

Delivering Best Value in Highways Major Maintenance Schemes: Case Study

Mary Ansell¹; Mike Holmes²; Rees Evans³; Christine Pasquire⁴; and Andrew Price⁵

Abstract: The Construction Management Framework (CMF) is a contract established by the Highways Agency in the United Kingdom, where collaborative working is used within a framework setting to deliver the best value in highways major renewals and improvements schemes. This research aims to establish the effectiveness of the CMF in achieving this aim. It aims to define best value as it is understood collectively by the participants in the framework, and evaluate the performance measurement used in terms of its relevance and suitability to deliver the best value. The research also looks at perceptions of the performance of the CMF by those companies included in the framework, and the benefits and disadvantages of using this type of arrangement in highway work. Data collected from the client were compared to that given by the contractors, supply chain, and construction managers of the CMF; results showed a perception by those involved in the framework that construction management is suited to the type of work it is currently used for, and there is potential for similar CMFs to be used elsewhere in the construction industry. However, the research also found that there is a need to improve the performance measures so that value is properly reflected in the goals of the CMF; and the presentation of evidence that demonstrates the benefits that can be gained using this procurement route.

DOI: 10.1061/(ASCE)0733-9364(2009)135:4(235)

CE Database subject headings: Construction management; Highways and roads; Partnership; Procurement; Case reports.

Introduction

In 2001, the Highways Agency (HA) published a procurement strategy in response to a succession of studies during the 1990s, including: Sir Michael Latham's "Constructing the Team" report; Sir John Egan's "Rethinking Construction" report; and the National Audit Office report "Modernising Construction" (HA 2001). The strategy covers the full range of the HA's activities, with a focus on its delivery of services to road users as the operator of England's motorway and trunk road network. In this respect, the HA's work is broadly divided into categories based on cost, namely maintenance contracts for works costing up to \$1 million, regional (or major maintenance) projects for works to

\$16 million, and major projects, which cover works costing above \$16 million (HA 2001).

Within the *regional projects* category, works are packaged together and procured through frameworks that facilitate long-term relationships with delivery teams as a means of providing best value (HA 2001). To further promote this, the HA has embarked on a new initiative in Area 9 (centered around the Midlands region of England) and Area 10 (primarily covering the North West of England) of entering into direct contractual arrangements with specialist trade contractors and suppliers to form the HA's Construction Management Framework (CMF). The contract commenced in July 2002 for a 4 year term, which was recently extended to 2009, and covers the delivery of road renewals, structures, renewals, and improvement schemes.

The aim of this research is to establish the effectiveness of the CMF in achieving best value, by using a case study approach of a framework working in collaboration to deliver highways major maintenance projects. The research aims to determine the meaning of best value as understood by the various groups working in the CMF, i.e., the client, contractors, supply chain, and construction managers. From this, the effectiveness of current performance measures used within the CMF can be evaluated, leading to the development of more appropriate CMF performance measures to reflect the success or otherwise of using this framework arrangement.

A literature review has been included in this paper to establish the HA's current guidelines and processes for achieving best value, and to explain the existing measurement used by the CMF for measuring value (including a short evaluation of this).

Best Value in Highways Construction

In order to evaluate how well the CMF represents and aligns itself with the HA's value objectives, the vision of the HA and its aims and objectives for delivering value to its customers must be un-

¹Research Engineer, AmeyMouchel, Stafford Park Depot, Stafford Park 10, Stafford Park Industrial Estate, Telford TF3 3BU, U.K. (corresponding author). E-mail: mary.ansell@ameymouchel.com

²Construction Team Leader, AmeyMouchel, Stafford Park Depot, Stafford Park 10, Stafford Park Industrial Estate, Telford TF3 3BU, U.K. E-mail: mike.holmes@ameymouchel.com

³Engineering and Delivery Manager, AmeyMouchel, Birmingham Business Park, Unit 2035, The Crescent, Birmingham, West Midlands B37 7YE, U.K. E-mail: rees.evans@ameymouchel.com

⁴Professor, Finance Director/Director for Postgraduate Studies/Programme at Loughborough University, Dept. of Civil and Building Engineering, Loughborough Univ., Loughborough LE11 3TU, U.K. E-mail: a.d.f.price@lboro.ac.uk

⁵Senior Lecturer, Dept. of Civil and Building Engineering, Loughborough Univ., Loughborough LE11 3TU, U.K. E-mail: c.l.pasquire@lboro.ac.uk

Note. Discussion open until September 1, 2009. Separate discussions must be submitted for individual papers. The manuscript for this paper was submitted for review and possible publication on January 3, 2008; approved on November 14, 2008. This paper is part of the *Journal of Construction Engineering and Management*, Vol. 135, No. 4, April 1, 2009. ©ASCE, ISSN 0733-9364/2009/4-235-245/\$25.00.

derstood. This can be examined through the HA's publications, in particular: the procurement strategy aimed at its potential and current suppliers; the corporate vision and plan publication "Customers First," aimed at its customers; and documents outlining the value management process, which identifies the key areas used to prioritize and identify solutions to the satisfaction of all its stakeholders.

The HA's actions toward achieving best value focus on: assessing a project's cost over the whole life of the investment; developing improved procurement guidance and new forms of contracts to speed up the procurement process; and reviewing the value of design features as projects are prepared (HA 2006a). Best value is defined by the agency as "the delivery of business objectives at the lowest affordable cost while achieving continuous improvement" with the four key components of best value being effectiveness, efficiency and economy underpinned by the demonstration of continual improvement (HA 2006b).

The agency's corporate plan and vision, named "Customers First" (HA 2005a), sets out the aims of the agency to become a customer-focused organization. This includes actions to: consult with local communities to gain a greater understanding and responsiveness to the needs of customers and stakeholders; achieve continuous improvement in the delivery of front line services; identify opportunities for improved collaboration and more efficient delivery of best value solutions and services; and drive down cost and speed up delivery (HA 2005a). These actions suggest that the agency has identified understanding customer expectations, continuous improvement, collaboration, and efficiency as key to delivering best value (HA 2005a).

Value management (VM) is a technique used to reconcile the different value judgements made by various stakeholders and enable an organization to achieve the greatest progress toward its stated goals with the use of minimum resources, in order to achieve value (Institute of Value Management 2002). Thus, VM aims to reconcile different stakeholders' value judgements and achieve the best value ratio between satisfied needs and resources, and is formally undertaken in the two step process of VM and value engineering (VE) by the Highways Agency (HA 2004). The development process for a project involves: identifying the need; prioritizing it; value manage and value engineer possible solutions; score the benefits delivered; identify the preferred (optimum) solution; then design, procure, and implement the works, with the VM and VE processes aimed at adding value (HA 2004).

The renewal and improvement of structures are value managed through risk assessments which weigh the consequences of options in terms of safety, functionality, sustainability, and environment, these being the value criteria ranked in terms of their weighting of importance (HA 2004).

