Cost Savings of Long-Term Performance-Based Maintenance Partnering

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Abstract

Dutch housing associations are for many reasons considering the application of performance-based maintenance partnership forms. With this they expect to manage maintenance processes efficiently and effectively.

If a contract is performance-based, the contractor has contract-related incentives to improve its way of working in terms of performance. That will result in direct and indirect cost-savings. Direct project costs represent the expenditure incurred during the actual performance of (long-term) maintenance activities. The indirect project costs are all costs in connection with the organization and performance of the maintenance activities, but which cannot be expressed as direct project costs. In other words, these are the process costs incurred by both client and contractor.

Indirect cost reductions can be realized because the long-term performance-based approach enables maintenance contractors to assume responsibility for certain activities which they are better equipped to perform than their clients. In the traditional approach, many activities are duplicated, i.e. conducted by both client and contractor, because information is lost following the once-only tendering process. In the performance-based approach, clear agreements are made with regard to which party is responsible for which activity during the cooperation period.

Ten projects show that the total indirect costs are lower in the performance-based approach than in the traditional working method. The costs of the initial processes in half of the projects are higher in the performance-based approach than in the traditional approach. The 'Evaluation and After-care' phase is more expensive in every project when using the performance-based approach. The fact that the indirect costs of the performance-based approach are lower overall than those of the traditional approach is entirely due to the reduction achieved in the subsequent phases. The performance-based approach offers the lowest indirect costs to the client. It offers not only a financial advantage in the subsequent processes, but in the initial process too. The indirect costs to the contractor are also lower in the performance-based approach than in the traditional working method, although the savings are somewhat more modest than those enjoyed by the client.

Keywords: cost-savings, long-term co-operation, maintenance, partnering, performance-based

1. Introduction

The professionalism of Dutch housing associations have led to a noticeably greater attention for maintenance processes and partnership forms in the supply chain for maintenance [3, 6, 7]. The growth in the size of the holdings for which an individual housing association is responsible is an important factor in considering the adoption of performance-based partnership forms for maintenance. Some larger housing associations have as many as 40,000 dwellings under their management, which renders it more or less essential to explore alternative means whereby maintenance processes can be managed efficiently and effectively. An additional factor is that the housing associations have chosen to re-focus on their core business, and a number now regard maintenance as a secondary process for which outsourcing, provided it is organized in a responsible manner, is preferable. Another reasons for considering performance-based partnering is the emergence of a strategic housing stock policy and the adoption of quality management systems. The appropriate partnership forms for a housing association depends on its size, organisational structure, business-like approach, the type of maintenance and building components involved and especially its goals for partnering.

In the traditional approach, tendering is a multiple, competitive process. Dutch housing associations generally invite three to five maintenance contractors an offer, based on technical specifications of the work. These contractors act as suppliers of capacity. By contrast, in the performance-based approach, it is assumed that the client conducts a single-phase tendering procedure. The performance-based approach centres on a set of desired performances. Maintenance contractors become active participants in the overall maintenance process. They assume certain risks and responsibilities with regard to the quality and costs of maintenance activities, doing so for a long period wherever possible.

Both clients and contractors cite a number of disadvantages attaching to the traditional process and advantages attaching to new procurement methods [8]. Clients emphasise the reduction of financial risks at the longer term and steering the maintenance processes on main points by a long-term performance-based agreement. Contractors underline improvements of performance and service and innovations in the whole maintenance process by having continuity in orders and sustainable relationships with clients. Self-motivation of contractors to increase performance is essential [2].

2. Research project

The OTB Research Institute for Housing, Urban and Mobility Studies, which is part of Delft University of Technology in the Netherlands, is doing research to the application of performance-based maintenance agreements by Dutch housing associations. The research project is entitled ‘Performance-based cooperation in the technical management of housing stock’. Main Dutch housing associations, real estate maintenance contractors and branch organisations contribute to this project, which consist of several ongoing studies.

One study is into performance-based maintenance agreements for several building components and organization’s maintenance activities and involves seven large, innovative housing associations and the Dutch Building Research Foundation (SBR). The study involves input from consultants and contractors specializing in exterior surfaces. Clients and contractors require

guidelines for an effective, efficient and transparent performance-based procurement processes and agreements. OTB Research Institute is working alongside the parties concerned in developing appropriate guidelines, with a focus on exterior surfaces and flat roofing. Those guidelines consist of flow charts and decisive performance requirements [8].

