

Delivering integrated solutions in the public sector: the unbundling paradox

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Biographical notes

Dr Jens Roehrich is a Lecturer at the School of Management, University of Bath, UK. His research focuses on the management of long-term inter-organizational relationships, including the dynamic interplay of contracts and trust, inherent in integrated solution provision. His research also explores innovative multi-utility service provision and value co-creation in urban infrastructure redevelopment projects and investigates innovation in the delivery of health projects in Europe.

Dr Nigel Caldwell is a Research Fellow at the School of Management, University of Bath, UK. From a general interest in how organizations manage their input requirements (supply) he is investigating how complex bundles of products and services are contracted for, the risks inherent in such complex performance and the optimum incentives for such contracts.

Research highlights

- We analyze changes in a supplier's organizational structures to deliver integrated solutions
- We focus on realizing risk transfer and through-life innovation across different project phases
- The solutions provider 'unbundles' the bundle of integrated solutions by creating sub-units to handle distinct phases
- We question whether bundling the different phases of a major project into one contract is appropriate

Abstract

The paper analyzes changes in suppliers' organizational structures to deliver integrated solutions by examining the bundling across different project phases with a focus on realizing risk transfer and through-life innovation. A multiple, longitudinal case study method is used to examine changes in integrated solution provision in Public Private Partnerships over a 15-year period. The study deploys rich data sets by combining 108 government reports with 38 interviews. Findings examine organizational transformation and suggest that as a response to the need to be competitive the solutions provider 'unbundles' the bundle of integrated solutions by creating sub-units to handle distinct phases. The paper questions whether bundling the different management and procurement phases of a major project into one contract is appropriate. Managers must weigh the transactional cost savings of dealing with a prime contractor against not only the transactional costs of dealing with distinct contractors for individual phases, but also the comparative ability of the two options to deliver.

KEYWORDS *Bundling, Integrated solutions, Customized solutions, Organizational transformation, Buyer-supplier relationship, Longitudinal case studies*

1. Introduction

Public and private organizations are moving from selling or acquiring products to selling or acquiring complex, long-term integrated solutions consisting of bundles of interrelated goods and services (Galbraith 2002; Davies, *et al.* 2007). In response to a shortage of public funding, governments around the world have increasingly deployed Public Private Partnerships (PPPs) as the principal method for delivering public sector capital asset projects and associated services, aiming for the realization of performance benefits and innovation via customized integrated solutions (Zheng, *et al.* 2008). This development towards integrated solution provision in the public sector, initially stimulated by market deregulations, offers unique opportunities and challenges to the capabilities of solutions providers (Cova & Salle 2007). One of these challenges being the solutions provider working with its customer to co-create value through customized solutions (Davies 2004).

Central to the PPP concept is that the private sector will trade high ex ante capital investments costs and associated risks in return for a long-term and relatively stable income stream. The public sector benefits from facilities that would not otherwise have been created. If much of the literature takes a private sector and provider perspective on integrated solutions, the public sector is a good context for investigating the corollary of how customized solutions are managed by the customer. A starting point is suggested by Storbacka's (2011) empirical work that indicates that successful solution providers have the ability to balance between the need for customization and the need for standardization. It can be inferred that successful management of integrated solution provision by a public sector customer will also involve optimizing this balance between customization and standardization as appropriate to the resources of the project. In bundling together various needs (e.g. design, build, operate and upgrade as appropriate) the management of this dynamic has to cut across various typically distinct project phases to optimize value. In large scale PPPs normal contractual risks compound over time. To offset the risk involved in embedding a prime contractor for 30 years, the public client expects innovation and effective management of through-life costs or to apply Storbacka's approach to the customer, an interplay between customization and standardization dynamically through the life of the project. A key challenge for the public sector then is to ensure there are appropriate levers in place to transfer an appropriate level of risk

and to sustain innovation over the decades of a PPP project. In turn, the embedded solutions provider faces the challenge during the multi-decade lifecycle of having to deploy distinct and phase-specific internal processes, capabilities and even business models (Lewis & Roehrich 2009; Caldwell & Howard 2010).

Viewed from both a customer and provider perspective, it becomes imperative that both parties possess the advanced contractual skills required by the integrated solution over the decades of PPPs and that the agreement contains the mechanisms to align and sustain that commitment such as cost and revenue sharing. While extant literature has studied the complexity inherent in Public Private Partnership projects, limited attention has been paid to the resulting complexity extended contractual periods create for the private sector delivering integrated solutions. Such issues lend themselves to a process, as opposed to a snapshot in time based methodology, as most likely to uncover insight into such issues. The other driver for long-term contracts is the scale of investment required to service these complex needs and the scale and learning necessary for a new solutions provider to begin to improve upon existing processes and practices.

The paper contributes through a relatively rare longitudinal perspective on the impact of long-term contracting for innovation and risk transfer on providers. The longitudinal research approach proved to be vital to investigate changes in the supplier's organizational structures and how the customer interacts to influence solution development over time. The study also contributes to our understanding of the emerging literature on public-private organizational change (Mahoney, *et al.* 2009) and on the nature of long-term public-private interactions in integrated solutions provision. Thus, the overarching question this paper addresses is: what transformations in suppliers' organizational structures are required to deliver integrated solutions in long-term Public Private Partnerships? In addition, the research takes advantage of the longitudinal research approach to examine the corollary issue of the customer's management of customizing the solution over time, specifically addressing to what extent the public sector client is able to maintain the value of contracting for a bundle of goods and services from one provider across project phases. In terms of assessing the achievement of this value, as the construction of the hospital is now a

given the focus in paper is on achieving contract value through the risk transfer and innovation elements as proxies for value. To answer these research questions, the study investigates the bundling of product/service offerings across different project phases in complex public-private relationships. The empirical element of the paper is informed by a longitudinal, multiple case study approach investigating PPPs. This approach enables generating rich qualitative and quantitative data sets (Yin 2003) and studying processes unfolding over time, rather than merely seeking to illustrate cross-sectional variation (Van de Ven 2007).

The paper is organized into six sections. Section 2 locates the paper in the literature on product bundling, integrated customized solutions and organizational structures. Section 3 discusses the methodological considerations for the longitudinal, multiple case study approach. Section 4 then presents the empirical findings across the investigated cases. Sections 5 and 6 discuss the findings of the research, present and elaborate on the development of integrated solutions in PPPs, and conclude by formulating implications for managers and future research.

2. Conceptual Background

The following sections review the literature on product bundling, customized integrated solutions and their drivers. A conceptual framework is developed based upon this review of organizational and market structures for solution provision.

2.1 Moving from product bundling to customized integrated solutions

Product bundling, or commodity bundling, refers to “grouping related products together into a unified marketing offering that is intended to be more attractive than separate, individual products” (Lawless 1991, p. 267). The bundling strategy is steered towards extracting customers’ surplus by companies offering to undertake the complex activities of combining different components into a unified system (Schmalensee 1984). Extracting customers’ surplus is achieved in two different ways, by bundling different products to meet different tastes (Stremersch & Tellis 2002) or by using the monopoly power of one product to sell another in the bundle (McAfee, *et al.* 1989).

Bundles are mostly less risky and expensive to create, they help to expand a company's market share, open up new markets and offer a shorter product introduction time (Eppen, *et al.* 1991). Adams & Yellen (1976) offer a classification distinguishing three (un-)bundling strategies which are: (i) pure components (unbundled offer), (ii) mixed bundling (components are available in a bundled as well as in an unbundled offer), and (iii) pure bundling (components are only available in a bundled offer). Scholars from different disciplines have contributed to product bundling strategies (Spiller & Zelner 1997). For instance, economists mainly focused on the welfare consequences of product bundling and studied this strategy as a practice performed by a monopolist (Schmalensee 1984). In contrast, marketing scholars investigated the importance of relationships with buyers, buyers' evaluation of product bundles and customer orientation in developing markets (Yadav 1994). Bundling products can be found across various industries and distribution channels. For instance, the concept of bundling new with refurbished products is gaining increased attention in health care supply chains in the USA (Ross & Jayaraman 2009). The authors report that several major health care systems in the US are purchasing refurbished and new health equipment in bundles to reduce costs.

Prior studies identified three key drivers that enable a firm to offer product bundling strategy: (i) taking advantage of complementarities existing between products, (ii) exploiting heterogeneous firm capabilities, and (iii) using modularity present in products. First, complementarities between products result from technological or regulatory changes (Spiller & Zelner 1997). Managing the complex interaction between products is a knowledge-intensive task and customers may not possess the appropriate capabilities to create a unified system, thus, specialized companies need to offer complete systems (Spiller & Zelner 1997). Second, the resourced-based view perspective considers firms to be a collection of resources (Penrose 1959). Hence, new coordination of existing resources may create new bundles of products, enabling a firm to implement a product bundling strategy. Third, modularity helps firms to achieve a higher degree of flexibility in managing the different components of the bundle. In this way, the firm can offer a quick answer to the market, introduce new configurations of bundles and offer product upgrades (Baldwin & Clark 1997). While bundling simplifies the range of offerings and can give economies of scale

for providers; buyers enjoy a simplified choice, but may end up paying for elements that are not required (Spring & Araujo 2009).

A product bundle is composed entirely of standardized components at a set price, and offered on the condition that the customer purchases the full line of internally developed products, irrespective of the differences in customer needs or capabilities (Porter 1985). While solutions are based on product bundling logic, they go beyond traditional bundling by addressing the client's specific needs through customization (Davies 2004; Storbacka 2011). Davies *et al.* (2007) argues that "the solution to customer's needs is a customized adaptation of the basic modular system and its standardized components" (p.186). In other words, customized solutions can be achieved through the combination and recombination of standardized, reusable and easy-to-deploy components and modules including some degree of customization to solve each customer's individual needs (Hax & Wilde 1999).