The value management process for roads considers aspects of maintenance work under the categories of safety, value for money, reduction of disruption, and environment (HA 2005b). Scores for "value for money" are determined using a whole life cost analysis of road maintenance schemes known as Software for the Economic Evaluation of Pavements (SWEET). The scoring of "reduction of disruption" is also determined by the outputs of SWEET. SWEET reports are used to assist in the examination of proposed VE options in terms of whole life costs and return on investment (HA 2005b). Road maintenance value criteria weights are: 0.2 for safety; 0.3 for value for money; 0.4 for reduction of disruption; and 0.1 for environment (HA 2005b). It can thus be inferred that disruption to the traffic is the most important value criteria which must be addressed in any maintenance scheme, in line with the HA's "Customer First" policy (HA 2005a).

HA Construction Management Framework

The benefits of partnering and collaborative working in construction have long been recognized and increasingly alliances between organizations are seen as a way of creating competitive advantage and adding value (Blayse and Manley 2004; Cheng et al. 2004; Egan 1998; Ingirige and Sexton 2006; Latham 1994; Ledger 2003; HA 2005a). Fortune and Setiawan (2005) point to the definition of partnering given by Fisher and Green (National Audit Office 2001) as being the most widely accepted by those involved in the delivery of construction projects. This definition refers to partnering as: "a management technique embracing a range of practices designed to promote more cooperative working between contracting parties... The objective is to align and unite the parties with a shared goal of completing the scope of work in a cost effective and timely manner which is mutually beneficial... Strategic partnering involves the main contractor and the client organization working together on a series of construction projects to promote continuous improvement" (National Audit Office 2001, p. 29).

Barlow and Jashapara (1998) highlighted the distinction in the construction industry between one-off partnering and long-term partnering, or strategic partnering as termed by Fisher and Green (National Audit Office 2001), as existing for the duration of several projects. Ingirige and Sexton (2006) support the view that it is through long-term partnering contracts that a sustainable competitive advantage can be achieved by establishing organizational mechanisms for the transfer of knowledge between projects, in order to continuously create new knowledge.

There is, however, some criticism of partnering, including an argument that clients are afforded buying power in which suppliers must buy into the culture of partnering, or risk being isolated from frameworks which make up a significant portion of the United Kingdom construction market (Green 2002). In addition, there may be some scepticism that competitiveness can be maintained within an established framework.

To procure work and address the need for continuous improvement, collaboration, and efficiency, the HA established a Construction Management Framework in the Agency Areas 9 and 10, covering parts of the West Midlands and North West regions. It involves 20 contractors covering a range of disciplines required to carry out the work (referred to as specialist framework contractors), two construction managers, and the agency teams in both areas (HA 2006a). Where construction management is used as the procurement route, the construction manager is an impartial professional employed by the client to manage the works in terms of supervising the works and ensuring coordination between the specialist framework contractors (Construction Management Forum 1991). The construction manager and the specialist framework contractors each have separate contracts with the client, and communication should flow freely among all parties, including the client, in true partnering style (see Fig. 1).

The contract is based on a modified version of the New Engineering Contract (NEC) and was commissioned for a 4 year term which has recently been extended to 7 years. The NEC was first published in 1995 as an alternative to the traditional forms of contract that existed at that time. It was designed to reflect the more modern procurement routes, such as design and build and private finance initiative (PFI), and looked to avoid disputes through providing a range of payment options which dealt with the uncertainty found in construction projects (Lewendon 2004). It encouraged the use of partnering arrangements and allowed parties involved to be more proactive in providing more robust

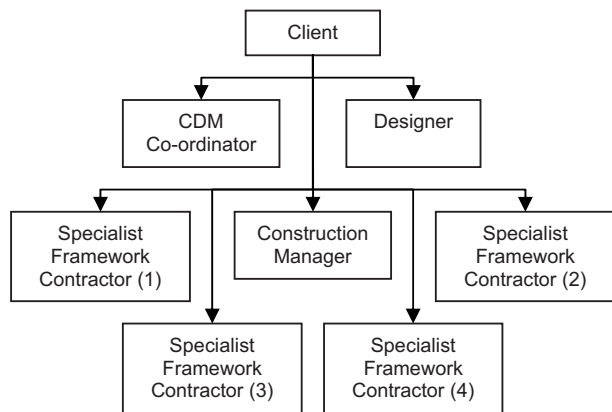


Fig. 1. Organizational structure of CMF

control to achieve better certainty of the project cost outcome (Lewendon 2004). The payment options offered by the NEC include: priced, target, and cost-reimbursable contracts. The CMF uses target contracts, where the tendered price forms the target cost, but rather than the contractor being paid according to the tendered price, he is reimbursed for his actual cost plus a fee (to cover overhead and profit), and the target cost is compared to the total cost with any profit or loss shared between the contractor and the client in a preagreed way (Lewendon 2004).

The scope of works involved in the framework comprises road renewals, structural renewals and improvement schemes (HA 2006a). The companies involved in the framework have established a community so that the areas of culture, process, and measurement are developed in a structured and coordinated manner (Construction Management Community 2004). The community is guided by "off-line" groups that have been set up to formulate and disseminate practices and procedures within the areas of processes, culture, and measurement. The primary objective of the community is to show that construction management provides, or shows the clear potential to provide, best value to the HA, and for the contractors involved (Construction Management Community 2004).

Current Measurement

The community uses the definition of best value identified by the Local Government Act of 1999 and defines economy, efficiency, and effectiveness based on publications from the Audit Commission (2000). Here, economy is acquiring resources of the appropriate quality and quantity at the lowest cost, efficiency is producing the maximum output for any given set of resource inputs or using the minimum inputs for the required quality, and effectiveness is meeting the client and/or customer needs (Audit Commission 2000). The community has interpreted economy to be the relative cost of construction management compared with alternative forms of procurement, efficiency as the ability to deliver input goals based on process, culture, and measurement, and effectiveness as the achievement of output goals based on key performance indicators (KPIs) (Construction Management Community 2004). The Rethinking Construction report, published in 1998, called for an industry-wide performance measurement system, so that clients could be presented with a comparative set of performance results in order to differentiate between companies

and provide a rational basis for selection and reward (Egan 1998). The report highlighted key areas for measurement and set ambitious improvement targets. The United Kingdom government responded by proposing a framework of KPIs for companies to use, so that performance could be examined and compared with others within benchmarking clubs (KPI Working Group 2000). The CMF used these KPIs to measure and compare performance between schemes in the following areas:

1. Customer satisfaction;
2. Site safety;
3. Time predictability;
4. Cost predictability;
5. Accrual expenditure forecasting (comparing the estimated cost of work to be carried out to the actual amounts certified on a monthly basis);
6. Defect free work;
7. Lean pricing; and
8. Client satisfaction with product and service.

However, there are significant problems associated with the effective use of KPIs. Beatham et al. (2004) pointed out five fundamental problems with the introduction of KPIs, i.e.: KPIs focussed on postevent lagging outcomes at a very high level; KPIs were not aligned to the strategy or business objectives of the construction companies; KPIs are generic, and have been seen as external to the business needs of many organizations; cross-industry benchmarking is not seen to be viable, and their use is not seen as an integral part of business management; they do not provide a holistic, company-wide representation of the business, where other performance measurement tools such as the balanced scorecard and Excellence models consider areas such as leadership and policy and strategy that are not included in the industry KPIs; and KPIs are not incorporated into a performance measurement system which includes review and action.