Another study is into direct and indirect cost savings by performance-based long-term cooperation between clients and contractors [7]. A breakthrough of performance-based maintenance agreements is obstructed by a lack of knowledge of clients and contractors, desired flexibility in maintenance policy by clients and their desired low market prices. In many cases the contract period is restricted to a maintenance interval, this being the period between the two years in which planned maintenance activities are scheduled.

Long-term, performance-based cooperation offer many advantages compared to the traditional tendering approach. One of the main benefits is that long-term performance-based cooperation is likely to reduce both direct and indirect costs. The essential preconditions are long-term involvement and freedom in the maintenance design and process, giving opportunities for product and maintenance process improvements and innovations.

The OTB Research Institute for Housing, Urban and Mobility Studies was asked by the WVB, a Dutch federation of property maintenance companies, to conduct a cost comparison of long-term performance-based cooperation against the traditional approach. The study distinguishes between direct and indirect cost components, and identifies both direct and indirect cost reductions. The research question was: what are the costs for both client and contractor when conducting exterior maintenance on a number of building complexes over a period of at least two maintenance intervals, comparing such costs under a long-term performance-based cooperation between client and contractor to those incurred when using the traditional method? The study involved modelling and case studies. The first step in the research was to develop calculation models that would compare the direct and indirect project costs of each method at individual project level. These models are based upon knowledge about the maintenance procurement processes, the traditional approach and the long-term performance-based co-operation form, and upon the flow charts of these processes developed in the related study.'

The outcome of the research will assist in discussions around the transition of the building sector from a one-dimensional orientation on costs, to process and value maximization. Therewith, impetus to unwelcome cooperation between building contractors in tendering processes can decrease [1].

2.1 Case studies

In order to make a thorough comparison of the direct and indirect maintenance costs involved in each method, ten actual cases were studied. Each case involves exterior maintenance of housing blocks owned and managed by a housing association. Presumably the size and scope of the project will influence the direct and indirect project costs. Here, a distinction was made between 'simple' and 'complex' projects, depending on the scope and type of maintenance work involved, and the lead-time of the (initial) process.

The cases studied vary in terms of the characteristics of each housing block, size, maintenance history and original quality, the working methods of client and contractor, etc. Accordingly, they are not directly comparable one against the other. However, each case enables a comparison to be made between the long-term performance-based and traditional approach in terms of direct and indirect project costs.

The cost comparison assumes a performance-based working method, with the applicable basic premises in terms of level of quality and maintenance period. The contactors will have produced a maintenance scenario for this period, together with the relevant costing and budget. The notional direct and indirect costs of the traditional working method can be closely estimated, based on the quality level and maintenance period. The maintenance history of the building will play a significant part here. It is assumed that the direct costs of painting – including preventative maintenance work – are cyclically recurrent.

3. Traditional contracting and long-term co-operation

Traditionally technical specifications are formulated by the housing association, being the basis of the multi-tendering process. The housing association supervises the maintenance work in detail. A final acceptance control also involves an examination of performance directly related to the quality of the workmanship. Measurement of client satisfaction might be done by the housing association.

In a long-term performance-based cooperation form the housing association and the maintenance contractor jointly specify decisive performance requirements for several housing complexes (housing blocks), concluded in a framework agreement [6]. The contract duration is a maintenance scenario covering several maintenance intervals, eventually lasting the expected exploitation period of a housing complex.

The contractor works out the desired performances, fitting them into the actual technical state of the housing complex and the expected service life. The technical solutions are laid down in maintenance scenarios and activity plans. A maintenance scenario covers several intervals of returning maintenance interventions, for example paintwork. The best maintenance scenario is chosen, based upon net present values and total costs of ownership. The scenario and the performance criteria are laid down in a performance agreement. In a performance-based partnership form the primary purpose of control and supervision by the housing association is to review the performance achievements and to identify problems with the necessary action. The contractors themselves monitor the degradation processes of building components by performing performance measurements. In case of fabric maintenance and paintwork this may for example concern the cracking of substrates and the degree of blistering of paints. They also monitor the process and especially the customers satisfaction during maintenance interventions and thereafter. They keep responsibilities for laid down performances and client satisfaction during the contract period. Performance control by independent third parties, may take the form of a random check rather than a full inspection of all performance criteria. During the contract period the maintenance scenario might be adapted. The housing association's objectives are likely to change over time, just as external circumstances may change.