Empirical findings by Storbacka (2011) indicate that successful solution providers have the ability to balance between the need for customization and the need for standardization. The proportion of standardized and customized components in a solution varies according to the needs, capabilities and sophistication of the customer (Davies, *et al.* 2006). While less experienced customers often require solutions comprised entirely of standardized offerings, more experienced customers can find their needs are not fully satisfied by standardized solutions (Davies, *et al.* 2007). Over time, previously customized solutions become standardized solutions as solution providers learn to standardize innovative modules and components (Davies, *et al.* 2006). This emerging perspective of integrated solutions favors the activities of bundling the offerings' elements over the degree of uniqueness of those elements as creating the customization and acknowledges development over time within the customers' view of what is a customized offering. This is a different integrated solutions perspective to that of others such as Krishnamurthy *et al.* (2003) and Sawhney (2006), whose perspective of integrated solutions is much more static and focused on the uniqueness of the elements over the activities of bundling. In our view, the prior more dynamic perspective is both more in tune with the speed of commerce today and the rise of outsourcing providers, and more relevant to construction where genuinely new to the world offerings are

extremely rare (e.g. an iconic architectural site) and risky for both customer and provider. In such a perspective, the customer-provider relationship is still intensive and multi-faceted (Tuli 2007); the ability to continuously create customer value is a central theme in the strategy and marketing literature (Ulaga 2001).

2.2 Origin and drivers of solution provision in private and public sectors

The roots of solution provision can be found in the industrial marketing literature of the 1960s which investigated 'system selling' or the 'systems marketing' paradigm (Mattson 1973), representing a form of bundling. Page and Siemplenski (1983) define system selling as the provision of products and services as integrated systems that provide solutions to customers' operational needs. In contrast to system selling, solution selling adopts a wider perspective encompassing the complete activity of the customer concerned, thus leading to organizational changes from acting as a seller of products or services to a strategic consultant assisting in the customer's value creation processes (Azimont, *et al.* 1998). These solutions can create value by improving operating efficiency, increasing asset effectiveness, enabling market expansion, and mitigating risk (Cornet, *et al.* 2000). Solution provision is associated with the shift towards a 'service-dominant logic' (Vargo & Lusch 2004) and 'servitization' (Vandermerwe & Rada 1988), reflecting a proposed paradigm shift from a goods-dominant logic to a service-centered logic.

While the shift towards customized integrated solutions was initially observed in manufacturing firms (Mathieu 2001), later it appeared in sectors mainly focused on delivering complex products and systems (Hobday 1998; Johnstone, *et al.* 2009), bringing together public and private organizations (Davies 2004; Kapletia & Probert 2010). Johnstone *et al.* (2007) draw out the long history of integrated solution need from the public sector with a special focus on PPPs. Delivering integrated solutions to meet customers' needs has been described as "combining product and system with services in order to specify, design, deliver, finance, maintain, support and operate a system throughout its lifecycle" (Brady, *et al.* 2005, p. 360). A myriad of drivers can be identified to explain the shift to solution provision, ranging from declining margins for manufactured products combined with a focus on core competencies (Baines, *et al.* 2009), high profit margins which can be derived from services and solutions (Johansson, *et al.* 2003), and

that services are considered a more stable source of revenue as they are resistant to the economic cycles that drive investment and equipment purchases (Quinn 1992).

Public sector demand for integrated solutions is driven by additional factors; the two main factors are discussed here. The first being a shortage of public funds, necessitating inviting private sector capital into what were formerly public funded activities. In response to a shortage of public funding, governments around the world have increasingly deployed PPP arrangements as the principal method for procuring public sector infrastructure and associated services leading to private engagement into long-term contractual agreements (Broadbent & Laughlin 2005). This motive for requiring bundled solutions is followed through in this paper in the form of studying the effect of risk transfer from the public sector to the integrated solutions provider. The second driver is based on the assumption by governments and public sector organizations that the private sector will be a better manager of resources than the public sector, creating innovative and cost effective projects. PPP arrangements may deliver a number of tangible performance benefits such as better efficiency and effectiveness via integrated build and maintenance service solutions (Brady, *et al.* 2005).

For the public sector there is an obvious need to ensure value for money, including risk transfer, has been achieved with public funds (Lonsdale 2005). For the solution provider, there is a need to rely on direct revenues throughout the operations phase in order to cover operating and capital costs. The public procurer seeks an effective use of public funds which in a PPP project can come from the integration of asset design, construction and operation and by the transfer of key risks (Table 1). These risks have been identified as design, construction delays, stable revenue streams, cost overruns, finance and insurance to private sector entities (Grimsey & Lewis 2004). The public sector's value for money considerations need to be fulfilled as well as the private sector's need for stable revenue streams (Grimsey & Graham 1997). PPP contracts provide for minimum revenue guarantees that limit the private operator's exposure to demand risk when demand is influenced by government policy (Lorenzen, *et al.* 2004). Project revenues (i.e. public sector 'rent') are used to pay for operation costs and cover debt financing while giving the desired return on risk capital.

Place Table 1 Here

Apart from risk transfer considerations, revenue sharing arrangements should be considered in a public-private relationship context. The private partner in PPP projects invests ex ante into the project in anticipation of expected revenues during the operation phase. Revenue returns have to be in proportion to risks faced by the private partner in PPP projects (Valsangkar 2008). If for example the revenues from a privately-financed road depended in part upon traffic flows, this uncertainty would impose a cost and needed to be reflected in increase revenue streams (Spackman 2002). Such risks, always related to the specific project entail bespoke solutions, creating lengthy contract negotiation and bid phases.

2.3 Organizational and market structures for solution provision

Firms must make strategic and structural decisions about how to best exploit the demand for product bundling or integrated solutions (Spiller & Zelner 1997). Thus, firms must consider restructuring inter-firm relationships and organizational structures to accommodate the shift towards a solution offering. Recent literature on integrated solution focuses on changes in capabilities and in the organizational structures required to offer integrated solutions (Wise & Baumgartner 1999). Prior studies draw out the aspect that integrated solutions are arrangements where customer and supplier are working together to co-create solutions (Crespin-Mazet & Ghauri 2007). Authors have identified the need for flexible organizational structures to support integrated provision (Hobday 2000; Antonacopoulou & Konstantinou 2008).

Prior studies report that firms moved downstream into services, developed new capabilities and changed their organizational assets in order to provide the range of services and products that customers need. For instance, Galbraith (2002) argues that firms must restructure their organizations around the customer in project-based organizations. In contrast, Davies (2004) argues that some firms needed to move upstream to offer integrated solutions. For example, engineering consulting firms like WS Atkins moved toward the provision of integrated solutions by adding products to its original service offerings. However, extant literature offers limited insights into the changes in organizational structures required to provide

integrated solutions over extended timeframes in public-private relationships (Cova & Salle 2007; Kapletia & Probert 2010).

Taking a closer look at which factors influence the firm structure, Ford & Slocum (1977) argue that size, technology and the environment are crucial indicators. Market characteristics differ in terms of, for instance, competition, degree of contestability, roles and entry barriers (Grant 1998). For example, the nature of the entry barriers differs across local, national and international markets. Entry barriers in international markets consist of economies of scale, the importance of brand and the use of advertising, while in smaller markets lower prices and customer loyalty may play a more important role in preserving competitive advantage (Rosenbaum & Lamort 1992).

Prior literature has investigated the capabilities needed for solutions providers to design and integrate internally and externally supplied components into a finished product, and coordinate and internally develop the technological knowledge needed for future product generations (Jacob 2006; Ceci & Prencipe 2008). Studies also showed the importance of learning from previous projects within an organization (Geyer & Davies 2000) and the shift from product focus to customer-centric focus (Windahl, *et al.* 2004). Researchers emphasized the need for organizational structures to be developed as a key strategic priority for product-service integration. For example, authors argued to allow for the development of mechanisms and channels of communication between and within project teams that will support the transfer of learning, and hence repeatability (Miller, *et al.* 2002).

Place Figure 1 Here

2.4 Developing an initial conceptual framework

To provide a context for the empirical research, Figure 1 illustrates a stylized model of the traditional ('unbundled') approach to procurement, where supply inputs are bought in distinct phases as discrete inputs from different suppliers. What is significant in this figure is that risk and innovation are bound by individual project phases. For example, the design contractor only has responsibility for the risks and innovation related to design. This model contrasts with the initial conceptual model of an integrated

solutions provider (Figure 2), where the distinct project input phases are provided by one vertically integrated supplier. In this model, the full amount of contractual risk is transferred to the solutions provider. The conceptual framework shows the provider internally generating innovation as a core activity through combining previously purely functional and silo activities into one coherent integrated solution. Customer and provider co-create value through working together in this framework. The paper tests this conceptual framework by deploying longitudinal case studies in Public Private Partnerships.

Place Figure 2 Here

3. Methods

The process-based case study approach adopted aims to identify explanations of complex phenomena that have evolved over time and which have received little prior investigation (Yin 2003). The research studied processes unfolding over time, rather than merely seeking to illustrate cross-sectional variation (Van de Ven 2007). In contrast to the majority of prior solutions literature, our adopted longitudinal perspective facilitates investigating solution provision as a process rather than the static perspective of one particular point in time. Following Storbacka (2011) and Tuli *et al.* (2007) integrated solutions are defined here as processes, a longitudinal research approach is most appropriate to reflect and analyze the process characteristics of the phenomenon under investigation. Additionally, insights into evolving concepts such as risk transfer, innovation and value co-creation are best realized when adopting a process study approach.

The empirical element of the paper stems from two discrete case studies of solution provisions in the PPP health sector. Although, inevitably, the two cases differ in some key aspects, they were both established exchange relationships as both had reached the operation phase at the start of the research project. As shown in Table 2, both projects are similar along the main characteristics. However, while the first project was commissioned during the ‘first wave’ of UK PPP projects from an immature supply market, the second project was commissioned when a more mature supply market had been established. In the UK, PPP contracts for the construction of: schools, prisons, bridges, hospitals, roads and military

equipment included over 650 projects which accounted for a capital value of more than £60bn (H.M. Treasury 2010). The UK PPP health market was chosen as the case study context as it constitutes one of the sectors with most PPP contracts let and a high value of contracts (H.M. Treasury 2010). Both hospitals are operated by the same prime contractor, one of only a few leading solutions providers in the UK PPP market. The rationale for choosing those case studies lies in the possibility to observe changes the solutions provider might have realized over an extended period of time.