In addition, while some of the measures are quantifiable, such as predictability of time and cost, others are subjective, for example customer/client satisfaction and quality. Subjective measures bring into question the validity of scoring and benchmarking. Also, the conflicting nature of KPIs is not considered, so while quality, for example, could produce a low score, this may be at the expense of cost, which will reflect a higher score in the KPI. Without reviewing the impact of one KPI on another, efforts to deliver value to the customer may be misdirected.

Research Survey

To investigate best value delivered by the CMF using a case study approach, a questionnaire was developed with the intended target for completing the questionnaires being solely the members of the CMF. The questionnaire was not directed at recipients outside of the CMF, as they would have little or no understanding of this particular case study.

As the researcher is involved in the framework, the questionnaire would also help improve understanding of the general situation, avoiding generalizations and a distorted view. The population of the CMF was small enough that questionnaires could be sent to every company involved in the CMF, rather than a sample being selected. This enabled a broad range of opinions to be considered, although to a limited depth. Although opportunities were given throughout the questionnaire through open questions for respondents to expand on their answers, this relied on a further investment of the respondent's time.

The questionnaire was separated into the following four sections.

1. Section A—the respondent background information: eight questions directed at the respondent's experience so that results could be separated to identify the views of the various parties in terms of experience with CM and the roles they play in the framework;
2. Section B—measuring best value: eight questions to identify what constituted best value in the opinion of the respondent, who could influence the delivery of value and the view of the effectiveness of current measurement (how relevant is the measure and how well is it measured);
3. Section C—CMF performance: three questions to understand the current perception of the performance of the CMF in terms of the KPIs, and the use of this type of procurement for different types of HA work; and
4. Section D—working in the CMF: six questions centered on the experiences of working in the CMF, how easily relationships were established and how strong those relationships needed to be, and what the perceived and actual benefits of working in the CMF are.

The questionnaire was piloted among the chairs of the various off-line CMF groups (six people in total). Some revisions were made in line with their recommendations; 50 questionnaires were then sent to the entire population of 23 companies in the CMF, consisting of the client, the construction managers, and the specialist framework contractors.

A questionnaire was sent to at least two people from each specialist framework contractor. One of these people was generally a high level manager involved in managing the CMF contract, while the other was typically a project manager involved in the management of CMF schemes. It was considered that these two levels of management had the most influence over the delivery of best value due to their involvement across a number of schemes.

The questionnaire was also sent to client representatives who work with the CMF. The questionnaire was sent to the area performance manager for each HA area, and to the project sponsor responsible for individual schemes, who reported to the area performance manager. Area performance managers are responsible for their team of project sponsors, and thus set the HA successful outcome criteria for individual projects.

The questionnaire was sent to the construction managers of both HA areas, as well as project managers and a senior valuation surveyor (who is responsible for administering the payment terms of the New Engineering Contract on behalf of the client). Questionnaires sent to supply chain partners were limited to the five companies most frequently used by the specialist framework contractors because of the limited involvement and response expected from this group.

Of the 50 questionnaires distributed, 30 responses were received. A particularly high rate of response was achieved from the client and specialist framework contractors. A low rate of response was given by the supply chain partner. It can be inferred from this that there was less interest on the part of the supply chain partner in supporting the research. A reason for this could be a lower level of involvement of this group in the framework, particularly in the values and culture espoused by the framework community, or a lack of interest in the issues covered by the research. However, the response rate was representative of the framework as a whole since responses from the entire population of companies involved were received.

The questionnaire used a number of input techniques including

tick boxes, Likert scale, ranking, and open ended questions. Open questions were analyzed in terms of themes, with descriptive statistics used to provide a general overview of the results. Inferential statistics were used for closed questions to compare the responses from the client with the other groups in the community to identify any significant differences in attitudes.

The results of the survey are discussed under the sections that the questionnaire considered.

Respondent Background Information

Responses were grouped into client and community, with community representing contractors, construction managers, and supply chain partners. Completed questionnaires were received from all companies, thus it is deemed the responses are representative of the views of all members of the CMF: 70% of responses were from contractors, 10% from the client, 10% from construction managers, and 5% from supply chain partners. The remaining 5% was received from others, namely the CMF manager who is independently employed by the HA. Prior to joining the CMF, most of the respondents had either 1–5 years experience using construction management as a procurement method (48%) or no experience at all (43%). Most respondents had been involved in more than seven construction projects in the CMF. The majority of respondents spend 2–3 days a month on nonproject specific activities, including meetings and work for “off-line” groups (e.g., culture group, measurement group, etc.) (44%).

Measuring Best Value

In answering the question: “what is best value?” many respondents included cost, quality, and time. Cost was mentioned in most of the answers, although this was mostly used in terms of “fair price,” “reasonable cost,” “optimum cost,” and “value for money.” Safety was mentioned in ten of the 30 answers, in that best value included carrying out the works safely. Meeting the client's needs was also raised by seven of the respondents, emphasizing a focus by the community on the role of the client in setting objectives and expectations.

Respondents were then asked to rank the requirements for delivering best value which they considered to be the most important to the client. The options given were as follows.

- Free from defects on completion;
- Delivered on time;
- Delivered within budget;
- Fit for purpose;
- Low construction costs;
- Pleasing to look at;
- Short construction period;
- Supported by worthwhile guarantees;
- Satisfactory life of repair;
- Low maintenance cost;
- Minimal disruption to the public; and
- Other (safety was specified by one respondent).

Responses showed that the client perceived a solution fit for purpose to be the most important criteria, followed by delivering within a budget, then minimal disruption to the public. The community identified delivering within budget as the most important criteria, followed by causing minimum disruption to the public, and then delivering on time. The client's top response of a

