-- FOR REVIEW --

An Analysis of Issues Pertaining to Qualifications-Based Selection

A National Study Developed at the Request of

the American Public Works Association (APWA) and

the American Council of Engineering Companies (ACEC)

Paul S. Chinowsky, PhD

University of Colorado, Boulder, CO

Gordon A. Kingsley, PhD

Georgia Institute of Technology, Atlanta, GA

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Executive Summary

In Brief

Public agencies that use Qualifications-Based Selection (QBS) to procure architectural and engineering (A/E) services are better able to control construction costs and achieve a consistently high degree of project satisfaction than those using other procurement methods, according to a two-year study led by Paul S. Chinowsky, PhD of the University of Colorado and Gordon A. Kingsley, PhD of Georgia Tech. The authors, both experts and noted researchers in the engineering and construction field, contend that QBS should continue to be the procurement method of choice for public contracting officers seeking to acquire A/E services to meet increasingly challenging infrastructure needs.

Background and Summary of Findings

The Brooks Act (Public Law 92-582), which has governed the Federal procurement of design services since 1972, sets forth a "Qualifications-Based Selection (QBS)" process requiring architectural and engineering firms to compete for government contracts on the basis of experience and technical expertise, rather than simply on cost. After firms are evaluated and short-listed based on their qualifications, the top ranked firm is selected for price negotiations, and a fair and reasonable price is reached based on a detailed scope of the project. If agreement on price cannot be reached with the most qualified firm, negotiations commence with the second most qualified firm. In the vast majority of cases the top ranked firm is selected at a price that fits the client's budget.

Most states have followed the federal example and adopted "mini-Brooks" laws and regulations. Yet, despite its widespread use, challenges to the process continue to emerge from advocates of cost-based procurement methodologies who place greater emphasis on the cost of design services rather than the technical qualifications of the designer.

The study conducted by Drs. Chinowsky and Kingsley provides a quantitative analysis of the use of QBS, testing its impact, relevance and implications in a number of ways. The researchers conducted an extensive survey of projects and analyzed the impact of QBS on project outcomes. Project data was gathered from a stratified sample, randomly drawn from geographically diverse projects. The study assessed cost, quality and other measurements.

Key findings:

- **QBS Ensures Cost-Effectiveness** – Hiring the most qualified design services at a reasonable price is the best way of ensuring that the final constructed project is completed on time and on budget. From a quantitative perspective, QBS-based projects are lower than the national average in terms of both cost and schedule growth – a key indicator of design impact on the constructed facility. While the industry average on cost growth (defined by the value of the cost of change orders as a percentage of the final construction cost) is approximately 10 percent, QBS projects are 3 percent. On schedule growth, the national average of about 10 percent can be compared to QBS projects which have an average of 8.7 percent, with 60 percent of those projects experiencing schedule growth of less than 3 percent.

- **QBS Results In Better Projects and Highly Satisfied Owners --** 93 percent of owners surveyed on QBS projects in the study rated the success of their final project as high or very high. There was also a strong correlation between the ratings of owners and those of the design teams. The study found other similar indicators of satisfaction and quality, including a high level of trust between owners and designers on QBS projects.

- **QBS Lowers Risk for Complex Projects –** Owners expressed special interest in using QBS on projects with higher risk factors and/or higher design complexity. QBS procurement enabled the owner to work with the design team to refine scope and explore alternatives on projects that have difficult technical, site location or other engineering challenges.

- **QBS Encourages Innovation, Protects Intellectual Property** – The study confirms widely-held views that QBS promotes a higher level of innovation. In addition, there was a high degree of satisfaction on the part of design firms that the intellectual property included in the innovations was properly protected.

- **QBS Takes Account of Emerging Societal Issues** – The team found that QBS procurements were more likely to address emerging societal needs such as sustainability than cost-based procurements. QBS also addressed the concerns of more stakeholders in the process than cost-based procurements.

- **Supports Owner Capacity Building –** QBS allowed owner organizations to gain specialized quality services from design firms as an extension of staff. Both owner and engineer-of-record gained knowledge and insight based on shared project experience.

The study results support the conclusion that QBS should continue to be considered the procurement method of choice for contracting entities. Both the historical success of QBS and its continued positive performance should dissuade contracting entities from favoring cost-based procurement methods. The factors and analyses that prompted the passage of the Brooks Act have not changed. Rather, new challenges that owners must address reinforce the need for QBS.

