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Procuring complex performance in construction: London Heathrow Terminal 5 and a Private Finance Initiative Hospital

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Abstract

This paper takes as its starting point that complex projects, interpreted as multiple dependent interactions between many stakeholders over time, challenge traditional procurement practices based on the serial purchase of discrete components. The paper examines how the procurement management of such projects – procuring complex performance – can be conducted. The paper utilises two contrasting case study examples of high profile UK construction project procurement. The findings suggest that the choice of mechanism or interface for the governance of upstream supply relationships critically relates to subsequent performance. The theoretical contribution is a fusion of procurement literature with the influential CoPS literature.

Keywords:

procuring complex performance, contracts and relationships, infrastructure projects

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Introduction

Recent scholarship, galvanised by the influence of Vargo and Lusch's work (2004) on service logic and environmentally grounded work such as Mont (2004), has begun to question the manufacturing bias and inheritance in many approaches to services. As the economy is increasingly servitized (Vandermerwe and Rada, 1988), the work of business to business procurement professionals is increasingly to purchase a combination of product and service. One example of this phenomena is the blurring of traditional boundaries of ownership, design and post construction performance in major construction projects. This development in part at least reflects previous disappointments with traditional "design construct and hand over" to the client models, where the construction team takes no responsibility for post construction performance, ease of use and flexibility (Egan, 1998).

The contractual forms that are emerging to support this newly 'servitized' construction model must incentivise the construction industry to provide new levels of service for example innovative environmental practices, ease of maintenance, flexibility once in use, and ease of ultimate disposal. The client must in effect, procure complex performance (as opposed to a complex building), clients increasingly value the "in use value" of the building or infrastructure over the bricks and mortar construction.

The construction industry then is a good sector to study how clients are procuring complex performance (PCP). PCP has been defined by Lewis and Roehrich (2009) in terms of a matrix comparing high and low transactional complexity, versus high and low infrastructural complexity. This is a helpful meta-analysis, but the concern of this paper is with the practices that make up procuring complex performance. The overall aim is to understand the practices that make up PCP in major construction projects that

are also product-service systems. Therefore given that procurement is relatively well accepted as professional purchasing, and performance from above indicates a product and a service being bought in combination, our focus here is on an initial working definition of the complex part of PCP. In line with for example Kash and Rycroft's (2002) definition of technological complexity we see complexity in this context as being that which prevents the buyer from simply buying discrete components (including service systems) and combining them together – i.e. the task cannot be accomplished by the serial and additive transaction mode of traditional (manufacturing) procurement.

To explore this issue of procuring for complex performance the paper compares the design, construction phases (therefore excluding the operation phase) of two complex construction product-service systems, both located in the UK. The first is the construction and delivery to the client operator of a new terminal at London Heathrow Airport, Terminal 5 (T5), and the second the construction of a new hospital funded under the 'Private Finance Initiative' (PFI). In Lewis and Roehrich's typology, the hospital would be high in performance complexity and low (or at least not high) in infrastructure complexity (hospitals construction contains many 'knowns'). The construction of T5 however would be both high transaction complexity and high infrastructure complexity. Figure 1 positions both project in the procurement complexity space. In both cases the focus is on the core project client/contractor relationship, with the network of wider relationships necessary to contract and deliver complex performance introduced only when necessary to understand client or contractor behaviour.

[Please insert: Figure 1: The Procurement of Complexity Space, about here]

Conceptual Background

The conceptual background first covers the Complex Product Systems (CoPS) literature (Davies 1997, Davies & Brady, 2000) which has focused on the management of complex projects. Secondly, a lack of attention to procurement issues is identified in the CoPS literature leading to a review of the supply relationship management and contracting literature.

Complex Product Systems

CoPS can be defined as high cost, technology intensive, customised, capital goods, systems, networks, control units, software packages, constructs and services (Hobday, 2000). Hobday (1998) defines CoPS as large-scale, engineering-intensive products that are supplied in unit or batch production and tailored to meet the requirements of particular large users. He suggests that where the standard model of innovation (e.g. the life cycle) is useful in studying mass production industries, a different analytical framework is required to explain supply in CoPS. Industries supplying CoPS are usually bilateral oligopolies with a few large suppliers facing a few large customers, or monopolists in each country (ibid).

CoPS therefore tend to be temporary structures involving many firms, introducing many network co-ordination issues that challenge traditional serial transaction based approaches to purchasing and supply: The prime contractor responsible for delivery of a CoPS project has to deal with a broad range of decentralised and self-directed

organisations in the innovation web, including component suppliers, manufacturers, financial institutions, government authorities, and diverse clients; becoming effectively a systems integrator, (Davies, Gann and Douglas, 2009; Geyer & Davies, 2000:997). Hobday (1998) provides a comprehensive comparison of CoPS and mass production industries (see Table 1).