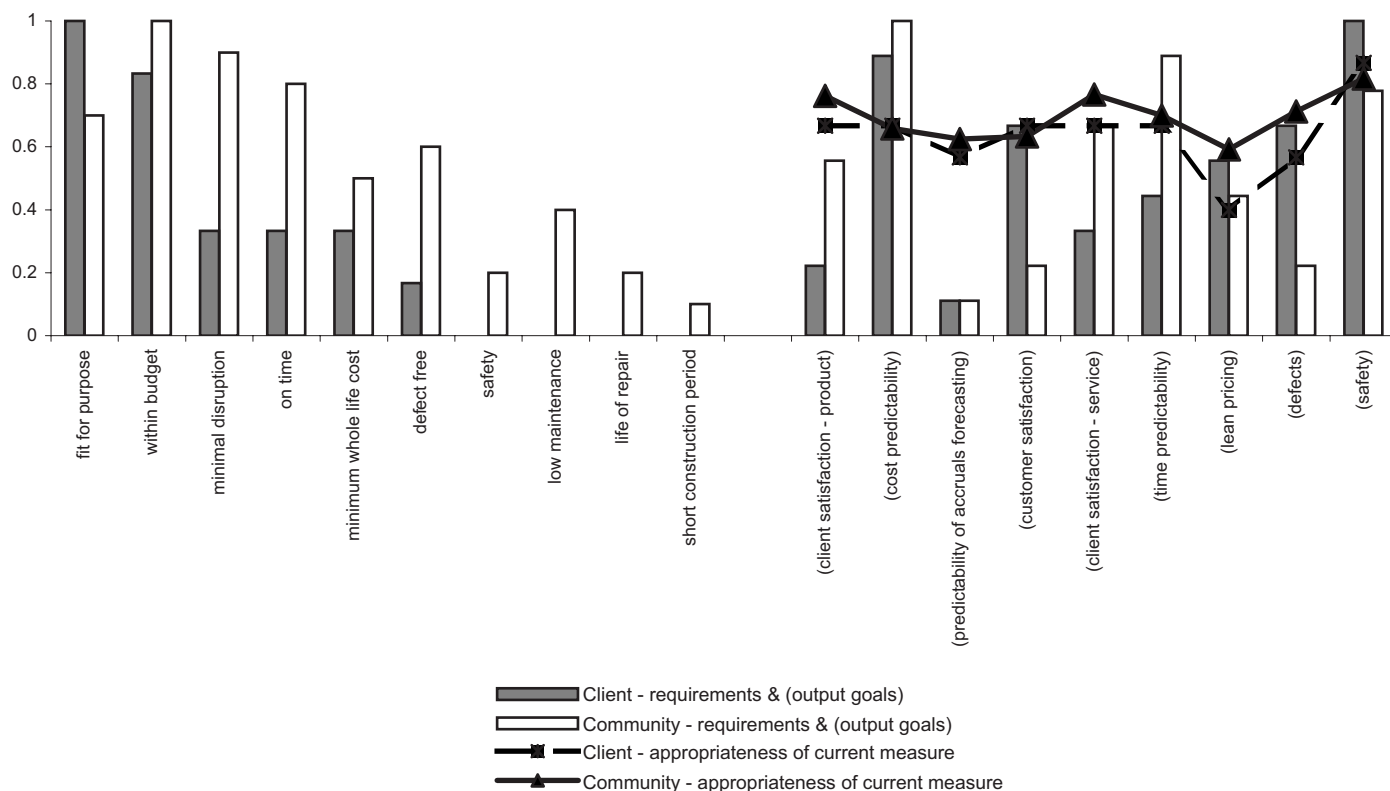


Fig. 2. Ranking of requirements and output goals in delivering best value. (Note: output goals are shown in brackets.)

solution fit for purpose was ranked fourth by the community (see Fig. 2).

To measure the difference in ranking between the client and other groups, the Spearman (rho) correlation was used. In this case, the value of rho was 0.75, which for nine factors, is greater than the critical value of 0.683 for $P < 0.025$. Thus, with less than a 2.5% probability that the correlation was due to a chance distribution of results, the hypothesis that the factors for delivering best value to the client differ for the client and the remaining community can be rejected; concluding that the difference in opinion between the client and the remaining community is not significant.

Respondents were then asked to rank the KPIs used by the community in order of how important the KPI categories are to achieving best value. In this case, the rho value of 0.400 was less than the critical value of 0.600 for $P < 0.05$, concluding that there was no correlation between the rankings given by the client or the remaining community. Thus there would seem to be some disagreement regarding the importance of the current measures being used as key performance indicators in delivering best value.

Safety was seen to be the most relevant output goal to the client, while it was ranked third by the community; the community ranked cost predictability the most relevant, ranked second by the client. While there was some agreement regarding these two output goals, there was a larger difference in opinion regarding time predictability (the community's second ranking which the client ranked sixth) and defects and customer satisfaction (both ranked third by the client, but only ranked seventh by the community).

The response of the most important requirements to the client for delivering best value, and the KPIs most important to achieving this, were then compared to see if respondents were consistent. The responses were aligned as follows.

- Fit for purpose=client satisfaction with product;
- Within budget=cost predictability and predictability of accruals forecasting;
- Minimal disruption to the public=customer satisfaction and client satisfaction with service;
- On time=time predictability;
- Minimum whole life cost=lean pricing;
- Defect free=free from defects; and
- Safety=safety.

These results of which output goals were relevant to achieving best value were compared with the responses to the requirements important to the client in delivering best value using the Pearson product moment correlation coefficient. The correlation coefficient of -0.07 for the client responses highlighted the fact that there was a low level of correlation between the responses given earlier by the client regarding the requirements for best value, and the measures relevant in achieving best value (the critical value for $P < 0.05$ is 0.4793). This summation could be a result of the researcher's interpretation of how the goals align with the requirements, however, in terms of delivery on time, there would seem to be a valid cause for pointing to the respondent's inconsistency in ranking this third for requirements important to the client, but only sixth as an output measure relevant to achieving best value. If fitness for purpose/optimum solution equates to client satisfaction, the inconsistency is even greater, with the former ranked first in terms of requirement important to the client, but the latter ranked equal last. In terms of the response to safety, which scored the highest ranking on relevance of output goal but lowest in terms of requirements for best value, the basis of inconsistency is less valid, because safety had not been offered for selection in the question for requirements of best value. There was agreement between the two questions in terms of delivery on time and time

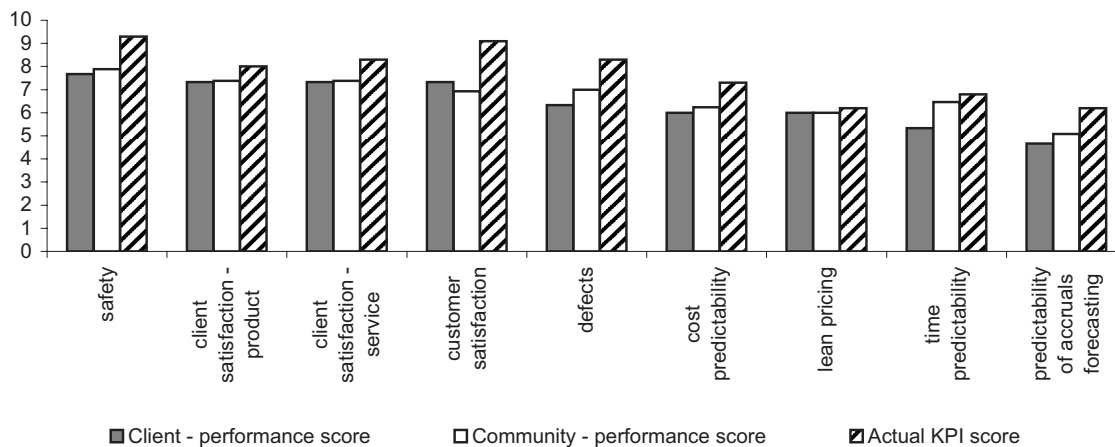


Fig. 3. Output goals—perception of performance compared to actual KPI scores. (Note: KPI scores are average across schemes undertaken in 2005.)

predictability, these ranking second for both the question of important requirement and relevant output goal.

