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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 the fact 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 mechanisms or interfaces 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.

1. Introduction

Recent scholarship, galvanised by the influence of Vargo and Lusch's (2004) work 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 characterised by purchasing a combination of product and service. One example of this phenomenon 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 compose 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 and 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

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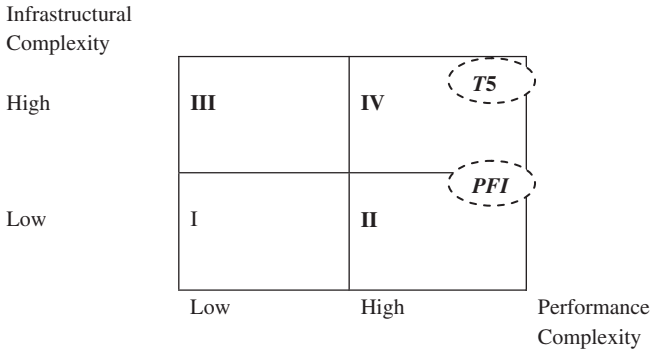

Fig. 1. T5 and PFI in the Procurement Complexity Space (adapted from Lewis and Roehrich, 2009).

both high transaction complexity and high infrastructure complexity. Fig. 1 positions both projects in the Procurement Complexity Space. In both cases the focus is on the core project client/contractor relationship, with the wider network of relationships necessary to contract and deliver complex performance. The wider network is only introduced when necessary to understand client or contractor behaviour.

2. Conceptual background

The conceptual background first covers the complex product systems (CoPS) literature (Davies, 1997; Davies and 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.

2.1. 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 (Hobday, 1998).

CoPS therefore tend to be temporary structures involving many firms, introducing many network coordination 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 et al., 2009; Geyer and Davies, 2000, p. 997). Hobday (1998) provides a comprehensive comparison of CoPS and mass production industries (see Table 1).

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

Table 1
CoPS versus mass production industries (two ideal types).

CoPS project organisation	Commodity or products, functional organisations
Product characteristics	
Complex component interfaces	Simple interfaces
Multi-functional	Single function
High unit cost	Low unit cost
Product cycles last decades	Short product life cycle
Many skills/knowledge inputs	Fewer skill/knowledge inputs
(Many) tailored components	Standardised components
Upstream, capital goods	Downstream, consumption goods
Hierarchical/systemic	Simple architectures
Production characteristics	
Project/small batch	High volume/large batch
Systems integration	Design for manufacture
Scale-intensive, mass	Incremental process, cost
Production not relevant	Control central
Innovation processes	
User–producer driven	Supplier driven
Highly flexible, craft based	Formalised. Codified
Innovation and diffusion collapsed	Innovation and diffusion separate
Innovation paths agreed ex ante among suppliers, users, etc.	Innovation paths mediated by market selection
People-embodied knowledge	Machinery-embodied knowledge
Competitive strategies and innovation coordination	
Focus on product design and development	Focus on economies of scale/cost minimization
Organic	Mechanistic
System integration competencies	Volume production competencies
Management of multi-firm alliances in temporary projects	Focus on single firm (e.g. lean production, TQM, MRP11)
Industrial coordination and evolution	
Elaborate networks	Large firm/supply chain
Project-based multi-firm alliances	Single firm as mass producer
Temporary multi-firm alliances for innovation and production	Alliances usually for R&D or asset exchange
Long-term stability at integrator level	Dominant design signals industry shakeout
Market characteristics	
Duopolistic structure	Many buyers and sellers
Few large transactions	Large number of transactions
Business to business	Business to consumer
Administered markets	Regular market mechanisms
Institutional/politicized	Traded
Heavily regulated/controlled	Minimal regulation
Negotiated prices	Market prices
Partially contested	Highly competitive

Source: Adapted from Hobday, M. (1998).

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 and 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).

2.2. Application of formal control

Formal control is applied through contractually stipulated agreements to reduce hazards of opportunisms by specifying a