Place Table 2 Here

Place Table 3 Here

This study collates primary and secondary data sources and consists of three interrelated data collection stages (Table 3). First, empirical data, collected from interviews with public organizations such as the Private Finance Unit (PFU), is collated with secondary data collected from over 100 government reports published between 1994 and 2010 (Table 4 offers a selection of key reports that informed the study). This pre-study helped to position and embed the case studies conducted in stage 2 in a market context. In stage 3, follow-up interviews were conducted to validate and verify the case study reports and findings. The research study followed an abductive research approach, commuting between theories and practice as an interweaving dialogue between theory and empirical findings (Dubois & Gadde 2002). Overall, the authors conducted 38 semi-structured, face-to-face interviews with different stakeholders over a period of three years, covering project data from the bid to the operate phase spanning 14 years. Interviews typically lasted from one to two hours and followed an interview guideline. The wide range of interviewees was necessary to capture a variety of perspectives and build rich insights relating to the three project phases and across two different levels of analysis, the UK PPP health market and inter-organizational relationships. The interview data was transcribed, open and axial coded, summarized and displayed in an iterative process (Miles & Huberman 1994). The data analysis process of coding was facilitated by the computer-based software tool NVivo.

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4. Research Findings

4.1 Case background and organizations

Figure 3 presents the multiplicity of actors involved in a typical hospital PPP project. The principal parties of PPP arrangements are the NHS Trust (the buyer) and the solutions provider (the contractor). The solutions provider is one of only a few providers of integrated solutions in UK PPP healthcare projects. The company employs over 50,000 people worldwide to deliver large-scale solutions across sectors such as healthcare, transport and highways. A NHS Trust is responsible for providing services on behalf of the National Health Service (NHS). The concession agreement is the formal agreement between the NHS Trust and its solutions provider, addressing governance issues such as reporting and information sharing, performance measuring, auditing and dispute resolution procedures.

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4.2 Case findings

4.2.1 Organizational restructuring to provide customized integrated solutions

In order to provide integrated solutions over extended periods of time, the solutions provider decided to undertake substantial internal restructuring after having delivered a number of Public Private Partnership projects across different sectors. Prior experience in delivering PPP solutions, such as Hospital A, led the contractor to split the PPP project, including design, construction and service delivery, into three distinct phases - bid/negotiation, build and operate - in which separate teams were responsible for each phase. Moreover, the solutions provider also separated its internal structure into different sub-units for each PPP solution sector: *“In practice, that means that our health bid team was mainly responsible for bidding for advertised health projects and negotiating the contractual terms with NHS Trusts before moving on to another new health PPP project. [...] Next, the build team takes over for the duration of the hospital’s build phase, before our operate team is then responsible for delivering associated facilities management services for the hospital over the contract duration”* (Project Director, private partner).

While this specialization led to faster project completion and a highly specialized skill set for individual sub-units, the contractor's Director of Business Development noted that the transition between project phases and team changes are most crucial and that the contractor needed to find an appropriated solution to avoid knowledge drain: *"[...] we have a team that bids it, and if we win the job they stay involved, but the people that are then going to be coming on to run it, they overlap, and we are increasingly trying to have that for a few months after the job is completed, so that their area of knowledge is transferred."* The specialization and separation into sub-units was crucial for the solutions provider to deliver better value for its customer by concentrating activities and capabilities relevant to individual project phases in a PPP sector into an individual sub-unit. However, a Project Director from the provider outlines some of the initial problems with separating into sub-units: *"[...] there are always stresses between the sub-units because they are working to different criteria. For instance, the design team needs to make sure the project is designed to budget. The build team is more concerned with the price of materials and getting it build on time. The operations team then needs to deliver services over 25 years."* In reviewing the extensive data set collected, no through life performance measures were found except the traditional project metrics of delivery on time, on budget and to quality standards. The individual contractor's project teams had specific performance measures relating to their phase of the solution only, which is not indicative of a truly integrated solution approach.

In terms of customizing the solution, both hospital projects offer a number of strategic and operational customization examples. Senior management at the NHS Trust made a strategic decision to integrate a children hospital into the main hospital infrastructure. During the design phase, intensive collaboration between nurses, doctors and the private partner's design and planning team in Hospital B led to the design of a children hospital which was integrated into the main hospital structure, but still separate. The private partner's Project Director states that: *"Facilities from the atrium to the clinics and wards have been designed specifically for the welfare of children and teenagers. The hospital includes a spacious outpatient department next to a new children's radiology department and a pediatric assessment center. There is accommodation for parents to stay overnight, either next to their child's bed or in a dedicated parent/ care-taker accommodation suite"*. The children hospital represents a customization to the main hospital structure as health services for children needed to be taken into consideration when designing this hospital. *"The integration of children's services offers many benefits for*

patients: for example, all children having major surgery are close to intensive care, and parents of disabled children, who previously have had to travel between three sites for regular appointments, now only have to visit one" (Private partner, Program Director).

On an operational level, senior nurses and doctors worked closely with the private partner's design team to customize individual ward and operation theater layouts. Instead of using standardized ward layouts, medical staff in both hospitals provided intensive input to the private partner's design team in modifying and customizing ward designs. The private partner's Program Director explained: *"Extensive experience from senior nurses and doctors was vital to customize the ward design. We wanted to get it right the first time and satisfy our customer [NHS Trust] rather than to build something which then needed to be changed all over again."* This view was echoed by a senior nurse from Hospital B: *"We did have the chance to work with [the private partner] during the design phase and it helped to customize our wards and operating theatres. I think that [the private partner] really appreciated our input and it helped them to offer better solutions to future customers."* This ongoing collaboration between both partners also yielded positive outcomes on some sustainability measures as the public sector wanted to use more sustainable paints (biocide paints) to reduce infection risks.

4.2.2 Capability building and learning over time

The solutions provider needed to build sufficient capabilities and skill sets to efficiently deliver PPP solutions. PPP projects are characterized by lengthy contract negotiations, complex construction and design considerations and service delivery over extended periods of time. Hence, the solutions provider acquired contract negotiation and drafting skills, developed design skills and strengthened process and project management skills which are vital during the operate phase. A project manager from the provider states that: *"Although we are a company delivering solutions across various sectors, delivering PPP solutions was a very challenging endeavor. [The company] needed to learn completely new skill sets ranging from contract negotiations, construction to delivering complex services over 30 years. We experienced a very steep learning curve when comparing [Hospital A] to [Hospital B]."* This development process allowed the company to acquire the necessary skills to deliver integrated PPP solutions by building on experiences from previous projects. The provider's Facilities

Management (FM) Director highlighted that: *“We have now taken it a step further on from where we were at [Hospital A] and we realized that the early involvement from an FM perspective really does give us long-term value because the Trust can give advice on various things and about their specific requirements.”*

This development across both projects illustrates that early stakeholder engagement proved vital for the solutions provider to deliver better value across the phases. However, having established individual sub-units, the solutions provider also experienced problems in retaining knowledge across the project phases. To counteract this problem, the provider’s FM Director explained that a separate team was formed incorporating individuals knowledgeable across the project phases to utilize existing experience and to realize through-life issues in PPP projects. *“Now, we have put in what we call a mobilization team which will stay with the client for a certain period of time. If you go through the phases of the project, we have separate teams for each individual phase. This is problematic as we are losing a lot of experience when teams move on. Hence, that is why we got a mobilization team, including people from bid, build and operate phases to make sure knowledge is transferred and we deliver the best solution possible to our client”* (Contractor’s FM Director). The mobilization team mainly facilitated the transition from the build to the operations phase, frequently interacting with the organization’s build- and operations sub-units and the team from the client public organization. Team consistency helped to further establish inter-personal relationships which facilitated a better information flow between contractor and client. The adoption of the mobilization team stood out as an organizational innovation that created and supported gains from knowledge sharing and improved the contractual relationship. However, the contractor’s FM Director pointed out that the formation of the mobilization team needed some *“initial convincing”* and *“commitment from senior project managers”* as setting up the team and committing individual team members is resource intensive. In contrast to early PPP hospital projects where individual teams or team members moved on to new projects, the mobilization team stayed on until initial transition problems were remedied.

4.2.3 Long-term innovation and risk transfer management

This study investigates long-term PPP projects lasting 30 years and both projects are currently in the early years of their operations phase. Thus, evaluating innovation realized in the operations phase itself and its

ability to deliver basic services needs to be treated with relevant caution, taking into consideration the limited timeframes that could be observed so far. While interviewees reported that the hospital overall delivered “*a stable service delivery*” flow as it was expected from the outset of the project, resulting inflexible contracts work counter to the risk transfer and innovation the public sectors seeks. According to the model presented in Figure 1, traditional infrastructure procurement limited innovation (and risk sharing) to the distinct project phase. In the PPP cases reported here, Figure 2 proposes that cross-phase innovation driven by the solutions provider will be observed. Table 5 presents examples of innovations found across both cases. Extensive re-examination and coding of our data has failed to uncover further examples of innovations. This finding is developed below and is in line with previous researchers’ findings on the poor performance of hospital PPPs on this measure.

Place Table 5 Here

The public sector’s contractual process, the scale and complexity of contracts, the costs of bidding and the amount and variety of risks to be managed leads to detailed and inflexible contracts. Interviewees from the client were concerned about the costs involved in achieving flexibility. They reported that contract variations, after the contract was signed, were expensive and time-consuming to realize. The Trust’s HR Director (Hospital A) argues that “*the contractor mainly saw the cost aspects of innovation*”.

PPP entails transferring the risks associated with public service projects to the private sector. Risks come in many forms and often depend on the characteristics of a particular project, ranging from financing, construction, performance to service availability risks (Table 1). In Hospital A, sustainability was one of the risks that the solutions provider needed to bear. Hospital A Trust’s technical advisor commented that the contractor had spent a lot of time on sustainability, reporting that the contractor tried out various types of low environmental impact materials and aimed to recycle the concrete of the old hospital building. Moreover, the contractor regenerated all the timber and surplus plaster and in cooperation with the NHS Trust, the contractor used linoleum and rubber instead of vinyl materials. However, interviewees from the Trust criticized the contractor for its lack of interest in another dimension of sustainability, energy cost and usage: “*I do not see as much innovation as I would like and if I give an example to*

illustrate that [...] you could have either creative ways of producing energy, maybe combine heat and power units or whatever, or certainly you would have very energy-efficient systems” (Trust’s HR Director).