The correlation coefficient for the community was higher than for the clients, with a coefficient of 0.44, which was just less than the critical value of 0.4793 for $P < 0.05$. Again, the inconsistency could be due to the researcher's interpretation of how the output goals and best value requirements align, as well as the fact that safety was not included in the question ranking requirements for best value. Overall, however, there was greater consistency in the responses given by the Community, than by the client, with agreement that delivering within budget was the most important requirement in delivering best value, and measuring cost predictability was the most relevant output goal.

When asked to score the appropriateness of each output goal, predictability of accruals forecasting and lean pricing was scored lowest by both the client and the remaining community (see Fig. 2). This might explain why these measures scored low in terms of importance, despite the requirement for delivering within budget being a high priority for both parties. If the measures currently in place are not appropriate and do not sufficiently reflect the goal, it is unlikely they will be thought of as relevant.

In questioning each group as to the importance of the various parties involved in the community, the specialist framework contractor was seen as most influential, followed by the construction manager, by both the client and community. The client saw itself as having the least impact on achieving best value; however this view was not shared by the community, who ranked the client higher than supply chain partners. Reasons for the clients ranking themselves least important in achieving best value are not known, and may be a focus of further investigation.

CMF Performance

Respondents were asked to provide a score for the performance of the CMF against the KPIs. From these results, performance in terms of cost and time was seen to be the worst areas in terms of the KPIs; performance was seen to be best in safety and client and customer satisfaction (see Fig. 3). The community perceived their performance outputs to be better than the client rated this to be; scores given by both the client and community were lower than

the actual scores for KPIs measured on the various schemes undertaken in the CMF in 2005.

In discussion of KPIs that should be excluded from the measurement, predictability of accruals and lean pricing were mentioned three and four times, respectively. Lean pricing was seen as an inappropriate measure of cost, with the current form of measurement being ineffective as prices are not set against competition, but are benchmarked against a form of procurement that is driven by competition. Accruals forecasting was also seen as a submeasure of cost, and was argued by one respondent as an inappropriate term for what is really predictability of spend and accurate forecasting of expenditure, rather than forecasting of accruals (accruals being an accountancy term for work carried out but not yet paid for). These comments would suggest that in reviewing the output goals, emphasis should be given to the measures of cost, lean pricing, and accruals forecasting, to effectively measure the competitiveness of procuring work through the CMF.

Not all respondents agreed that CMF as a procurement route achieves the best results for the output goals that the community measures itself on (see Fig. 4). Accruals forecasting and lean pricing in particular did not score well among the community as goals that are achieved through the use of construction management. Most significantly perhaps, the client did not view the CMF as an effective form of procurement for achieving cost objectives or delivering work that is free from defects. However, it did see the CMF as a way of delivering to time requirements and predicting accruals.

Respondents were asked what form of procurement was best suited to the four different categories of work procured by the HA: maintenance, renewals and improvements, work in sensitive locations, and short term contracts. The CMF scored well for renewals and improvements schemes, and projects in sensitive locations. However, two responses chose other forms of procurement as being best suited to carry out renewals and improvements work, which is the category of work where it is currently being used. Both responses were from specialist contractors; one chose PFI as being a better form of procurement for this type of work, the other pointing to management contracting as the better procurement route. Of the client's responses, construction management was indicated as the best suited procurement route for this type of work.

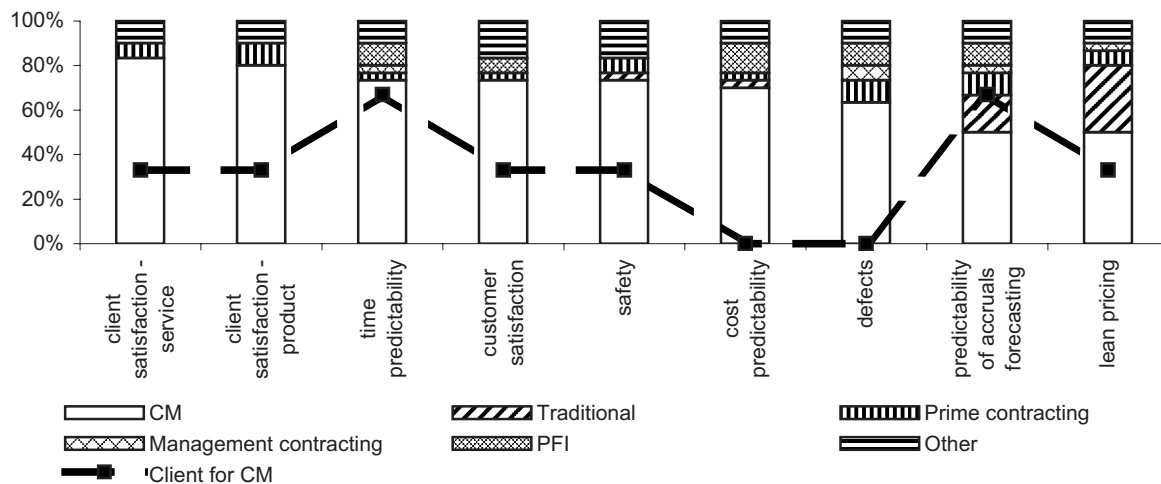


Fig. 4. Forms of procurement favored for achieving output goals

Working in CMF

Finally, respondents were asked what the advantages were to working within the CMF community. There were two parts to the question: first, what they thought the advantages would be in theory; and second, what the advantages are in practice. In most cases, the reality did not meet the expectations of the community, particularly in predictability of workflow and opportunities outside the HA (see Fig. 5). However, in the case of improving their organization's performance and creating better relationships with other contractors, the actual outcome was better than expected.

For the client, there were more instances where expectations were matched in practice, with the benefits of having a better relationship with contractors being greater in practice than anticipated. However, there were some areas where the practice had not met expectations for the client as well, including early contractor involvement (ECI) and innovation. ECI is promoted by the CMF community as a key feature for delivering best value. It is a process where the construction manager, designer, and contractors involved in a scheme meet at various stages during the design stage, allowing the contractor to provide input into the buildability of the scheme at an early stage. A further area of study could