Flow charts are presented to depicture the process steps that have to be taken by housing associations and maintenance contractors when pursuing performance-based co-operation. Figure 1 gives a picture of the traditional procurement process model, used as a reference model. Figure 2 gives a picture of performance-based cooperation for maintenance.

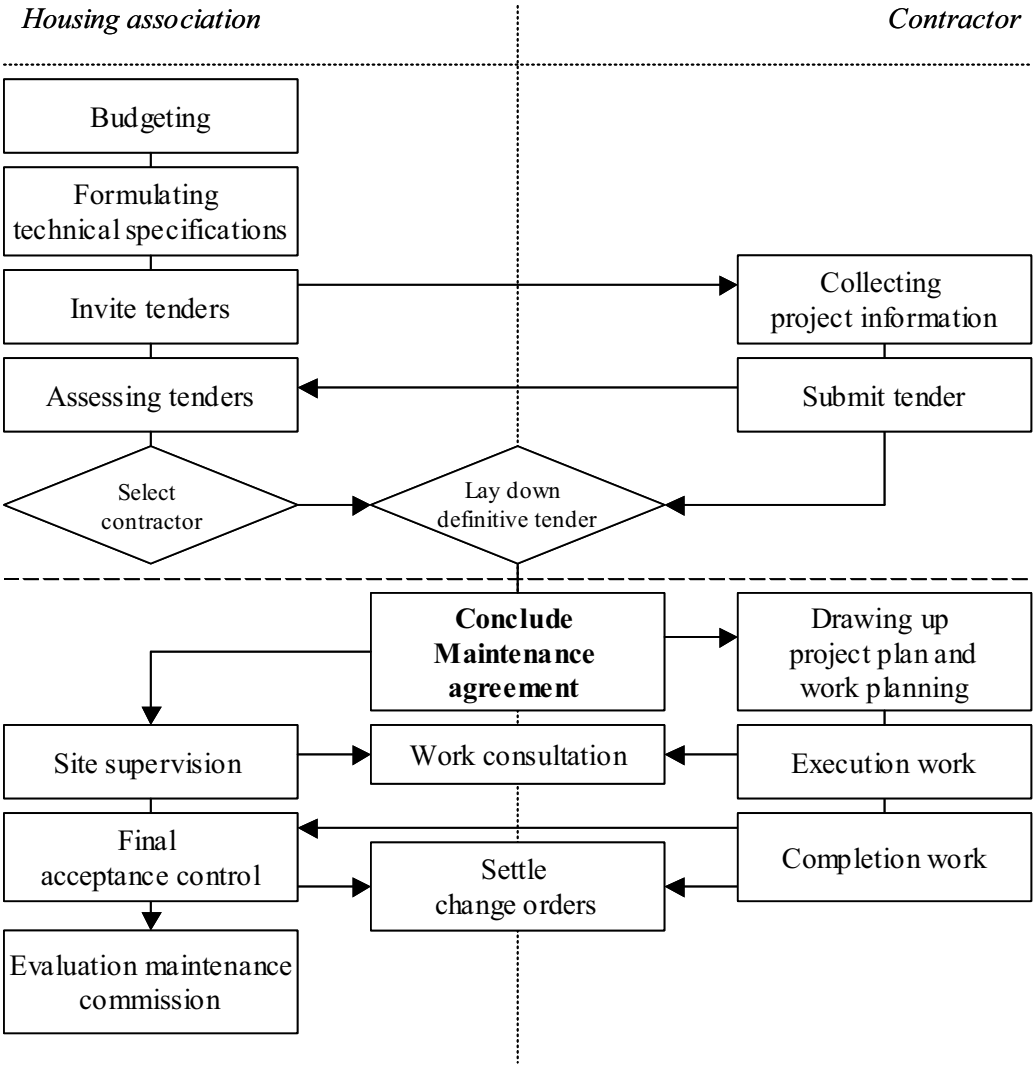

Figure 1 Process model traditional approach

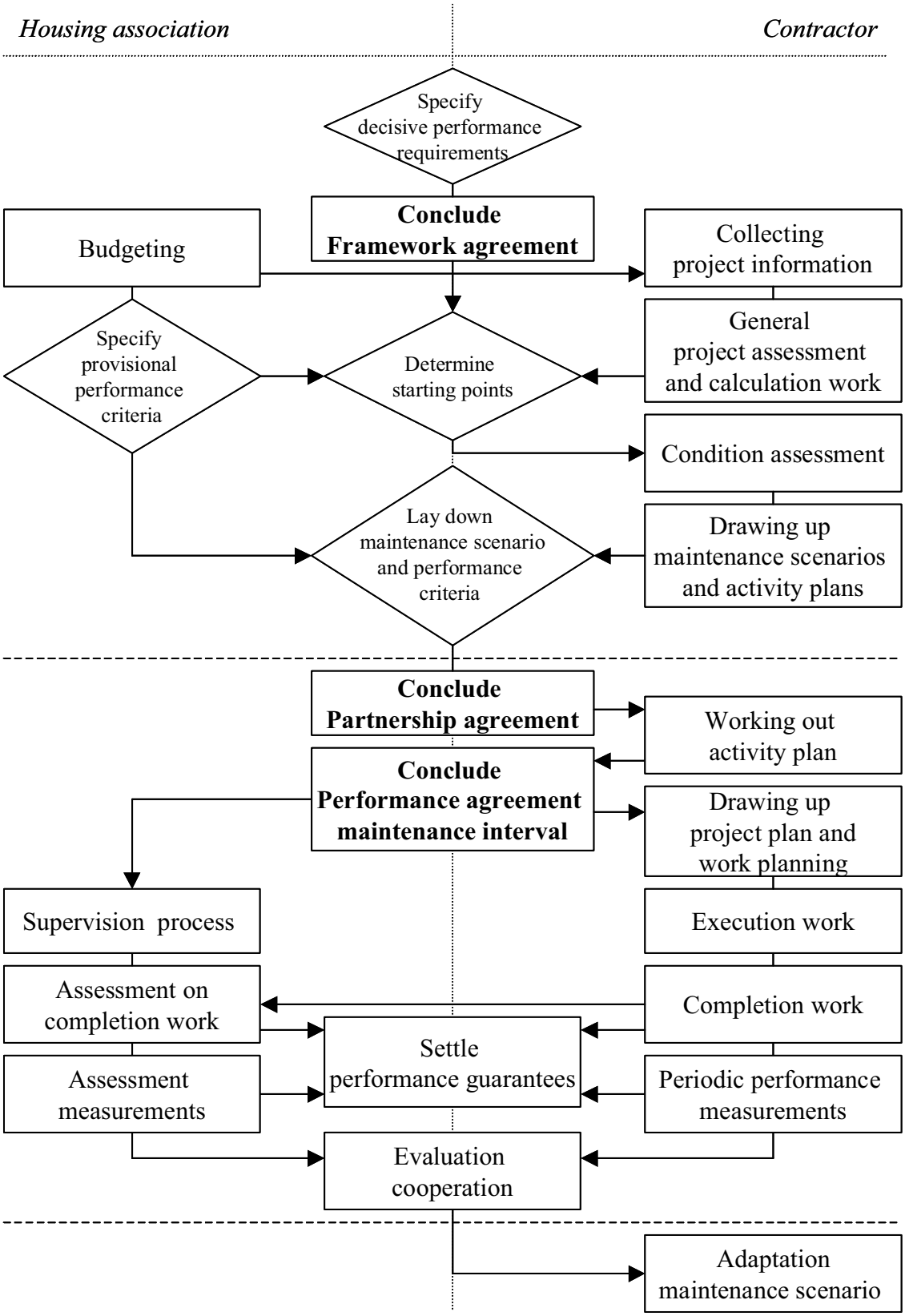

Figure 2: Long-term performance-based cooperation

4. Indirect costs model

Direct project costs represent the expenditure incurred during the actual performance of (long-term) maintenance activities. The indirect project costs are all costs in connection with the organization and performance of the maintenance activities, but which cannot be expressed as direct project costs. In other words, these are the process costs incurred by both client and contractor. Third parties, such as consultants or inspection agencies, may perform some activities, the costs involved being charged to the client and/or contractor. For the client, the overall maintenance costs consist of the direct and indirect project costs for the (long-term) performance of maintenance activities, together with the project-related costs of the services of consultants or inspection agencies, where these are not included in the direct or indirect costs.