Apart from risk transfer considerations, both PPP arrangements also included small revenue sharing schemes. In general, PPP arrangements do not include a cost sharing scheme as the private partner borrowed funds to build public sector infrastructure and the public partner then pays ‘rent’ over a contractually stipulated period. Service payments by the NHS Trust (public buyer) which are based on continuity of service supply and infrastructure use, rather than on service demand, are used to generate private sector income over contract periods. However, both arrangements studied here included contractually stipulated revenue sharing and cost saving incentives. Revenues were achieved through incomes generated by small shop outlets (which were integrated in the hospital infrastructure). These revenues were split equally between public and private partners. In addition, contractually stipulated incentives emphasized that funds saved during the construction phase, for instance, through innovative construction techniques, would be shared through an ex ante established formula between both partners. This scheme was established to incentivize the private sector to save costs during the construction phase stimulated by innovative responses. The private partner’s Project Director mentioned that: *“We had some incentives in the construction phase to manage our expenses as remaining funds would be split between us and the public partner. [...] We basically receive an income stream from day one when the Trust occupies the hospital and we also get some funds through the income generated by the shops.”*

It is though in the issue of innovatively future proofing Hospital A through building in flexibility that the link between customized solution provision and through-life management is most broken. Undoubtedly, administrative space could be converted quickly into a 36 bed wards. The contractor installed the services above the ceiling, the drainage in the floor, and the floor pans for shower trays were already cut into the screed, but covered over. However, “flexibility” and customization was one dimensional, the solution provided was to enable adding capacity, but no provision was made for managing the reverse potential client requirement, that is to help the Trust have the flexibility to reduce or contract capacity. The explanation is provided by the terms of the contract: *“[...] and the contractor’s point of view is that the bigger*

benefit is about having a bigger hospital [...] because effectively they get paid more, the larger the hospital. So if we wanted to become very innovative, and we do, around reducing the size of the hospital, making it more efficient, increasing usage in the same areas, it is quite difficult for [the contractor] to derive any benefits from that [...]" (Trust's Head of Estate).

Table 6 summarizes some key quotes across both public and private partner across the key themes discussed in the findings section.

Place Table 6 Here

5. Discussion

The literature review identified four dimensions that differentiate traditional infrastructure procurement from the PPPs integrated solutions provider model. These can be summarized as: organizational structures, the scale of risk transfer, the extent of innovation and its location, and the importance of value co-creation.

5.1 Organizational structure, customized integrated solutions and risk transfer in PPPs

In the traditional model of infrastructure procurement, organizational structure helped contain risk by placing a boundary on its related to project phase. Within PPP projects, organizational structure becomes a key part of risk containment, which means that unbundling a unitary organizational structure becomes a logical response by the provider to carrying the overall risk inherent in a PPP.

A solutions provider in PPP projects is responsible for distinct, but interrelated, phases which individually require very different skill sets and capabilities (compared to the traditional model of subcontracting where each phase is subcontracted to a specialist contractor with skills in one of those phases). For example, the skills and capabilities required in the bidding phase such as negotiation skills, contract drafting skills, design and commercial skills do not align with the skills and capabilities required, for example, in the build phase which are mainly process and project management and supply chain management. PPPs are designed to transfer risks to the private sector. Part of the risk premium the contractor has to manage is the likelihood of losing the contract if their processes are considered

inefficient. A vertically integrated firm carrying overheads (critically in the form of skilled personnel) from one project phase to the next, must be competitive with market rates. However, potential phase specific market entrants are able to cherry pick phases and activities. Opportunistic entrants would target the operations phase which is highly commoditized and where soft FM services are market tested on a regular interval.

The natural response of the contractor is to manage the risk of the project by vertical disintegration; sharing the risk out by breaking down the phases of the PPP into separate organizational components as was observed across the cases. The main contract (i.e. concession agreement) is let between an NHS Trust as client and the solutions provider. The contractor unbundles the initially bundled project phases to better cope with inherent risks. In addition, disintegration would allow to further outsourcing of parts of the bundled solution to sub-contractors and thereby passing on risks to lower tiers in the supply chain. However, the investigated cases illustrate that these components are mostly managed by sub-units of the contractor, each with a limited set of activities focusing on one aspect of bidding, designing, building, and operating the public infrastructure. The case findings illustrate this split into effectively independent contractual entities.

Closely related to project risks are project revenue considerations in PPP projects. The project revenues (i.e. public sector 'rent') are used to pay for operation costs and cover debt financing while giving the desired return on risk capital. Project revenue depends on, amongst other factors, the size of the infrastructure, the quality of service delivery during the operation phase and the risks managed by the private partner. PPP project risks can be measured in terms of financial, business, social and administrative risks and financial returns have to be in proportion of the risk faced by the PPP partner (Valsangkar 2008). It should be noted that the private solution provider will not be generally willing to enter into a public infrastructure project in which it does not expect to recover all of its costs through guaranteed and stable income flows, including capital (direct or opportunity) costs. Empirical findings show that there are limited cost saving incentives or revenue sharing schemes in place which may have further stimulated innovative responses from the solutions provider.

Although public-private relationships enable each firm to focus on what it does best (e.g. public sector delivering health services and private partner delivering maintenance services), they also introduce new issues associated with the alignment of decisions and incentives. In contrast to most private-private relationships where development cost and work is shared (Bhaskaran & Krishnan 2009), PPPs are characterized by the private partner assuming all development and building costs *ex ante*. In our investigated PPP arrangements, the government did not make a direct contribution to project costs (in the form of equity, loans, or subsidies) and the private sector needed to borrow sufficient funds to construct and operate the public sector infrastructure and to deliver accompanying services.

5.2 Value co-creation

The vertical disintegration of the contractor appears to defeat taking a holistic through-life approach by re-creating intra-organizational silos. However, the most significant effect of this unbundling into sub-units on innovation, may be in the barriers it raises to integration and alignment between buyer and supplier. Other authors have noted, for example, the lack of engagement with clinicians representing a vital stakeholder in health infrastructure projects (Barlow, *et al.* 2010). On the topic of clinician involvement the study reports contradictory but compatible findings. In the interviews, senior clinicians were described as being both as too powerful and lacking in contribution. Certainly the contractor learnt from Hospital A to better seek clinical involvement, and certain clinicians wielded significant authority and could make sure their views were aired and incorporated. However, this involvement was always in the bid or design phase of the hospital and related to the special interests of certain clinical roles. The research observed a lack of end-to-end involvement from clinicians combined with a highly concentrated and effective lobbying power at distinct phases and issues. This front loading as it were of clinical input does not conform to a view of integrated solution provision being continuously evolving in partnership with the customer (clinicians here being a key stakeholder).

Extant literature identified that integrated solutions providers co-create value with customers, playing a creative and innovative role in how the client defines the value they offer (Tuli, *et al.* 2007). The literature

proposes that solutions providers are working with their customers to address the challenges of lifecycle management, including maintenance, increasing reliability and inter-operability (Davies, *et al.* 2001). In a hospital context, for example, this might be through enabling flexible use of space, such as wards that can expand or contract or even change use. However, the solutions provider in the cases reported here is not concerned with value creation per se, where the definition of value is shared. The provider is focused solely on the value adding (for them) option of expansion and ignores customer options that would decrease capacity and therefore current contractor value. What the research suggests here is that where much of the extant literature assumes a degree of asymmetry between customer and provider capabilities, it also assumes a continuity and consistency that may be not present where the customer represents time pressed professional bodies whose primary focus must always be service provision and for whom the contractual side is an additional burden. A client short of time, with a demanding front line care role, with no experience of construction contracting will give the provider certain problems but also open up for a more unilateral approach for the contractor – as here in not providing for downsizing - than the solutions literature would suggest. In addition, there may be mixed motives for staff who would be unlikely for example to value planning for contraction in a new build hospital.

Moreover, the long-term nature of PPP contracts should be noted in relation to the number of potential customers, whose relative importance changes over the project lifecycle. Solutions providers delivering PPP health infrastructure and associated services face a myriad of diverse customers including, but not limited to, the Treasury, the Department of Health, and the NHS Trust client which will occupy the hospital. This dynamic multiplicity of customers confirms the focus on co-creating value in networks or value constellations as promoted by previous co-creation studies (Vargo & Lusch 2006).

5.3 Innovation

In line with others (e.g. Barlow & Köberle-Gaiser 2008), this research reports UK PPP hospitals innovation as incremental and somewhat generic (e.g. child friendly night lights) and not as a customized solution. Where this account of innovation in PPP projects makes a contribution, is in linking what little innovation was reported by either client or contractor to distinct project phases. With the exception of

the investment in a more expensive flooring (build phase) that would create savings in the operate phase, innovations appear to be more in tune with the distinct phase model of traditional infrastructure procurement (Figure 1), than based on the deployment of cross-phase core activities of solution provision (Figure 2). The innovation examples presented in Table 5 are dominated by incremental innovations in the operate phase, and where the value created by those innovations is unique to the operate phase. An exception is the apparent concern with environmental impact in Hospital A, which appears an example of cross phase innovation. However, viewed from the customer's perspective, even this rare example is undermined. Two different interviewees from the buyer in Hospital A criticized the same contractor for its lack of interest in a much more important and through-life dimension of sustainability, energy cost and usage.

Thus far, we have considered the PPP project at the level of the individual project. However, there are in effect multiple contracts to tender for in the PPP hospital market (Audit Commission 2001). The solutions provider in these cases is in fact simultaneously delivering similar PPP hospitals and other PPP infrastructure projects and associated services across the UK. Having discussed the organizational innovation inherent in the contractor delivering at a project level, what the research study's extensive data sets indicate is the meta-level emergence of a new organizational capacity development in meeting national PPP needs. Findings point to the creation of a new PPP solution market (e.g. Jacobides 2005 discusses vertical disintegration to form new markets). PPP arrangements cumulatively, but not individually, replacing what may have been incumbent monopoly public sector provision with a new and potentially, more dynamic, innovative and contested private sector supply for complex, long-term, risk-laden public sector infrastructure projects. In addition, there is the issue of the benefits of through-life innovation management anticipated by PPP arrangements (NAO 2007). These expected benefits may be reduced by the vertical disintegration of the contractor side, if the silo based decision making which defeats through-life management in inter-organizational contractual arrangements cannot be avoided (Figure 4). It is indicative that in our case findings, the only example of through-life management is found where a Program Director has cross-phase responsibility (innovative but costly flooring in Hospital A) and took a decision on flooring based on through-life and not project phase associated costs.

