THE MAINTENANCE CONTRACTOR AS SERVICES' INNOVATOR IN PERFORMANCE-BASED PARTNERSHIPS

AD STRAUB
TU Delft
OTB Research Institute for Housing, Urban and Mobility Studies
The Netherlands
a.straub@tudelft.nl

Abstract
Long-term performance-based maintenance partnering focuses on redesign, maintenance planning, construction and maintenance work by maintenance contractors. A major change within a performance-based approach compared to a traditional approach based on technical specifications, is contractors acting as engineering consultants to clients. Clients specify their needs in performance-based specifications for the new service life.
The concept of performance-based maintenance can be seen as a service innovation. As a consequence of performance-based contracting maintenance companies implement innovations in their service concept, client interface and service delivery system to guarantee the quality of the services. The new service concept is most obvious in guaranteed setting of the wishes, requirements and expectations of the client. The traditional role of the contractors is extended by design questions, performance measurements and conducting customer satisfaction surveys. The execution of these activities demands additional competences and capabilities. Contractors need knowledge about concepts as whole life costing, (key) performance indicators and life cycle assessment and need communication and empathy skills, and skills in dealing with end-customers in a client-friendly manner.

Keywords: capabilities, competences, innovation, maintenance contractors, performance-based partnering, service concept, service delivery system.

INTRODUCTION

Traditional maintenance contracts using prescriptive specifications are simple in their structure and implementation. Clients that tender maintenance projects competitively and prescribed-based hope to achieve the lowest price or best price-quality ratio by means of competition. Implementation of prescriptive-based specification decreases the flexibility of the procurement and limits the possibilities of the contractor to innovate the in-sight operation. Performance-Based-Specifications (PBS) and Performance-Based-Contracts (PBC) attain an alternative scheme for outsourcing of maintenance. Performance-based maintenance partnering is concerned with the dyadic relationships between clients and its key maintenance contractors. In a performance-based maintenance relationship performance criteria are explicitly stated by the client. Maintenance contractors no longer work as suppliers of capacity only, but become active participants in the overall maintenance process of a project for a specific agreed-on period (Straub and Van Mossel, 2007).

Performance-based building innovation

Barrett et al. (2005) offer two thoughts to address the relationship between performance-based building (PBS) and innovation. The content school of thought advocated that PBS is the innovation in itself, and the context school of thought argues that PBS provides the enabling environment to stimulate a raft of innovation activity which may include prescriptive as well as performance-based elements. There is a general belief that traditional prescriptive approaches act as a barrier to innovation and performance-based building stimulates construction innovation (e.g. Sexton and Barrett, 2005). "Successful performance-based guides and encourages the generation and implementation of appropriate new ideas by relevant actors throughout the building life cycle, which enhances overall building performance and satisfied actors' need" (Sexton and Barrett, 2005: 147). Other authors advocate the innovation benefits of partnering. New procurement approaches combined with performance-based building approaches will improve performance and service and reduce costs (e.g. Blayse and Manley, 2004; Bresnen and Marshall, 2000; Saad et al., 2002).

Performance-based maintenance

The professionalism of Dutch housing associations has led to paying more attention to maintenance processes and partnerships in the supply chain of maintenance, leading to project partnering and strategic partnering with maintenance suppliers based upon the performance concept. The objectives of the housing associations for performance-based maintenance contracting are (Straub, 2007):

- achieving budget certainty and cost savings,
- improving product quality,
- simplifying the maintenance management process,
- and promoting innovation by maintenance contractors.

At the moment the Dutch Governmental Buildings Agency and several corporate real estate organisations are developing performance-based maintenance contracts too. Besides, they incorporate performance-based maintenance and facilities management in new procurement methods like Design Build (Finance) Maintain and Operate (DB(F)MO).

Performance-based maintenance approach

The performance approach is, first and foremost, the practise of thinking and working in terms of ends rather than means. It is concerned with what a building is required to do, and not with prescribing how it is to be constructed (Meacham et al., 2005). In a performance-based maintenance relationship performance criteria are explicitly stated by the client. Maintenance suppliers act as consultants, selected at an early stage, enabling them to contribute ideas about maintenance strategies, performance criteria, maintenance solutions and the financial aspects that apply to each building asset. Contractors monitor the entire maintenance process; especially end customer satisfaction during maintenance interventions and thereafter (Straub, 2007). Performance-based working means major changes in working processes, methods, and the need for information.

