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Perspectives of different parties involved in the selection of capital equipment for sewerage and wastewater-associated infrastructure investment projects

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Abstract

This paper presents a study of UK water industry capital equipment selection, focusing in particular on behaviour in relation to sewerage/combined sewer overflow (CSO) and wastewater-associated investment activities. Valuable new insights into the perspectives of different parties, including water service providers (WSPs), design consultants and construction companies, are provided. Through analysis of over 200 questionnaires, equipment selection is confirmed to be multi-organisational, with different parties dominating different roles. Among the selection criteria, service and quality are found to be valued as parameters worth paying for. Relationships and sustainability considerations are also found to be important, although views on whether sustainability benefits will be paid for are divided. While interparty alignment of views is generally good, there are occasional discrepancies at the individual water region level. It is suggested that optimisation might derive from recognising the significance of intangible components of the supplier offering, and managing relationships to allow these to be capitalised upon.

Introduction

Levels of investment in UK water industry infrastructure in recent years have been enormous. Often, the requirement to invest has stemmed from the implementation of European Directives. In England and Wales, the operation of 'asset management plan' (AMP) investment cycles, developed by water service providers (WSPs) in consultation with the office of water services (OFWAT), has given structure and control to the process, providing a mechanism to ensure that the requirement to invest is balanced with the ability of the consumer (i.e. the bill payer, including the general public) to pay. This trend is likely to continue, as further environmental legislation is implemented.

The position faced by the UK water industry is a challenging one. In England and Wales, privatisation of the former Water Authorities under the Water Act of 1988 has meant that the perspectives of shareholders must now be taken into account. This is essential to ensure that sufficient equity investment is maintained to enable companies to operate effectively, while carrying out their obligations in relation to the various European Directives and associated spend programmes. Consideration of shareholder interests is also likely to be an issue for the water authority-led public–private joint venture approach adopted in Scotland.

Lying at the heart of water industry-restructuring initiatives has been the need to optimise efficiencies. Privatisation itself has long been regarded as a catalyst for efficiency improvement, given the addition of 'shareholders' and ultimately 'competitors' to the management equation. Hence, it is no coincidence that privatisation, or increased involvement of private sector organisations has coincided with the requirement to invest. Indeed, it could be viewed that such changes have served as an enabler of the process.

Since 1988, the individual water companies of England and Wales have undergone waves of restructuring and downsizing, often coupled with increased outsourcing of business components (Hall & Lobina 2001). This has been accompanied by several changes of ownership. While the long-term implications of change have provoked debate (Smith & Hannan 2003), it is generally accepted that efficiency improvements have resulted, in turn assisting the ability to invest. As a result, water–environmental improvements are being reported (Environment Agency 2003).

It has been suggested that, since privatisation, up to 75% of the scope for efficiency improvement in the UK water industry has already been achieved (Water UK 2003). Some of this is attributable to refinements in the investment implementation process. Historically, the construction industry, upon which the water sector is reliant for investment work, has had a reputation as being adversarial (Latham 1994; Egan 1998), being highly subcontractor orientated, and tending to be short term and over cost-conscious in outlook. It is now acknowledged that this type of approach and associated culture is unlikely to be conducive to efficiency optimisation in the longer term. Promoted by the current climate of investment, coupled with the need to optimise efficiencies and balance the demands of a range of stakeholders, the water industry has been both proactive and innovative in its development and adoption of structures and protocols with which to manage its investment programmes effectively. Frequently, partnerships have been formed, and preferred suppliers have been identified and drafted, often under the terms of protocols such as framework agreements. These initiatives have generally been approached as a means of optimising efficiencies and generating capital savings.

In the study presented here, involvement in and perspectives towards capital equipment selection/buying in the water industry are examined, conducted under the proposition that the degree of alignment of views between different parties, including design consultants, construction companies and WSPs, and the nature of their views, can be used as indicators of supply chain efficiency. The study focuses in particular on behaviour in relation to sewerage/combined sewer overflow (CSO) and wastewater-associated investment activities.