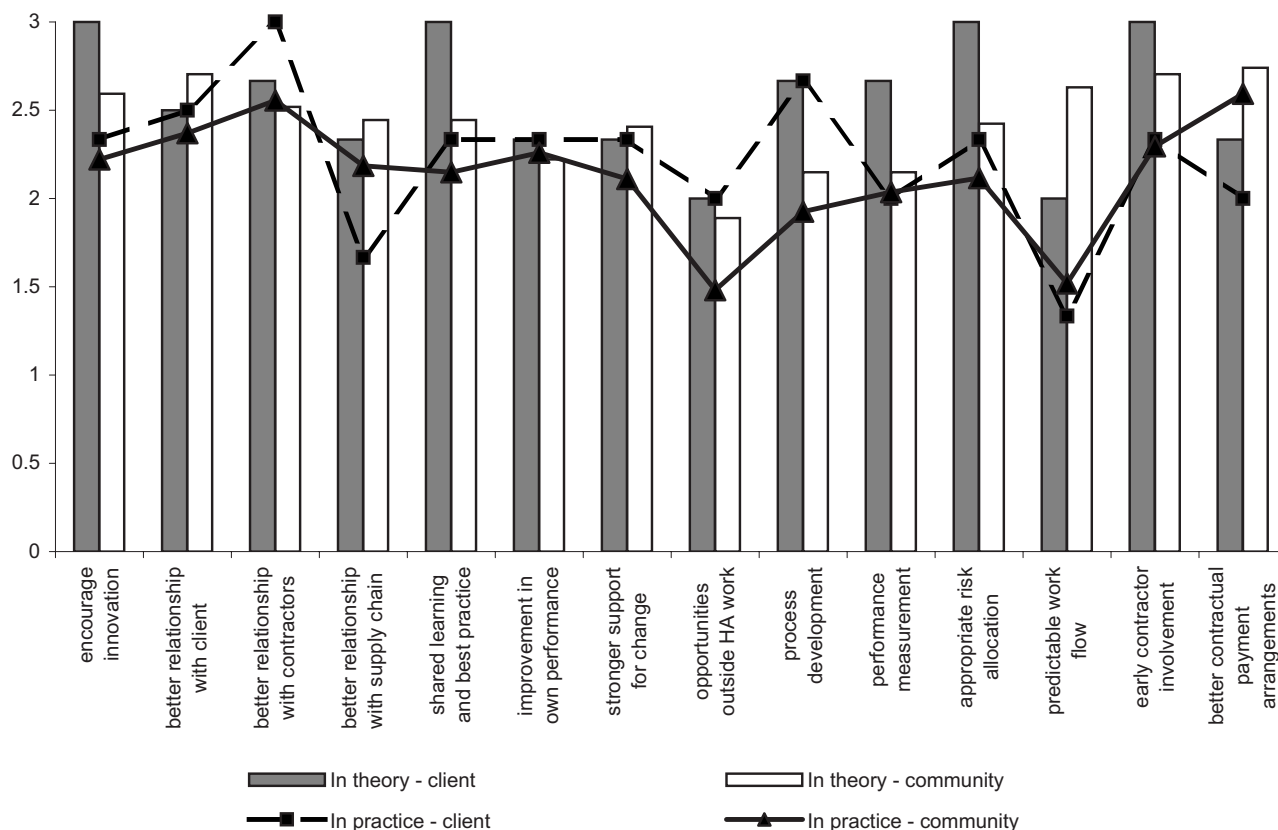


Fig. 5. Advantages (supposed and realized) to working in CM community

be conducted to see where it is important to improve practice to achieve best value. This would enable the community to focus on improving those areas to reap greater benefits.

When asked what the future potential of the CMF is for the highways construction industry, responses ranged from massive potential and it should be the preferred method of working for the whole of the HA, to very little potential until there is a genuine focus on performance. This last comment was the only negative comment; 16 positive comments were received from the total of 27 responses (three respondents did not answer this question). However, of the 16 positive responses, five believed further improvement was still required. The remaining ten respondents withheld judgement on the future potential, pointing to the need for improvement before any potential is realized or otherwise.

Other Studies

While this research canvassed the opinions of the people involved in the CMF, an independent study commissioned by the HA has compared the CMF to the Works Framework Contract (WFC) currently in operation in the southeast of England, covering Areas 3, 4, 5, 6, and 8 (Halcrow Group Limited 2006). The WFC operates on a contract similar to the CMF; that is, a cost reimbursable basis against an agreed target cost. However, the WFC comprises five main contractors with their own supply chain, delivering projects in relative isolation, working across five HA areas (Halcrow Group Limited 2006). The study reports that the CMF shows an efficiency saving of 5.11% when comparing actual cost to the final agreed on target price, while the WFC shows an efficiency saving of 3.38% (Halcrow Group Limited 2006, p. 13). The report concludes that the CMF delivers realistic, accurate target costs, with most projects delivered at below the target; furthermore, it praises the framework for creating a delivery group that acts as a single supplier tailored to meeting client objectives (Halcrow Group Limited 2006). This report would seem to have a more optimistic outlook on the CMF than the research might show, and generally agrees with the respondents of the research that there are real benefits to this type of procurement arrangement and it is well suited to the type of work it is currently being used for.

Conclusions

The research shows there are benefits associated with using the CMF for highway maintenance, however, there are definite areas of improvement that have been highlighted. These include aligning best value definitions so that all agree on what constitutes best value, and aligning measurement to the best value definition. For the CMF, this includes removing the measures for: company performance, process development, pricing procedure, predictability of accruals, and lean pricing. Further goals that should be considered for inclusion are: value management, clear client brief/ clearly identifying the problem to be addressed, agreement to measures/client expectations, effect of road works on congestion, and quality.

Measures for cost predictability, customer satisfaction, and company performance, if these remain on the measurement agenda, need to be reviewed to better reflect actual performance. Greater effort should be given to improving performance in: identifying the optimum solution, integrating the supply chain, cost, and time predictability, and lean pricing.

If the CMF is to improve its potential in achieving output goals, it needs to be more effective in achieving cost objectives

and delivering work that is defect free. It also needs to improve the relationships between various parties, particularly where good relationships may not be so easy to build, but are important to the delivery of best value.

To achieve the expectations of the client, the CMF needs to improve in the areas of innovation and ECI, demonstrating how these tools do actually provide best value to meet the client's expectations. From the client's side, better predictability of workflow is required by the specialists. In particular, the latter is an area to be considered when establishing any framework as the problems involved with irregular workflows are a source of discord for contractors.

Scepticism regarding framework contracts based on a cost-reimbursable contract is prevalent across the construction industry. However, this case study shows that there are real benefits to be gained through forming and maintaining relationships, facilitated by a nonadversarial environment. The sample involved in the research appears to have been open in their responses; there has not been as positive an endorsement for the framework as might be expected and constructive criticisms aimed at improving the current contract for the benefit of all parties have been provided. It has been acknowledged that a focus on performance is lacking; however, actual measures of performance are higher than perceived—possibly this is evidence that a culture of continuously improving drives the need for improving performance and promotes the belief that performance can be bettered. The CMF has been independently praised in a study commissioned by the HA (Halcrow Group Limited 2006) and the members of the framework can build on its success by focusing on delivering to a shared definition of best value.

Appendix

Questionnaire: Defining and measuring best value in Construction Management.

The Construction Management Community (CMC) has been in operation for highways renewals and improvements schemes in Areas 9 and 10 for the last three years. The Community defines its primary objective as demonstrating that Construction Management provides (or shows the clear potential to provide) Best Value to the HA, and for the Specialists involved.

The aim of this questionnaire is to seek current views and expectations of Construction Management, with an emphasis on the achievement and measurement of best value.

Please tick the appropriate boxes ☒, circle the most appropriate choice, and/or provide comments where necessary.

Section A: The Respondent Background Information

1. Which Highways Agency Area do you work in?

☐ Area 9 ☐ Area 10 ☐ Both

2. Which of the following roles does your organisation take in the CMC?

☐ Client ☐ Specialist Framework Contractor
☐ Construction Manager ☐ Supply Chain Partner
☐ Other - please specify: _____

3. What position do you hold in your company?

4. Prior to joining the CMC, have you had any previous experience of construction management as a procurement method, in which specialist contractors have a direct contract with the client?