OUTLINE OF THE STUDY

The paper focuses on innovations by contractors involved in performance-based maintenance projects and partnerships. Performance-based maintenance contracting is seen as an enabler of service innovation. Research questions are: (1) What kinds of innovations are implemented by maintenance contractors as a consequence of performance-based contracting aimed at to guarantee the quality of the services? and (2) What capabilities do maintenance contractors

need to enable them to act as maintenance-engineering consultants in performance-based maintenance projects and partnerships?
The concept of innovation and its definition is often debated. Construction innovation literature emphasise often technical product innovations to compete in the market (e.g. Blayse and Manley, 2004). Barrett et al. (2005) distinguish performance-based building innovation in four areas: process construction innovation, process building in use innovation, product innovation and capability innovation. The scope of our research is building in use performance. We stress the innovations in services related to the 'product' of a refurbished and/or well-maintained building.
In our study innovation has been defined as: Successful launching of new, improved or more competing products, services or organisation structures (De Jong, 2005). This definition is quite similar to the broadly accepted definition of construction innovation provided by Slaughter (1998). She defines innovation as the actual use of a nontrivial change and improvement in a process, product, or system that is novel to the institution developing the change. First these definitions mean that innovations stand for more than knowledge development; it should be implemented. Second the innovation is the whole route from knowledge development till market introduction. Finally, products, processes and organisational structures are new for the own organisation (see also Cobbenhagen, 1999). Capabilities are defined as "architectural abilities or bonding mechanisms whereby resources are combined in new and innovative ways" (Duncan et al., 1998: 10).

Research methods
Research methods are a literature study, modelling an analytical framework and a postal survey of the members of the Dutch association of medium-sized employers 'WVB', specialized in paintwork and small construction work. Members of the WVB were the first construction and maintenance companies that promoted the performance-based maintenance contracts amongst clients and set up model contracts. All 33 members have received a questionnaire. 13 filled-in questionnaires were returned, meaning a response rate of 39%. The questionnaires were filled in by board members of the companies. The responded maintenance companies realize between 10 and 20% of their annual turnover by performance-based maintenance, performing on average 15 projects working for 5 clients, especially housing associations. They employ between 65 and 450 people.

MAINTENANCE CONTRACTORS AS SERVICE ORGANISATIONS

The thinking on services and services innovation has progressed quite remarkably since the 1980s. Services were long thought of in terms of technological innovation. Gradually non-technologist approaches to service innovation have been added to the field of services innovation studies. This resulted in a better understanding of e.g. the peculiarities of services (Miles, 1993), service management (Norman, 1991), the fact that interaction with clients (and clients competences) can hardly be underestimated as well as the importance of recombination of existing elements in new services (Henderson and Clark, 1990).

Maintenance companies as professional service organisations
Maintenance companies can be considered as professional service organisations. To produce a service is to organize a solution to a problem (a treatment, an operation) which does not principally involve supplying a good (Gadrey et al., 1995). It is to place a bundle of capacities and competences (human, technological, organizational) at the disposal of a client and to organize a solution, which may be given to varying degrees of precision.

The definition makes clear that apart from technological capabilities, human and organizational capabilities are equally important for providing services. Furthermore the definition allows for a differentiation between highly standardized service products or service formulas and the more customized services that are much harder to pinpoint. In the latter more tacit forms of knowledge play an important role and co-production is generally judged as vital (some advisory types of services are an example of this).
Løwendahl (1997) names the following characteristics of professional services:

- custom-made. This implies the need for interaction between the service-provider and the client. The interaction can be hampered by a knowledge gap between the client and the service-provider;
- individual judgements. Judgements of people are crucial and thereby those people are crucial for the organisation;
- need for innovations. Related to the need for custom-made solutions and individual wishes of clients, innovations are needed above matters of practise.

The organisation for small and medium-sized maintenance contractors FOSAG distinguishes three service types (FOSAG, 2009):

- services based on execution capacity for described maintenance work,
- services based on offering well-maintained buildings,
- and services based on the use and exploitation of buildings.

Not surprisingly is that services based on the use and exploitation of building requires other competences and capabilities of maintenance contractors than services based on offering capacity for execution maintenance work.

