Delivering Innovation in Hospital Construction: CONTRACTS AND COLLABORATION IN THE UK'S PRIVATE FINANCE INITIATIVE HOSPITALS PROGRAM

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The increasing pace of change in healthcare technologies and policies has generated increased interest in the future adaptability in the physical infrastructure that supports health services. This challenge is especially acute in the UK, where the reorganization of the National Health Service (NHS) is taking place parallel to an infrastructure modernization program worth over \$70B.¹ To stimulate investment, various forms of public-private partnership (PPP) have been introduced whereby a capital project for a public-sector client is delivered and operated for a fixed period by a private-sector consortium.

The Private Finance Initiative (PFI), one of several models of PPP, is the main funding mechanism for hospitals and has been used for almost all schemes in England since 1997. Government had several objectives in introducing PFI. First, it was seen as a means of renewing NHS facilities faster than would be the case under conventional public funding models. Second, the long-term contractual arrangements should ensure that facilities are adequately maintained over their lifetime.

However, a key driver was also the perceived benefit that PFI would bring by injecting innovation into the health sector.² As one health minister put it,

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PFI is “much more than a new hospital building program...It has to become the principal mechanism for getting new design solutions into the NHS, not just in buildings, but in processes too.”³ A Treasury Technical Note published in 2000 stated that innovation is a key principle in PFI for delivering the ambition of good design. This was described in terms of “breaking the grip of historic or standard public sector design approaches.”⁴

The use of PFI within the NHS has been highly controversial. Both the research literature and official reports focus almost entirely on its financial characteristics, especially its long-term cost to health service operators. This article addresses another, little researched aspect—the relationship between PFI and innovation in the design of healthcare infrastructure to enable future adaptability.

Background: The Changing Healthcare Infrastructure System

Coping with uncertainty—including uncertainty associated with changing patterns of demand—has long been seen as a core challenge for planning, designing, and managing complex engineered systems.⁵ Healthcare infrastructure is an example of such a system. It comprises many functional and operationally interconnected parts that interact with non-built systems. Changing patterns of demand for and use of healthcare services have an impact on the type and amount of infrastructure required to support them.

There are complex relationships between innovation in the technologies, infrastructure, and services associated with healthcare. Cycle times for changes in these elements of the health system vary considerably between long-lasting fixed capital infrastructures, more-rapidly changing technologies and services, and a frequently unstable policy context (see Figure 1). Even though a project to design and build a new hospital may not be inherently complex,⁶ the environment within which it is taking place may be one of considerable market and technological uncertainty. Furthermore, hospitals themselves tend to be large sophisticated buildings that have to be kept working around the clock, meaning that alterations or extensions are disruptive and expensive. High switching costs in terms of time, money, and disruption associated with adapting infrastructure to changes in services and demand therefore make it all the more important to build a degree of adaptability into healthcare built assets.

In the UK—as in other countries—there is a growing acceptance that a reduction in the number of beds in large general acute hospitals might be necessary as the balance between hospital and community-based care facilities changes. This reflects a concern that some services provided by hospitals could be more appropriately and economically provided in local settings or at home.

Please supply author bios.

FIGURE 1. Key Elements and Dynamics of the Healthcare Infrastructure System

Developments in care policy and healthcare technologies are therefore helping to position the large general acute hospital along a “fault line” between specialist and community-based health services. A recently published review of services in London⁷—now being extended nationally—proposed a reconfiguration of healthcare infrastructure into a network of “polyclinics,” providing a much wider range of services than a conventional health center. Complex and specialist care would be carried out in fewer hospitals and there would be more emphasis on care delivered at home. Some of the remaining hospitals would provide non-emergency operations and other non-urgent care, but they would also face competition from the polyclinics, which by 2017 could provide up to 50% of outpatient treatment currently carried out in hospitals. Competition is also possible from a new wave of “community hospitals,” which are seen as an important node in the bundle of services designed to enable older people to remain in their own homes.

Adaptability has long been highlighted as an important goal for planning and designing healthcare facilities that are sufficiently “future proofed.” During the 1960s and 1970s—the previous wave of major hospital investment in the UK—several innovative design and construction solutions were developed and put into practice. Subsequent refinements focused on economies of scale, predictability in costs, and quality control through standardized design and construction systems for hospitals.⁸

Following completion of the last hospitals planned during this period, there was almost no new construction until the PFI was introduced in the late 1990s. The momentum for innovative solutions was lost as the organizational infrastructure⁹ for hospital planning and delivery was dismantled. By the early

FIGURE 2. Key Actors and Their Relationships under PFI

2000s, however, the need for adaptability and innovation was back on the agenda, with the then Secretary of State for Health arguing that innovative new hospital designs could help raise care standards and ensure the flexibility needed to plan for future medical advances.¹⁰ The Treasury Taskforce on PFI stated in 2000 that hospital trusts procuring new PFI schemes should encourage in-built flexibility and “modern production processes” in the design specification so they could respond to changing requirements with minimal disruption.¹¹

The key question here is whether the PFI model is capable of stimulating innovative solutions to reduce the risk of potential future obsolescence in hospitals. Indeed, concern about its ability to “future-proof” healthcare facilities was raised early in the initial wave of PFI hospitals.¹² So how might PFI affect innovativeness in hospital schemes?