Organisational buying behaviour

The management literature, particularly that relating to *industrial marketing*, provides an insight into the nature and characteristics of organisational buying. Much of this is developed along the premise that suppliers must understand their customers' perspectives on equipment selection in order to be able to develop appropriate sales and marketing response strategies. Taking the water industry case, or indeed, any case where subcontractors play a part, it becomes apparent that a supplier must understand the perspectives of each of the different supply chain members in order to optimise its response. This concept is illustrated in Fig. 1, used as the basis for design of the study.

Organisational buying is generally understood as being a 'process'-based activity involving a range of individuals (the *buying centre*), through which decisions are made

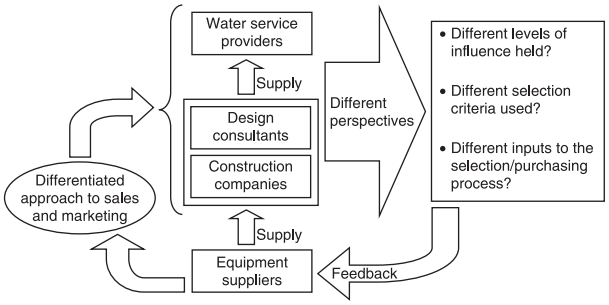

Fig. 1. The concept of differentiated sales and marketing response as applied to the water industry.

based on a range of criteria, the relative importance of which will depend upon the characteristics of the purchase, and the viewpoints of the individuals involved (Michel *et al*. 2003). Webster & Wind (1972) identified five buying centre role types: the buyer, the user, the influencer, the gatekeeper and the decider. Later authors have identified additional role types including the initiator (Jobber 2001). These classifications, utilised in the study, are described below:

- *The buyer* – process supervisor, identifies suppliers, administers the actual purchase, but does not necessarily have deciding influence over the outcome.
- *The user* – actual user, often also the initiator, can be influential in the early stages of supplier search and evaluation.
- *The influencer* – influences the ultimate purchase, may be from outside the organisation.
- *The gatekeeper* – often also the 'buyer', controls buying centre/supplier communications, may be able to 'blacklist' suppliers through blocking information.
- *The decider* – can determine the final outcome of the process, whether based on financial or technical considerations.
- *The initiator* – individual who actually begins the purchase process.

While buying centres can be complex and difficult to characterise in practice (Morris *et al*. 1999), development of an understanding of their form and structure is a prerequisite to understanding buying situations.

A further important parameter of organisational buying, also considered in the study, is selection criteria. Traditionally, the factors of quality, price, service and delivery have been focused upon in the studies of others (Lehmann & O'Shaughnessy 1982; Wilson 1994), although in recent years, there has been increasing interest in subfactors, including relationships (MacKenzie & Hardy 1996), supplier cutting-edge expertise (Ghingold & Johnson 1997), and in relation to water industry decision-making, sustainability (Butler *et al*. 2003). The diversity of criteria and associated rankings identified generally

supports the notion of organisational buying as being context dependent. Some suggest that 'risk' can be used as a primary, sometimes all-encompassing characterising parameter of buying situations (Johnston & Lewin 1996; Michel *et al*. 2003), with high levels of risk or uncertainty tending to denote more rigorous selection processes, involving more people and taking more time.

Given the complexity of organisational buying in practice and the fact that most research has focused on buying in individual organisations (Lewin & Johnston 1996), the literature enables only a limited picture to be developed of how buying behaviour might be in highly subcontracted industries such as the water industry. The development of such an understanding, with its prospect of providing extended insights into areas such as supply chain efficiency, can only be achieved through empirical investigation.

Methodology

A questionnaire-based research approach was adopted, selected due to its suitability for collecting large numbers of responses at minimal expense. This was developed based on a combination of literature review findings, knowledge of water industry issues and insights gained from an initial series of exploratory interviews.