MODELS FOR MAPPING AND ANALYSING INNOVATIONS

Den Hertog and Bilderbeek (1998) developed a model of services innovations that we used as an analytical framework to map innovations related to performance-based contracting and to relate the innovations to the needed competences and capabilities of contractors (see also Den Hertog, 2000). The model exists of four dimensions: (1) the service concept, (2) the client interface, (3) the service delivery system and (4) technological options. See Figure 1.
Den Hertog and Bilderbeek (1998) argue that each service innovation a different mixture or combination is of these four dimensions of service innovation. They explain their model as follows: “If you look at (service) innovations these seldom are limited to a change in the characteristics of the (service) product itself. Most of the time it coincides with new ways of distributing the product, new ways of interacting with the client, new ways of making sure that the product is produced according to a certain standard, etc. However, what is important for introducing one new product onto the market (service or good) might be totally irrelevant for other products. Offering a completely new service product differs considerably from offering an existing service using a new distribution channel. Similarly some innovations are mainly the product of co production by the innovator and his client while others are clearly the result of applying for instance ICT. In practice, however, most innovations are mixtures of major and minor changes and adaptations that together form the innovation” (Den Hertog and Bilderbeek, 1998: 6). Central links between the four dimensions are marketing and distribution, organisation development and human resource management. Launching a new service concept for existing and new clients requires marketing expertise. Similarly interfacing with clients and adapting the service delivery system requires knowledge on how services are distributed. Further new services require organisational knowledge: can the current organisation deliver the new service?; what organisational changes are needed?

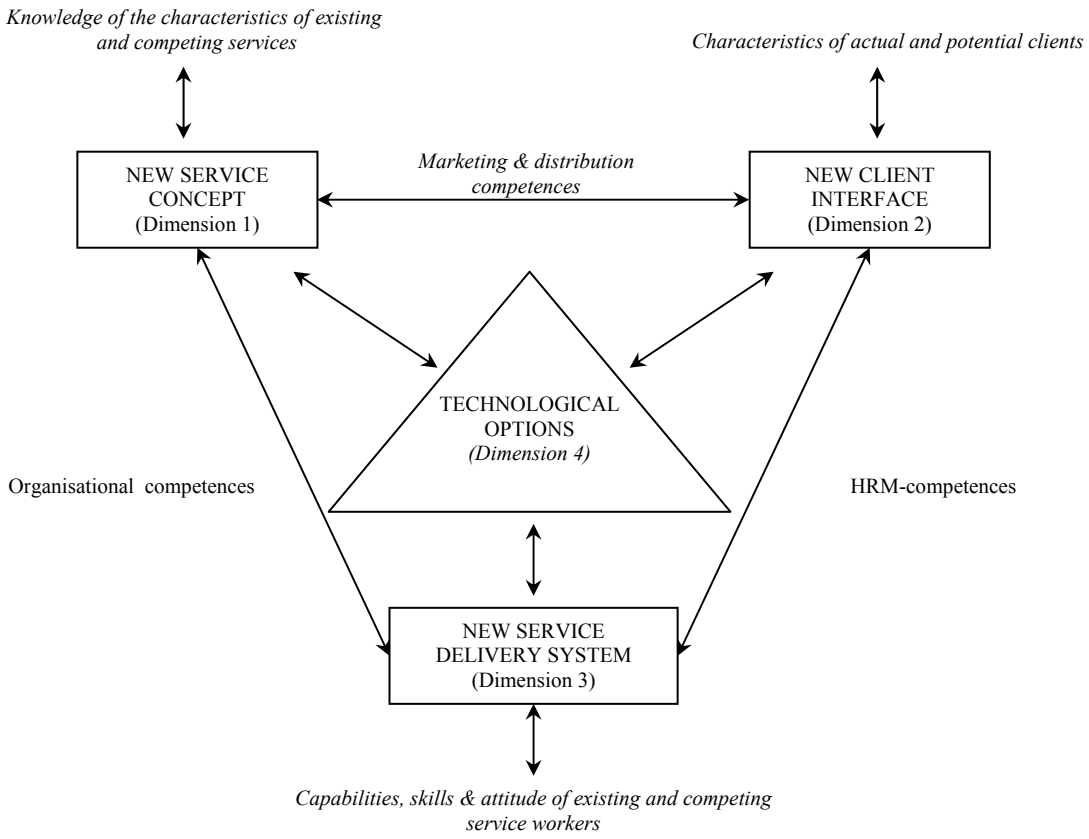

***Figure 1**: Four dimension model of service innovation (Den Hertog and Bilderbeek, 1998)*

Service Quality Model

In the study the innovations are mapped according the four dimensions of the model of Den Hertog and Bilderbeek and in four categories. These categories correspond with the activities that maintenance contractors perform in theory to guarantee the quality of their offered services. These premises are based upon the 'Service Quality Model' of Parasuraman, Zeithaml and Berry (1985).