PFI and Innovation: Contracts and Collaboration

Under PFI, several private-sector partners form a consortium, a “special purpose vehicle” (SPV), to deliver capital assets and some services to an NHS hospital trust¹³ on a long-term contract, typically lasting thirty years or more. The arrangement usually involves finance, design, construction, facilities management, and sometimes “soft facilities management” such as cleaning and catering. The SPV contracts with other companies for the provision of these services. The hospital trust maintains sole responsibility for all clinical services (see Figure 2). The trust makes regular payments to the SPV for the availability

or use of the asset and for the service provided. These are linked to performance through a system of penalty payments and periodic market testing.

Procurement Process

Understanding the PFI procurement process and how typical schemes are structured is important for considering the implications for design and construction innovation. During the bidding process, the aim of client (i.e., the hospital trust) is to promote competition to maximize the value for money of bids. The trust's "invitation to negotiate document" (ITND) includes details of the output specification, proposed contractual terms, payment mechanism, risk allocation arrangements, and bid evaluation criteria (which include mandatory factors such as value for money and design compliance, as well as desirable criteria such as innovation). Consortia submit preliminary bids during this stage, and a small selection are then asked to make a full proposal against an agreed outline scope for design, operational services and performance, and other contractual terms.

PFI Structure

Three features of PFI have implications for the extent to which innovative design and construction approaches are stimulated—the way risk is allocated between the various stakeholders, the degree to which integration across supply chains is promoted, and the arrangements for long-term performance management (see Table 1 for a summary).

A Focus on Risk

A key consideration for government in introducing the PFI was to transfer risk from the public to the private sector and inject greater discipline in risk analysis and allocation into public sector procurement methodology.¹⁴ Under PFI, some operational risks that traditionally rest with the client—in this case, the hospital trust—are transferred to the SPV, notably those relating to inflation in maintenance and operational costs, and any inability to achieve projected performance standards. Risks arising from technical obsolescence, changing regulations or policies, and unidentified future healthcare needs—including falling demand for services—remain with the hospital trust.¹⁵

Clearer allocation of risks—along with regular, guaranteed fees payable to the SPV—may reduce the financial and legal uncertainty faced by the contractor and benefit innovative activities.¹⁶ Because difficulties in foreseeing future demand risk potentially expose the trust to future unsustainable payments to the SPV,¹⁷ this may stimulate its interest in innovative adaptable design solutions. This is recognized in Treasury guidance, which states that a well-written output specification, reflecting the client's views on potential changing needs, is critical for achieving optimum risk allocation.¹⁸

However, some have argued that under PFI the desire to allocate as much risk as possible from the hospital trust to the SPV (and onward down its supply chain) is potentially detrimental to innovation because it reduces the likelihood of collaborative relationships and "partnering" between suppliers.¹⁹ A number of

TABLE 1. Implications of PFI for Innovation

Feature	Potential Benefits (+) and Disadvantages (-)	Innovation Implications
Focus on Risk	<div><div>+ More discipline in transparency and allocation</div><div>- Drive to transfer risk away from public sector</div></div>	<div><div>+ Reduction in financial and legal uncertainty incentivizes innovative thinking</div><div>+ Future demand risk remains with hospital trust and stimulates focus on adaptability</div><div>- Excessive risk transfer to suppliers detrimental to collaborative relationships</div><div>- Risk allocation fixed too early in bidding process detrimental to innovative proposals</div></div>
Integration across the Supply Chain	<div><div>+ SPV / investors glue together necessary design, construction, operation skills</div></div>	<div><div>+ Better communications, more collaboration stimulates innovation during development and construction phase</div><div>- Multiple stakeholders with conflicting interests detrimental to collaboration</div></div>
Long-term Performance Management	<div><div>+ SPV's equity stake guarantees long-term commitment</div></div>	<div><div>+ Financial and reputational incentive to focus on long-term asset management stimulates innovative thinking in design and construction</div></div>

commentators have emphasized the importance of mechanisms that allow the rewards for innovation to be distributed according to the risk that each party has assumed.²⁰

A further factor weighing against innovation is the way contract terms and risk allocation arrangements are specified during the ITND stage, which is competitive and therefore makes bidders wary of giving away good ideas. To guard against this, the official guidance makes it clear that clients cannot import design solutions from one bid into a competing bid that is more attractive financially without the specific permission of the originating bidders.²¹

Integration across the Supply Chain

There is an emerging literature on innovation processes within high value and engineering-intensive projects,²² one-off projects that involve a degree of risk. Large hospital developments often display these hallmarks. In this type of project, systems integration capabilities,²³ close collaboration, and open communication are seen as significant factors in successful innovation.²⁴

Some believe that the emergence of integrated procurement contexts under PFI may provide a more supportive climate for collaborative ways of

working²⁵ with the SPV acting as a form of system integrator.²⁶ During the project development and construction phase, it is in the interest of the SPV to ensure that architects, consultants, and contractors share the same goals and work well together. This may speed the design process, and improved collaboration may stimulate innovation. The need for synergy between bidders in promoting innovation was noted in the Treasury guidance on the role of PFI in good design, as was the importance of direct communication between the designer and the ultimate end-user.²⁷

