FUNCTIONAL CONSEQUENCES OF TRUST IN THE CONSTRUCTION SUPPLY CHAIN: A MULTI-DIMENSIONAL VIEW

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Trust is often linked to the emergence of cooperative behaviours that contribute to successful project outcomes. However, some have questioned the functional relevance of trust in contractual relations, arguing that control-induced cooperation can emerge from enforcement of contracts. These mixed views are further complicated by the multi-dimensional nature of trust, as different trust dimensions could have varying functional consequences. The aim of this study was to provide some clarity on the functional consequence of trust in the project supply chain. Data was gathered through passive observations, document reviews and semi-structured interviews with supply chain parties on two case study projects in the UK. A thematic data analysis approach was used to uncover multiple perspectives on the functional consequences of trust in the supply chain. Findings revealed that the weaker dimensions of trust, which are impersonal (cognition-based and systems-based) and the stronger (relational-based) dimension of trust, all fostered beneficial behaviours in the supply chain (effective knowledge sharing and self-organising behaviours). However, additional behavioural consequences (relational flexibility and extra commitment) emerged when trust was relational in nature, implying that different trust dimensions and their associated behavioural consequences can be prioritized in the supply chain based on perceived work package risks.

Keywords: cognition-based trust, construction supply chains, relational-based trust, systems-based trust

INTRODUCTION

Inter-organisational trust has consistently been linked to different aspects of business performance. Sako (2007) argued that inter-organisational trust enhances business performance by reducing transaction costs, serving as an investment with future returns and contributing to continuous improvement and learning. Zaghloul *et al.*, (2003) revealed that the absence of trust in business relationships raises the need to manage the contracting process using powerful control systems. Broadly, construction management literature has often associated trust with cooperative behaviour amongst

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project parties and consequently successful project performance (see Kadefors 2004, Eriksson *et al*., 2007, Hartmann *et al*., 2010; Laan *et al*., 2011). However, this relationship between trust and performance has often been mixed, inconsistent and contradictory (Guinot *et al*. 2013, Jiang *et al*., 2015). Aubert and Kelsey (2000) revealed that in the operation of virtual teams, effective team performance was independent of trust formation. Researchers like Cox *et al*., (1997) have similarly questioned the relevance of trust in contractual relations given its fragile nature, particularly in construction. They have argued that cooperation can emerge from other interventionist equivalents of trust such as 'control' through the exercise of power and authority. These mixed views, coupled with the argument by Laan (2009), that trust issues in construction are often conceptually discussed but rarely empirically explored, therefore underscores the need for further empirical investigation. The aim of this study was to investigate the functional implications of trust in the project supply chain assembled to deliver projects. Whilst the project supply chain is complex and multi-layered, this study only focused on the supply chain relationship between main contractors and first-tier subcontractors. The sections that follow examine the nature of trust, the research methodology adopted, the research findings and discussions, based on which conclusions are then drawn.

TRUST PRODUCTION AND THE NATURE OF TRUST

The elusive nature of trust has contributed to the emergence of numerous definitions. The definition that features most prominently in literature is that trust is "a psychological state that enables a party to accept vulnerability based on positive expectations in the intentions or behaviours of other parties" (Rousseau *et al*., 1998, Dekker 2004). Rousseau *et al*., (1998) described trust as a complex multi-faceted and 'meso' concept that integrates micro-level psychological and sociological processes with macro-level institutional arrangements. This 'meso' nature of trust suggests that psychological and sociological processes, together with other contextual or institutional arrangements, would have to be taken into account when investigating the modes of trust production (Bachmann *et al*., 2011). Three modes of trust production, which reflect this 'meso' nature of trust, have consistently emerged in the literature as cognition-based trust, systems-based trust and relational-based trust.

Cognition-based trust, which is sometimes referred to as knowledge-based trust, is the primary origin of trust in inter-organisational relationships (Kadefors *et al*., 2007). Trust at this level is impersonal and devoid of previous relational experience (Kadefors *et al*., 2007). It is rational and knowledge driven (Johnson *et al*., 2005, Kadefors *et al*., 2007, Wong *et al*., 2008). As such, it derives from the assessment of a trustee's trustworthiness by obtaining and reflectively interpreting information about their credibility, reputation and competencies (Rousseau *et al*., 1998). It is founded on an assessment of the likelihood that a party will act in a self-interested manner, given the extent of interdependency, short-term gains and future exchange prospects (Kadefors *et al*., 2007). Poppo *et al*., (2015) argued that the acquisition of credible trustee information, deterrence mechanisms, potential benefits and losses, are all foundational to that willingness to accept vulnerability in exchange relationships. This dimension of trust is however subject to issues such as bounded rationality and information asymmetry (Kahneman 2003). This makes cognition-based trust relatively fragile and as such, has been described as 'thin or weak trust' (Kadefors *et al*., 2007, Ngowi 2007).