Table 1: Schedule of activities calculation model indirect costs, initial process

	Traditional		**Performance-based**	
	Client	**Contractor**	**Client**	**Contractor**
Specification, Selection and Contracting				
Budgeting				
Formulating technical specifications				
Formulating performance criteria				
Invite tenders contractors				
Collecting and collating project information				
Condition assessment				
Reporting condition assessment				
Collecting external advice				
Consultation				
Drawing up maintenance scenarios				
Invite tenders subcontractors				
Assessment bids subcontractors				
Calculation maintenance scenario				
Formulating bid				
Assessment bids contractors				
Cancel contractors				
Consultation				
Assign work				
Confirm work				
Work and Supervision				
Drawing up project plan and work planning				
Reporting work				
Work consultation				
Site supervision				
Supervision process				
Consultation and information tenants				
Supervision process				
Final acceptance control				
Reporting completion work				
Settle change orders				
Evaluation and After-care				
Evaluation process				
Assessment customer satisfaction				
Performance measurement				
Reporting performance measurements				
Consultation performance measurement				
Settle performance guaranties				
Subsequent calculation				

In practice, it has proven somewhat difficult to identify the indirect costs involved in the traditional and performance-based working methods according to the above definitions. This is because these costs are generally incorporated in the bid price, perhaps by means of underlying unit prices. This applies not only to the process costs previously mentioned, but also the indirect costs for secretarial support, purchasing of material, taking stock, etc. In fact, these non-process-related indirect costs will be approximately the same for both the traditional and performance-based working approach. For pragmatic reasons, it was therefore decided to base the direct costs on the tender price of each method. The bid price is therefore assumed to include all project-related indirect costs. In addition, a separate comparison of the indirect process costs for each method was made.

4.1 Calculation models

Calculation models were produced to render the direct and indirect project costs visible. The calculation model for the direct costs enables the direct long-term maintenance costs at project level to be determined on the basis of both the traditional and the performance-based approach.

The indirect project costs will depend on the process activities that must be conducted by the client and contractor respectively throughout the maintenance period of the complex. The initial process and the subsequent processes consist of all activities conducted during a maintenance interval. Following the initial process, one or more subsequent processes will take place. It is assumed that these subsequent processes will be equal in scope and cost, although the actual maintenance activities undertaken in each can of course vary.

The activities in the initial and subsequent processes can be clustered into three phases (see Table 1):

- Specification, selection and contracting;
- Work and supervision;
- Evaluation and after-care.

The indirect cost model is based on a differentiation in hourly charges per activity, with the level of charges depending on the various wage scale groups applied by both client and contractor. The model assumes that each party will have three such groups.

In calculating the net present value of both direct and indirect project costs, the study took into account both the annual price rises due to inflation and the relevant depreciation factor.

5. Anticipated cost reductions

5.1 Direct cost reductions

The direct cost savings offered by long-term performance-based maintenance cooperation can be realized by:

- planning the maintenance activities according to the existing level of quality, the desired performance level and the service life of a housing complex, taking performance degradation into account;
- conducting maintenance activities on a 'just-in-time' or 'condition-based' basis, according to the agreed performance level ;
- ensuring better coordination between work to the substrates and to the finishing (e.g. undercoats and final painting).

A performance-based cooperation form offers a better guarantee of actually achieving the advantages of condition-based maintenance than the traditional approach, since it is the contractor who conducts the performance measurements and who also bears the risks relating to the timely performance of maintenance activities. The deterioration can be predicted more accurately, and hence the controllability of costs is enhanced. In the initial process, a thorough analysis of the causes of defects will be conducted. During the maintenance period, the performance level will be monitored by means of performance measurements. Based on these measurements, the maintenance activities will be carried out 'just-in-time'.