This Service Quality Model explains five service 'gaps': (1) between expected service by consumers and the management perceptions of consumer expectations, (2) between management perceptions of consumer expectations and the translation of perceptions into service quality, (3) between translation of perceptions into service quality and the service delivery, (4) between service delivery and external communications to consumers and (5) as the 'resulting gap' between the expected service and perceived service. A mismatch between the expected service and perceived service means a poorly observed quality. Good communication between the customer and supplier is crucial to reduce the gaps.

In our research project the customer is a professional client that requires professional services of maintenance companies. The gaps are translated for performance-based contracting subsequently in (1) guaranteed setting of the requirements and expectations of the client, (2) guaranteed design of the offer to the client, (3) guaranteed execution of the maintenance work and (4) guaranteed contract period

RESEARCH RESULTS AND DISCUSSION

When asking the companies about their motivation for performance-based partnering 9 of the 13 answered continuity in ordering. This continuity means for them amongst others a better relationship with the client and a better understanding of his wishes leading to saving of time in the long run, a reduce of failure costs and a better control of the maintenance process, business development by expansion and knowledge development, and higher performance leading to distinguishing characteristics of the firm. Performance-based contracting meant for 12 of the 13 companies the implementation of a new service concept. The new service concept is most obvious in guaranteed setting of the wishes, requirements and expectations of the client. All companies made changes in their client interface and almost all in their service delivery system. Technological innovations were just mentioned by 3 of the 13 companies, however the questionnaire was not really addressing (new) technology of maintenance materials and activities, and maintenance working processes. Innovations of performance-based maintenance contracting mentioned by at least 7 respondents (out of 13) are shown in Table 1.

	Guaranteed setting of the requirements and expectations of the client	Guaranteed design of the offer to the client	Guaranteed execution of the maintenance work	Guaranteed contract period
New service concept	• General project assessment and calculation of work • Document with performance requirements	• Detailed report of condition data	• Report of completion of work • Report of end-customers satisfaction	• Report and evaluation of periodic performance measurements
New client interface	• Be in charge of designing maintenance scenarios • Pay attention to the building strategy and exploitation period • Conclude agreements between contractor and client • Organisation of mini symposia		• Gearing execution progress to client • Gearing information for end-customers with client	
New service delivery system	• Set down of starting points and building strategy • Set down of functional requirements • Set down of performance level building components • Convert functional requirements in performance criteria	• Methods and tools for condition assessment • Method for cost calculations • Standardized procedures for the design of maintenance scenarios	• Improved, better controlled and more efficient execution process • More efficient organisation of the maintenance company	• Adjusting maintenance scenarios based on performance measurements • Optimizing future maintenance scenarios based on performance data

***Table 1**: Innovations of performance-based contracting*

Innovations dealing with a new service concept were merely initiated by the supplier. Innovations dealing with a new client interface were the outcome of co-operation of the client and the supplier. New service delivery systems were initiated by suppliers as well as suppliers together with clients. Finally technological innovations were initiated by suppliers.
We have to comment that the maintenance companies were asked for innovations as a consequence of performance-based contracting. This means that business innovations might have been implemented, but the companies do not solely address these as consequences of performance-based contracting.

Competences and capabilities
The surveyed maintenance contractors mentioned the following (organizational) capabilities and skills to ensure the new service concept to the clients:

- the effects of maintenance activities,
- materials, substrates and maintenance techniques,
- maintenance systems and costs,
- degradation of products and maintenance systems,
- related performance levels and costs,
- net present value calculations of maintenance costs,
- the design of maintenance scenarios,
- the design of performance measurement plans,
- and the execution of performance measurements.

Surprisingly is that (key) performance indicators, life cycle costing, risks analyses and end customer satisfaction surveys were not mentioned by the respondents. More striking is that competences and capabilities dealing with the new client interface were not mentioned at all.