An initial part of the questionnaire was designed to establish participants' roles in equipment selection/buying, based on the role descriptions identified previously. The UK water industry is clearly reliant on subcontractors, and in this regard, the development of an understanding of role divisions between parties was deemed important. Following this, the importance of a range of different selection criteria was investigated. Criteria pertaining to cost, quality, service and delivery were initially investigated, followed by sustainability, supplier cutting-edge expertise, relationships and risk. For the criteria of cost, quality, service and delivery, the importance of one factor in relation to another was directly probed. This approach was adopted to ensure that ranking lists could be established even for the smallest sample sets. Further questionnaire sections investigated buying process stage involvement and types of information source used. Responses from these components of the study are presented elsewhere (Faram 2004). Supplementary characterisation information was also collected, relating to type of project involvement, project time-scales (i.e. from initiation to equipment purchase), numbers of people involved in equipment selection and types of procurement protocol used (i.e. descriptors of the buying situation), along with information about individual's organisations, job positions and water region involvement (information to allow respondent profile analysis and response categorisation).

The target group was selected randomly from the contacts database of a supplier of sewerage/CSO and wastewater-related equipment, and owner and operator of an industry conference series. The database was therefore deemed likely to include a wide array of individuals who might have inputs to the selection of capital equipment associated with these areas. The questionnaire was administered by e-mail during a period within the final stages of the England and Wales AMP3 (2000–2005) investment programme.

Results

Respondent characteristics

Out of around 650 questionnaires issued, over 200 were returned, including responses from each of the 11 water and sewerage regions of England, Wales and Scotland. Around three-quarters indicated that they were in senior technical, or senior part/nontechnical positions. Most of the remainder indicated occupation of technical positions, but not necessarily at a senior level.

A reasonably good degree of division between WSP, design consultant and construction company individuals was achieved, allowing analysis according to these parameters. Division according to type of project involvement produced a relatively even split between 'wastewater'-related activities and 'sewerage/CSO'-related activities, with around 10% indicating involvement in both.

Buying centre membership

Response data collected relating to buying centre roles confirmed that equipment selection in the areas focused upon is indeed multi-organisational, with over 95% of participants indicating occupation of at least one of the proposed role positions. Summary findings are presented in Fig. 2, in which responses are divided according to participant's organisation type.

The findings correspond well with logical expectations. Projects that may lead to a purchase requirement are primarily initiated by the WSPs themselves. This party also dominates final decision-making, and becomes the end user. Actual 'buying' of equipment, also the management of supplier communications (under the 'gatekeeper' role), is dominated by the construction companies. This corresponds with their typical position in practice as an implementer. The design consultants, as might be expected, play a dominant role as equipment selection influencers, although they have least representation in the buyer, decider and user roles.

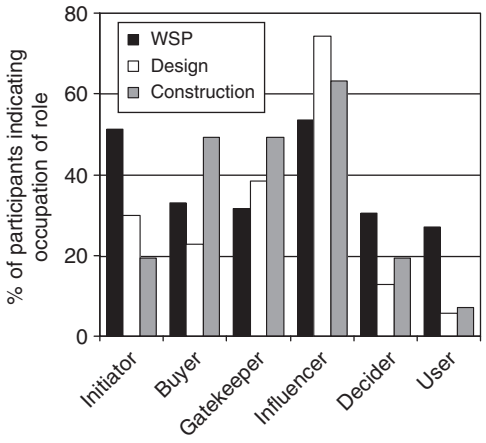

Fig. 2. Buying centre role types represented in water service provider (WSP), design and construction organisations.

Equipment selection criteria

Questionnaire response data relating to equipment selection criteria, divided according to participant's organisation type, are presented in Fig. 3, along with abbreviated forms of the statements and associated options used to generate the responses. This shows percentage distribution between response options for each statement (thin line-linked points, with percentage on the vertical axis), and average responses (thick line-linked points, with degree of disagreement/agreement on the horizontal axis).