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1.0 Introduction

Qualifications-Based Selection (QBS) has been the procurement method of choice for architectural and engineering services for the better part of the last half century. QBS was adopted as federal law through passage of the Brooks Act in 1972, and since then most states have adopted laws and procurement rules based on the federal statute. Public owners understood that the private design sector was an essential partner for meeting the design objectives for the public sector, and that a procurement system focused on qualifications – e.g. the ability to deliver a project that meets or exceeds the client's goals, on time, and on budget – was critical to meeting those objectives.

However, a distinction should be understood that QBS is a way of procuring (i.e., purchasing) rather than an overall acquisition scheme (e.g. project delivery). QBS can be used for all project delivery methods. Major project delivery systems for facilities and infrastructure projects include Design-Bid-Build, Design-Build, and CM At Risk. Major procurement strategies to implement these delivery systems (or various aspects or phases of these delivery systems) include Qualifications-Based Selection, Best-Value Source Selection (Technical Response plus Price), Low Bid, and Sole Source.

Currently, changes in Federal and state laws now provide contracting officers with a spectrum of procurement choices through which the overall acquisition scheme can be implemented. The need to utilize QBS for the procurement of design services within an overall acquisition and delivery plan is no longer viewed as a strict requirement by some contracting officers. In specific scenarios, contracting officers are adopting the perspective of needing different tools in different contracting situations. This change in perspective is challenging the specific applications of QBS.

The challenge to QBS is emerging from several fronts. First, the introduction of prototype or standardized designs in areas such as school and Federal facility design is leading to questions of why qualifications are required to implement prototype designs. Second, the move to greater standardization in the horizontal (e.g., roads and pipelines) engineering sector is motivating some public agencies to question the need for a qualifications-based process. Third, the prevalence of information technologies has made the transfer of designs between firms appear to be a simple "click-and-copy" process. Fourth, the emergence of design-build as a delivery option is enabling contract officers to focus on direct financial competition rather than qualifications-based competition. Uninitiated contract officials are often unaware that costs are not excluded from the QBS process, but rather introduced later in the procurement process after the entity deemed most qualified to do the work is determined and in-depth discussions about scope and price ensue.

The question for public agencies, funding bodies, and the licensed professional engineering industry is which direction is going to be followed for QBS. Is the engineering industry made up of unique entities that provide a set of qualifications that make them qualified to provide the quality and life-cycle cost savings required for today's complex designs? Or, are the changes in technology and standardization changing the engineering market to one of commoditization? Answers to these questions are not straightforward. The uniqueness of projects and the context in which projects are developed create different scenarios for the arguments regarding the appropriateness of QBS. However, to assist individuals in gaining an appreciation for the issues surrounding this topic, this study provides an analysis of how QBS impacts project procurement and execution as well as providing an overview of the current status of QBS procurement.

1.1 Study Motivation

The adoption of the Brooks Act by Congress in 1972 codified the use of QBS for the acquisition of architectural and engineering (A/E) and related professional services. While the Brooks Act remains the federal law guiding A/E procurement and similar (Mini-Brooks) laws guide the majority of state governments, some procurement officials (who may be schooled only in commodity purchasing procedures) still question the QBS process. In response, a number of education initiatives have been undertaken by both national and state organizations to introduce legislators and procurement officials to QBS principles. Concurrently, a limited number of studies have been undertaken to quantify the results of QBS procurement policies. However, a national study of QBS procurement has not been undertaken up to this point. The current study was undertaken to fill this gap and answer the question of QBS impact through a structured analysis process.

These results will assist policy makers in filling the gap between anecdotal evidence of QBS impact and statistical evidence of QBS impact. Although project procurement is varied between different legislative entities and market sectors, the current study represents a first step in altering the discussion on QBS from anecdotal evidence to structured research results.

1.2 Scope of Study

The core of the current QBS research effort is a survey analysis of QBS procurement and its impact on project outcomes. The study is designed to provide a quantitative analysis of the justification for using QBS including both the classic engineering perspective and an emerging relationship to both societal and policy views. The justification for using QBS is multi-faceted:

- Ensures A Competitive and Cost-Effective Process for Owners - QBS incorporates multiple variables in the selection of professional services, with particular importance placed on the experience of firms in addressing projects that have similar characteristics. Furthermore, by procuring the most qualified design services at a reasonable price, owners are best positioned to ensure that the final constructed project is completed on time and on budget.

- Enhances Product Effectiveness – The QBS process emphasizes design capability and experience, and the effect that these attributes can have on safety, function, performance, constructability and life cycle costs of facilities. The initial cost of design is outweighed by the final product performance that results from good design solutions.