Learning across projects and transferring existing expertise onto new projects is vital when delivering integrated solutions (Geyer & Davies 2000). Thus, the solutions provider has established a so called ‘mobilization team’ which stays with the client during the handover period between build and operate. Limited extant literature has explored the practical challenges of delivering long-term integrated solutions across distinct, but interrelated, project phases (Brady, *et al.* 2005). This team helps to retain knowledge from one phase to another and can more quickly address possible occurring operational problems in the early operate phase. Such operational problems are manifold during the build-operate transition phase including, for example, malfunctioning lifts and poor service delivery by understaffed porters. The mobilization team, consisting of team members with different skill sets, helped to mitigate such “teething problems”. Working closely with the client, the solution provider was able to shorten the hand-over phase in Hospital B dramatically. The use of mobilization teams proved to be useful to counter balance the unbundling effects of having different sub-units responsible for the build and operate phases. Based upon the beneficial impacts of the ‘mobilization team’ observed in this study, the deployment of such teams is recommended across all project phases to minimize transition problems. The formation of a mobilization team was a new organizational form deployed in PPP projects, helping to mitigated occurring problems during the build-operate transition phase.

Place Figure 4 Here

5.4 Research limitations

Although established literature was used to frame the investigation, this was an exploratory study, not reliant on formal hypothesis development or testing. Other limitations are more specific to the study. The research setting of UK PPP and health infrastructure projects offers an opportunity to theorize about how a solutions provider adapts its organizational structures to deliver integrated solutions over time. While this study mainly focused on the intra- and inter-organizational relationships and developments over time, future research could also explore the wider network of relationships. The constructs put forward here would benefit from further research in other sectors and countries.

6. Conclusions and Implications

The paper reviewed the literature on customized integrated solutions provision and the public sector as client to develop an initial conceptual framework of public sector integrated solutions provision. Prior to solutions providers, the model had unique suppliers for each phase and created risk and innovation envelopes around each phase, thus value was mainly created by the contractor. The solutions provider model delivers through integrating functions into core activities; creating a customized solution through creating value delivery by individual teams responsible for separate project phases.

The model is examined through longitudinal case studies of integrated PPP solution provisions in the UK health sector. This longitudinal perspective allows examination of how the integrated solution plays out over time, as a process (Storbacka 2011; Tuli, *et al.* 2007), rather than as a discrete offering. Critically the solution provider model studied here extends over decades, during which time scale the value of the solutions bundle will change and for the customer tend to dissipate, as new practices, opportunities and innovations from early phases become part of the standard way of working. The solutions provider model has one supplier for all phases, all of the risk and innovation requirements are with that provider. This model assumes close cooperation and value co-creation between customer and provider, and for PPPs assumes that this high contact, high intensity 'dialogue' can be sustained over decades.

The bundling of services with construction and financing contributed significantly to the immaturity of the market for early UK PPP projects. Neither customer nor integrated solutions provider could draw on previous experiences. Theory suggests buyers value bundling in less mature markets where a solution simplifies choice; as a market matures buyers' premium should decline (see discussion in Spring & Araujo 2009). This study uses a longitudinal approach to question the value of the interaction between customer and provider over time. The involvement of the operational customer in the form of the Trust and clinical staff peaks at the design phase, thereafter the customers' limited construction experience, the pressing needs of day-to-day healthcare provision and high turnover in personnel mitigate the customer's impact on subsequent phases.

This research has reported on a paradox, PPP contracts call for an integrated solution which involves high customer involvement. However, in order to provide that customized integrated solution and manage the attendant risk transfer and innovation requirements, the chosen integrated solutions provider has to 'disintegrate' or unbundle itself to fulfill the contract. The public customer does not have the skill set and tenacity to follow this over the extended time frames of a PPP. In the investigated cases, the solutions provider unbundles the integrated solution by creating sub-units to manage distinct project phases. The paper raises major doubts over the value of bundling requirements across project phases in major infrastructure projects where the advantages of relationship management cannot be easily carried across infrastructure delivery phases. Absent such consideration, the public buyer is paying the additional price for bundling over that which could be obtained for a simpler turnkey project.

It may be that integrated solutions providers in PPP market are demonstrating competence at providing what were once uniquely public services. Recent market developments indicate that organizations offering services to UK government are diversifying into various facility and service provision activities. This diversification suggests such solutions providers have gained both credibility and capability at delivering a broad range of services. If, as many commentators suggest, governments worldwide will continue to expand the range of facilities and services that will be transferred from the public to private provision, a significant commercial opportunity exists. It may be that rather than developing operational competence as solutions providers, these leading providers are developing a meta-level solution capability through their ability to tender for, contract and deliver public services regardless of specific operational competencies.

Managerial implications

This research study addresses the global trend for private sector involvement in major new public projects. When measured in decades not years, this research reports examples where the ability of the main contractor to act as an integrated solutions provider appears to be reduced leading to the unbundling paradox. The client does not have the resources and will (given pressing day-to-day concerns)

to insist otherwise, becoming by default a reactive rather than proactive customer. This stands in stark contrast to the public sector's intention at a national level to receive an integrated solution rather than an 'unbundled' one. For managers of major projects such as PPPs, this paper addresses the decision on whether or not to bundle project phases such as bid/design, build and operate into a single contract in seeking to stimulate innovative solution delivery.

In addition, in future PPP arrangements parties should install cost saving schemes that incentivize through-life issues rather than short-term behavior on both parties. These incentives in combination with revenue sharing schemes may further stimulate innovative responses from the solution provider and foster joint working initiatives. Instead of incentivizing short-term construction savings, incentives should encourage through-life issues taking into consideration the project lifecycle.

Given a longitudinal perspective, solution provision can be examined in terms of how it evolves (Davies, *et al.* 2006). The organization of the solution provider was seen to evolve through sub-division of tasks and the creation of a mobilization function. What is missing is customer understanding of how the solution bundle should evolve over time as the value of initial offerings lessens. A key finding and contribution is the need in multi-decade integrated solution contracts such as PPPs for the client to have a strategy for managing post contract the value of the solution bundle. For example, in the hospital construction cases presented here, the ongoing evolution of the clinical role and input to the solution should be spelt out in future contracts. In Hospital B, having an experienced NHS Trust project manager with previous hospital PPP experience undoubtedly improved the outcome. What is needed in addition though is institutionalizing the clinical role to ensure it remains engaged at a strategic level such as on issues like customizing the operations phase to include the option to downsize. Without some form of institutionalized clinical engagement the assumption in these cases that clinicians and nurses will be able to disengage from demanding front line roles to join a dialogue about the future implications for integrated solution bundles appears naïve.

The use of mobilization teams proved to be useful to counteract unbundling effects between the build and operate phase. Team consistency had also a positive effect on developing inter-personal relationships across client/contractor organizations' personnel, facilitating frequent information exchange. However, while the organization in the cases set up a mobilization team to facilitate the transition from the build to the operate phase, the study suggests that the positive effects of mobilization teams should be harnessed across all project phase transitions. A further improvement is suggested, in which managers consider deploying 'integrated mobilization teams' consisting of individuals from both client (including clinical input) and contractor. Such an approach would also signal shared investments in joint capabilities in the form of shared knowledge and experience across all project phases. Where the study found performance measures were fragmented across the phases and disparate teams, part of the challenge of an integrated mobilization team would be in establishing joint performance measures.

Managers must weigh the transactional cost savings of dealing with a prime contractor against not just the transactional costs of dealing with distinct contractors for individual phases, but also the comparative ability of the two options to deliver. Based on our findings, transferring large amounts of risk whilst anticipating continual and non-incremental innovation may be unrealistic without robust mechanisms for ensuring customer involvement at each phase. Integrated solutions might be the optimal buyer's strategy in mature markets where risks and innovation expectations are lower and where solution providers are willing and able to deliver the customization inherent integrated solutions over time.

References

- Adams, W. J., & Yellen, W. L. (1976). Commodity bundling and the burden of monopoly. *Quarterly Journal of Economics*, 90 (3), 475-498.
- Antonacopoulou, E.P., & Konstantinou, E. (2008). The new service model: a review, a critique and a way forward. *The Service Industries Journal*, 28 (6), 845-860.
- Azimont, F., Cova, B., & Salle, R. (1998). Solution selling and project marketing: a convergence towards customer intimacy for joint construction of offer and demand. *Communication at the 14th IMP Annual Conference*, Turku, Finland September 1998, Proceedings, 1, 113-132.
- Audit Commission (2001). *Building for the future: the management procurement under the Private Finance Initiative*. Webpage: <http://www.audit-commission.gov.uk/SiteCollectionDocuments/AuditCommissionReports/NationalStudies/BuildingfortheFuture.pdf> (accessed on 18 November 2010).
- Baines, T., Lightfoot, H., Peppard, J., Johnson, M., Tiwari, A., & Shehab, E. (2009). Towards an operations strategy for product-centric servitization. *International Journal of Operations & Production Management*, 29 (5), 494-519.
- Baldwin, C.Y., & Clark, K.B. (1997). Managing in an age of modularity. *Harvard Business Review*, 75 (5), 84-93.
- Barlow, J., & Köberle-Gaiser, M. (2008). The private finance initiative, project form and design innovation. *Research Policy*, 37, 1392-1402.
- Barlow, J., Köberle-Gaiser, M., Moss, R., Noble, A., Scher, P., & Stow, D. (2010). Delivering innovation in hospital design. Finance, Contracts and the institutional contest. In N. Caldwell and M. Howard (eds.), *Procuring Complex Performance* (pp. 159-173). New York: Routledge.
- Bhaskaran, S.R., & Krishnan, V. (2009). Effort, revenue and cost sharing mechanisms for collaborative new product development. *Management Science*, 55 (7), 1152-1169.
- Bing, L., Akintoye, A., Edwards, P.J., & Hardcastle, C. (2005). The allocation of risk in PPP/PFI construction projects in the UK. *International Journal of Project Management*, 23, 25-35.
- Brady, T., Davies, A., & Gann, D.M. (2005). Creating value by delivering integrated solutions. *International Journal of Project Management*, 23 (5), 360-365.
- Broadbent, J., & Laughlin, R. (2005). The role of PFI in the UK government's modernisation agenda. *Financial Accountability & Management*, 21 (1), 75-97.
- Caldwell, N.D., & Howard, M.B. (2010). *Procuring Complex Performance: Studies of Innovation in Product Service Management*. New York: Routledge/Taylor & Francis.
- Ceci, F., & Prencipe, A. (2008). Configuring capabilities for integrated solutions: evidence from the IT sector. *Industry and Innovation*, 15 (3), 277-296.
- Cornet, E., Katz, R., Molloy, R., Schaedler, J., Sharma, D., & Tipping, A. (2000). Customer solutions: from pilots to profits. *Booz, Allen & Hamilton Viewpoint*, 1-16.
- Cova, B., & Salle, R. (2007). Introduction to the IMM special issue on 'project marketing and the marketing of solutions' - a comprehensive approach to project marketing and the marketing of solutions. *Industrial Marketing Management*, 36 (2), 138-146.
- Crespin-Mazet, F., & Ghauri, P. (2007). Co-development as a marketing strategy in the construction industry. *Industrial Marketing Management*, 36, 158-172.
- Davies, A. (2004). Moving base into high-value integrated solutions: a value stream approach. *Industrial and Corporate Change*, 13 (5), 727-756.
- Davies, A., Tang, P., Hobday, M., Brady, T., Rush, H., & Gann, D. (2001). Integrated solutions: the new economy between manufacturing and services. *Working paper*, SPRU-CENTRIM, Brighton, UK.
- Davies, A., Brady, T., & Hobday, M. (2006). Charting a path toward integrated solutions. *Sloan Management Review*, Spring, 39-48.