Over the longer term, the equity provider is incentivized to make integration work and may therefore play a part in gluing together the skills required to maintain the value of its asset. Others, however, have argued that the multiplicity of stakeholders in a typical PFI project, often with conflicting interests, may reduce the quality of relationships.²⁸

Long-Term Performance Management

In a PFI project, the SPV finances construction and is paid a unitary payment over the life of the project by the hospital trust. The return to the SPV's equity is therefore assumed to guarantee its long-term commitment to the project. If problems were to arise during the operational phase of the contract, there is therefore a financial incentive—along with the consequences of poor performance on the SPV members' reputations—to spend the money required to fix the problem. The need for the SPV to focus on the maintenance and running of the hospital for thirty years or more may stimulate innovative thinking in approaches to design and construction, such as the use of new materials that are easier to clean or new ways of assembling structural components to increase adaptability.

To examine how the perceived benefits of PFI impacted on design and construction innovation, especially the ability to accommodate future adaptability, we conducted a series of case studies of PFI hospital schemes. As PFI hospital projects are still in their early operational stages, it is not yet possible to investigate long-term performance management outcomes. Our focus was therefore on the interfaces between the various project stakeholders and way these affected collaborative working and attitudes towards risk, and in turn innovation in design and construction.

Research Approach

The research followed a three-stage process. First, we conducted background interviews with nineteen domain experts in order to build a thorough understanding of the issues and help to identify potential case studies. Interviewees included senior representatives from the NHS, the Department of Health, and the construction sector (including architectural and legal practices), as well as PFI consultants.

Second, short case studies of six hospitals built under pre-PFI delivery models (during the 1970s and early 1980s) were undertaken. These were

TABLE 2. Case Study Sites

Hospital	Attributes
A	Greenfield site, with a repetitive, standardized structure and standardized, multifunctional rooms.
B	Greenfield site, with a “matrix” design intended to be internally adaptable and expansion space on site.
C	1970s “nucleus” hospital (designed for flexibility) with a major extension woven into the existing structure.
D	Existing site with redevelopment via a modular construction approach, partially based on existing foundations.
E	Major extension to existing facilities, with new ward layouts to encourage flexible ward management and top floor adjustable for different functions.
F	Urban site with flexible ward layouts, a new renal dialysis unit potential space for a further inpatient beds.
G	Greenfield site, medium-sized, with special emphasis on environmental sustainability.
H	Redevelopment of existing site, demolition of old facilities, and construction of new hospital with all rooms en-suite single bedrooms.

designed to situate the current PFI model for hospital development within its historical context. They allowed us to capture lessons from a different financial and procurement model on the organization of hospital projects, the strategies employed for adaptability, and on how innovative they were perceived to be. These case studies were based on informal interviews with those responsible for their planning and design—where they could be traced—and site visits, supplemented by evaluation of background documentary information. These findings are reported elsewhere.²⁹

Third, the main data collection phase involved detailed case studies of the processes for planning and delivering seven PFI schemes. Brief details of the case study schemes are described in Table 2. To control as much as possible for the impact of contextual factors on innovation outcomes, seven cases were selected from schemes planned during the first wave of the government’s PFI program. They were therefore all subject to the same policy and economic environment. In addition, the general level of knowledge and experience of PFI amongst project participants was felt to be similar due to their status as first-wave schemes. This was an important issue at the time because of concerns that the general unfamiliarity with the PFI process was increasing procurement costs.³⁰ The case study schemes could therefore be expected to yield insights into how PFI—as configured during this period—affected innovation. We also conducted a short case study of a contemporary PFI hospital project currently under construction. The main contractor and lead partner had been involved in one of the older projects we examined, enabling us to gain an insight into any improvement in the PFI process since the first wave of schemes forming our main body of case studies.

The specific examples chosen followed discussion with the key experts. We are required to maintain confidentiality over their identity. The schemes ranged in value from \$65M to over \$800M, representing 24% of the total value of first-wave schemes. The projects included both greenfield (i.e., wholly new) sites and redevelopment sites. The hospitals all became operational between 2000 and 2007.

The research included semi-structured interviews with the project stakeholders, site visits, and analysis of background documentary information. For the main body of case studies, thirty-three key representatives from the SPVs and hospital authorities were interviewed, including trust project directors and clinical planners, and managers and directors from the SPVs and contractors, facilities management companies, and architects. The semi-structured interviews were guided by an interview protocol consisting of forty open-ended questions, including sub-questions to substantiate given answers. In some cases, two interviewers were present. All interviewees were assured of confidentiality to elicit as much unrestricted information as possible. Interviews were taped, when possible, or manually recorded. Data collection was carried out over a nine-month period in the second half of 2005 and early 2006. A further eight representatives from the contemporary PFI scheme were interviewed individually or participated in group discussions in October 2007 and April 2008.