[Please insert: Table 1: CoPS vs. mass production industries (two ideal types), about here]

Davies and Brady (2000) suggest that CoPs firms can develop ‘economies of repetition’ in moving from one bid to another achieving economies in bid preparation and execution from putting in place routines and learning processes. A constant theme of the CoPs literature is the need for strong co-ordinating roles in linking projects together. However, CoPS approaches do have limitations; for example, they tend not to consider the customer’s operating environment or the impact of wider developments (beyond the project) (e.g., Geyer & Davies, 2000), and highly relevantly here, often have little to report on the formal and informal control mechanisms of procuring complex performance. However, Lewis and Roehrich (2009) argue that procuring complex performance is associated with various distinct governance challenges. The paper therefore adds to the perspective from the CoPS literature formal and informal control mechanisms as governance. Formal control is considered as contractual obligations and formal organisational mechanisms for cooperation (Ouchi, 1979). In contrast, informal control in this study refers to social control and relational governance, relating to informal cultures and systems (Ouchi, 1979).

Application of formal control

Formal control is applied through contractually stipulated agreements to reduce hazards of opportunisms by specifying a ‘complete relationship framework’ for the contracting parties (Williamson, 1975). The formal control approach considers trust as an unreliable safeguard and thus it is critical to contracting parties to deploy safeguards based on contractual enforcement and monitoring. In practice, drafting a complex and ‘complete’ contract, that is a contract that safeguards for every possible future contingency, is costly and ineffective due to asymmetric information and, hence, may lead to potential inefficiencies in a relationship (Lyons and Metha, 1997; Baiman and Rajan, 2002). In practice, asymmetric information and drafting costs result in ‘incomplete’ contracts, thus contracting parties can only define procedures and processes for resolving unforeseeable contingencies (Klein Woolthuis et al., 2005). Accepting contract incompleteness, those contracts may contain non-legally enforceable and poorly specified intentions and promises that are easily by misinterpreted by the courts (Deakin and Wilkinson, 1998).

In the context of Private Finance Initiative (PFI) as an example of PCP, contracts are complex by nature as they consist of agreements covering the design, building, finance and operation phases of long-term projects. Such PFI supply arrangements tend to increase asset specificity and uncertainty (Lonsdale, 2005; Bennett and Iossa, 2006). Contracting for such systems requires the quality of services to be well specified or the availability of appropriate performance measures that reward or penalise the service

providers accordingly (Hart, 2003). Empirical research shows that the use of PFI contracts, for instance, to mitigate relationship risks, is highly problematic due to their incompleteness (Froud, 2003).

Application of informal control

With respect to alternative governance mechanisms, informal control mechanisms are based on trust and mutual commitment. Buyer-supplier relationships which are characterised by informal control are governed by social processes that promote norms of trust, flexibility, solidarity and information exchange (Poppo and Zenger, 2002).

Informal control mechanisms are applied as safeguards against relationship hazards, a way of facilitating the enforcement of obligations and a bilateral approach to problem solving (Zand, 1972). Relational approaches, such as informal control mechanisms, are appropriate when organisations are inter-dependent with relationships developed when two companies build up activity links, resource ties, and actor bonds (Håkansson and Snehota, 1995). Hence ongoing interaction in relationships is achieved by managing these inter-dependent activities. However, developing and maintaining informal control mechanisms in the context of complex procurement arrangements is time- and resource consuming (Larson, 1992). Equally, as project scale and scope increase, relationships are harder to maintain and sanction through informal control because repeat business and cultural homogeneity are less likely (North, 1990).

Interplay of formal and informal control mechanisms in complex procurement projects

There is a divergent view within the literature on the relationship of formal and informal mechanisms. Some researchers consider trust, as part of informal control mechanisms, as a substitute for a complex contracts, as part of formal control mechanisms (Granovetter, 1985; Dyer and Singe, 1998). Others argue that trust and formal control are inter-related in various dynamic patterns (Larson, 1992; Ring and Van de Ven, 1994; Zaheer and Venkatraman, 1995; Poppo and Zenger, 2002; Klein Woolthuis et al., 2005; Zheng et al., 2008). For instance, well-specified contracts may actually promote more co-operative, long-term, trusting relations; continuity and cooperation may lead to contractual refinements that further support greater inter-organisational cooperation (Poppo and Zenger, 2002). Joint use of contracts and trust may provide a ground for more efficient outcomes than the use of either of them in isolation (North, 1990). In terms of public-private relationships, Essig and Batran (2006) state that the strategic importance and specificity of individual goods and services influence the particular choice of institutional or contractual arrangements. Along the same line, Klein Woolthuis et al. (2005) argue that it is important to understand the content of contracts and trust and their meaning in relationship development to further clarify the exact role of both approaches.

