

OPERATION AND MAINTENANCE (O&M) MANAGEMENT IN PFI ROAD PROJECTS IN THE UK

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Private Finance Initiative (PFI) projects are designed to fund long-term infrastructure and public services. A typical PFI road scheme involves the public sector client (Granting Authority), the private sector partner – Special Purpose Vehicle (SPV)-, the financial lenders, the road constructor and his supply chain, technical advisers (legal, financial, technical) and the Operation and Maintenance (facilities) Management Company. The main contracting party from the private sector side in a PFI road procurement mechanism is the SPV. The SPV must ensure that every design and construction of a road in respect of O & M shall be carried out in accordance with the requirement of Project Agreement (PA); in accordance with all statutory requirements and Environmental Statement; in accordance with the road project's Quality Plan; and in accordance with Good Industry Practice in order to satisfy the Granting Authorities Requirements. The Operation and Maintenance is the longest phase of PFI road project, the most important phase because the service and payment is created. The payment of the unitary fee is conditional on the SPV meeting certain "performance" and "availability" requirements set out in the PFI contract. The fee can be reduced if these standards are not met. This practice of "deductive payments" and "non-performance" is one of the main justifications for PFI, described by the UK government as transferring operational and maintenance risks to the private sector in a PFI road project. This paper will examine the current O&M management practice and will propose a conceptual framework for the O&M management practice in PFI road projects in the UK based upon two empirical case studies detailing physical and functional performance as the critical O&M criteria. The conceptual framework identifies that the functional and physical performance requirements need to be considered at the beginning of the life-cycle of the project and O&M has to be focused on delivery of the service by minimizing operation and maintenance expenses and maximizing the quality of services and satisfying the end-users' needs.

Key words: concession, payment mechanism, performance, availability, SPV.

INTRODUCTION

Over the last two decades there has been a shift away from in-house provision of services by the UK public sector towards the contracting out of services by the private sector. These services are a contribution and an addition to the provision of services by the government to the public, but the services are supplied by private sector employees. The Private Finance Initiative (PFI) was launched in 1992 as a legal framework for concessions in the UK, to encourage private capital investment into the construction industry. In the PFI framework the public sector defines the output

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specification for the services to be purchased from the private sector with a predefined payment mechanism. The public purchases a service, not an asset.

In the PFI framework, the public sector becomes the procurer and the regulator of services, not the provider.

LITERATURE REVIEW

When the Conservative Party came to power in the UK in 1979, the then Prime Minister Margaret Thatcher stated that a primary aim of her government was to roll back the frontiers of the public sector and to allow the private sector to take over many services (Birnie, 1999). According to Mumford (1998), successive Conservative governments in the UK introduced privatisation and compulsory competitive tendering for local authorities from 1979 onward. The John Major administration of 1992 continued the policies of downsizing the public sector, deregulating and introducing market principles into public services, reorganising government functions into agencies, introducing the Citizen's Charter and promoting market testing in which the private sector competes with public services (Shinohara, 1998). The underlying objective of these policies was to shift the paradigm of government from public administration to public management.

PFI is an extension of this policy and its real aim is administrative reform and for PFI, Public Private Partnerships (PPP) is the means to transfer much of the public sector's role to the private sector.

The aim of introducing PFI was to achieve closer partnering between the public and private sectors at both central government and local authority levels. The intention was to increase the flow of capital to projects against a background of restraint on public expenditure by utilizing private sector money and management skills. As noted by De Lemos *et al.* (2000) it is not expected that the public sector will be the sole beneficiary, but rather that the PFI is supposed to offer real benefits to the private sector in the form of increased business profit.

The philosophy behind the PFI is that it is intended to transform government departments from being owners and operators of assets into purchasers of services from the private sector (HM Treasury Taskforce, 1997). In PFI procurement the public sector specifies its services by way of an output specification covering the objectives, purpose, scope and performance requirements for the contract, with emphasis being on the 'what' and not the 'how' in relation to the service provision (Private Finance Panel, 1996).

PFI is not about borrowing money from the private sector. It is all about creating a structure in which improved value for money is achieved through private sector innovation and management skills delivering significant performance improvements and efficiency savings.

Under PFI the Government no longer builds roads, it purchases miles of maintained highway; it no longer builds prisons, it buys custodial services; it no longer builds and refurbishes schools but buys services to run the schools.