- Davies, A., Brady, T., & Hobday, M. (2007). Organizing for solutions: systems seller vs. systems integrator. *Industrial Marketing Management*, 36 (2), 183-193.
- Dubois, A., & Gadde, L.E. (2002). Systematic combining: an abductive approach to case research. *Journal of Business Research*, 55 (7), 553-560.
- Eppen, G. D., Hanson, W. A., & Martin, R. K. (1991). Bundling new products, new markets, low-risk. *Sloan Management Review*, 32 (4), 7-14.
- Ford, J., & Slocum, J. (1977). Size, technology, environment and the structure of organizations. *Academy of Management Review*, 2 (4), 561-575.
- Galbraith, J. R. (2002). Organizing to deliver solutions. *Organizational Dynamics*, 31 (2), 194-207.
- 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.
- Grant, R. (1998). *Contemporary Strategy Analysis*. Malden, MA: Blackwell.
- Grimsey, D., & Graham, R. (1997). PFI in the NHS. *Engineering, Construction and Architectural Management*, 4 (3), 215-231.
- Grimsey, D., & Lewis, M. K. (2004). Evaluating the risks of public private partnerships for infrastructure projects. *International Journal of Project Management*, 20, 107-118.
- Hax, A.C., & Wilde, D.L. (1999). The Delta model: Adaptive management for a changing world. *Sloan Management Review*, Winter, 11-28.
- H.M. Treasury (2010). *Public private partnerships – signed project list*. Webpage: available at: http://www.hm-treasury.gov.uk/ppp_pfi_stats.htm (accessed 12 December 2010).
- Hobday, M. (1998). Product complexity, innovation and industrial organization. *Research Policy*, 26, 689-710.
- Hobday, M. (2000). The project-based organization: an ideal form for managing complex product systems. *Research Policy*, 29 (7), 871-893.
- Jacob, F. (2006). Preparing industrial suppliers for customer integration. *Industrial Marketing Management*, 35, 45-56.
- Jacob, F., & Ulaga, W. (2008). The transition from product to service in business markets: an agenda for academic inquiry. *Industrial Marketing Management*, 37, 247-253.
- Jacobides, M.G. (2005). Industry change through vertical disintegration: how and why markets emerged in mortgage banking. *Academy of Management Journal*, 48 (3), 465-498.
- Johansson, J.E., Krishnamurthy, C., & Schlißberg, H.E. (2003). Solving the solutions problem. *McKinsey Quarterly*, 3, 116-125.
- Johnstone, S., Dainty, A., & Wilkinson, A. (2007). Hunters and farmers? The HRM implications of 'product-service' in construction. *CIB2007 – 073*, Loughborough University, 1-11.
- Johnstone, S., Dainty, A., & Wilkinson, A. (2009). Integrating products and services through-life: an aerospace experience. *International Journal of Operations & Production Management*, 29 (5), 520-538.
- Kapletia, D., & Probert, D. (2010). Migrating from products to solutions: an exploration of system support in the UK defense industry. *Industrial Marketing Management*, 39 (4), 582-592.
- Krishnamurthy, C., Johansson, J., & Schlißberg, H. (2003). Solutions selling: is the pain worth the gain? McKinsey & Company report, 1-12.
- Lawless, M. W. (1991). Commodity bundling for competitive advantage: strategic implications. *Journal of Management Studies*, 28, 267-280.
- 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). Risk transfer and the UK Private Finance Initiative: a theoretical analysis. *Policy & Politics*, 33 (2), 231-249.
- Lorenzen, C., Barrientos, M.E., & Babbar, S. (2004). Toll road concessions: the Chilean experience. *World Bank PFG Discussion Paper Series*, No. 124, the World Bank, Washington D.C.
- Mahoney, J. T., McGahan, A. M., & Pitelis, C. N. (2009). The interdependence of private and public interests. *Organization Science*, 20 (6), 1034-1052.
- Mathieu, V. (2001). Service strategies within the manufacturing sector: benefits, costs and partnership. *International Journal of Service Industry Management*, 12 (5), 451-475.
- Mattson, L-G. (1973). Systems selling as a strategy on industrial markets. *Industrial Marketing Management*, 3, 107-120.
- McAfee, R. P., McMillan, J., & Whinston, M. D. (1989). Multiproduct monopoly, commodity bundling and correlation of values. *Quarterly Journal of Economics*, 104 (2), 371-383.
- Miles, B.M., & Huberman, M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook*. 2nd ed. Thousand Oaks: Sage Publications.
- Miller, D., Hope, Q., Eisenstat, R., Foote, N., & Galbraith, J. R. (2002). The problem of solutions: balancing clients and capabilities. *Business Horizons*, 45 (2), 3-12.
- NAO (2007). *Benchmarking and market testing the ongoing services component of PFI projects*. Webpage: available at: http://www.nao.org.uk/publications/0607/benchmarking_and_market_testin.aspx (accessed 25 November 2010).
- Page, A. L., & Siemplenski, M. (1983). Product systems marketing. *Industrial Marketing Management*, 12, 89-99.
- Penrose, E. (1959). *The Theory of the Growth of the Firm*. Oxford: Blackwell.
- Porter, M. E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. London: The Free Press.
- Quinn, J. B. (1992). *Exploiting the Manufacturing-Services Interface*. New York: The Free Press.
- Rosenbaum, D., & Lamort, F. (1992). Entry, barriers, exit, and sunk costs: an analysis. *Applied Economics*, 24(3), 297-304.
- Ross, A. D., & Jayaraman, V. (2009). Strategic purchases of bundled products in a health care supply chain environment. *Decision Sciences*, 40 (2), 269-293.
- Sawhney, M. (2006). Going beyond the product, defining, designing, and delivering customer solutions. In R. F. Lusch, & S. L. Vargo (Eds.), *The service-dominant logic of marketing: Dialog, debate and directions* (pp. 365-380). Armonk, NY: ME Sharpe.
- Schmalensee, R. (1984). Gaussian demand and commodity bundling. *The Journal of Business*, 57 (1), 211-230.
- Spackman, M. (2002). Public-private partnerships: lessons from the British approach. *Economic System*, 26, 283-301.
- Spiller, T., & Zerner, B. (1997). Product complementarities, capabilities and governance: a dynamic transaction cost perspective. *Industrial and Corporate Change*, 6 (3), 561-594.
- Spring, M., & Araujo, L. (2009). Service, services and products: rethinking operations strategy. *International Journal of Operations & Production Management*, 29 (5), 444-467.
- Storbacka, K. (2011). A solution business model: Capabilities and management practices for integrated solutions. *Industrial Marketing Management*, 40 (5), 699-711.
- Stremersch, S. and Tellis, G. J. (2002). Strategic bundling of products and prices: a new synthesis for marketing. *Journal of Marketing*, 66 (1), 55-72.
- Tuli, K. R., Kohli, A. K., & Bharadwaj, S. G. (2007). Rethinking customer solutions: from product bundles to relational processes. *Journal of Marketing*, 71, 1-17.

- Ulaga, W. (2001). Customer value in business markets: an agenda for inquiry. *Industrial Marketing Management*, 30 (4), 315-319.
- Valsangkar, P. (2008). *Revenue sharing models in a 'public private partnership' (PPP) context*. Webpage: www.csi-sigegov.org/1/11_375.pdf (accessed on 21 July 2011).
- Van de Ven, A. (2007). *Engaged Scholarship: A Guide for Organizational and Social Research*. Oxford: Oxford University Press.
- Vandermerwe, S., & Rada, J. (1988). Servitization of business: adding value by adding services. *European Management Journal*, 6 (4), 314-324.
- Vargo, S., & Lusch, R. (2004). Evolving to a new dominant logic for marketing. *Journal of Marketing*, 68, 1-17.
- Vargo, S. & Lusch, R. (2006). Service-dominant logic: reactions, reflections and refinements, *Marketing Theory*, 6 (3), 281-288.
- Windahl, C., Andersson, P., Berggren, C., & Nehler, C. (2004). Manufacturing firms and integrated solutions: characteristics and implications. *European Journal of Innovation Management*, 7 (3), 218-228.
- Wise, R., & Baumgartner, P. (1999). Go downstream: the new profit imperative in manufacturing. *Harvard Business Review*, September-October, 133-141.
- Yadav, M. S. (1994). How buyers evaluate product bundles: a model of anchoring and adjustment. *Journal of Consumer Research*, 21 (2), 342-354.
- Yin, R.K. (2003). *Case Study Research: Design and Methods*. London: SAGE Publications.
- 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 & Supply Management*, 14 (1), 43-54.