Considering the typical length of complex procurement projects, for instance PFI projects with project life-cycles of up to 50 years, various benefits and problems are associated with the application of long-term contracts as opposed to short-term contracts (Cohen and Agrawal, 1999). For example, long-term relationships enable the development of trust, while at the same time it is unavoidable that conflicts will arise in many long-term relationships (Deakin et al., 1997). Formal control may play an

elevated role in managing long-term supply arrangements; especially when considering changing personnel, stakeholders and regulations/policies. Contracts as part of formal control may be used as a planning and incentivisation tool with the provision of legal enforceability in long-term business relationships (Deakin et al., 1997). Furthermore, the importance of formal control in long-term relationships may also be related to relationship termination and conflict resolution issues. Relationship dissolution is particularly challenging in the absence of legally-binding contracts and when the relationship is of an exclusive, long-term nature, involving substantial investments by suppliers (Harrison, 2004).

With specific reference to complex public-private supply arrangements, it has been argued that the sheer multiplicity of stakeholders, with the various and often conflicting interests and strategies (Klijn and Teisman, 2003), necessitates the active consideration of relationships as co-ordinating mechanisms for intra- and inter-organisational networks (Tranfield et al., 2005, Koppenjan, 2005). Conversely, research has highlighted the additional difficulties that public-private relationships might face (Lonsdale, 2005, Erridge, 2002). For instance, Teisman and Klijn (2004) argue that commercial contract negotiations between the private and public sector may be influenced by their different values and strategies. They state that public actors are driven by politics and an emphasis on formal transparency in delivering public value; whereas private actors are driven by financial value creation. These difficulties are also partly reflected in an imbalance of power between the actors (Grimshaw et al., 2002) – although different authors have interpreted this in different ways; some arguing that the public sector has a sub-ordinate role in the relationship, whilst others present such

relationships as problematic for a buyer organisation due to post-contractual lock-in to suppliers (Lonsdale, 2005). That is, in relationships where asset specificity and switching costs are significantly high, buyers face problems with exiting the relationship and become dependent on suppliers. Furthermore, the extent of political influence on PFI procurement decisions may impact on the nature of public-private supply relationships (Lonsdale, 2005).

Combining the capital goods project co-ordination perspective of the CoPS literature with insights from formal and informal governance mechanisms suggests there is still a problem space to address. In spite of some prescription, there is a variety of divergent opinion that validates the central research question of the paper; how should complex performance be procured in the design and construction phase of major construction projects?

Research methodology

Although, inevitably, the projects differ in some key aspects they were both selected as challenging complex procurement projects. The hospital was contract was pioneering in being among the ‘first wave’ of PFI healthcare projects in the UK, while the Heathrow Terminal 5 project is one of Europe’s largest projects, T5 on its own being equivalent to Europe’s fifth largest airport (Davies, Brady and Gann, 2007:10).

Given the relatively limited extant literature explaining how complex performance can be procured, exploratory empirical case studies were used. Case studies are particularly useful when exploring new areas of research (Eisenhardt, 1989). Equally, the rich qualitative and quantitative data sets generated (Yin, 1994) are particularly important

for the measurement of complex and intangible phenomena and the need to look beyond organizational boundaries. Therefore, the adaptation of a contextualised view (Pettigrew, 1985) was a central premise of this research. The empirical element of the paper stems from two discrete case studies of complex procurement environments; both of which provide a wealth of published and unpublished secondary material. The first case study is a design, build, finance and operate (DBFO) PFI hospital project and the second case study the newly built Terminal 5 (T5) at Heathrow airport in London. Table 2 summarises the key characteristics of the cases, some data has been disguised for reasons of confidentiality. Also the table highlights the difference in scale between the two projects, being larger, T5 had more scope for bespoke performance.

[Please insert: Table 2: Overview of key case characteristics, about here]

In the PFI case twenty semi-structured, face-to-face interviews with different key stakeholders (lasting between one to two hours) were conducted over a period of two years. This total includes interviews with public sector organisations such as the NHS Trust (effectively the ‘buyer’) and the Private Finance Unit (PFU), a public sector consultancy organisation, and with private sector organisations, for instance, the construction company and banks. The case study of T5 took place over 20 months from June 2005 to January 2007. 30 interviews were conducted with most of the senior managers on the project, including past and present project directors and senior project managers from BAA (the client), Laing O’Rourke (LOR) the major constructor on the project and the former project director of British Airways (BAA’s customer), and some project team members. The research acknowledged the complex network associated

with both case studies and thus data collection moved beyond the dyadic relationship of client and prime contractor. The breadth of interviewees was necessary to capture a variety of perspectives and build rich insights relating to the bidding/contract negotiation and construction phases of the two projects. All interviews were digitally recorded and transcribed, whilst the confidentiality of participating organisations and individuals was assured. One feature of complex infrastructural projects is that they tend to be high profile and therefore produce a variety of reports some pure public relations, and others, much more informative for research purposes, aimed at institutional stakeholders such as financial analysts and public audit authorities. Hence, interview data was further strengthened through triangulation using secondary data including company documentation and reports from HM Treasury and the Audit Commission on Private Finance Initiative (e.g. The Stationery Office, 2000; HM Treasury, 2006). NVivo7 was used to support analysis of the interview transcripts and secondary data sources. Specific coding included contextual variables and items attached to the use of formal and informal control mechanisms. Coding items included dimensions such as reliability, credibility, fairness, goodwill and competence across individuals. In addition, to facilitate the interpretation of commonalities and differences between cases, data matrices were used (Miles and Huberman, 1994) to analyse changes in key contextual variables in relation to changing patterns of governance mechanisms.