The performance-based method offers the contractor greater opportunities to coordinate the maintenance activities to the requirements of the client during the duration of the maintenance period, and to coordinate maintenance activities with each other. This is the result of the contractor's long-term involvement in, and responsibility – including financial responsibility – for the maintenance project under the performance-based partnering agreement. The fact that the same contractor is responsible for both the paintwork and maintenance work to the substrates is also important. The contractor will select the solution offering the lowest costs over the entire service life. In the traditional approach, this service-life cost approach is more difficult [4]. It may therefore be assumed that the performance-based method will encourage the use of more sustainable materials.

The direct costs can be reduced not only in terms of savings on manpower and materials, but also – and especially – in terms of incidental costs such as the hire of scaffolding and site costs. Scaffolding hire now represents a growing proportion of the total direct project costs. Longer maintenance cycles enable this type of expenditure to be reduced significantly.

5.2 Indirect cost reductions

Indirect cost reductions can be realized because the long-term performance-based approach enables maintenance contractors to assume responsibility for certain activities which they are better equipped to perform than their clients. In the traditional approach, many activities are duplicated, i.e. conducted by both client and contractor, because information is lost following the once-only tendering process. In the performance-based approach, clear agreements are made with regard to which party is responsible for which activity during the cooperation period.

Process improvements and indirect cost reductions will become particularly apparent following an initial period, once both parties have gained some experience with the new method. The costs of collecting project information, consultation, inventories, inspections and the production of alternative maintenance scenarios are likely to be high. Due to the continuity of the performance-based partnering agreement, however, maintenance contractors can improve their internal

business processes, with more efficient logistical deployment of manpower and equipment, and more efficient purchasing of materials.

6. Direct and indirect cost savings projects

6.1 Comparison of indirect costs

Table 2 shows the differences in indirect and direct costs of the projects between the performance-based approach and the traditional approach in percentages. In every project, the total indirect costs are lower in the performance-based approach than in the traditional working method (18-72%). However, the costs of the initial processes in half of the projects are higher in the performance-based approach than in the traditional approach. Further analysis reveals that the each of the subsequent part-phases within the initial process will vary, and may be more expensive or less expensive. Only the 'Evaluation and After-care' phase is more expensive in every project when using the performance-based approach.

The fact that the indirect costs of the performance-based approach are lower overall than those of the traditional approach is entirely due to the reduction achieved in the subsequent phases, being in excess of 26%. The phases 'Specification, Selection and Contracting' and 'Work and Supervision' become markedly less expensive. The 'Evaluation and After-care' phase is markedly more expensive in every case when the performance-based approach is adopted.

It may be seen that the performance-based approach will offer the lowest indirect costs to the client. It offers not only a financial advantage in the subsequent processes, but in the initial process too. The indirect costs to the contractor are also lower in the performance-based approach than in the traditional working method, although the savings are somewhat more modest than those enjoyed by the client. The initial process is more expensive within the performance-based approach. That this method is nevertheless less expensive overall for the contractor is due to the cost reductions in the subsequent processes. The situation in complex cased is almost similar to that in the simple cases.

6.2 Comparison of direct costs

In all cases, the direct costs of the performance-based approach are lower, or at worst the same, as in the traditional approach. However, it should be noted that the maintenance scenarios used were based on several assumptions. Clients and contractors believe that the maintenance intervals could be extended if working with the performance-based system, from six to seven years, for example. Accordingly, in a maintenance scenario of thirty years, there would be only four maintenance intervals rather than the current five. This view is based on experiences with performance-based partnering and the results of performance measurements. The performance of adequate preventative maintenance would also obviate the need for building components to be replaced. This potentially large financial advantage was incorporated into only a few of the case studies.

In a traditional multiple, competitive tendering process a lower price may be the outcome compared to price, based upon agreed unit prices in performance-based partnering. This is especially the case in very competitive markets, like the Dutch maintenance market at present.

However, on the long term and under changing market circumstances, clients and contractors believe that this will have no effect.

Cost savings of indirect costs may be unimportant compared to the direct costs. Our findings prove not. The indirect costs are in the proportion of 12 to 25% in the traditional approach and 4 to 20% in the performance-based approach. We think that proportion is very significant.