In general, the water industry is posited as adopting a forward-thinking approach to equipment selection. Whole-life costs tend to be regarded as more important than capital costs. Good service (including after-sales support), delivery and technical performance are indicated as being attributes worth paying for. Beyond these factors, relationships (including prior business connections) are found to be important, followed by environmental sustainability considerations, track record of equipment and supplier cutting-edge expertise.

Some areas of conflict are identified between some of the responses. While most participants consider that environmental sustainability is considered in equipment selection, there is a divided view on the willingness of organisations to pay for this. This conflicts to some degree with the question of importance of capital costs compared with whole-life costs, and infers uncertainty as to whether 'sustainability' is a factor that will, or has potential to yield savings in the longer term. A further contrast of responses is found in relation to aspirations towards open and co-operative relationships with suppliers, and views on the formality/contractuality of relationships in practice. While the question of aspiration for close relationships yields a very positive response in general, the

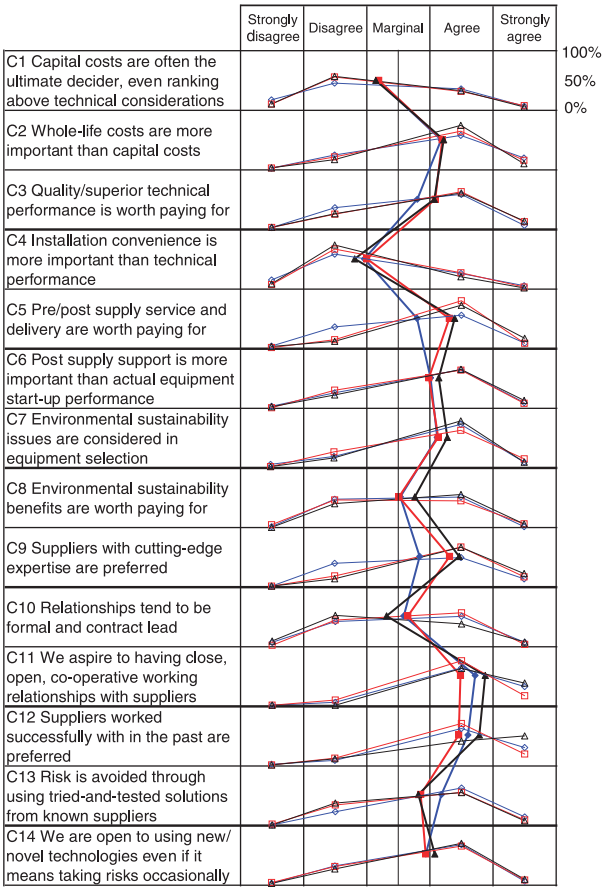

Fig. 3. Response data relating to equipment selection criteria, divided by type of organisation —◇—, WSP % division (82); —□—, design % division (71); —△—, construction % division (57); —◆—, WSP average (82); —■—, design average (71); —▲—, construction average (57). WSP, water service provider (bracketed figures on key indicate sample size).

view of whether or not actual relationships tend to be formal and contract lead in practice is divided. A final contrast of responses is found in relation to 'risk-taking' in equipment selection. In most cases, respondents indicate a preference for known solutions, while also indicating openness to new ideas. It is suggested that this may reflect different perspectives: one relating to the current tendency towards the use of procurement protocols (e.g. preferred suppliers lists, framework agreements, etc.), and hence constraints over the range of selection options, and the other relating to the fact that in recent years, the industry has been faced with the challenge of satisfying increasingly stringent environmental criteria, while delivering increased business efficiencies. Hence, while there might be an underlying preference for known solutions, evolving technical requirements, combined with commercial considerations may be demanding the consideration of 'novel' options.

This overall average view suggests good alignment between the perspectives of the different parties involved in water industry projects. The primary deviations from this are for statements C5 and C9, the first relating to the importance of service and delivery in relation to cost and the second relating to the relevance of supplier cutting-edge expertise. In both cases, while the overall perspective is towards agreement with the statements, the WSPs viewpoint is marginal. This may relate to the level and nature of interaction of WSP personnel with suppliers at the design and implementation phases of a project compared with that of other parties, and in turn, their exposure to and appreciation of the service components of a supplier's offering.