Case findings

This section presents a description of the two cases including a brief summary of the case backgrounds.

PFI hospital

Background of PFI hospital

Limited existing healthcare capacity and increasing demand on the town centre hospital, which had been built in the late 1950s, resulted in the decision to replace the old hospital and centralise a number of other health facilities into one large, new, hospital on a ‘greenfield’ site outside the town. The 500 plus bed acute district general hospital was designed, built, financed, and operated (DBFO) by a private sector contractor under the PFI scheme. The principal public–private relationship between a single National Health Service (NHS) Trust and a private partner, a company that combines both a building and a facility management (FM) division, is covered under the concession agreement (see Figure 2). The concession agreement represents a legally-binding contract covering the rights and obligations during the construction and operation phases over a 30-year relationship life-cycle. Since signing the contract in the late 1990s, the contract has been modified to accommodate changes in the stakeholder equity structure. In 2003 the concession agreement was adjusted to incorporate additional capacity in the form of a multi-bed Diagnostic Treatment Centre at an additional cost of almost £30million.

[Please insert Figure 2: PFI hospital project structure, about here]

Heathrow Airport London Terminal 5

Background of *Terminal 5 at London’s Heathrow Airport*

T5 will be the new operational base for British Airways (BA) at Heathrow. BAA built the fifth terminal to increase Heathrow’s capacity by 28 million passengers a year. The

vision for the project was ambitious – not just completion on time and within budget, but to *‘create a new standard for project delivery in the UK’* - a requirement on the process. In addition, key principles were *‘fair reward for achievements of our partners’* (the contractors) and *‘no surprises for BAA shareholders’*.

The basis of the contract between BAA, their main client (BA) and their 60 main suppliers is the ‘Team Handbook.’ The contracts are reimbursable, with open-book accounting and sampling audit. The contracts are also incentivised, with payments for saving made based on a share of a reward fund – a pooled fund of the benefits gained, which will be distributed on the achievement of key milestones in the construction phase, and on the achievement of key objectives during the operational phase. Central to project delivery and performance in T5 was the BBA policy that ‘The client always *bears the risk*’. BAA’s operated T5 from the perspective that the client should always bear and pay for the risk on the project. This involves identifying possible sources of risk and to bring together the best capabilities and resources to manage the risk.

[Please insert Figure 3: Heathrow Terminal 5 project structure, about here] –

Beyond the challenges of the main terminal buildings and new air traffic control tower the project involved new roads, hotel facilities, the diversion of two rivers, over 13km of bored tunnel and more (see Shanghavi et al 2008 for more detailed statistics). T5 also holds the record for the longest public inquiry in UKK planning history, over 40 months (see table 2).

Both the construction of T5 and a PFI hospital involve therefore substantial and sophisticated procurement, this section concludes with a summary table (Table 3) that identifies core comparisons between the two forms of complex performance so that the analysis section can be focused on key issues. Therefore not all the issues reported in table 3 can be pursued here (see Davies, Gann and Douglas 2007 for a full account of T5), the focus is only on those that inform our understanding of procuring complex performance.

[Please insert: Table 3 Summary project features, about here]

Discussion

Drawing on the literature review this discussion section is structured into three parts; complex product systems, formal, and then informal, control mechanisms.

Complex product systems and procuring complex performance

In Hobday's (1998) comprehensive comparison of CoPS and mass production as idealized types, T5 and the early PFI hospital match well with CoPS product characteristics (e.g. complex component interfaces; high unit cost; product cycles last decades; many skills/knowledge inputs; (many) tailored components and upstream, capital goods). Similarly under the comparison heading of production characteristics both entities are project/small batch arrangements. However marked differences emerge under Hobday's last four headings; innovation processes; competitive strategies and innovation co-ordination; Industrial coordination and evolution and market characteristics. The differences suggest that many of the features of procurement in the

hospital case resonate more with traditional mass production commodity or product based management and procurement.

Under innovation Hobday suggests innovation processes are user/producer driven suggesting co-creation of knowledge (Vargo and Lusch, 2004) and innovation paths agreed ex-ante among suppliers, users etc. T5 provided examples of co-created solutions such as the extension and within project underground excavation and tunnelling required (Shanghavi et al., 2008). Authors have generally been highly critical of innovations arising from early PFIs (Barlow and Koeberle-Gaiser, 2008 & 2009). In the T5 case innovation was both co-created with suppliers, part of the 'no blame' culture of the project, however in the early PFI example innovation was the responsibility of the contractor, and the contractor's interpretation of the requirement. In the hospital case, an interpretation often made more complicated by the much greater detail of upfront specifications.