Maintenance contractors acting as maintenance-engineering consultants
The maintenance contractors are acting as maintenance-engineering consultants. The core competence of maintenance-engineering consultants should be their ability to apply scientific and technical knowledge (in a combined form of technical calculations and tacit knowledge of design, based on extensive experience) to a maintenance project. The fact that the contractor has to act as a service provider and maintenance-engineering consultant to the client is vital for a performance-based maintenance approach. For engineering consultancy, the quality of the result of the service will dependent heavily on the technical knowledge. Generally knowledge of and experience with condition assessment and performance measurement, methods for diagnosing the cause of deterioration, planning and calculation methods, and knowledge of the service life of building components and maintenance activities is needed to act as maintenance-engineering consultants in performance-based maintenance relationships. Contractors should substantiate the (financial) risks associated with the various maintenance scenarios. For example, the contractors must be able to assess whether damage is likely to reoccur or whether damage to other parts of the exterior envelope will increase, given certain maintenance work.
The required capabilities of maintenance-engineering consultants can be compared to those required by management consultants. Simon and Kumar (2001) have conducted studies to the strategic capabilities of management consultants, as identified by clients. Although the strategic capabilities of management consultants do not necessary reflect those required by performance-based maintenance consultancy, it could be assumed that they bear many similarities. The importance of communication and empathy skills towards the client is obvious for all consultancy activities. Together with the integrity and honesty of the consultant, these seem to be the most important strategic capabilities from the viewpoint of

the client. Partnering between enterprises may be needed to deal with full maintenance contracts, asking for coordination skills.
Performance-based maintenance services are custom-made services. Innovations are often incremental and the outcome of co-production with the client. Within performance-based relationships both parties getting in the relationship should have similar views and should approach the relationship with similar perspectives. Custom-made services imply the need for interaction between the service-provider and the client. The interaction can be hampered by a knowledge gap between the client and the service-provider. That is why communication and empathy skills of the service provider are very important. Communication with the client in a performance-based relationship may force innovations in the client interface, e.g to visualize performances and performance decay.
To a large extent, the real competitive assets of engineering consultants are thus contingent on their human resources (Baark, 2001). In addition to this, the quality of memorization of knowledge within the organisation affects the sustainability of these resources. Concurrently, as the consultant in performance-based projects and partnerships is part of the maintenance company, the most important capability of this company lies in combining resources and the degree it succeeds in obtaining synergy by combining design and execution of maintenance work.

Competitive advantage of services
Long-term relationships with customers are seen as a prerequisite for competitive advantages of a company (Webster, 1992). Many building contractors agree with the competitive advantage of services, especially maintenance and facility services. They have to innovate to compete with maintenance service providers. We argue like many others that offering services is a prerequisite for establishing long-term relationships based on trust between the partners. Generally, management of construction innovation is complicated by the discontinuous nature of project-based production in which, often, there are broken learning and feedback loops (e.g. Gann and Salter, 2000). In the case of performance-based maintenance the business model changes from transaction to relationship based, with the characteristics of strategic partnering or framework arrangements. This guarantees innovations based on evolving knowledge and experience. Services, by being less visible and more labour dependent, are much more difficult to imitate, thus becoming a sustainable source of competitive advantage (Heskett et al., 1997). The costs of innovations in the service sector are generally low. It rarely requires substantial investment (Gadrey et al., 1995). The transitioning from product manufacturer (or building contractor) into service provider constitutes a major managerial problem (Oliva and Kallenberg, 2003). Providing services require new processes and new capabilities. The business model changes from transaction to relationship based, asking for new competences and capabilities too.

CONCLUSIONS

Maintenance companies can be considered as professional service organisations. In a performance-based maintenance relationship maintenance contractors no longer work as suppliers of capacity only, but become active participants in the overall maintenance process of a project for a specific agreed-on period. As a consequence of performance-based contracting maintenance companies implemented a lot of innovations in their service concept, client interface and service delivery system to guarantee the quality of the services. The new service concept is most obvious in guaranteed setting of the wishes, requirements and expectations of the client. The traditional role of the contractors is extended by design

questions, performance measurements and conducting end-customers satisfaction surveys. The execution of these activities demands additional competences and capabilities.
Performance-based maintenance partnering is an innovative approach to the market incorporating a lot of incremental innovations (small and based on existing experience and knowledge) in all dimensions. Working in a performance-based manner entails that the focus of the maintenance operation becomes the added value for the client and no longer the mere efficiency of the maintenance work itself.