- Addresses Incomplete Scope - QBS allows design professionals to provide input to the evolution of the design solution and provide owners with options for completing the project prior to a final price being budgeted.

- Promotes Capacity Building - QBS allows owners to retain core functions such as contract management at a high-level of professional quality while insuring a commensurate level of professional quality by the external design professional.

- Promotes Innovation and Protects Intellectual property - QBS provides encouragement for innovation and the application of creative knowledge to the solution process by emphasizing a total evaluative approach over a singular emphasis on price.

- Links to Societal issues – The current topics of interest to owners intersect the engineering and societal needs of communities and demand the use of professionals who have the knowledge, experience, and foresight to address these issues in the broad context in which they exist.

The analysis of these justification components required an adequate representation of QBS processes across the country. To achieve this representation, the study includes a sample set that comprises **several perspectives** as follows:

- Horizontal Versus Vertical Markets
- Project Procurement Types
- Project Success Spectrum
- Geographic Diversity

As introduced in the methodology section, the study is based on a stratified sample randomly drawn from a population of nominated projects. Data from the selected projects was

requested through a web-survey administered to the project managers. The survey was designed to compare and assess the cost and quality of projects resulting from a QBS contracting process. Key factors reviewed in the study based on the collected data include:

- Design Cost Leverage: The core component of QBS is the belief that qualified firms produce short-term and long-term benefits. The survey obtained project cost data to analyze this core component based on items such as design fee versus total project cost, design fee versus projected life-cycle cost, design fee versus predicted and actual construction cost, and design fee versus schedule, and design fee versus quality outcome.

- Project Risk: The cost and quality of the project may be related to the level of risk associated with the project. The question of how QBS procurement may minimize risk is examined along several dimensions including project, owner, and social risk factors.

- Design Complexity: Projects will differ on the level and types of complexity demanded in the design. This may stem from the range and number of technical skills required to complete the design or from the challenges posed by the size, performance requirements and/or location of the project.

- Project Complexity: The complexity of a project can be described along several dimensions that may influence cost and quality. Among these is the project size in terms of dollars or the number of firms working together. Another is amount of interdependency amongst the different actors in the project and whether the work must be done in a sequential fashion or can be done in a reciprocal fashion. These issues result in cost and time outcomes that can be measured.

- Contracting Costs: The overall costs and quality may be influenced by the transaction costs associated with the contracting process. Poorly designed processes may yield specifications that are poorly articulated resulting in higher costs as the design details are worked out, supplemental requests, and lower quality designs

- Embeddedness/Trust: Transaction costs associated with contracting and contract monitoring can be mitigated to a certain extent if the project managers in the firm and the agency have a history of working with one another. Such a history (i.e., embeddedness) may mean that the contracting parties have more experience with agency procedures, or that they have a higher level of trust in working together which can reduce the amount of time and negotiation.

- Contract Management Costs: Another source of transaction costs are those associated with the maintenance and monitoring of the project. The number of checkpoints in the project, the adequacy of the reporting and oversight practices, and the performance measures used can all has a significant impact on the costs and quality.

- Emerging Societal issues – The concerns of society are beginning to focus on long-term issues such as sustainability, quality of life, human factors, and flexibility. A design

firm's ability to address these issues within the context of a project is an intangible asset that may not be realized for years after the project is completed. However, the ability to analyze and identify opportunities to enhance these components within a design is a significant benefit to the project, to the agency, and to the broader society. Therefore, the study includes a list of emerging issues to determine how the firm addressed these issues during the design process. It is hypothesized that firms with enhanced qualifications in these areas will return higher quality designs in terms of social awareness.

The aggregate of these areas results in a study that is both broader and deeper than anything that has preceded this work and provides a foundation for discussions of QBS from a quantitative rather than qualitative perspective.

1.3 Study Limitations

There are some limitations to this study: chief of which is the population of nominated projects (approximately 200) may not be representative of the overall population of projects eligible to employ the QBS process. We sought to capture variances that might arise from geographic location of firms and owners, whether the contract form relied upon a QBS process or not, whether the delivery system relied upon QBS or not, and also by seeking nominations of a range of projects from successful to unsuccessful in the eyes of owner and designer. However, because of the dataset (nominations = 195; sample = 89; n=41) we have too few responses for several cells to employ powerful statistical tests. In these areas we placed greater reliance upon descriptive statistics rather than inferential tests. This is particularly true when comparing QBS with non-QBS based projects (fewer non-QBS projects were submitted than QBS, perhaps reflecting the predominant use of QBS by public owners) . Consequently our findings are strongest when comparing types of QBS processes.