Under competitive strategies and innovation co-ordination Hobday presents key features of CoPS as being a focus on product design & development rather than a focus on economies of scale/cost; the management of multi-firm alliances in temporary projects and most critically of all here; system integration competencies. The biggest contrast between the two cases and their approach to procuring complex performance flows from their contrasting approaches to managing co-ordination. BAA as stated set out to have a few but close relationships, having meticulously pre-selected key supply partners (Table 3). By dividing the business into four keys areas (see Figure 3) the size of the project was kept manageable and risk, and supplier performance (and capability for innovative working) could be exposed. In contrast the PFI hospital had an arms length relationship

with sub suppliers managing only the relationship with the key contractor. In the hospital case procurement did not include a systems integration role – this was delegated to the contractor. This emphasis on the co-ordination mechanism (noted in the literature review above) in CoPS is also reflected in Hobdays treatment of industrial coordination and evolution, where the comparison is on the ‘elaborate network’ of CoPS with the large firm/supply chain focus of mass production. Whilst the PFI case exhibits an elaborate network of stakeholders, the approach to procurement resonates more with that of a focal firm operating in a standardized product, uni-flow supply chain. Although the pyramid presentation in Figure 3 is not ideal for stressing the network nature of T5, Figure 3 does demonstrate the breadth of engagement with the T5 supply base.

Having started with features from Hobday that suggested both the construction and the hospital fit well with definitions of CoPS, his final category market characteristics returns to highlighting similarities across the cases with CoPS. Both cases feature few buyers and few sellers, a small number of large transactions, business to business (not consumer) markets and the absence of market prices. In terms of expanding our understanding of procuring complex performance this absence of market prices appears an important element of the difference between traditional and complex performance procurement.

This section, whilst highlighting enough similarities between CoPS and the two cases to confirm that both are CoPS, has highlighted key areas in which the procurement of performance in the PFI case drew on an earlier mass production procurement notably in

contracting for complex performance through a traditional dyadic interface with one contractor in contrast to the more networked approach in T5.

Formal control and procuring complex performance

The literature review highlighted that formal control can be applied through a tightly specified contract, where such a ‘complete’ contract can be written. However in both cases, and perhaps more generally in complex construction (Akintoye et al., 2000), non-contractually specified collaboration will be required; and pragmatically is anticipated by both parties whatever the completeness level of the written contract. In terms of formal control the strongest contrast between the two cases is how the projects used the substantial ‘start-up’ phase. In the PFI interviews problems with the sheer size and complexity of the (first wave and therefore non-standard) PFI contract were commonly reported; driven initially by an ambiguous and prolonged drafting process abetted by a time-consuming contract variations process. Despite its legal formality, different stakeholders interpreted the PFI contract documents very differently: for instance several NHS Trust interviewees perceived the contractor as being mainly interested in ‘building rather than delivering the service’, highlighting how they specified cheap lift products with high maintenance costs. Conversely, the contractor argued that the specification problems had been caused, partly by the ‘early project’ status where pivotal contract information was sparse or missing (e.g. for a meaningful risk transfer to be assured, market tested life-cycle costs for a whole range of products – including lifts - were needed). These ‘first wave’ problems eventually led to the creation of the PFU unit (table 3).

In contrast to the time spent in the start up phase on formal, contractual mechanisms in the PFI, the early work in the T5 approach was much more informal, both in the lack of emphasis on the contract and in the strong emphasis on behavioural standards. This relative informality is perhaps only made possible by BAAs assumption that they will always own risk (Table 3). It is surely deliberate that the T5 equivalent to the PFI concession document was called an Agreement implying collaboration rather than hierarchy. Setting an objective as ‘no surprises for shareholders’ illustrates the clarity inherent in the BAA approach – albeit also the huge risks that were underwritten.

This analysis of the cases appears to support Teisman and Klijn (2004)’s view that the public and private sectors may be influenced by their different values and strategies. In the PFI case formal control is a part of the philosophy of UK public procurement, driven, these authors suggest, by politics and an emphasis on formal transparency in delivering public value whereas private actors are driven by financial value creation. Thus in the public sector PFI case the start up phase appears to focus on clarification of what the contract will cover (the what? question – the transparency of objective/what will be done and the shape of the financial envelope of the project) but at the expense of transparency of practice or the how? question. A number of NHS Trusts interviewees perceived the formal PFI contract to be almost exclusively about the legal and financial aspects of the deal. For instance, although the Hospital Company was responsible for the ‘entirety’ of the PFI contract, several interviewees argued that the Hospital Company was mostly focused on the financing (and re-financing) aspects of the governance process. In contrast the T5, private sector (financial value creation) approach in this case, is to spend less upfront time on the what question (as in the PFI

case, there is a face answer – build a new terminal or a hospital) and concentrate upfront time instead on the how – especially in the form of supplier selection and relationship management.