What makes PFI different is that the public sector retains a substantial role in the projects and the private sector provides capital assets as well as services. Increasing levels of partnering with the private sector have evolved and by this partnering agenda the public sector receives the benefit to increase its efficiency through the introduction of managerial change and expertise drawn from the private sector.

There are therefore “two fundamental characteristics” of any form of PFI projects:

- A genuine “risk transfer” to the private sector;
- Provision of “value for money” to the taxpayer.

The premise is that the transfer of risk to the private sector, coupled with the efficiencies in management skills will outweigh the higher costs of private funding, resulting in greater value to the taxpayers (Private Finance Panel, 1995).

A NAO (2001; 2003) study of 98 projects and HM Treasury (2003) study of 61 projects has provided initial indications of overall project performance through seeking the view of public sector PFI managers on achievement of expectations and VFM. Delivery to budget occurs in 79% PFI projects, compared to the non-PFI benchmark of 27%. This corresponds to an improvement of the order of 290%. The improvement must be qualified; delivery to budget means that the client has incurred no increase. However, this does not mean that construction costs have not increased, merely that the PFI agreement has no provision to allow the contractor to pass on such increase to clients.

The same study concludes that the achievement of Public Sector PFI managers expectations is as expected or better in 76% of the responses. The 35% response of “as expected” is not qualified in the report. It does not distinguish whether this “as expected” is compared to the claimed benefits of PFI procurement or to “traditional project” expectations. Hence PFI surpasses the public sector expectations on achievement, VFM and overall performance.

RESEARCH METHODOLOGY

This paper is based upon two detailed case studies of major UK PFI Road Projects. The findings have been triangulated against a previously published PFI case study (Eaton & O’Connor, 2002a, b). The case study was selected as the most appropriate holistic mechanism for data collection. (Akbiyikli, 2005)

CASE STUDY

Both road projects are executed through a DBFO contract which is a long-term contract entered into between a Government Agency or Local Authority – the Granting Authority and a Contracting Vehicle – a Special Purpose Vehicle (SPV)- which consists of a design and build (asset) provider (DB) a finance provider (F) and an operation and maintenance (service) provider (O). The SPV is likely to be jointly owned by companies involved in the project, often the construction firm and operation and maintenance (facilities management) group that will build and maintain the road over the life of the PFI concession. DBFO is an output focused contract and it sets out a functional specification. In an output based contract specification the public sector specifies the requirements – the what, and leaves the private sector to determine and decide the best way – the how, to meet the specification. This arrangement increases the scope for the private sector to innovate in designing solutions and operation and maintenance service provision to meet the output specification.

In such contracts the SPV provides assets, arranges debt financing from commercial banks and equity for the balance of the funding requirement and on-going operation and maintenance services in respect of the assets. The SPV then enters into matching back-to-back contracts with a construction contractor for the provision of the built

asset as a guaranteed maximum price (GMP) contract, and an operation and maintenance (facilities management) contractor for the provision of services.

The public pays no up-front payments during the construction of the asset. All the design and build expenses are borne by the private sector through debt and equity financing. The financial institution (bank, insurance company, etc.) makes the monthly payments to the works contractor as per the financial agreement between the SPV and the lenders. These payments are drawn down from the loans given to the SPV. The granting authority starts its payments to the private sector only when the performance of the services specified in the Output Specification of the granting authority is satisfied. The project debt advanced to the SPV depends exclusively for its repayment on the payments made to the SPV by the granting authority.

The granting authority contract with the SPV is for a single annual payment, the “Unitary Charge” which incorporates a capital charge annualised over the contract life and an annual O&M charge. The total cost to the public sector of the DBFO contract is the net present value of these “Unitary Charges”.

Operation and Maintenance (O&M) is the longest phase of these PFI road projects. It varies between 30 – 40 years. It is the most important phase because the service delivery and payment conditions are created here. The payment of the annual “Unitary Charge” is conditional on the SPV meeting certain “performance” and “availability” requirements set out in the PFI contract. The fee can be reduced if these standards are not met. This practice of “deductive payments” and “non-performance” is one of the main justifications for PFI which is described by the UK government as transferring operational and maintenance risks to the private sector in a PFI road project. Details of the Unitary Charge calculations can be found in Akbiyikli and Eaton (2005).