Tables and Figures

Table 1 Common risk types for infrastructure projects (based on Grimsey & Lewis 2004, p. 172;

Bing, *et al.* 2005)

| Risk types | Brief description |
|----------------------------|---|
| Technical risk | Due to engineering and design failures |
| Construction risk | Due to faulty construction techniques, cost escalation and delays in construction |
| Operating risk | Result of higher operating and maintenance costs |
| Revenue risk | Because of occupancy shortfall; volatility of demand for services and products |
| Financial risk | Inadequate hedging of revenue streams and financing costs |
| Force majeure risk | Including war and other acts of God |
| Regulatory/political risks | Resulting from planning changes, legal changes and unsupportive government policies |
| Environmental risks | Because of adverse environmental impacts and hazards |
| Project default | As a result of failure of the project from a combination of any of the above |

Table 2 Overview of key case characteristics

| | Hospital A | Hospital B |
|---|---|---|
| <i>Product service provision</i> | Design, build, finance and operate (DBFO) | Design, build, finance and operate (DBFO) |
| <i>OJEU advert</i> | Mid 1990s | Around 2000 |
| <i>Financial close</i> | Late 1990s | Around 2004 |
| <i>Operation since</i> | Late 2002 | Late 2006 |
| <i>Contract nature and value</i> | Non-standard contract; approx. £150m | Based on a standard contract; approx. £150m |
| <i>Contract duration</i> | 30 years | 30 years |

Table 3

Overview of data collection stages

| Stage | Data collection | Main unit of analysis | Description |
|--------------|---|---|---|
| I. | 108 government reports and industry reviews in addition to company reports and press clippings; 4 semi-structured interviews with Department of Health and Private Finance Unit | Market | To increase domain-specific knowledge about PPP health market |
| II. | 30 semi-structured interviews with public and private organizations <i>(16 interviews with the solutions provider and 14 interviews with NHS Trusts)</i> | Inter-organizational relationship and project | In-depth, processual analysis of two inter-organizational relationships in the UK PPP health market |
| III. | 4 validation and follow-up interviews | Inter-organizational relationship and project | To receive comments and feedback on case-study reports and to verify and validate case findings |

Table 4 Selected reports on Public Private Partnerships (*references are available upon request*)

| Source | Year | Title | Brief description of content |
|---|------|--|---|
| The Stationery Office | 2000 | Public Private Partnerships: The government's approach | Definition of PPP; value for money considerations; performance regimes; guidance for public sector to develop partnerships |
| The Audit Commission | 2001 | Building for the Future: The management procurement under the Private Finance Initiative | Introduction to PFI; guidance on specifying long-term service requirements; performance measurements; risks and value for money |
| Arthur Andersen and Enterprise LSE | 2001 | Value for money drivers in the Private Finance Initiative | Value for money considerations; survey of public sector project managers' opinions |
| National Audit Office (NAO) | 2001 | Managing the relationship to secure a successful partnership in PFI projects | Review of partnership approaches including shared understanding of public and private partners' objectives, establishing a contractual framework and value for money considerations |
| 4Ps (Public Private Partnerships Programme) | 2002 | The final business case | Guidance on the final business case including project objectives, stakeholder consultation and procurement process and competition |
| Office of Government Commerce (OGC) | 2002 | Green Public Private Partnerships | Whole life-cycle costing; sustainability issues in PFI/PPP projects |
| European Commission – Directorate-General Regional Policy | 2003 | Guidelines for successful Public Private Partnerships | PPP structures; assessment of suitability and effectiveness of PPP projects across different sectors; legal and regulatory structures; financial and economic implications of PPP projects; PPP planning and implementation |
| H.M. Treasury | 2004 | Value for money assessment guidance | PPP background; explanation of tendering process; guidance on investment and project level assessment |
| International Financial Services London (IFSL) | 2006 | PFI in the UK: Update | Breakdown of PFI projects and contract value by government departments; progress report; review of operational performance of PFI projects |
| Partnerships UK | 2007 | PFI: The state of the market | Analysis of PFI market including project investors, lenders and contractors |
| Confederation of British Industry (CBI) | 2007 | Going global: The world of Public Private Partnerships | Drivers for success in PPPs; lessons learnt from PPP markets around the world |
| National Audit Office (NAO) | 2007 | Benchmarking and market testing the ongoing services component of PFI projects | Value for money considerations; review of benchmarking arrangements in PFI contracts |
| PriceWaterhouseCoopers (PWC) | 2008 | The value of PFI: Hanging in the balance sheet | Evaluation of the PFI model in light of the UK Government's decision to adopt International Financial Reporting Standards and thus bring most projects on balance sheet. |
| National Audit Office (NAO) | 2008 | Making changes in operational PFI projects | Value for money and risk considerations; relationship management guidance |

Table 5 Summary of findings on innovation

| Hospital A | | Hospital B | |
|--|--|---|--|
| <i>Innovation</i> | <i>Outcome</i> | <i>Innovation</i> | <i>Outcome</i> |
| The design of ceiling lighting mimicking a night sky | More homely environment than the standard functional NHS lighting | A flooring solution that added cost to the construction phase (60% linoleum, 25year lifecycle) | Cost-effective in the operation phase due to improved and simpler cleaning and longer lifecycle (from 10-15y to 25y) |
| Adoption in the form of motorized floor maintenance equipment | Saving labor on cleaning and polishing floors | Modular construction off-site, especially of repeatable spaces like toilet pods and ward blocks | Adding speed and flexibility at low cost and disruption levels |
| Contractor tried out different types of materials and regenerated all the timber and surplus plaster | Aimed to recycle the concrete of the old hospital building and in cooperation NHS customer, the contractor used linoleum and rubber instead of vinyl materials | Porters were given radios | Improved previous practice where porters were not directly contactable and were sent to jobs with little knowledge of what to expect |
| Contractor had included design for expansion; office space could be quickly converted to ward space | To future proof the hospital; conversion would lead to minimal disruption of medical services and offers flexibility of hospital expansion | Design improvement in Hospital B was a long linking corridor | Infection control through separate access levels for the public, clinical staff and service providers |
| Catering | Widely agreed better standard of catering | Catering | Widely agreed better standard of catering |

Table 6 Key quotes from the public-private relationship

| | Public partner | Private partner |
|---|---|--|
| Organizational restructuring and customization | <p><i>"We [NHS Trust] had to constantly get used to new faces from [private sector partner]."</i> (Project Director, Hospital A)</p> <p><i>"I had the feeling they brought in a new team every months. [...] you get used to working with XYZ and then the next day somebody else was in charge. We [public partner] are not used to this kind of working."</i> (Senior nurse, Hospital B)</p> <p><i>"I find it very difficult, and I am sure my colleagues agree with me, to build up long-term relationships with them [private partner] as there were a lot of time and staff changes."</i> (Finance Director, Hospital A)</p> | <p><i>"It became clear very early on that it would be much more economically viable to have different teams with core capabilities. [...] this really helps to develop core strengths and to deliver the best possible result for the customer. I think this is a win-win situation."</i> (Project Director, Hospital B)</p> <p><i>"[...] this restructuring lead to faster project completion and highly specialized skills within the teams which is definitely good for us and the customer too."</i> (Programme Director, Hospital A and B)</p> |
| Capability building and learning | <p><i>"We definitely experienced a very steep learning curve because we [public partner] had very limited prior PPP experience."</i> (Project Manager, Hospital A)</p> <p><i>"I was part of another PPP hospital project prior to this. This really helped to understand the process and to be more of an equal partner to [private partner]. I think they [private partner] noticed very quickly that they could not push us around so much and had to take us seriously."</i> (Project Director, Hospital B)</p> | <p><i>"We worked very hard to ensure that all our projects are delivered on time and within budget. But, you need to build and constantly improve your capabilities. That does take time and is a huge task. [...] it is not that we know everything there is to know about PPP projects right from the start."</i> (Project Manager, Hospital A)</p> <p><i>"You learn a lot from previous projects and we learnt from the [Hospital A project] a lot. [...] Here [in Hospital B] we also partnered with a much more experienced buyer. Their Project Director was very experienced which helped to deliver a high-quality solution."</i> (Project Manager, Hospital B)</p> <p><i>"A good example of learning is the mobilization team which we used for this project. It really helped to address problems during the transition phase much quicker and more efficiently."</i> (Project Director, Hospital B)</p> |
| Innovation and risk management / revenue sharing | <p><i>"There was some innovation with the design of the ceiling lighting which does mimic a night sky. This is really a nice and innovative feature."</i> (Senior nurse, Hospital A)</p> <p><i>"We have some income being generated through our hospital shop area."</i> (Head of Estate, Hospital B)</p> <p><i>"It is important to make sure right from the start of the project that risks are appropriately transferred to the private sector. However, we also needed to ensure that we are not charged too much for transferring these different risks."</i> (Project Director, Hospital B)</p> | <p><i>"I think there was a lot of innovation being realized here. To give you an example, we installed sustainable flooring solution, and we won prizes for constructing such a sustainable hospital."</i> (Project Manager, Hospital B)</p> <p><i>"We had some innovative practices installed here. For instance, we now use motorized maintenance equipment which is much faster."</i> (FM Director, Hospital A)</p> <p><i>"That is definitely very important to identify and then to manage all the risks. [...] there are construction risks, operations risks and so forth. You really need to make sure all is properly identified right from the start."</i> (Programme Director, Hospital A and B)</p> |
| Process of working together | <p><i>"I do think that we worked together and tried our best to give input to all important decisions. It was not always easy and we had to learn how to deal with more commercially driven organizations."</i> (Project Manager, Hospital A)</p> | <p><i>"I think we did make it work. There are always some teething problems, but you need to sit together and try to work it out."</i> (Programme Director, Hospital A and B)</p> <p><i>"There are always problems in such long-term relationships, but they [NHS Trust] need to understand that we need to work together. I think that was new to them to work with another organization."</i> (Project Manager, Hospital A)</p> |