Before translating this analysis into implications, there are some counter balancing factors to consider. BAA was better placed in the T5 project to leverage learning and capabilities from other projects, drawing significantly both on an internal project methodology and prior experience with project applied information systems (table 3). It would appear financial rather than project issues dominated the pre construction phases of PFI as well as significant co-ordination issues. It appears BAA internalized much of what PFI leaves to the market/client/contractor interface to solve (table 3). Although again the caveat is necessary that the PFI has a much longer horizon and it is almost impossible at this stage to assess success in achieving some goals. Even allowing for BAA's greater expertise (they were regular buyers of airport facilities), the implications from comparing these two cases are that in procuring complex performance in construction, the use of start-up phase is one key variable, and that project success appears more likely if this project start up time is devoted to working on the how of delivery complex performance than the what.

The differing interests/capabilities of the public private sectors have been discussed as constraints and enablers. It was suggested that in complex construction projects the start up phase needs to address how issues such as selecting innovative suppliers and relationship management and communicating how the project will work.

Informal control and procuring complex performance

Much of the content of Table 3 contrasts the use of less formal control mechanisms (although certainly control mechanisms are there) in the T5 project. The influence of behavioural and even reputational factors is high (table 3). Certainly in the period covered here the T5 project can be characterised as making greater use of trust than the PFI project. However the cases do not appear to address a simple bifurcation between either trust or a complex 'complete' contract. As the literature suggested, long term relationships such as PFI ones are often a context for trust to be used as a governance mechanism (Cohen and Agrawal, 1999). But what we see in the PFI case is two key variables that relate to the maturity of the project that restrict the development of for example a trust based approach: the maturity of the market for PFI, and internal employee turnover on the PFI side.

Under formal control the work undertaken in the start up phase was linked to the fragmented and perhaps over detailed approach of the PFI project in the start up phase. Now the initial, early stage conduct of this public sector project is linked to constraining the extent to which collaborative working and the build up of goodwill and trust for future collaborative working was possible. BAA's T5 approach had been to carefully select senior managers and keep them in place for the initial phases, and specifically the contract negotiation team. A constant complaint from all parties about the PFI project was the constant turnover of staff, and particularly the project manager role itself. Critically here BAA kept the same contract negotiation team in place for the length of the bidding phase. For the health service 'buyer' there was a real lack of internal experience of PFI, and an inability it seemed to pay market rates for good staff.

Therefore as the PFI market matured any NHS staff with sound experience of PFI found they were in demand and at salaries not available in the local NHS.

This issue of a shortage of skills in an immature market or industry also affected the ability of the NHS buyer to use trust and informal mechanisms when it had so little experience of the likely outcomes for PFI. Whereas in T5 whilst the major contractor had not built such a large project before it had extensive relevant experience from other projects, and industries such as oil and gas.

Rather than support a distinction between either the use of contracts or softer, behavioural mechanism this analysis draws attention to the influence of context and relationship development as important variables in line with Klein Woolthuis et al. (2005). Particularly the cases may be examples where the context of the market is asymmetric for buyer and supplier (e.g. in their varying capacities here to cope with an immature market) and that this externally driven asymmetry in at least the early stages overrides the contract versus trust debate.

Conclusions

The paper has added a procurement perspective to the influential CoPS perspective to examine actual procurement practices in two complex performance procurements in major construction projects. It has also identified actual practices to support and inform the meta level analysis of the Procurement Complexity Space proposed by Lewis and Roehrich, (2009).

It has been suggested that the two examples of contracting for complex performance take substantially different approaches. The PFI case is more traditional in trying to offload to risk via a detailed contractual mechanism, and in adopting manufacturing style procurement practices. In contrast T5 sought to identify and expose risk, and then to incentivise those parties best qualified to manage the risk to take innovative approaches, comfortable with the knowledge that their work load and margin would be acknowledged and protected. Other differences relate to the extent that previous learning and capabilities could be brought to the project, although the advantage provided by the scale of T5, e.g. in designing an information system has to be acknowledged. Although this paper has only examined a limited number of areas, one key area of difference is the client/contractor interface. Here BAA sought to control internally much of the early decision making in comparison to the contractor led approach taken in PFI. The BAA approach was far better suited to engaging the talents of the supply base, whereas in PFI such contributions are directly mediated by the prime contractor. It should also be stressed that BAA will have no relationship in the operating phase of T5, whereas in PFI the main contractor is still involved, albeit via a facilities management division.

The paper has explored the practices of complex procurement to address the question how should complex performance be procured in the design and construction phase of major construction projects? The cases analysis suggests traditional mass production commodity or product based management and procurement are not appropriate, evidenced in a lack of innovation in the PFI case. Procuring complex performance from these cases needs to involve suppliers and some levels of value co-creation, often ex

ante. A lack of market prices was identified as sign of procuring complex performance (PCP). In these construction cases the start up phase appears critical, the more successful case spent start up time on how the project could work (including communication, supplier selection and relationship management) not on formal specifications. This is suggested as a feature of PCP and linked to the differing motives of public and private clients, that is transparency versus value creation. Finally the influence of market maturity on the possible levels of trust was identified, suggesting a key factor of successful PCP is understanding and working with the dynamic of the market, for example not attempting to move faster than the market will allow, e.g. in terms of recruitment and retention or even risk taking.