We also note that respondents experienced some item difficulty with specific questions in the administration of the survey. While the QBS process is established there is considerable variance in the language used to describe this process from state-to-state. Throughout the report we have noted when the item difficulty was sufficient to act as a threat to data quality.

In spite of these concerns, we also note that this survey is unique in the effort to develop a national survey of QBS processes. It is also unique in that responses are anchored in specific experiences associated with engineering design projects rather than general impressions based upon the opinions of professionals. We argue that this provides a better basis for comparing the experiences that firms and owner have in working with the QBS process.

1.4 Reader Guide

The study is divided into six primary sections as follows:

- Methodology – An introduction to the process used to collect the data from which the analysis was conducted.
- Current State of QBS – An overview of the current state of QBS at the Federal and state levels including emerging challenges to the QBS procurement standard.
- Nominated Projects – A demographic summary of the nominated projects from which the final sample was selected.
- Data Analysis – A detailed summary of the data collected in the study including both traditional project measures and emerging societal issues.
- Result Interpretation – An analysis of the study results and their impact on the QBS procurement discussion.

A companion white paper has been developed in conjunction with this study to provide readers with a broader introduction to QBS and the impact of the process on project delivery. The reader is encouraged to read the white paper to obtain a broader understanding of the QBS procurement process.

2.0 Methodology

The QBS Study encompassed two distinct components; the statistical survey and the case studies. Each of these components focused on obtaining a cross section of current projects to determine the effect of QBS on the design-procurement process. To effectively obtain such a cross-section of projects, the completion of the QBS Study required a sample population that was both representative of the geographic diversity in the country and the project diversity that exists within the geographic locations. Project diversity includes size of projects, types of projects, and contract types. Given this requirement, the methodology for the QBS Study emphasized obtaining a project population that was representative of the projects recently completed in the United States.

The initial step in the project population process was to define the requirements for the projects. Based on discussions between the researchers and the sponsors, the following project criteria were established:

- The project should have completed construction within the last 7 years.
- Financial information is available on the project including the total design fee, total construction costs, change orders, etc.
- The projects varied in terms of owner satisfaction from very successful to projects that did not meet expectations. Each responding organization was asked to submit an "excellent" project and a second project that did not meet all expectations
- The projects varied in terms of contract and delivery options.
- The projects originated in every part of the country.

The establishment of the project criteria provided the research team with the basis from which to enter into a two-step project population process; project nominations and project details. In the first step, project nomination, communications were sent to all ACEC and APWA members requesting that projects be submitted for the study. A form was provided that requested basic project and contact information from the nominator. The researchers also conducted outreach independently to obtain additional project data. The result of this process was a pool of over 200 project nominations that met the criteria established for the project population. From this population, the statistical sample and case study projects would be extracted.

The second phase of the project sampling process, project details, required the research team to select 50% of the nominated projects as a random sample for collecting additional project details. The project team used the project type, cost, contracting type, and geographic distribution factors to randomly select projects from the population pool for the statistical and case study sample. The result of this process was a pool of 90 projects that were selected for

project detail analysis. Using a web-based collection tool, Survey Monkey, the team contacted each of the project nominators in the final pool to obtain additional project information.

The results from the project detail phase provided the input for the final analysis presented in this report. From the initial pool of 90 projects that were selected for detailed analysis, 42 responded for a rate of 47%.

3.0 Current State of QBS

QBS is the foundation for Federal procurement law and most states have enacted QBS laws. Therefore, QBS remains the predominant procurement method for public agencies. In the following two sections, an overview is provided of the primary Federal and state issues that are either emerging or continuing to effect QBS procurement.

3.1 Federal Government

In any review of Federal government procurement, there must be some distinctions developed between the overall Federal law and individual interpretations and adjustments within specific Federal agencies. The overall Federal procurement process for design professionals remains guided by the Brooks Act (Public Law 92-582), enacted in 1972. The Brooks Act states clearly that:

> … it is to be the policy of the Federal Government to publicly announce all requirements for architectural and engineering services, and to negotiate contracts for architectural and engineering services on the basis of demonstrated competence and qualification for the type of professional services required and at fair and reasonable prices.