All findings from the case studies were independently analyzed in an evaluation matrix by each researcher to identify common themes. The preliminary research findings were then presented to the research advisory board (comprising experts from healthcare architecture and construction) and at a workshop that included other academic researchers and 45 representatives from health policy, health services, and the construction supply chain.

Findings

We have outlined the implications of PFI for innovation, highlighting three factors that might explain the level of innovation in hospital construction projects—the allocation risk between project and operational partners, the degree of integration between them, and the role of the SPV's equity in the project in stimulating concern about the long-term performance of the facilities. We will now discuss how the case studies performed in relation to risk allocation and integration—it was not possible to explore long-term performance issues because the case study schemes were all in an early stage of their lifecycles. The key points from the discussion are summarized in Table 3.

A Focus on Risk

“Many ideas were kicked around but it’s all down to financial issues and risk.”
—Hospital Trust Director of Estates and Support Services, Hospital B

The case studies suggested that while there may have been more discipline in identifying and allocating risk, the drive to transfer as much risk away from the public sector as possible was not conducive to innovative thinking. Interviewees reported that “innovation”—including innovation to facilitate

TABLE 3. Summary of Key Findings from the Case Studies

Factor Potentially Stimulating Innovation in PFI	Key Findings
Focus on Risk	Drive to transfer risk away from public sector and risk allocation fixed early in bidding process-SPV not interested in putting forward innovative solutions. Awareness that future demand risk lies with hospital trust stimulated concern over adaptability, including some use of innovative solutions.
Integration across the Supply Chain	Generally poor integration between trust and SPV. Some evidence of conflicting interests that were detrimental to collaboration and possibly hindered innovation. Too early to conclude on long-term interests of SPV / investors in gluing together necessary skills to safeguard long-term returns.
(Long-Term Performance Management)	(Not explored in detail, but some evidence of interest in long-term asset management, which stimulated interest in lifecycle costs in new schemes.)

adaptability in design—was a potentially important “sales factor” when seeking to win bids for new schemes. However, we found a tension between the desire to promote innovation at the bid stage and the generally risk-averse attitude that prevailed within PFI consortia. Pressure to use “tried and tested” approaches was exerted by funders to protect their return on investment. The project director from an SPV summarized the position thus: “PFI stifles innovative solutions. Investors and financiers are not interested in innovation. They do not want to take risk” [Hospital B]. This view was reinforced by the commercial manager for the contractor in the same scheme, who said, “You need the certainty that what you are constructing is protecting your company’s business” [Hospital B].

The PFI bidding process also stifled innovation. Bidders were asked to design to a brief that often contained generalized statements about the need for adaptability, but without detailed specifications. Competing consortia were therefore unwilling to offer more than the minimum necessary for a successful bid. There was a widespread feeling that since design was carried out concurrently with tendering and that risk allocation was fixed early in bidding process, opportunities for innovation were very limited. Collaboration and open discussion of new ideas was constrained by commercial sensitivities and the fear of consortia that they might lose the project in the next phase of the tendering process. As one contractor observed, “innovation would need to start during the bidding process . . . After financial close (when the contract is finally signed) it is too late” [Hospital F].

We found little concern about the need to build in innovative solutions to minimize future maintenance or adaptation costs. In fact, it was suggested that there is a disincentive to plan for adaptability because the SPV could achieve additional income through alterations needed in the future. Another factor was

the separation between companies responsible for construction of the hospital and those responsible for facilities management. Since the latter would bear the cost of future maintenance, innovative solutions—which were likely to result in a higher initial cost for the construction contractor—were not implemented. However, interviewees indicated that this attitude is now changing and that PFI consortia in more recent schemes were incorporating incentive mechanisms into their contracts that allow the lifecycle costs of the facility to be taken into account. There was also some evidence that the desire to develop a long-term relationship with a hospital trust—for the purposes of securing future work—was regarded as a clear incentive to ensure good design quality [Hospital F].

To what extent were hospital trusts concerned with adaptability because the future demand risk remained with them? Trusts displayed a generally cautious attitude towards risks associated with what they perceived to be innovative design and construction solutions, and they were consequently reluctant to approve ideas that were untested or required derogation from the Department of Health's design and technical guidance.³¹

More significant, however, was the overriding concern with cost. Trusts were highly price sensitive and unwilling to pay for innovation that often involved additional short-term costs. In every interview, it was pointed out that affordability was the overriding issue during the project planning and procurement process. The need to reduce costs to match the approved affordability limits established by the Public Sector Comparator (PSC) was often cited as a reason for low levels of innovation. Under the PSC, a trust's outline proposal, including costs, would be submitted for approval by the Department of Health. Value engineering would then be applied to adjust the costs to a level that would enable the scheme to go forward.³² This was in spite of official guidance that the indicative design solutions forming the basis for PSC capital cost estimates should be made available to bidders to provide a reference point and that the client needed to make it clear that this "should not stifle innovation."³³ As one SPV project director put it, "It's a game to bring the business case down to get approval from the Department. This results in an unrealistic budget, which doesn't allow for the implementation of innovative ideas" [Hospital B].