REFERENCES

Baark, E. (2001), "Routines and Innovation in Engineering Consultancy Services", *Proceedings of DRUID's Nelson-Winter Conference*, Danish Research Unit for Industrial Dynamics, Denmark.
Barrett, P, Sexton, M. and Lee, A. (2005) *Performance Based Building Innovation*, PeBBu Domain 8, Final domain report, CIB (PeBBu) General Secretariat, Rotterdam.
Blayse, A.M. and Manley, K. (2004), "Key influences on construction innovation", *Construction Innovation,* 2004, 4, 143-154.
Bresnen, M. and Marshall, N. (2000), "Partnering in construction: A critical review of issues, problems and dilemmas", *Construction Management and Economics*, 18(2), 229-237.
Cobbenhagen, J., (1999), *Managing Innovation at the Company Level*, Maastricht University Press, Maastricht.
De Jong, J.P.J. (2005), *Mythe en werkelijkheid, gedrag van innoverende dienstverleners in zeven sectoren*, EIM, Zoetermeer.
Den Hertog, P. (2000), "Knowledge Knowledge-intensive business services as co-producers of innovation", *International Journal of Innovation Management*, 4(4), 491-528.
Den Hertog, P. and Bilderbeek, R. (1998), *Conseptualising (Service) Innovation and the knowledge between KIBS and their clients*, SI4S Topical paper, Apeldoorn.
Duncan, W.J., Ginter, P.M. and Swayne, L.E. (1998), "Competitive Advantage and internal organizational assessment", *Academy of Management Executive*, 12(3), 6-16.
FOSAG (2009), *Leidraad Resultaatgericht Vastgoedonderhoud*, FOSAG, Waddinxveen.
Gadrey, J., Gallouj, F. and Weinstein, O. (1995), "New modes of innovation. How services benefit industry", *International Journal of Service Industry Management*, 6(3), 4-16.
Gann, D.H. and Salter, A.J. (2000), "Innovation in project-based, service-enhanced firms: the construction of complex products and systems", *Research Policy*, 29, 955-972.
Henderson, R.M. and Clark, K.B. (1990), "Architectural innovation: the reconfiguring of existing product technologies and the failure of established firms", *Administrative Science Quarterly*, 35(1), 9-30.
Heskett, J.J., Sasser, W.E., and Schlesinger, L.A. (1997), *The Service Profit Chain*, Free Press, New York.
Løwendahl, B.R. (1997), *Strategic Management of Professional Service Firms*, Handelshøjsklens Forlag, Copenhagen.
Meacham, B., Bowen, R., Traw, J. and Moore A. (2005), "Performance-based building regulation: current situation and future needs", *Building Research & Information*, 33(2), 91-106.
Miles, I (1993), "Services in the new industrial economy", *Futures,* 25(6), 653-672.
Normann, R. (1991), *Service management. Strategy and leadership in service business* (2nd edition), John Wiley, London.

Oliva, R. and Kallenberg, R. (2003) “Managing the transition from products to services”, *International Journal of Service Industry Management*, 14(2), 160-172.
Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1985), “A Conceptual Model of Service Quality and Its Implications for Future Research”, *Journal of Marketing*, 49(Fall), 41-50.
Saad, M., Jones, M. and James, P. (2002), “A review of the progress towards the adoption of supply chain management (SCM) relationships in construction”, *European Journal of Purchasing & Supply Management*, 8(3), 173-183.
Sexton, M.G. and Barrett, P. (2005), “Performance-based building and innovation: balancing client and industry needs”, *Building Research & Innovation*, 33(2), 142-148.
Simon, A. and Kumar, V. (2001), “Clients' views on strategic capabilities which lead to management consulting success”, *Management Decision*, 35 (5), 362-372.
Slaugther, E.S. (1998), “Models of construction innovation”, *Journal of Construction Engineering and Management*, 124 (3), 226-232.
Straub, A. (2007), “Performance-based maintenance partnering: a promising concept”, *Journal of Facilities Management*, 5(2), 129-142.
Straub, A. and Van Mossel, H.J. (2007). “Contractor selection for performance-based maintenance partnerships”, *International Journal of Strategic Property Management*, 11(2), 65-76.
Webster, F. (1992), “The changing role of marketing in the corporation”, *Journal of Marketing*, 56(October), 1-17.