Division of response data by water region identifies occasional deviations from the overall view discussed above. Figure 4 presents average responses to statements C1–14 (as included in Fig. 3), divided according to both water region and type of organisation (note: actual company names are omitted, respecting obligations to participants). Based on considerations of statistical significance, data sets consisting of less than five response inputs are omitted.

It is evident that some water regions exhibit better interparty alignment of views than others. For Region 9, alignment is particularly good, with average responses being similar for all parties for the majority of statements. Alignment is also relatively good for Regions 7 and 8. Other regions are less well aligned (excepting Regions 1 and 4, for which only WSP data are shown). Region 6 exhibits a particularly high degree of variability, with party averages spanning response categories for many of the statements. This may manifest as conflict and inefficiencies in practice.

Further contrasts in views are occasionally found between different water regions. In illustration, while most parties disagreed that capital costs might rank above technical considerations (under statement C1), there is a bias towards agreement from one or more parties in Regions 1, 5 and 6, inferring a short-term view. This view is further reinforced by WSP parties in Regions 1 and 5, through a divided consensus on whether whole-life costs are more important than capital costs.

WSP parties in Regions 7 and 9, identified as exhibiting superior interparty alignment, indicate the highest overall levels of agreement with statements C6, C9 and C11, relating to postsupply support, supplier cutting-edge expertise and relationships. Notably, for Region 9, all WSP respondents indicate 'strong agreement' with C11, relating to aspirations towards having good working relationships with suppliers, representing the most positive response of the entire survey. This party also has one of the most positive views towards using 'new' or 'novel' technologies. In contrast, WSP respondents in Region 6, for which interparty alignment is poor, indicate some of the strongest levels of disagreement with statements C6 and C9, and only an average response to C11. This party also indicates least openness to using new or novel technologies (C14).

A further factor found to influence equipment selection criteria is type of project involvement. Response data, divided and averaged according to the two main investment areas, sewerage/CSO and wastewater are presented in Fig. 5.

For wastewater-related projects, capital costs are indicated to have a stronger weighting in relation to technical criteria compared with the case for sewerage/CSO projects (under C1). This view is confirmed for WSP respondents under C3, where only marginal agreement is indicated that more will be paid for superior technical solutions. Further to this, installation convenience is ranked higher compared with technical performance than for sewerage/CSO-related projects (C4).

While parties consistently agree that environmental sustainability issues are taken into account in equipment selection (C7), the strength of agreement is slightly less for WSP and construction parties involved in wastewater projects. This also corresponds to less willingness to pay for such benefits by design and construction parties working in this area (C8). This may stem from the nature of the different types of activity. The improvement or elimination of a CSO discharge has a more obvious environmental implication than the expansion of a wastewater treatment facility.

Parties involved in wastewater-related activities indicate supplier relationships to be more formal and contract led than those involved in sewerage/CSO-related activities (C10). However, aspirations towards having close working relationships are stronger, with a preference to work with suppliers with which they have had successful working relationships in the past (C11 and C12). This is accompanied by less willingness to take risks (C13 and C14).

Broadly, although the behaviour of the different parties is similar, those involved in wastewater related projects tend to be more cost-conscious, more risk averse and generally more keen to manage relationships and work with known parties than their sewerage/CSO project counterparts.

The reasons for the above differences can be attributed to the characteristics of the respective types of project. A separate part of the questionnaire found that initiation to purchase times were longer for wastewater-related projects, and that more people had an influence in the process (Faram 2004). These factors all denote a greater level of risk (Johnston & Lewin 1996).