Nevertheless, despite these constraints, measures for future design adaptability had been included in all the case studies. These typically involved conventional solutions, such as multipurpose or "soft" spaces designed for expansion—in Hospital A, for example, a zone at each end of the hospital's "main street" included potential for expansion; in Hospital B, the organization of the layout into zones allowed for change within each zone; and in Hospital E, the balconies on the fifth floor were designed to be convertible into additional, internal space. In four of the hospitals, however, more innovative options had been introduced (Hospitals A, B, D, and G). These included modularized service and mechanical systems to allow for easier upgrading as well as the option to provide future vertical expansion. In Hospital G, a relatively new type of thinner reinforced slab was considered for this purpose, although this approach was eventually not used because of concerns over the level of vibrations affect-

ing sensitive hospital equipment. In this scheme, other innovations to improve adaptability were included, notably an extra-wide steel-grid system to maximize the internal use of space and provide an easy platform for the installation services.

Integration across the Supply Chain

“The client is the bank and the trust is just a tenant.”—Commercial Manager, main contractor, Hospital B

We argued above that a potential benefit of PFI is increased integration between the design, construction, and operational functions in hospital projects. Greater collaboration and improved communication might lead to more innovation during the development and construction phase. In the longer term, the SPV and funders may be more likely to glue together the necessary skills to safeguard their investment, although the involvement of multiple stakeholders with conflicting interests could also harm collaboration.

Because the case study schemes are still relatively young in operational terms, it is too early to draw conclusions on the implications of PFI on integration over the longer term and our findings are therefore restricted to the design and construction phases.

Interviewees often pointed out that since the hospital trust is not the owner of the facility, it only had a limited role in overall project delivery. One interviewee compared the SPV to “a king in a castle” who had to agree to any changes the hospital wished to make [Hospital D]. The project director for another hospital trust even felt that it was “not seen as the client but rather as an impediment.”

Since the main contract in a PFI project is between the trust and the SPV, case study SPVs often insisted to project stakeholders that all communication between those responsible for planning and design and the contractors had to be channeled through them. The SPV therefore formed an additional administrative layer between the design capability (i.e., the architects and planners) and the end-users (i.e., the hospital trust and its staff). In two cases, it was reported that the SPV was uneasy about overly close relationships between the healthcare planners working for the trust and the architects [Hospitals B and C]. According to the director of planning for one trust:

“We had very good relationships with (the architects) . . . However, the SPV was concerned about this closeness and tried to prevent close contact. Eventually we were allowed to deal directly with the architects, though a representative of the SPV had to be present at each meeting, which slowed the process down.”
—Hospital C

Some architects therefore felt their loyalties were divided, as they were employed by the SPV’s contractor but felt responsible to the hospital trust and the users of the proposed facility. According to one, there was a feeling that the practice had to service two “clients,” the SPV and the hospital trust and its users [Hospital A].

This reflects concerns expressed by others working in the field at the time. For example, the August 2005 issue of *Hospital Development* drew attention to the fact that compared with earlier models for hospital procurement, architects have fewer opportunities to talk directly to the clinical staff who would be working in the buildings they were designing. Another commentator argued that the briefing process was less systematic than previously, with research on user needs not being fed into the design process in a way that is as methodical and performance-oriented as possible.³⁴

A lack of integration between the trust and the SPV—with a resulting impact on briefing and design—was not just a result of the structural characteristics of PFI, whereby the SPV was technically the client. Hospital trusts were sometimes unwilling or unable to engage in the planning processes as much as the SPV would have liked. Several interviewees suggested that trusts were content simply to be getting a new hospital and were not prepared to become fully involved in detailed planning. In one example, the contractor's director of construction felt that the trust “just saw the finished product but not the process. They would have liked to go away after financial close and have a finished hospital in several years” [Hospital C]. There was also a feeling that trusts were unprepared for the level of input required of them and that they often failed to consider how clinical processes could be redesigned to take advantage of the new facilities before the planning process started. Cultural differences between the private and public sectors were also felt to be a significant factor influencing design innovation. This was expressed by interviewees from SPVs in terms of a “public-sector mentality” that did not allow representatives from trusts to “think outside the box” and “design by committee” [Hospital F].

Discussion and Conclusions

PFI has undoubtedly brought forward a high volume of healthcare infrastructure—probably higher than would have been the case under traditional funding models. As a recent assessment argues,³⁵ the case for PFI turns on whether it has achieved the beneficial outcomes it was meant to bring about. These partly relate to more rigorous risk analysis and optimal risk allocation; synergies through improved integration of design, construction, operation, and maintenance; and a focus on whole life costing and long-term performance management.

However, it is also necessary to consider whether PFI has delivered any benefits in stimulating innovation in new hospital schemes, given the government's emphasis on this in its original objectives. All the assumed benefits of PFI have the potential to influence the level of innovation, so how did it perform in our cases?

Has PFI Delivered Innovation in Hospital Design and Construction?

Greater discipline in risk analysis and allocation is regarded as a key benefit of PFI, representing a major cultural shift in public-sector procurement meth-

odology. The introduction of PFI as a mainstream approach to procurement has undoubtedly led to increased focus on the analysis of *project* risks and their allocation between the client, the hospital trust, and the SPV. Longer-term *demand* risk remains with the client. Yet despite concern over the potential future impact of changes on the demand for services, and a desire to include a degree of adaptability in schemes, there was very little innovative thinking with regards to new design solutions.