The O&M process is the business strategy within the continuous improvement domain of the PFI road project. O&M performance is the “output” of this PFI philosophy and reflects the strategic value of PFI in the sense that it achieves the quality of the service specified in the Public Sponsor’s Output Specification - Client Satisfaction; it provides an understanding of the relationship between the performance and availability requirements of the constructed road -Asset Availability and Performance; it gives a clear indication of revenue generation potential-Equity and Debt Lenders’ Satisfaction; it is where the end-users utilize the physical resources -End-user Satisfaction; it is where the private sector innovation, management and skills are tested -Private Sector Innovation and Management Skills; it is where the public sector test its Value for Money (VFM) and affordability issues -VFM and Affordability for the Public Sponsor and it is where the aggregated road project risks are tested -Risk and Risk Management.

The PFI brief -Output Specification- clarifies the functional requirements and physical performance criteria. This provision has a profound impact on the O&M management of these road projects. The SPV shall: keep the PFI Road sound, free from undue deterioration and undue wear to ensure and secure that delay of road users is minimised; that all accidents and emergencies are responded to as quickly as possible; that users are given adequate information and forewarning of any events on the road and that traffic data and O&M data shall be collected and provided to the Granting Authority. The O&M brief is the main “driver” for the design, development and realisation of the road projects. The design and build (D&B) phase becomes the “means” to the “end” and the “end” is the service provision to the Public Sponsor and payments to the private sector partner.

Fig.1 shows the procurement and operation and maintenance phases with notional cost and revenues for a road project. This figure is based on actual data from case study of a road project in the UK (Akbiyikli, 2005; Eaton and Akbiyikli, 2005).

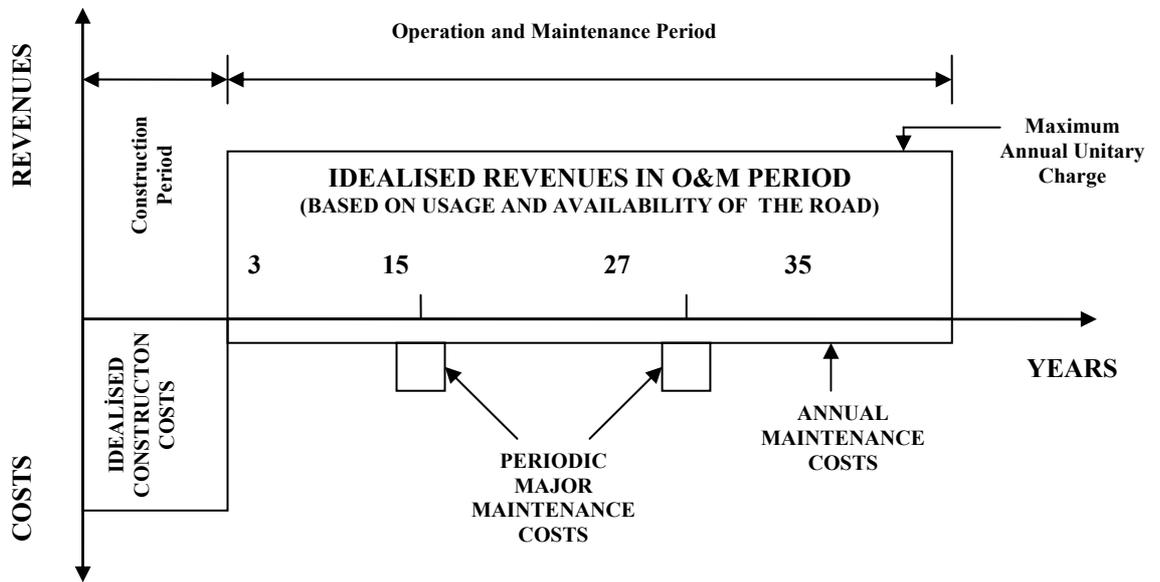


Fig. 1: Notional revenues and costs for a PFI road project (Akbiyikli and Eaton, 2005).

An O&M Whole Life-Cycle (WLC) Management Framework is proposed in Fig.3 based on the PFI Framework for road projects in Fig.2, disseminating a knowledge base for future road projects.