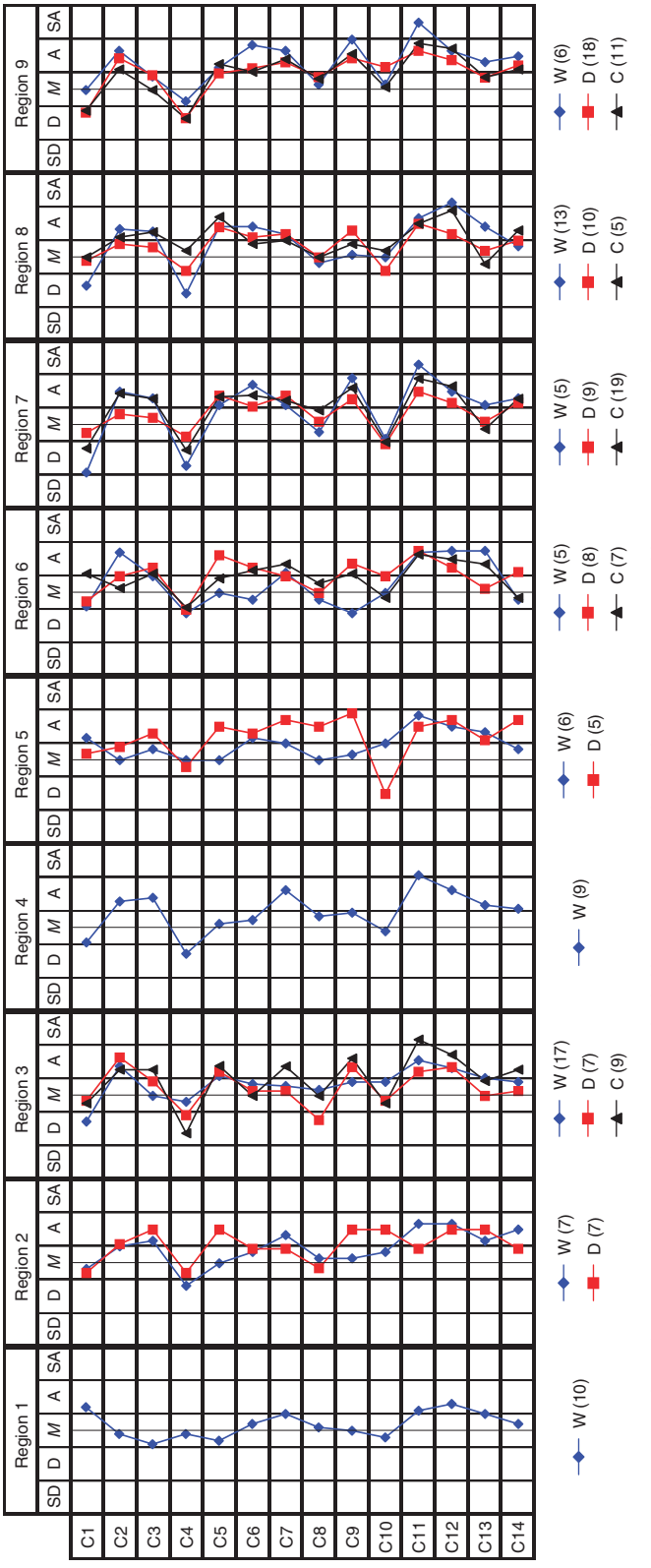

Fig. 4. Average response data relating to equipment selection criteria, divided by water region and type of organisation. (Letter abbreviations correspond to response categories and organisation types as included in Fig. 3, bracketed figures indicate sample size.) *M*, marginal.

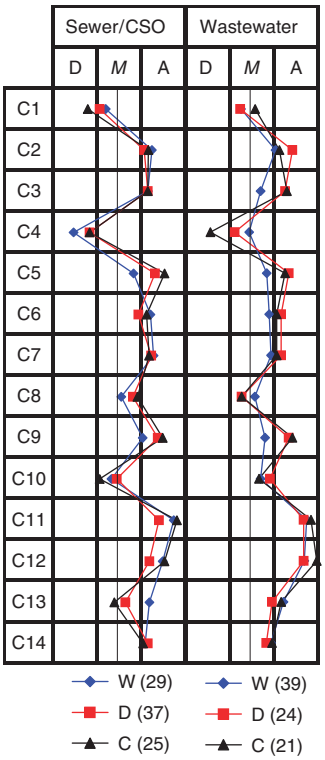

Fig. 5. Average response data relating to equipment selection criteria, divided by type of project involvement and type of organisation. (Notation as for Fig. 4.) *M*, marginal; CSO, combined sewer overflow.