Our case studies suggested that PFI has not been supportive of innovation because SPVs were concerned with minimizing exposure to possible risks and clients needed to reduce project costs to meet value for money norms. Under the current PFI model, the contract is designed to ensure as much certainty as possible—as early as possible—in the design process to minimize project risks. This has advantages and disadvantages. It reduces the potential for innovative behavior later in project delivery; and project funders are unwilling to assume any unnecessary risks often associated with innovation.

It was not evident from the case studies that PFI had promoted more collaborative ways of working, nor that the SPV was acting as a form of systems integrator as some have argued. Indeed, the role of SPVs—as configured in the initial wave of schemes—appeared to have led to fragmentation in responsibilities and communications between the *project delivery* and *clinical operational* sides within PFI hospital schemes. Although it is too early to determine how SPVs' financial and reputational responsibilities under PFI affect integration over the longer term, we could hypothesize that unless the performance incentive structure is changed, this lack of integration may not be improve. This is because of the separation of SPVs from *clinical* operations (rather than facilities management); while they are incentivized to avoid penalties for non-availability, there are no incentives for them to innovate to help improve care outcomes.

The picture in the first-wave hospital schemes therefore supports the contention that the use of PPPs for major infrastructure projects may shift responsibility for coordinating planning, design, construction, and operation from public bodies to the private sector, without creating any more integration between the different project delivery stages.³⁶

Were the Case Studies Representative?

To what extent has the situation improved with greater experience of PFI? A lack of innovation might have been exacerbated during the early years by the relative unfamiliarity of the PFI process to the public and private sectors, a lack of necessary project management skills, and excessive bid costs. In early PFI schemes, the limited skills and resources of public-sector healthcare and education organizations engaged in contract negotiation were identified as a problem.³⁷ The problem of high bid costs limiting the number of firms that can enter the bidding process and reducing the likelihood of innovative design was recognized a few years after the introduction of PFI.³⁸ There were also early concerns that the lengthy selection and contract negotiation periods would not lead to faster delivery of facilities.³⁹

In our case study schemes, it was suggested by interviewees that knowledge gained from experiences on PFI projects was not systematically captured, nor was it transferred between individual trusts. As the healthcare director of one architect summed up, “the old problems of inexperienced trusts still exist, despite the available information, and trusts are no more able to articulate their needs and compile an adequate brief” [Hospital B]. However, at an average of 3% of total capital costs in the three case studies for which we were able to obtain data, bid costs did not appear to be excessively high.⁴⁰ Therefore, while the limited knowledge and experience of PFI may have had some negative impact on innovativeness, the cases appear to be representative of all schemes that were being planned and developed at the time.

It is by no means certain that the position has improved with time. The picture of limited innovation resulting from a concern with risk and possible increased costs appears to have persisted. In the case study of the contemporary scheme, the *clinical* design solution—a reorganization of the service model—was described by the interviewees as the innovation, while the building was seen simply as “the box to put this activity in” [Hospital H]. Construction involved the use of modularized services and as much prefabricated structural components as possible, but this was not regarded as especially innovative. As the main contractor’s project manager—with experience of several PFI hospital schemes—described it, “there is nothing radical under PFI. You need [to build] something you know you can deliver and something that will meet the [expected] design life” [Hospital H].

The Way Forward

Can PFI be improved in order to deliver more innovative and adaptable hospitals? Features of the model, as it was applied in the case study schemes, could certainly be addressed. The time and costs of procurement are already being streamlined under newer “smart PFI,” where the design stage is separated from the subsequent tendering process. This should shorten the procurement process and make tendering more transparent and predictable. Not only will this reduce bid costs, but it should also reduce uncertainties around the tendering process and in turn may encourage firms to explore innovative solutions without concern over failing to reach financial close.

Smart PFI will not, however, tackle a fundamental barrier to embedding an interest in long-term performance in public-private partnerships for healthcare infrastructure, and the design and construction innovation needed to support this. Until a model that incorporates a coordinating and integrating function that includes clinical operations is developed, the separation between project supply/facilities management and clinical operations will remain. Greater use of incentive contracts could be encouraged, whereby the client includes mechanisms to incentivize the SPV to consider quality and efficiency improvements in the hospital’s clinical outcomes. This might be more effective in helping to exploit the innovative potential of the private partner. More work is needed

to develop appropriate performance metrics, but these might include measures such as average length of stay or rates of hospital acquired infection.

In thirty or forty years, the hospitals built under PFI will be taken back into the NHS ownership. Whether these will be sufficiently adaptable to changing healthcare needs and service delivery models remains a moot point. The adjustments to the PFI model we have described could help to deliver facilities fit for meeting future needs. However, whether PFI will survive is another matter. Concerns have been increasingly expressed about the ability of hospital trusts to sustain existing PFI arrangements. The “payment by results” system—under which hospitals are paid a tariff for treatments provided—is said to be creating affordability problems and making hospital income more unpredictable. Since they hold all the risk for future demand changes, hospital trusts may in the future become more circumspect in committing to large long-term strategic investments under a PFI model.