Figure 1 Traditional public sector procurement model

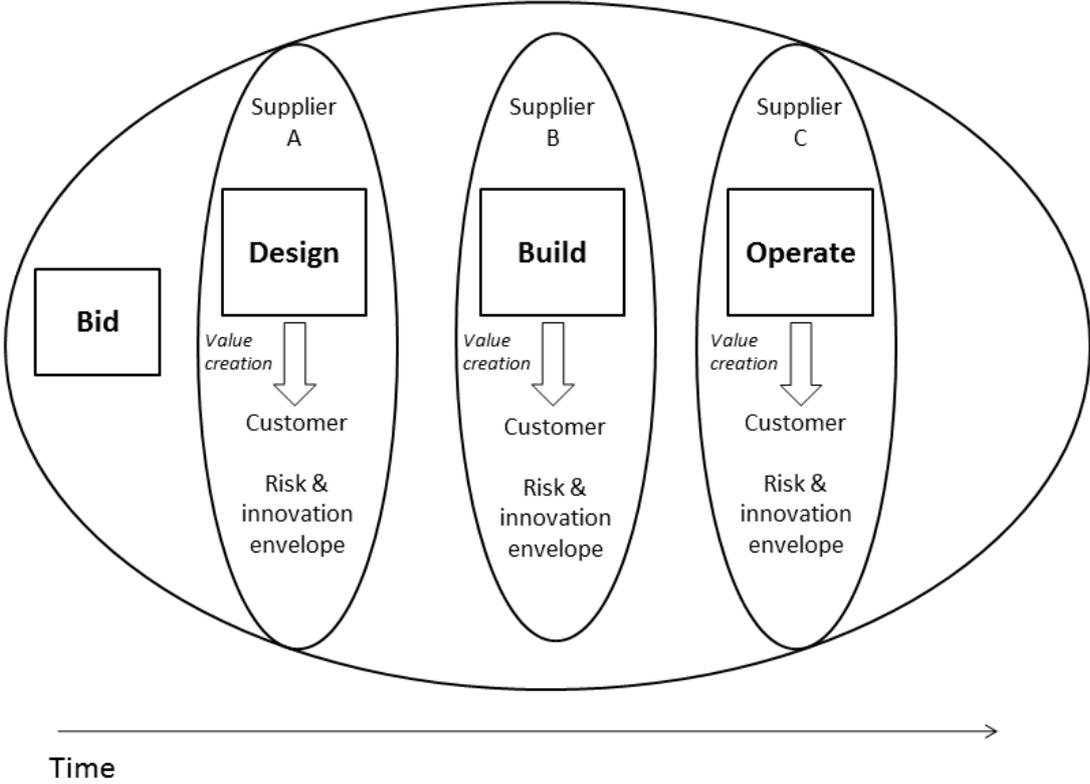
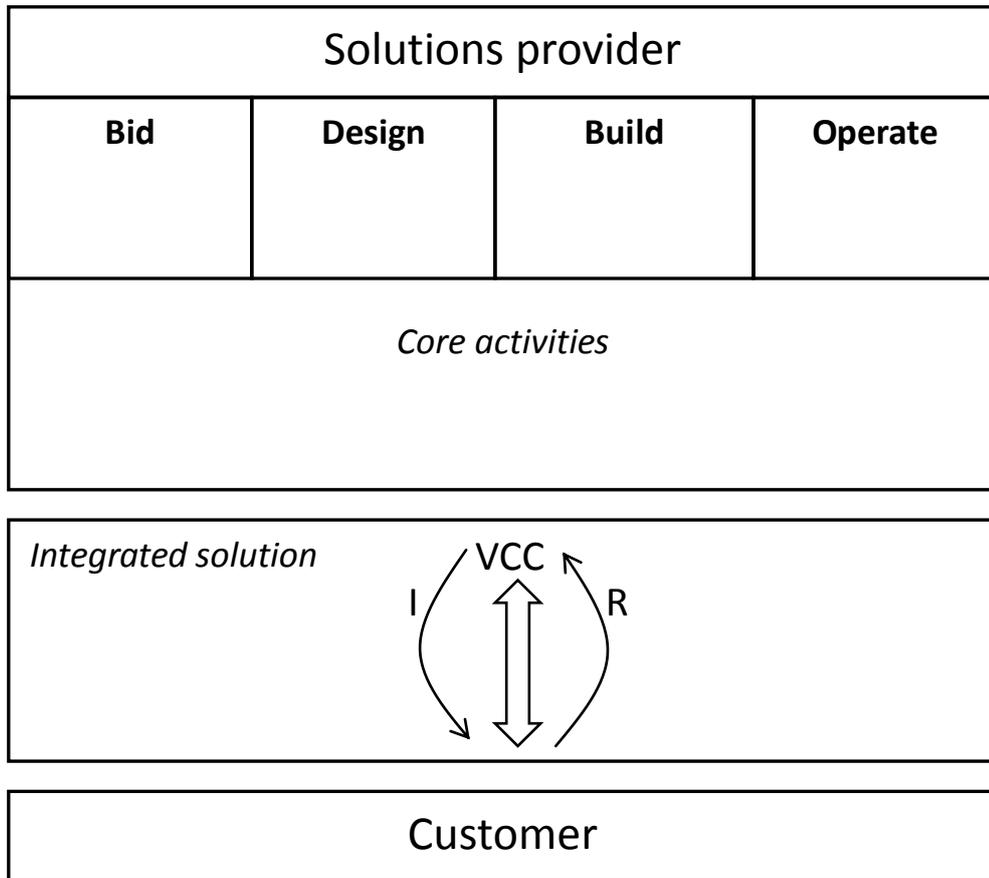


Figure 2 Initial conceptual framework of public sector integrated solution provision



I – innovation

R – Risk

VCC – Value co-creation

Figure 3 Overview of simplified PPP hospital structure (adopted from Zheng, et al. 2008, p. 47)

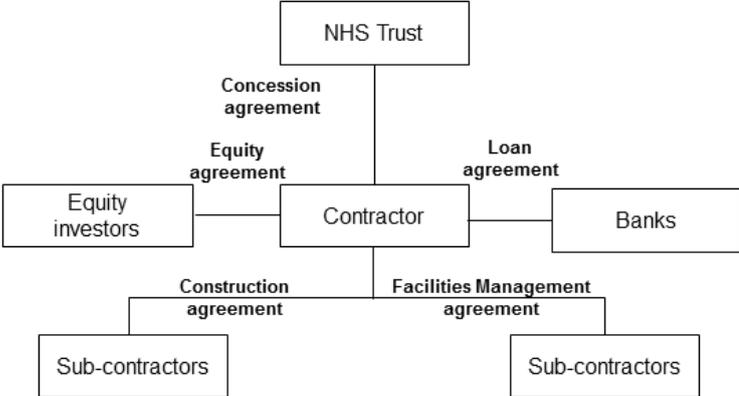
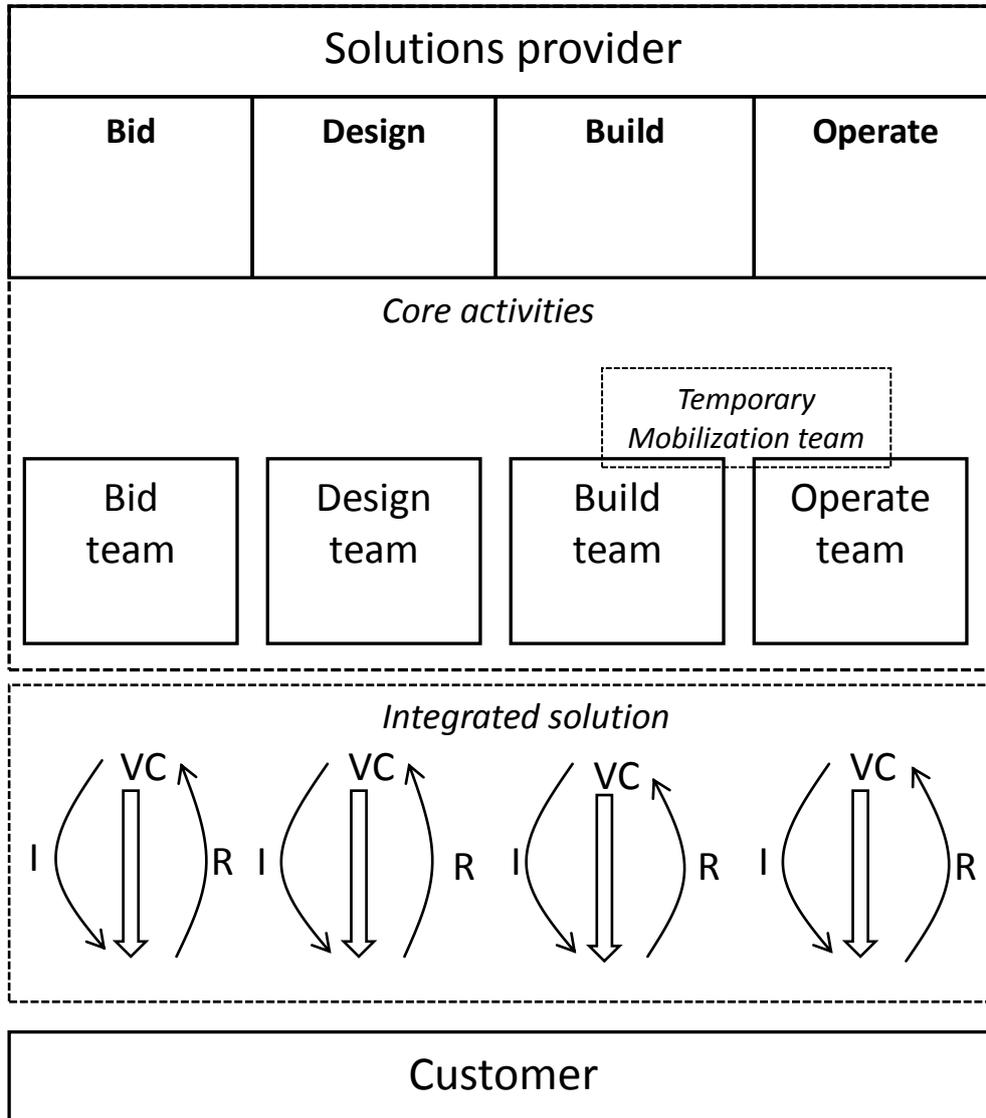


Figure 4 Revised conceptual model



I – innovation
 R – Risk
 VC – Value creation