It is important to reflect upon the work's limitations and further research opportunities. The research work presented here is highly context-bound, further conceptual and empirical work is needed to investigate the relationships between context, process and outcome of using different governance mechanisms (Pettigrew, 1985). There is a need to understand how unique the PFI/PPP and T5 contracting mechanisms really are, such large undertakings have in fact been constructed since before written records. Apparently new techniques and approaches may mask deeper continuities.

References

- Akintoye, A., McIntosh, G., & Fitzgerald, E. (2000). A survey of supply chain collaboration and management in the UK construction industry. *European Journal of Purchasing & Supply Management*, 6, 159-168.
- Baiman, S., & Rajan, M. V. (2002). The Role of Information and Opportunism in the Choice of Buyer Supplier Relationships. *Journal of Accounting Research*, 40 (2), 247-278.
- Barlow, J. & Koeberle-Gaiser, M. (2008). The private finance initiative, project form and design innovation: The UK's hospitals programme. *Research Policy*, 37, 1392-1402.
- Barlow, J. & Koeberle-Gaiser, M. (2009). Delivering innovation in hospital construction: Contracts and collaboration in the UK's Private Finance Initiative hospitals programme. *California Management Review*, 51(2), 126-143.
- Bennett, J., & Iossa, E. (2006). Building and managing facilities for public services. *Journal of public economics*, 90 (10-11), 2143-2160.
- Caldwell, N. D., & Roehrich, J. K. (2008). Innovation within complex product-service healthcare systems: A case of PFI and contestable markets in the UK. HaCIRIC Symposium, *'Redefining healthcare infrastructure. Integrating services, technologies and the built environment'*, April 3-4, 2008; Imperial College London.
- Cohen M. A., & Agrawal, N. (1999). An analytical comparison of long and short term contracts. *IIE Transactions*, 31, 783-796.
- Davies, A. (1997). The life cycle of a complex product system, *International Journal of Innovation Management*, 1, 229 – 256.

- Davies, A., & Brady, T. (2000). Organisational capabilities and learning in complex product systems: towards repeatable solutions, *Research Policy*, 29, 931- 953.
- Davies, A., Brady, T.& Gann, D. (2007). Innovation in project management: learning from Heathrow Terminal 5. Internal Report, November, Tanaka Business School, Imperial College, London.
- Davies, A., Gann, D.& Douglas, T. (2009) Innovation in Megaprojects: Systems Integration at London Heathrow Terminal 5. *California Management Review*, 51(2), Winter, 101-125
- Deakin, S., & Wilkinson, F. (1998). Contract Law and the Economics of Interorganisational Trust. In: Lane, C. and Bachmann, R. (eds.) (1998). *Trust Within and Between Organisations: Conceptual Issues and Applications*. Oxford: Oxford University Press, 146-172.
- Deakin, S., Lane, C., & Wilkinson, F. (1997). Contract Law, trust relations and incentives for cooperation: a comparative study, In Deakin, S and Michie, J. (eds) *Contract, Cooperation, and Competition*, Oxford.
- Dyer, J. H., & Singh, H. (1998). The relational view: cooperative strategy and sources of interorganizational competitive advantage. *The Academy of Management Review*, 23(4), 660-679.
- Egan, J. (1998) *Egan Report (Rethinking Construction)*, HMSO, UK
- Eisenhardt, K. (1989). Building theories from case study research. *Academy of Management Review*, 14(4), 532-550.
- Erridge, A. (2002). Partnerships and public procurement: building social capital through supply relations. *Public Administration*, 80(3), 503-522.

- Essig, M., & Batran, A. (2006). Public-private partnership - Development of long-term relationships in public procurement in Germany. *Journal of Purchasing & Supply Management*, 11(5&6), 221-231.
- Froud, J. (2003). The Private Finance Initiative: risk, uncertainty and the state. *Accounting Organizations and Society*, 28(6), 567-589.
- Geyer, A., & Davies, A. (2000). Managing project-system interfaces: case studies of railway projects in restructured UK and German markets. *Research Policy*, 29, 991-1013.
- Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology*, 91(3), 481-510.
- Grimshaw, D., Vincent, S., & Willmott, H. (2002). Going privately: partnership and outsourcing in UK public services. *Public Administration*, 80(3), 475-502.
- Håkansson, H., & Snehota, I. (1995). *Developing Relationships in Business Networks*, London: International Thomson Business Press.
- Harrison, D. (2004). Is a Long-term Business Relationship an Implied Contract? Two Views of Relationship Disengagement. *Journal of Management Studies*, 41(1), 107-125.
- Hart, O. (2003). Incomplete contracts and public ownership: Remarks, and an application to public-private partnerships. *Economic Journal*, 113(486), 69-76.
- HM Treasury. 2006. Website: http://www.hm-treasury.gov.uk/media/F11/C2/pfi_stats_furtherinfo_290404.pdf [accessed 02 February 2009]