System-based or institutional-based trust is that which derives from contextual characteristics like the contractual agreements, contracting environment, cultural and societal norms as well as what is known to constitute ethical behaviour in a given business environment i.e. norms of practice (Dekker 2004, Kadefors *et al*., 2007). Laan *et al*., (2011) echoed somewhat similar views by linking systems-based trust to extrinsic factors such as formal contractual rules and monitoring processes. Wong *et al*., (2008) has argued that communication systems, contracts and agreements, organisational policy and the establishment of joint ethos, are all sources of system-based trust in construction contracting. Kadefors *et al*., (2007) further describes system-based trust as 'semi-strong trust' given that it still incorporates cognition-based trust but can still be impersonal and devoid of any prior relationship or exchange. Broadly, this dimension of trust is founded on the establishment of a contracting environment that reduces the potential for opportunism; thereby increasing the trustor's ability to be trustful.

Relational-based trust is that which derives from repeated interactions and exchanges that evolve as inter-organisational relationships are projected into the future. In this instance, information about a party's trustworthiness already becomes implicit in the relationship (Rousseau *et al*., 1998). This dimension of trust is synonymous with affect-based trust (Johnson *et al*., 2005, Wong *et al*., 2008), which originates from the emotional bonding and thoughtfulness that exists between trustor and trustee (Cheung *et al*., 2011). Johnson *et al*., (2005) argued that trust at this level is characterized by feelings of security and perceived relationship strength that emerges as emotional connections deepen. This form of trust has been described as 'thick' or 'strong' trust (Murphy 2006, Kadefors *et al*., 2007), given that it is rooted in interpersonal relationships that have evolved over a considerable period of time. This relational-based dimension of trust reflects the meso-level trust (Rousseau *et al*., 1998), which integrates both cognition and systems-based dimensions of trust, as well as that which derives from repeated social interactions. Hence, its development requires a combination of cognitive, emotive, and communicative factors (Murphy 2006). Zaheer *et al*., (2005) has also linked relational-based trust to the opportunity for reciprocation. The time element (repeated social interactions) that is needed for relational based trust to evolve implies that there can be that preparedness to defer reciprocation of trust to a future exchange. It is thus linked to the demonstration of goodwill - bounded by empathy, dedication and openness (Ireland *et al*., 2007).

This three dimensional view of trust is centred on the manner in which trust evolves in inter-organisational relationships and the nature of trust that will exist, depending on the state of the relationship. Given this three-dimensional view, there is the opportunity to probe further into the functional consequences of trust during projects. The performance benefits of trust could be narrowed down to the functional consequences that these three trust dimensions present during inter-organisational exchanges. In most instances, trust is used within the context of the relational-based dimension that exists when relationships have evolved over a considerable period of time. However, for any inter-organisational exchange where trust is considered to be absent or minimal, there is arguably a degree of trust although this could be of a more cognitive and weaker nature. Such cognition-based dimensions of trust could still be sufficient for achieving desirable outcomes depending on the transaction circumstance. Yet in the literature, the attribution of performance benefits to trust only seems to be broadly directed towards the stronger relational-based dimension (see

Doloi 2009, Smyth *et al*., 2010). This highlights the need to examine the influence of these distinct dimensions of trust.

METHODOLOGY

A multiple case study approach was adopted as part of a larger study on trust in the construction supply chain. The case study approach was employed because of the proximity to reality that it allows (Flyvbjerg 2006) when studying complex concepts and the ability to triangulate multiple sources of evidence (Proverbs *et al*., 2008). The research drew on the interpretivist epistemology. This enabled knowledge on trust and its functional consequences to emerge from interpretation of multiple realities from the different parties (main contractors and subcontractors) working together on live projects. Whilst four case studies were conducted, only the two case studies summarised in Table 1 are being reported here due to space constraints.