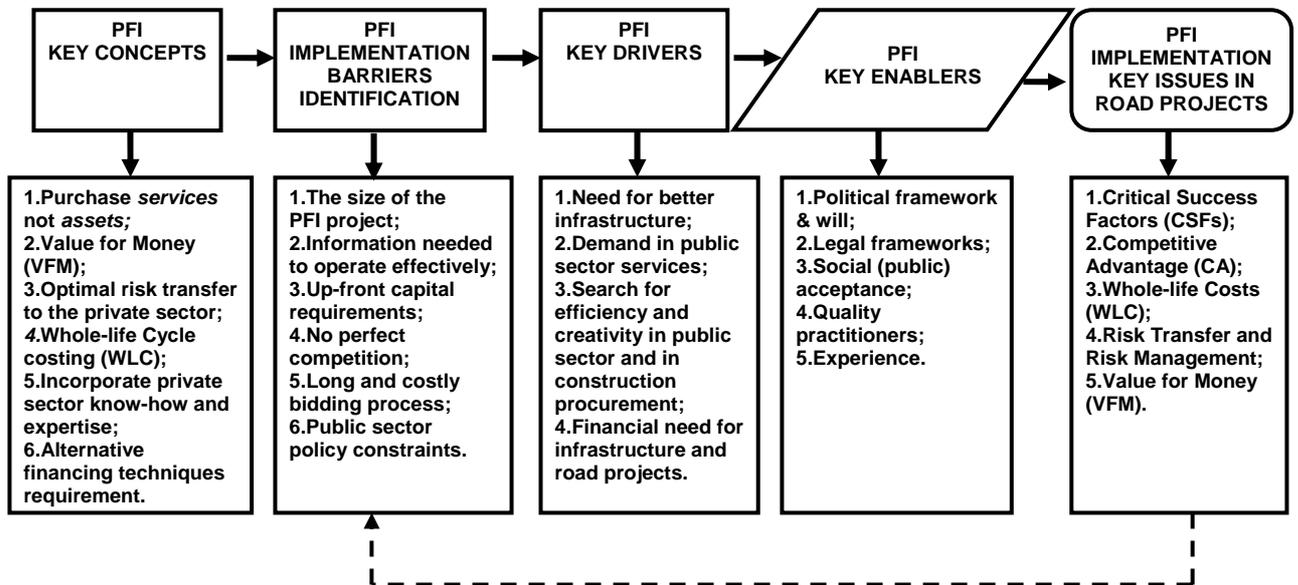


Fig. 2: PFI Framework for road projects (Akbiyikli, 2005)