☐ No
☐ Yes ☐ <1 year ☐ 1-5 years ☐ 5-10 years ☐ >10 years

5. How much of your total construction experience has been spent working with the following forms of procurement? Give your answer as a percentage.

Traditional - bid and build _____
 Prime contracting (eg design and build) _____
 Management contracting (including CM) _____
 PFI _____
 Other - please specify: _____
 Total 100

6. How many CMC projects have you been involved with (or are currently involved with) at ECI stage?

☐ 0 ☐ 1 ☐ 2-3 ☐ 4-7 ☐ >7

7. How many CMC projects have you been involved with (or are currently involved with) at construction stage?

☐ 0 ☐ 1 ☐ 2-3 ☐ 4-7 ☐ >7

8. On an individual basis, how much time do you spend on non-project specific community activities?

☐ < ½ a day a month
☐ 1 day a month
☐ 2-3 days a month
☐ 4-5 days a month
☐ < 5 days a month - please specify: _____

Section B: Measuring Best Value

9. In your own words, define best value.

10. From the list below, or specifying any others, rank what you consider to be the three most important requirement to the client in delivering best value (eg if you thought the most important requirement to the client would be low construction costs, you would put a 1 in the box next to "Low construction costs").

Free from defects on completion	<input type="checkbox"/>
Delivered on time	<input type="checkbox"/>
Delivered within budget	<input type="checkbox"/>
Fit for purpose	<input type="checkbox"/>
Low construction costs	<input type="checkbox"/>
Pleasing to look at	<input type="checkbox"/>
Short construction period	<input type="checkbox"/>
Supported by worthwhile guarantees	<input type="checkbox"/>
Satisfactory life of repair	<input type="checkbox"/>
Low maintenance cost	<input type="checkbox"/>
Minimal disruption to public	<input type="checkbox"/>
Other: please specify _____	<input type="checkbox"/>
Other: please specify _____	<input type="checkbox"/>
Other: please specify _____	<input type="checkbox"/>

11. Score the following groups so that the total equals 100 of the impact you think each group has on achieving best value within the CMC (e.g. if you think all the groups have an equal impact, you would give each group a mark of 25, i.e. 4 x 25 = 100).

Client _____
 Construction Manager _____
 Specialist Framework Contractor _____
 Supply Chain Partner _____
 Total 100

12. The CM community identifies nine input and nine output goals to measure best value. Rank these goals in order of relevance to achieving best value, from highest (1) to lowest (9).

A. INPUT GOALS

- ☐ **Integrated Supply Chain** – ensuring Processes and Culture are shared throughout the Supply Chain.
- ☐ **Teamwork** – the ability to develop strong integrated teams on projects.
- ☐ **Optimum Solution** – identifying the Optimum Solution at the earliest opportunity including identifying risks.
- ☐ **Respecting and Valuing our People** – valuing all individuals.
- ☐ **Integrated Safety Culture** – working as a Community to improve Safety.
- ☐ **Pricing Procedure** – consistent use of prescribed pricing procedures to ensure optimum prices for schemes.
- ☐ **Process Development** – improving key processes to drive overall improvements.
- ☐ **Robust Measure of Performance** – effective measurement of key goals and strategies to drive continuous improvement.
- ☐ **Company Performance** – effective measurement of individual organisations / companies to provide a platform for improving performance.

B. OUTPUT GOALS

- ☐ **Time Predictability** – delivering projects to initial time estimates.
- ☐ **Cost Predictability** – delivering projects to initial cost estimates.
- ☐ **Predictability of Accruals** – forecasting accrual expenditure during the lifetime of a scheme.
- ☐ **Safety** – delivering schemes in a safe way.
- ☐ **Defects** – eliminating defects.
- ☐ **Lean Pricing** – schemes being built to a competitive cost, showing savings by eliminating waste.
- ☐ **Client Satisfaction Product** – satisfying client expectations in terms of product.
- ☐ **Client Satisfaction Service** – delivering the scheme in a manner that is to the HA's satisfaction and contributes to the HA's objectives.
- ☐ **Customer Satisfaction** – ensuring the public are kept informed of circumstances which impact on the network.

13. In your opinion and giving reasons, are there any other goals for achieving best value which require measurement?

INPUT GOALS:

OUTPUT GOALS:

14. In your opinion and giving reasons, are there any goals which should be excluded from measurement?

INPUT GOALS:

OUTPUT GOALS:

15. On a scale of 1 to 10, with 1 being not at all and 10 being completely, how appropriate do you think the current measure for each output goal is in reflecting the performance of the CMC?

	Not at all → Completely									
Time Predictability	1	2	3	4	5	6	7	8	9	10
Cost Predictability	1	2	3	4	5	6	7	8	9	10
Predictability of Accruals	1	2	3	4	5	6	7	8	9	10
Safety	1	2	3	4	5	6	7	8	9	10
Defects	1	2	3	4	5	6	7	8	9	10
Lean Pricing	1	2	3	4	5	6	7	8	9	10
Client Satisfaction - Product	1	2	3	4	5	6	7	8	9	10
Client Satisfaction - Service	1	2	3	4	5	6	7	8	9	10
Customer Satisfaction	1	2	3	4	5	6	7	8	9	10

Comments

16. On a scale of 1 to 10, with 1 being not at all and 10 being completely, how appropriate do you think the current method of reviewing company performance is in reflecting the performance of the CMC?

	Not at all → Completely									
Company Performance Review	1	2	3	4	5	6	7	8	9	10

Comments

Section C: CMC Performance

17. Rate the input and output goals according to your perception of the current performance of the CM community in general (1 – Highly unsatisfactory, 10 – Highly satisfactory):

A. INPUT GOALS:

	Highly unsatisfactory → Highly satisfactory									
Integrating the Supply Chain	1	2	3	4	5	6	7	8	9	10
Teamwork	1	2	3	4	5	6	7	8	9	10
Optimum Solution	1	2	3	4	5	6	7	8	9	10
Respecting and Valuing our People	1	2	3	4	5	6	7	8	9	10
Integrated Safety Culture	1	2	3	4	5	6	7	8	9	10
Pricing Procedure	1	2	3	4	5	6	7	8	9	10
Process Development	1	2	3	4	5	6	7	8	9	10
Robust Measure of Performance	1	2	3	4	5	6	7	8	9	10
Company Performance	1	2	3	4	5	6	7	8	9	10

B. OUTPUT GOALS:

	Highly unsatisfactory → Highly satisfactory									
Time Predictability	1	2	3	4	5	6	7	8	9	10
Cost Predictability	1	2	3	4	5	6	7	8	9	10
Predictability of Accruals	1	2	3	4	5	6	7	8	9	10
Safety	1	2	3	4	5	6	7	8	9	10
Defects	1	2	3	4	5	6	7	8	9	10
Lean Pricing	1	2	3	4	5	6	7	8	9	10
Client Satisfaction - Product	1	2	3	4	5	6	7	8	9	10
Client Satisfaction - Service	1	2	3	4	5	6	7	8	9	10
Customer Satisfaction	1	2	3	4	5	6	7	8	9	10

18. Using the letters assigned to each form of procurement shown below:

A Construction management

B Traditional (bid & build)

C Prime contracting (eg design & build)

D Management contracting

E PFI

F Other – please specify: _____

G Other – please specify: _____

In your opinion, what form of procurement would achieve the best results for the following output goals?