Table 1: Background details of case study projects

	Nature of project	Nature of works	Client type	Contractor selection	Procurement route & contract form	Project duration and status	Contract sum	Number of sub-contractors
Case A	Offices	Refurbishment and new-build	Public client	Competitive tendering	Design & build with NEC3 contracts	15 months with 55% complete at Month 9	£ 30.5 million	29
Case B	School	Refurbishment and new-build	Public client	Negotiation	Framework agreement with NEC3 contracts	12 months with 65% complete at month 8	£ 2 million	30

These projects varied in size, and had been procured through different routes, all of which could have an influence on the main contractor's approach to subcontractor selection. The unit of analysis in each of the cases was the project supply chain. Data was gathered through semi-structured interviews, non-participant observations (site meetings and pre-start meetings) and document reviews. In total, 16 in-depth interviews were conducted face-to-face with main contractor and subcontractor personnel across the two projects, with each interview lasting approximately 60 minutes. Interview transcripts, word-processed observation notes and documentation were integrated onto a single platform using the qualitative data analysis software QSR Nvivo. The three-pronged qualitative data analysis strategy proposed by Miles and Huberman (1994) - data reduction, data display and conclusion drawing or verification - was used to undertake thematic analysis of the data. The thematic analysis process was also influenced by the three dimensional view of trust as uncovered in the literature.

For example, Wong *et al*., (2008) suggested in their trust framework that knowledge, communication and interactions are paramount for the development of cognition-based trust on projects. This dimension of trust was also suggested to be more related to development of confidence in a party's competence (Johnson *et al*., 2005). As such, when confidence in the project supply chain derived from the reflexive process of knowledge acquisition and interpretation, it was ultimately abstracted as cognition-based trust during the analysis (see example in Table 2 and thematic analysis output in Figure 1).

Four behavioural consequences emerged from the analytical process as self-organising behaviour, effective knowledge sharing, extra commitment and relational flexibility. A thematic analysis was then undertaken using the matrix coding query function in QSR Nvivo. The first query mapped the 'nature of trust' against the 'behavioural consequences'.

Table 2: Example of transcript extracts showing coding and data reduction process

Extracts from transcripts	Coding and abstraction
"…we'll meet them, sit down with them, get the drawings, package is out, discuss the package and get an idea, a gut feeling, on the people that you're dealing with at that point and how they kind of come across to you…so it is your gut feeling and your confidence of what they do" – Project QS, Case A	gut feeling → cognition-based trust → nature of trust
"…that subcontractor worked with [main contractor A] a number of times before, knows exactly what we do, our procedures, and what to expect so they really synergise with our own procedures and policies" – Project QS, Case A	previous impersonal experience with firm → existence of joint ethos → system-based trust → nature of trust
"I know nearly all their site managers, I know nearly all the surveyors, I know the managing director, I know the managing quantity surveyor as well, I've got awards from them, health and safety awards in the past as well, on two occasions. So I know them quite well and you get sort of a confidence with them. When you do a job with them you are confident that the job is going to go ok because of the site staff" – Brickwork subcontractor, Case B	Previous interpersonal experience → relational-based trust → nature of trust

The second query mapped the 'behavioural consequences' against the project supply chain, which was an attribute of the data. These queries enabled the exploration of emergent patterns across the data. The resulting thematic analysis output is illustrated in Figure 1.

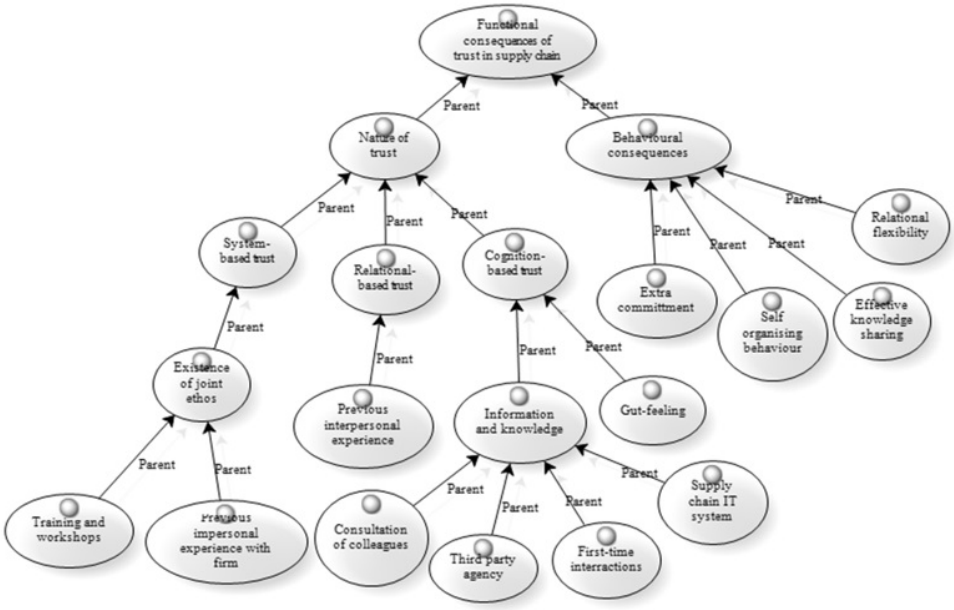

Figure 1: Thematic analysis output on the functional consequences of trust in the supply chain