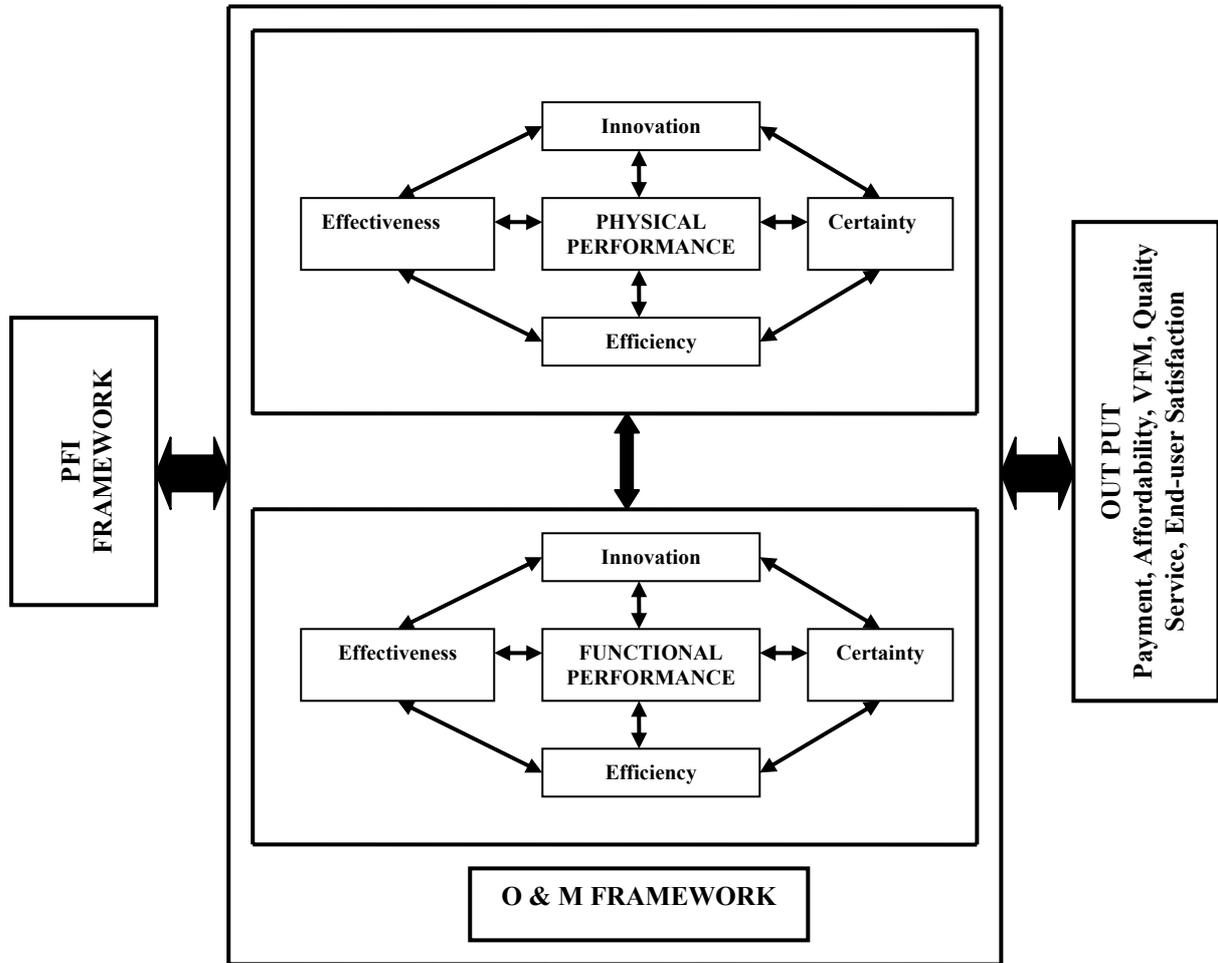


Fig. 3: O&M Management WLC Framework for PFI Road Projects (Akbiyikli and Eaton, 2005).

The primary parameters in the O&M Framework are Physical Performance and Functional Performance. The Physical Performance is related to the designed and built asset and in road projects covers the issues such as maintenance, durability and environmental impact. The Functional Performance is related to the proper functioning of the constructed asset and it covers driving comfort, safety and easy access.

The other secondary parameters of the framework are: innovation, effectiveness, efficiency and certainty. The possibilities in road projects are directly related to the procurement path chosen to create a product or service and this is possible through the interaction with suppliers, clients and government agencies. Innovation must satisfy the criteria set by the regulatory framework, contract for the works, VFM and the quality of the output product/service set by the client.

In these projects the majority of innovations confirmed De Lemos *et al.* (2003) contention that they are derived from the need:

- To promote easy and cost-effective long-term maintenance of the roads;
- To give the designer freedom to innovate in the aim of providing a service in the most effective way, thus increasing the project’s profitability;

- On a whole-life cycle basis since the operator needs to consider the interaction between a more expensive design solution and lower operating and life-cycle costs or vice-versa.

Effectiveness ensures the consistency between the intended results and the actual results of the PFI activities to obtain an appropriate quality. It concerns the cost of outputs from an activity and conformance of those outputs to the Output Specification. The effectiveness is both related to process and product and its typical measures are time, cost, quality and people. Therefore, effectiveness reflects the level of performance achieved throughout the useful life-cycle of the asset.

Efficiency minimizes the resource requirements for the delivery of agreed outputs for obtaining an appropriate quality. It concerns the ratio of inputs (economy) to outputs (effectiveness). Efficiency reflects the management of the delivery and operation of the road throughout its useful life-cycle.

The certainty parameter is associated with achieving improved risk awareness, response and risk transfer; avoidance of project changes and change orders in order not to deviate from the agreed guaranteed maximum price (GMP) and cost certainty; and achieving a high level of control of time and quality. This is also associated with the avoidance of conflict and litigation throughout the life-cycle of the project.

Through utilizing the Framework (Fig.4) the SPV benefits by:

- Evaluating different options before Financial Close;
- An awareness of Whole Life-Cycle Costs (WLCC) for different option appraisals before BAFO (Best and Final Offer) stage;
- Accurate forecasting of cost profiles;
- Physical and Functional Performance trade-off against cost;
- Achieving project financial close. The financial close between parties is the agreed financial model of the WLCC of the particular PFI road project.

Efficiency, effectiveness, innovation and certainty in the O&M Management WLCC Framework are measured relative to the Public Sector's Output Specification expressed in terms of time, cost and quality.