Notes

1. NHS Executive, *Public Private Partnerships in the National Health Service: The Private Finance Initiative* (London: Treasury Public Enquiry Unit, 1999).
2. Government argued that it would take advantage of the private sector’s “experience and skills in order to bring innovative solutions to the needs of the health service.” J. Shaoul and P. Stapleton, “Partnerships: For Better, for Worse?” *Accounting, Auditing and Accountability Journal*, 16 (2003): 397-421; T. Dixon, G. Pottinger, and A. Jordan, “Lessons from the Private Finance Initiative in the UK: Benefits, Problems and Critical Success Factors,” *Journal of Property Investment and Finance*, 23 (2005): 412-423.
3. “Innovation in the NHS,” speech by John Hutton, Minister of State Health, June 9, 2004.
4. HM Treasury (2000) Taskforce, “Technote 7: How to Achieve Design Quality in PFI Projects,” ¶ 2.15, <www.ogc.gov.uk>.
5. See R. De Neufville, “Uncertainty Management for Engineering Systems Planning and Design,” Engineering Systems Monograph, Boston, MA, MIT, Engineering Systems Division, 2004; F. Moavenzadeh, “Large-Scale Infrastructure Systems,” Working Paper Series ESD-WP-2003-01.24-ESD Internal Symposium, Boston, MA, MIT, Engineering Systems Division, 2002.
6. For a categorization of projects and implications for project management, see A. Shenhar and D. Dvir, *Reinventing Project Management* (Boston, MA: Harvard Business School Press, 2007).
7. *A Framework for Action* (London: NHS London, 2007).
8. See S. Francis, R. Glanville, A. Noble, and P. Scher, *50 Years of Ideas in Health Care Buildings* (London: Nuffield Trust, 1999); J. Green and R. Moss, *Hospital Research and Briefing Problems* (London: King Edward’s Hospital Fund for London, 1971); J. Weeks, “Indeterminate Architecture,” *Transactions of the Bartlett Society, Volume 2 1963-1964* (London: Bartlett School of Architecture, University College London, 1965).
9. Fifteen Regional Hospital Boards—consisting of multidisciplinary teams drawn from clinical, health management, and engineering and construction professions—were responsible for the coordination and delivery of healthcare in their area, including infrastructure projects. They were supported by research and guidance conducted in the Department of Health’s Hospital Planning Unit. Specialist training and research was provided by the Medical Architecture Research Unit. See C. Rawlinson, “The Medical Architecture Research Unit: Past, Present and Future,” *Health Service Estate, No. 56* (London: HMSO, 1985).
10. Department of Health, Press Release, 2001/0553, November 16, 2001.
11. HM Treasury (2000), ¶ 2.15, op. cit.
12. “Ensuring Good Design for Healthcare,” *Future Healthcare Network, NHS Confederation Briefing*, 6 (London: NHS Confederation, June 2004).
13. There are currently 170 NHS Trusts (sometimes known as “acute trusts”) responsible for providing hospital and mental health services, on commission from 152 primary care trusts