FINDINGS AND DISCUSSION

All the three trust dimensions of trust were revealed to have promoted effective knowledge sharing and self-organising behaviours across the two case study projects

(see Table 3 and 4). When trust was cognition-based and subcontractors were being used for the first time, they were keen to perform on the project so as to affirm their competence with the main contractor's project team. The roofing subcontractor on Case A for instance, had been vetted as a good performer but was unproven to neither the main contractor nor their project team. This subcontractor had been carefully vetted by obtaining considerable information during supply chain assessments, pre-order and pre-start meetings.

During the project, this roofing subcontractor self-managed their work package satisfactorily and contributed as much as other regular subcontractors when it came to proposing value engineering solutions and sharing valuable knowledge that helped to improve project outcomes. In their view, a good performance with this first work opportunity was foundational to building a long-term business relationship with the main contractor. These two behaviours (effective knowledge and self-organising behaviours) were also detected when trust was of a systems-based and relational-based nature. Despite the project team's confidence and vulnerability acceptance in respect of the roofing subcontractor on Case A (cognition-based trust), relational flexibility, as a behavioural consequence of trust, was absent.

Table 3: Trust between main contractor and subcontractors in Case A

Subcontractors	Cognition-based trust	System-based trust	Relational-based trust	Manifested Behaviours
Panelling subcontractor	✓	✓	✓	EKS, SO, EC, RF
Tiling/mosaic subcontractor	✓	✓	✓	EKS, SO, EC, RF
M&E services contractor	✓	✓	✓	EKS, SO, EC, RF
Scaffolding subcontractor	✓	✓	✓	EKS, SO, EC, RF
Carpentry/Joinery Subcontractor	✓	✓	✓	EKS, SO, EC, RF
Roofing Subcontractor	✓	✘	✘	EKS, SO

EKS – Effective knowledge sharing, SO – Self organisation, EC - Extra commitment, RF-Relational flexibility

Table 4: Trust between main contractor and subcontractors in Case B

Subcontractors	Cognition-based trust	System-based trust	Relational-based trust	Manifested Behaviours
Roofing Subcontractor	✓	✓	✘	EKS, SO
Bricklaying Subcontractor	✓	✓	✓	EKS, SO, EC, RF
Interior Works Subcontractor	✓	✓	✓	EKS, SO, EC, RF
Electrical Subcontractor	✓	✓	✘	EKS, SO

EKS – Effective knowledge sharing, SO – Self organisation, EC - Extra commitment, RF-Relational flexibility

As such, governance remained predominantly formal and in compliance with contractual provisions. Similar patterns of contractual governance were also detected

when trust derived from the embeddedness of subcontractors in the main contractor's way of working (system-based trust).

This was exemplified by the roofing subcontractor on Case B (see Table 4). This roofing subcontractor's site management personnel had completed an in-house health and safety (H&S) training and certification with the main contractor. As such, the main contractor's project team exhibited considerable confidence in the ability of the roofing subcontractor to uphold safety standards on site (system-based trust). They were even exempted from lengthy H&S inductions during the project. This confidence existed despite the absence of any previous working relationship between the project team and the subcontractor (impersonal). Nonetheless, relational flexibility was still absent due to the impersonal nature of the relationship.

Relational flexibility and the display of extra commitment by going an extra mile, were however distinctively linked with the existence of relational-based trust in the project supply chain. Subcontractors were prepared to make more sacrifices and accept higher vulnerabilities by considering the 'bigger picture' of future reciprocation opportunities that could accrue from their trusting behaviours. Beyond their contractual obligations on the project, subcontractors across the two cases that had a long-standing relationship with the main contractor's team had provided tendering assistance through early involvement, worked weekends on normal rates to get programme back on track and made pre and post-tender design inputs. The scaffolding contractor on Case A went as far as continuously progressing with changes based on mere verbal instructions so as to avoid delays to the project. They had a positive psychological expectation that even if they were not fully reimbursed for these changes, the favour will be reciprocated on a future exchange - relational based trust.