Time Predictability	<input type="checkbox"/>
Cost Predictability	<input type="checkbox"/>
Predictability of Accruals	<input type="checkbox"/>
Safety	<input type="checkbox"/>
Prevention of Defects	<input type="checkbox"/>
Lean Pricing	<input type="checkbox"/>
Client Satisfaction - Product	<input type="checkbox"/>
Client Satisfaction - Service	<input type="checkbox"/>
Customer Satisfaction	<input type="checkbox"/>

19. Using the same letters as in question 15, what form of procurement is best suited to the following categories of work procured by the Highways Agency in your opinion?

Maintenance	<input type="checkbox"/>
Renewals and improvements	<input type="checkbox"/>
Sensitive locations	<input type="checkbox"/>
Short term contracts	<input type="checkbox"/>

Section D: Working in the CMC

20. In achieving best value in the CMC, how important do you think it is for your company to establish a good relationship with the following people? Rank in order of importance, with 1 being most important, to 4 being least important.

Client (ie Highways Agency)	<input type="checkbox"/>
Construction Manager	<input type="checkbox"/>
Specialist Framework Contractors	<input type="checkbox"/>
Supply Chain Partners	<input type="checkbox"/>

21. In general, how easy have you found it to establish a good relationship with the following people:

	Not easy at all → Very easy				
A Client	1	2	3	4	5
B Construction Manager	1	2	3	4	5
C Specialist Framework Contractors	1	2	3	4	5
D Supply Chain Partners	1	2	3	4	5

22. In your experience, what did you think would be the benefits of working within the CM community (in theory), and what are the actual benefits (in practice)?

	IN THEORY			IN PRACTICE		
	No benefit	Some benefit	Great benefit	No benefit	Some benefit	Great benefit
Encourage innovation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Better relationship with client	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Better relationship with contractors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Better relationship with supply chain partners	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shared learning and best practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improvement in own performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stronger support for change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	IN THEORY			IN PRACTICE		
	No benefit	Some benefit	Great benefit	No benefit	Some benefit	Great benefit
Opportunities outside HA work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Process development	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Performance measurement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Appropriate risk allocation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Predictable work flow	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Early contractor involvement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Better contractual payment arrangements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. In your opinion, are there any other benefits of working within the CM community:

A In theory?

B In practice?

24. From your experiences, what do you consider are the disadvantages of working within the CM community, if any?

25. In your opinion, what is the future potential for construction management as a procurement method in the highways construction industry?

Thank you for completing this questionnaire

If you would like a summary of the results, please write your contact details below:

<p>Please return to: Mary Wolbers Senior Project Engineer AmeyMouchel Highways Maintenance Compound Stafford Park 10 Stafford Park Industrial Estate Telford TF3 3BU</p>	<p>If you have any queries concerning this questionnaire please contact me: By telephone: 01952 655558 / 07736 739629 By email: mary.wolbers@ameymouchel.com By fax: 01952 655501</p>
---	---

References

- Audit Commission. (2000). "On target: The practice of performance indicators." London.
- Barlow, J., and Jashapara, A. (1998). "Organisational learning and inter-firm partnering in the UK construction industry." *Learn. Organ. Int. J.*, 5(2), 86–98.
- Beatham, S., Anumba, C., Thorpe, T., and Hedges, I. (2004). "KPIs: A critical appraisal of their use in construction." *ATB Metall.*, 11(1), 93–117.
- Blayse, A. M., and Manley, K. (2004). "Key influences on construction

innovation." *Constr. Innovation*, 4, 143–154.

- Cheng, E. W. L., Heng, L., Love, P. E. D., and Irani, E. (2004). "Strategic alliances: A model for establishing long-term commitment to inter-organizational relations in construction." *Build. Environ.*, 39, 459–468.
- Construction Management Community. (2004). "2004 annual report." Newcastle-under-Lyme: Construction Management Community, Newcastle-under-Lyme.
- Construction Management Forum. (1991). "Report and guidance." Centre for Strategic Studies in Construction, RhysJones Consultants, Univ. of Reading, Reading, U.K.
- Egan, J. L. (1998). "Rethinking construction: The report of the Construction Task Force to the Deputy Prime Minister, John Prescott, on the scope for improving the quality and efficiency of UK construction." *Rep.*, Department of the Environment, Transport, and the Regions, London.
- Fortune, C., and Setiawan, S. (2005). "Partnering practice and the delivery of construction projects for housing associations in the UK." *Eng., Constr., Archit. Manage.*, 12(2), 181–193.
- Green, S. D. (2002). "Partnering: The propaganda of corporatism?" *J. Constr. Procure.*, 5(2), 177–187.
- Halcrow Group Limited. (2006). "Construction management framework value for money study." Yorkshire, U.K.
- Highways Agency (HA). (2001). "Delivering best value solutions and services: HA procurement strategy." London.
- Highways Agency (HA). (2004). "Value management of the structures renewal programme." *Highways Agency Guidance Document Version 2.2*, London.
- Highways Agency (HA). (2005a). "Customers first: The highways agency corporate plan." Highways Agency Publications Group, West Yorkshire, U.K.
- Highways Agency (HA). (2005b). "Value management of pavement renewal schemes." *Highways Agency Guidance Document*, London.
- Highways Agency (HA). (2006a). "Achieving best value in construction and maintenance." London, (<http://www.highways.gov.uk/aboutus/984.apx>) (Jan. 23, 2006).
- Highways Agency (HA). (2006b). "Procurement strategy review." London, (<http://www.highways.gov.uk/business/1172.aspx>) (Jan. 25, 2006).
- Ingrige, B., and Sexton, M. (2006). "Alliances in construction: Investigating initiatives and barriers for long-term collaboration." *Eng., Constr., Archit. Manage.*, 13(5), 521–535.
- Institute of Value Management. (2002). "What is value management?" (http://www.ivm.org.uk/vm_whatism.htm) (Jan. 23, 2006).
- KPI Working Group. (2000). "KPI report for the Minister for Construction." *Rep.*, Department of the Environment, Transport, and the Regions, London.
- Latham, M. (1994). "Constructing the team: Joint review of procurement and contractual arrangements in the United Kingdom construction industry." *Final Rep.*, HMSO, London.
- Ledger, A. (2003). "An agenda for collaborative working arrangements: The role of partnering and alliancing in the U.K." *Dispute Resolut. J.*, 58(2), 36–46.
- Lewendon, R. S. (2004). *Proc., Use of NEC: Engineering and Construction Contract*, London.
- National Audit Office. (2001). *Modernising construction*, Stationery Office, London.