptive Capacity Routines. Could insight be gained into design time predictability performance issues, through a better understanding of how a client’s exploiting knowledge routines, combine with an architect’s knowledge assimilation routines? In a similar vein, could insight also be gained into measures to reduce the impact of defects at handover stage, through greater clarity on how a client’s assimilation routines combine with a contractor’s knowledge transformation routines? In raising the question as to how we might better understand the dynamics of the impacts of Absorptive Capacity, could further research into Absorptive Capacity Routines, deliver the means for the UK construction sector to move beyond the ‘headlines’ of weak performance and develop not just incremental performance improvements but positive radical change, based on a true understanding of the Absorptive Capacity of the sector.

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