- Hobday, M. (1998) Product Complexity, innovation and industrial organisation.
Research Policy, 26, 689-710
- Hobday, M. (2000). Editorial “Innovation in complex products and system”, Research Policy, 29, 793-804.
- Kash, D.E.& Rycroft, R. (2002) Emerging patterns of complex technological innovation, Technological Forecasting & Social Change, 69, 581-606
- Klein Woolthuis, R.; Hillebrand, B., & Nooteboom, B. (2005). Trust, contract and relationship development. Organization Studies, 26(6), 813-840.
- Klijn, E. H. & Teisman, G. R. (2003). Institutional and strategic barriers to public-private partnership: An analysis of Dutch cases. Public Money & Management, 23(3), 137-146.
- Koppenjan, J F.M. (2005). The formation of public-private partnerships: Lessons from nine transport infrastructure projects in the Netherlands. Public Administration, 83(1), 135-157.
- Larson, A. (1992). Network dyads in entrepreneurial settings: A study of the governance of exchange relationships. Administrative Science Quarterly, 37(1), 76-104.
- Lewis, M.A. & Roehrich, J.K. (2009). Contracts, relationships and integration: towards a model of the procurement of complex performance. International Journal of Procurement Management, 2(2), 125–142.
- Lonsdale, C. (2005). Post-contractual lock-in and the UK Private Finance Initiative (PFI): The cases of national savings and investments and Lord Chancellor's Department. Public Administration, 83(1), 67-88.

- Lyons, B., & Mehta, J. (1997). Contracts, opportunism and trust: self-interest and social orientation. *Cambridge Journal of Economics*, 21(2), 239-257
- Miles, M.B., Huberman, A.M. (1994) *Qualitative Data Analysis: an expanded sourcebook*, Second Edition, Sage Publications Inc, USA
- Mont, O., (2004) *Product-Service Systems: Panacea or Myth*. Doctoral Dissertation. Lund University, Sweden
- North, D. C. (1990). *Institutions, Institutional Change and Economic Performance*. Cambridge: University Press.
- Ouchi, W. G. (1979). A conceptual framework for the design of organizational control mechanisms. *Management Science*, 25, 833–848.
- Pettigrew, A. (1985). Contextualist Research: A Natural Way to Link Theory and Practice. In E. Lawler (Ed.), *Doing Research That Is Useful for Theory and Practice*, San Francisco: Josey-Bass, 222-274.
- Poppo, L., & Zenger, T. (2002). Do Formal Contracts and Relational Governance Function as Substitutes or Complements? *Strategic Management Journal*, 23(8), 707-725.
- Ring, P. S., & Van de Ven, A. H. (1994). Developmental processes of cooperative interorganizational relationships. *The Academy of Management Review*, 19(1), 90-118.
- Shanghavi, H., Beveridge, J., Darby, A., & Powderham, A. (2008) Engineering the space below Terminal 5. *INGENIA*, Issue 34, March, 13-20
- Teisman, G. R., & Klijn, E. H. (2004). PPPs: Torn between two lovers. *EBF Debate*, Summer (18), 27-29.

- The Stationery Office. (2000). *Public Private Partnerships, The Government's Approach*, UK.
- Tranfield, D., Rowe, A., Smart, P. K., Levene, R., Deasley, P., & Corley, J. (2005). Coordinating for service delivery in public-private partnership and private finance initiative construction projects: early findings from an exploratory study. *Proceedings of the Institution of Mechanical Engineers Part B-Journal of Engineering Manufacture*, 219(1), 165-175.
- Vandermerwe, S., & Rada, J. (1988), Servitization of business: adding value by adding services, *European Management Journal*: 6 (4): 314-324.
- Vargo, S.L., Lusch, R.F. (2004) "Evolving to a New Dominant Logic for Marketing", *Journal of Marketing*, 68, January, pp. 1-17
- Williamson, O.E. (1975). *Markets and hierarchies*. New York: Free Press.
- Yin, R.K. (1994). *Case Study Research: design and methods*. London: Sage.
- Zaheer, A., & Venkatraman, N. (1995). Relational governance as an inter-organizational strategy: an empirical test of the role of trust in economic exchange. *Strategic Management Journal*, 16(5), 373-392.
- Zand, D.E. (1972). Trust and managerial problem solving. *Administrative Science Quarterly*, 17(2), 229-239.
- Zheng, J., Roehrich, J.K., & Lewis, M.A. (2008). The dynamics of contractual and relational governance: Evidence from long-term public-private procurement arrangements. *Journal of Purchasing and Supply Management*, 14(1), 43-54.