A model of buying in the water industry

Based on the study findings, a simple model of buying in the water industry can be developed. This is presented in Fig. 6.

The model, focusing on behaviour in relation to wastewater and sewerage/CSO-associated investment activities, presents the concept that WSP, design consultant and construction company personnel, through occupation of different roles, have collective input to the equipment selection process. A variety of criteria influence the process, including financial and technical factors, along with less tangible factors including service, relationships, environmental sustainability considerations and supplier expertise. The relative importance of these factors depends upon the characteristics of the situation, and the perspectives of those involved.

While overall industry average views suggest a relatively good alignment between different supply chain parties, more detailed analysis reveals discrepancies at the individual water region level, and between different types of investment activity. While views pertaining to different types of project activity can be explained in part by considering risk factors, explanation of regional variances is less straightforward. It is suggested that such an

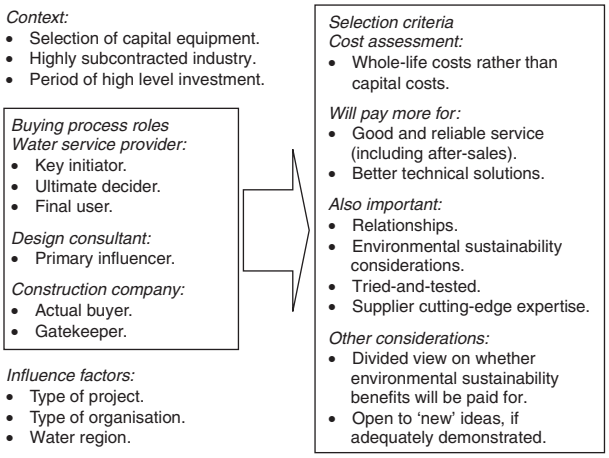

Fig. 6. A model of buying behaviour in the water industry.

explanation might stem only from the development of a better understanding of the nature of relationships between different supply chain parties, their business strategies and perhaps their cultures. The study results do, however, provide some pointers. Significantly, in the best-aligned regions, postsupply support, supplier expertise and in particular, relationships, are consistently ranked higher by WSP respondents in these regions than by their counterparts in poorly aligned regions. The general response of these parties suggests a broad-based approach to equipment selection, recognising intangible components of a supplier's offering as being at least as important as tangible components.

Conclusions

This study provides new insights into the perspectives of those involved in the selection of capital equipment for sewerage/CSO and wastewater-associated investment projects, giving rise to the following conclusions:

(1) Equipment selection is influenced in different ways and to differing degrees by WSPs, design consultants and construction companies.

(2) Alignment between the views of different parties is generally good, although there are some discrepancies at the individual water region level. Further to this, views depend on the type of project activity.

(3) Overall, the criteria of service and quality are high on the agenda in relation to price. Relationships and sustainability issues are also important, although there is uncertainty as to whether sustainability benefits will be paid for.

(4) Broad-based approaches to capital equipment selection must be adopted, recognising that optimisation depends on more than simply getting a good 'physical' product at a good price. WSPs in particular must recognise

the importance of managing relationships in order to capitalise fully upon both the intangible as well as tangible components of the supplier offering. This attention to relationships may also be the key to optimising interparty alignment, and ultimately, supply chain efficiency.

The UK water industry has made strides from the adversarial and over cost-conscious position claimed for the construction industry in general in the past. While scope for improvement remains in some water regions, and in relation to certain criteria, the overall view is positive, providing a useful benchmark for other subcontractor-oriented industries.

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