Relational flexibility, as a behavioural consequence, also made it possible for governance to be less formal and relaxed. It is this functional consequence that reduced the transaction costs associated with managing the project supply chain. This was clearly depicted by the electrical subcontractor on Case B. This was a subcontractor that previously had a long-standing supply chain relationship with the main contractor and their project teams. However, having not secured any work for a considerable period of time, this repeated relationship and consequently relational-based trust was destroyed. The main contractor came to the realisation that the relationship with a good and helpful subcontractor had become strained, and hence offered them an opportunity on this new project in an attempt to repair the broken-down trust. However, relational-based trust was only just under repair but still non-existent. The subcontractor revealed their difficulty in accepting any vulnerabilities that were underpinned by future reciprocation opportunities with the main contractor or their project team as clearly captured below:

> So, whereas before, if something small needed to be done and we'd just say 'oh, we'll do that.' Now, it's like...'it's a cost.'…So they've broken the supply chain friendship in a way - Electrical subcontractor, Case B

The above statement reveals how contractual the supply chain relationship had become in the absence of relational-based trust. Extra commitment and relational flexibility were now absent as behavioural consequences due to this absence of relational-based trust. Previous studies have revealed similar links between inter-organisational trust and strategic relational flexibility in supply chain networks (see Wathne *et al*., 2004). However, whilst most of these studies acknowledge the multi-dimensional nature of trust, the relationship between trust and performance is often analysed in a composite manner. This present study has revealed that it is rather the

relational dimension of trust that gives rise to relational flexibility, which consequently reduces transaction costs of projects. This relational dimension of trust and consequently relational flexibility, increases the relevance of social capital as a social form of contract for governing more complex transactions during a project. This is also consistent with the findings by Moore *et al*., (2016), who argued that existing social capital minimizes the negative relationship between project complexity and project performance. In effect, this social contract increases operational flexibility beyond that which is explicitly specified in the written contracts. This further places into perspective, previous links between trust and performance of projects (see Zaghloul *et al*., 2003). Zaghloul *et al*., (2003) revealed that trust-based relationships reduce transaction costs of projects through less reliance on formal contractual provisions. However, the discourse on trust and performance should be narrowed down to these influences of the different trust dimensions.

The above findings support the assertion that dependence on strong trust that is developed through repeated face-to-face interactions (relational-based) is not necessarily a pre-requisite for project success. Other dimensions of trust also give rise to some beneficial behavioural consequences that can be adequate for achieving success, particularly when work packages are less complicated (less complex, risky and critical tasks). According to Meyerson *et al*., (1996), swift sources of trust that are impersonal, are required for one-off transactions where time and energy (resources) cannot be devoted to building trust-based relationships through repeated face-to-face contacts over a considerable period. For such work packages, behaviours that derive from the impersonal cognition and system-based trust (self-organising behaviour and effective knowledge sharing) can just be enough for achieving success. However, a caveat is that even the weaker cognition-based dimension of trust does not emerge automatically. The main contractors in this study had implemented a rigorous supply chain vetting process based on which considerable information on subcontractor performance was acquired and analysed, particularly when trust was impersonal. It is therefore prudent that project teams understand the risk profiles of their work packages so as to gauge the priority that is placed on relational-based trust and its behavioural consequences.

CONCLUSIONS

This study represents an attempt to isolate and analyse the performance effect of the different trust dimensions in the project supply chain. The analysis has revealed how different trust dimensions varyingly influence behaviour of the project supply chain. Beyond the behavioural consequences that are promoted in the presence of all three trust dimensions (self-organising behaviour and effective knowledge sharing), there are additional behavioural consequences that emerge when trust is relational in nature (extra commitment and relational flexibility). It is these additional behaviours that allow for relational forms of governance to manifest and become beneficial by reducing transaction costs during a project. The relationship between trust and performance is thus contingent on other factors. As such, different dimensions of trust and their associated behavioural consequences can be prioritized and promoted in the project supply chain based on perceived work package risks. Reconsideration should therefore be given to the over-emphasis on relationally derived trust as the only pre-requisite for fostering positive behaviours and project success. These findings and conclusions are however not without limitations. They cannot be generalised beyond the cases that were studied and only focused on the dyadic relationship between main

contractors and first-tier subcontractors despite the complex multi-layered nature of the project supply chain.

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