The SPV has "Payment" as the output of the framework which comprises an *availability element* and a *shadow-toll element*. The *Payment Mechanism* is closely related to the *Performance* of the constructed asset since it contains the interrelations between *risk*, *value*, *quality* and *function*. The Payment reflects the SPV's bankability; the SPV needs to ensure that it has access to sufficient finance and obtains income from the operation of the constructed road over the concession period to cover the cost of borrowing to finance the duration of the concession.

The Public Sponsor has "Affordability" and "Value for Money" as the output of the framework. Affordability for the Public Sponsor is the ability to access funds and that the expenditure of the available funds provides an adequate return when compared with other investment alternatives.

The O&M Management WLCC Framework has an iterative and systematic approach which maximizes the physical and functional value of a PFI road project by managing it from inception to the end of concession period according to the value and quality requirements of the Public Sponsor.

In these projects Facilities Management as a profession was not used. This profession is more related and linked to building type of facilities. In PFI road projects O&M Companies and their management services are more common. The O&M Company Management expertise links the Public Sponsor's strategic, tactical and operational issues explicitly to the corporate strategic business plan in order to better deliver the service outcomes. The main issue in roads is the service delivery on time and quality and affordability to the public sector creating VFM of the core activities. The core activities in roads are defined as those relating to delay of users, adverse effect on the environment, adverse effects of accidents and emergencies to users, performance and availability of road.

O&M Management from project inception to the end of the concession period, need to adopt a planned approach that takes into account public sponsor input, evaluation of options, and implementation costs at strategic, tactical and operational levels. This has to develop as an overall framework for the vision and purpose of the public sponsor and establish and apply a rationale that guides and systematically identifies how services may contribute to the public sector's project aim and objectives. Besides this, management requires a planned approach to the evaluation of options and the provision of resources and development of appropriate policies and systems to establish what is needed in O&M activities in a changing environment.

Operation and maintenance activities are different issues. Operation is essential to running a road in a manner to satisfy the end-users' needs. Maintenance is essential to keeping a road running in the manner for which it was designed. The functional and physical performance requirements can not be separated because when the physical performance of a specific O&M issue is defined its functional performance should also be defined. The O&M Management is focused on the management and delivery of the outputs: by minimizing operating and maintenance expenses; by maximizing investment value and quality of service. This management is based on the "continual upkeep and quality servicing" of the constructed road project.

CONCLUSIONS

Based on research of two PFI road projects in the UK the O&M Services are carried out:

- in accordance with the requirements of the Project Agreement (PA);
- in accordance with all Statutory Requirements;
- in accordance with the Environmental Requirements;
- in accordance with the Quality Plan;
- in accordance with Good Industry Practice.

Maintenance activities were subdivided into three categories: (1) *Preventive Maintenance* consisted of scheduled operations performed to keep the systems operating; (2) *Responsive Maintenance* referred to operations that were initiated by a fault or trouble report; and (3) *Emergency Maintenance* was initiated by a fault or trouble report which required immediate action.

The O&M management procedures were developed and implemented by the SPV to produce inputs to and general reports from a Project Database. Besides Design Certificates and Check Certificates, a Final Construction Certificate signed by the Designer, the O&M Contractor and the SPV was provided by the SPV.

This paper has developed and proposed a conceptual framework for the O&M management practice in PFI road projects in the UK, based upon two empirical case studies detailing physical performance and functional performance as the critical O&M criteria.

The conceptual framework identified that the functional and performance requirements need to be considered right at the beginning of the life-cycle of the project and O&M has to be focused on delivery of the services by minimizing operation and maintenance expenses and maximizing the quality of services and satisfying the end-users' needs. The O&M service provider is required to, as it is also in the PFI mechanism philosophy, be involved in all the phases of a PFI road project to respond to all the issues concerning the whole life-cycle of physical and functional performance of the designed and constructed asset to achieve the full satisfaction of the Granting Authority and end-users.

The interviewees from the Special Purpose Vehicle (SPV) in the road case studies considered the WLCC of the constructed road, which according to their experience led to higher construction quality than the traditional procurement. This higher construction quality, according to the same informants, was to reduce the need for longer term maintenance throughout the life-cycle of the project.

The SPV was responsible to maintain the road to the Output Specification throughout the contract life of the project, and in the event of any failure or deviation the SPV was aware that this could result in payment deductions. This issue, as emphasised strongly by the informants, incentivises the SPV to integrate input from the design and O&M management into the procurement and construction process.

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