Table 2: Cost savings performance-based approach compared to the traditional approach

Project		Dwellings	Indirect costs									Direct costs
			Client			Contractor			Total			
			Ini	Seq	Tot	Ini	Seq	Tot	Ini	Seq	Tot	
Koekoekstraat	S	28	-21	-65	-60	+33	-55	-44	+ 4	-60	-53	-25
Vrijmoedhof	S	92	-16	-37	-32	+27	-17	- 7	+ 5	-26	-19	0
Guldenslag	S	111	+17	-56	-36	+32	-48	-27	+26	-51	-30	-10
Platte Daken	S	178	-61	-64	-63	+13	-20	-12	-28	-44	-40	0
Geroflat	S	360	-40	-56	-52	+18	-13	- 6	-15	-38	-32	-19
Lelie	S	68	-22	-72	-62	+30	-27	-15	+ 4	-49	-38	-14
Eksterstraat	C	103	-46	-72	-65	+18	-49	-28	- 7	-59	-44	-13
Celebesstraat	C	28	-24	-47	-36	-25	-29	-27	-24	-27	-31	- 8
Eekhoornweide	C	45	-33	-40	-37	+18	-23	+ 2	- 5	-33	-18	- 9
Molenhoek	C	27	-41	-92	-82	+24	-92	-70	+11	-92	-72	- 5

S = simple project, C= complex project. Ini = initial process, Seq = Subsequent process.

7. Business operations

The performance-based partnering approach has consequences for all aspects of business operations, organizational structure, organizational culture, the necessary knowledge and expertise, information flows, and the availability and use of methods and instruments on the part of both client and contractor. The costs and returns of these factors are difficult to quantify.

7.1 Client's business operations

The client's initial selection of contractors is likely to cost more time in the performance-based approach than in the traditional method. The selection will not be for each individual project, but the client will divide the projects among a number of pre-selected contractors. Standard activities and unit prices can be agreed between the client and the selected contractors, to be established by means of a framework contract (which will also cover other project-related matters).

Prior to the initial phase of the first project (or projects) the client and contractors will be required to devote considerable time to seeking out the most appropriate partnership form(s), agreeing unit prices and normative performance indicators, and drawing up the relevant framework contracts. However, these activities are also part of the traditional working method, albeit under different names. Like selection, the evaluation of contractors and the assessment of customer satisfaction will also take place outside the confines of individual projects, although project-related aspects will also be taken into account in the evaluation.

7.2 Contractor's business operations

Within the performance-based approach, the contractor acts as a consultant to the client. This entails new activities, such as providing advice on maintenance strategies, the production of maintenance scenarios, performance measurement and conducting customer satisfaction surveys. These activities demand a different type of knowledge and expertise on the part of the contractor. The maintenance contractors must be able to achieve a sufficient level of turnover under performance-based partnering agreements in order to be able to perform these 'advisory tasks' in a satisfactory manner.

Within the performance-based partnering approach, new projects will often require the client to conduct a single-phase tendering procedure. This greatly increases the likelihood of the offer being accepted, compared to the competitive tender procedure common in the traditional approach. This enhanced likelihood of acceptance represents a marked reduction in operating costs for the contractor. Moreover, because maintenance activities are assigned to the contractor for a long period (covering a number of maintenance intervals), it is no longer necessary to re-bid for each period. This continuity will result in lower indirect project-related costs throughout the subsequent process.

8. Conclusions

Long-term, performance-based partnering offers many advantages compared to the traditional tendering approach. One of the main benefits is that long-term performance-based cooperation reduces both direct and indirect costs. The essential preconditions are long-term involvement and freedom in the maintenance design and process, giving opportunities for product and maintenance process improvements and innovations.

Our research findings show that indirect costs are lower in a performance-based approach than in a traditional working method. The fact that the indirect costs of the performance-based approach are lower overall than those of the traditional approach is entirely due to the reduction achieved in the subsequent phases. The performance-based approach offers the lowest indirect costs to the client. It offers not only a financial advantage in the subsequent processes, but in the initial process too. The indirect costs to the contractor are also lower in the performance-based approach than in the traditional working method, although the savings are somewhat more modest than those enjoyed by the client.

A long-term performance-based cooperation form offers a better guarantee of actually achieving higher performance and lower direct costs. In practise maintenance intervals are extended if working with the performance-based system, from six to seven years.

Most benefits of a performance-based partnering approach are not easy to quantify. For contractors a performance-based approach meaning a single-phase tendering procedure offers great benefits. An enhanced likelihood of acceptance represents a marked reduction in operating costs for the contractor.

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