- (PCTs). These manage general and specialist hospital services on one or more hospital sites. Some are regional or national centers for more specialized care and some are attached to universities or medical schools to train health professionals.
14. PricewaterhouseCoopers, "The Value of PFI: Hanging in the Balance (Sheet)?" London, PwC Public Sector Research Centre, 2008.
 15. A. Pollock, J. Shaoul, and N. Vickers, "Private Finance and 'Value for Money' in NHS Hospitals: A Policy in Search of a Rationale?" *British Medical Journal*, 324 (2002): 1205-1209.
 16. R. Leiringer, "Technological Innovation in PPPs: Incentives, Opportunities and Actions," *Construction Management and Economics*, 24 (2006): 301-308.
 17. J. Froud, "The Private Finance Initiative: Risk, Uncertainty, and the State," *Accounting Organizations and Society*, 28 (2003): 567-589. On risk, see also R. Ball, M. Heafey, and D. King, "Risk Transfer and Value for Money in PFI Projects," *Public Management Review*, 5 (2003), 279-290; J. Froud and J. Shaoul, "Appraising and Evaluating PFI for NHS Hospitals," *Financial Accountability & Management*, 17 (2001): 247-270.
 18. HM Treasury (2000), ¶ 2.15, op. cit.
 19. Barlow et al. (1997), op. cit.; P. Grout, "The Economics of the Private Finance Initiative," *Oxford Review of Economic Policy*, 13 (1997): 53-66; V. Narayanan and A. Raman, "Aligning Incentives in Supply Chains," *Harvard Business Review*, 82/11 (November 2004): 94-102.
 20. Barlow et al. (1997), op. cit.; Winch (1998), op. cit.; Barlow (2000), op. cit.; Slaughter (2000), op. cit.
 21. Treasury (2000), ¶ 4.10, op. cit.
 22. See M. Hobday, "Product Complexity, Innovation, and Industrial Organization," *Research Policy*, 26 (1998): 689-710; M. Hobday, "The Project-Based Organization: An Ideal Form for Managing Complex Products and Systems?" *Research Policy*, 29 (2000): 871-893.
 23. A. Geyer and A. Davies, "Managing Project-System Interfaces: Case Studies of Railway Projects in Restructured UK and German Markets," *Research Policy*, 29 (2000): 991-1013.
 24. For example, see J. Barlow, M. Cohen, A. Jashapara, and Y. Simpson, *Towards Positive Partnering: Revealing the Realities in the Construction Industry* (Bristol: Policy Press, 1997); J. Barlow, "Innovation and Learning in Complex Offshore Construction Projects," *Research Policy*, 29 (2000): 973-989; M. Dulaimi, F. Ying, and A. Bajracharya, "Organizational Motivation and Inter-Organizational Interaction in Construction Innovation in Singapore," *Construction Management and Economics*, 21 (2003): 307-318; R. Leiringer, "Technological Innovation in PPPs: Incentives, Opportunities and Actions," *Construction Management and Economics*, 24 (2006): 301-308; E. Slaughter, "Models of Construction Innovation," *Journal of Construction Engineering and Management*, 124 (1998): 226-231; E. Slaughter, "Implementation of Construction Innovations," *Building Research and Information*, 28 (2000): 2-17; G. Winch, "Zephyrs of Creative Destruction: Understanding the Management of Innovation in Construction," *Building Research and Information*, 26 (1998): 268-279; S. Green, R. Newcombe, S. Frenie, and S. Weller, *Learning Across Business Sectors: Knowledge Sharing between Aerospace and Construction* (Reading, UK: University of Reading, 2004).
 25. A. Davies and A. Salter, "The Great Experiment: The Impact of PPP on Innovation in the Procurement and Production of Capital Goods," in M. McKelvey, K. Smith, and M. Holmen, eds., *Flexibility and Stability in the Innovating Economy* (Oxford, UK: Oxford University Press, 2006).
 26. Treasury (2000), ¶ 3.6, op. cit.
 27. E. Klijn and G. Teisman, "Institutional and Strategic Barriers to Public-Private Partnership: An Analysis of Dutch Cases," *Public Money & Management*, 23 (2003): 137-146; G. Teisman and E. Klijn, "PPPs: Torn between Two Lovers," *EBF Debate*, 18 (2004): 27-29; D. Tranfield, A. Rowe, P. Smart, R. Levene, P. Deasley, and J. Corley, "Coordinating for Service Delivery in Public-Private Partnership and Private Finance Initiative Construction Projects: Early Findings from an Exploratory Study," *Proceedings of the Institution of Mechanical Engineers Part B, Journal of Engineering Manufacture*, 219 (2005): 165-175; J. Koppenjan, "The Formation of Public-Private Partnerships: Lessons from Nine Transport Infrastructure Projects in the Netherlands," *Public Administration*, 83 (2005): 135-157.
 28. J. Barlow and M. Köberle-Gaiser, "The Private Finance Initiative, Project Form and Design Innovation: The UK's Hospitals Program," *Research Policy* (in press).
 29. House of Commons, Hansard, July 17, 2000, col. 71W, <www.publications.parliament.uk/pa/cm199900/cmhansrd/vo000717/text/00717w19.htm>, accessed June 3, 2008.

30. In one case, the introduction of an innovative flexible oxygen tubing system—which offered advantages in installation and use—was prevented because the system did not comply with guidance documents dating from 1956.
31. In the case study of the contemporary scheme, the proposed size of the hospital changed eleven times and was reduced by 25 percent during the final invitation to negotiate stage.
32. Treasury (2000), ¶ 2.15, op. cit.
33. R. Moss, “The Evolution of the English Hospital,” presentation to CABE Health Week, May 17, 2006, London, Commission for Architecture in the Built Environment, 2006.
34. PricewaterhouseCoopers (2008), op. cit.
35. T. Brady, A. Davies, and D. Gann, “Can Integrated Solutions Business Models Work in Construction?” *Building Research and Information*, 33 (2005): 571–579.
36. Dixon et al. (2005), op. cit.; D. Asenova, M. Beck, A. Akintoye, C. Hardcastle, and E. Chinyio, “Partnership, Value for Money and Best Value in PFI Projects: Obstacles and Opportunities,” *Public Policy and Administration*, 17 (2002): 5–19; *Modern Government, Modern Procurement* (London: Office of Government Commerce, 1999); A. Akintoye, C. Hardcastle, M. Beck, E. Chinyio, and D. Asenova, “Achieving Best Value in Private Finance Initiative Project Procurement,” *Construction Management and Economics*, 21 (2003): 461–470.
37. Royal Institution of Chartered Surveyors, “PFI—The Payback,” [Online 2005], <www.rics.org/BuiltEnvironment/Constructionprocurementandtendering/PFI%20-%20the%20Payback.htm>, accessed May 24, 2006.
38. NHS Confederation, “Action Points 22—Investment for Modernization,” London, 2000, <www.newlondonarchitecture.org/media/exhibitions/catalogues/CapitalHealth.pdf>.
39. The average for nineteen first-wave schemes was 3.9%. House of Commons (2000), op. cit.
40. **NOTE TO AUTHORS: There is a reference to note number 40 in text, but there is no note here for that number.**