The intent of this statement is that the procurement of A/E services should be determined based on competence and not price. Today, 35 years later, this concept remains the overall guiding force in federal procurement law for professional design services. However, the absolute nature of this legislation is somewhat compromised due to the ability of awarding agencies to use alternative delivery strategies. Specifically, a number of Federal departments and agencies are employing different forms of project delivery, which (because of bundled goods and services) allows alternative interpretations in how purchasing of professional services is implemented.

Variations that have been implemented include the ability to use design-build and best value contracting to bypass the strict interpretation of the Brooks Act. Although this interpretation process may not be intended to bypass the intent of the legislation, the implementation leaves some question as to the ultimate goal of the alterations. In these recent interpretations, there is an increasing blurring of the divide between professional design services and project delivery. Specifically, the increased use of design-build within the Departments of Defense and Transportation is opening the door to evaluating design-build teams on a cost basis rather than a qualifications basis. Similarly, the continuing evolution of the definition for best-value is enabling individual departments to determine how to evaluate best-value and what is the appropriate process for the evaluation. Similar to the discussion of individual state interpretations below, the introduction of these ambiguities is creating an inconsistent procurement environment.

In summary, although the Federal Acquisition Regulations specifically require Federal agencies to follow the Brooks Act guidelines when procuring professional design services, the question of how the Brooks Act is implemented in alternative delivery processes is one that requires examination. As discussed below, the individual states provide an initial look into how this issue is being addressed.

3.2 State Agencies

As documented by the AIA, ACEC, and others, procurement continues to rank as one of the most discussed issues related to the design profession within state legislatures[1]. The focus of these discussions varies significantly between states. Although 47 states currently have some form of QBS law or regulation in place (Figure 3-1), the extent to which these requirements are considered safe or challenged varies significantly. In states such as Illinois, QBS laws such as Illinois SB 1453 - Qualification Based Selection for Design Professionals, are just being adopted to introduce the concept as a legal requirement. In some cases, such as in Georgia and Wisconsin, QBS procurement is either being adopted or reinforced to enhance the process in public projects. However, in states such as Virginia and Maryland, the focus on QBS remains neutral, with legislation to enhance the process delayed or rejected, leaving the current processes in place. At the other end of the spectrum, states such as Hawaii and New Jersey are seeing active moves to weaken QBS procurement laws as arguments are put forth that public projects need more flexibility in contracting options.

The emphasis on challenging existing procurement laws is being driven by different agendas in different states. These various perspectives can be summarized as follows:

- Alternative Delivery Options – Although QBS is not a delivery system, it is being discussed in conjunction with a broad push towards the adoption of alternative contracting strategies such as design-build and CM-at-Risk. In states such as Tennessee and Washington, the move towards design-build is an active government priority. This priority is having the effect that QBS is being examined as to how it either helps or hinders the design-build process. In some states, the priority to move to design-build and a low-cost selection process is driving government agencies to analyze whether QBS is required in these scenarios. Strong support from contractors and contracting associations is keeping this issue at the forefront of legislative agendas.

- Sole Source Selection – A second issue that appears to be gaining strength is the discussion of sole source contracting for professional design services. In this argument, states are analyzing whether it is appropriate to contract with a single design firm for a period of time such as one or two years, and allow that firm to perform all engineering tasks under a certain dollar limit. The issue with this selection is the dollar amount that is

[1] AIA (2006). State Government Affairs legislative Survey, American Institute of Architects.

being discussed. Specifically, states are looking at allowing the sole source design consultant to handle projects with higher budgets to remove the need for a selection process on a greater number of projects.

- Best Value Selection – A third area of consideration that is challenging existing QBS processes is the investigation of Best Value procurement policies. In these scenarios, states are analyzing the opportunity to bring price into the front end of the selection equation by arguing that price is part of the multi-attribute analysis. (As stated earlier, cost is also a factor in the QBS process, and is introduced in the process after the most qualified A/E has been determined for a specific project.) Considerable discussion is taking place as to how the role of price is being balanced in the so-called "best value" equation and whether it should be separated into a two-phase selection process. This discussion continues to develop and will continue to garner attention.

- Outsourcing – The final area of discussion that is a perennial issue within states, but which appears to be gaining momentum, is the issue of outsourcing. In this discussion, the issue before the states is the degree to which engineering services should be conducted in-house or by a professional design firm. The engineering industry is advocating an increase in the outsourcing of engineering services. The concern in this topic is how this outsourcing is occurring. Specifically, some proposals for new laws that will encourage outsourcing are shifting the focus of procurement in these instances away from QBS. Since the focus of these contracts is on providing engineering services on

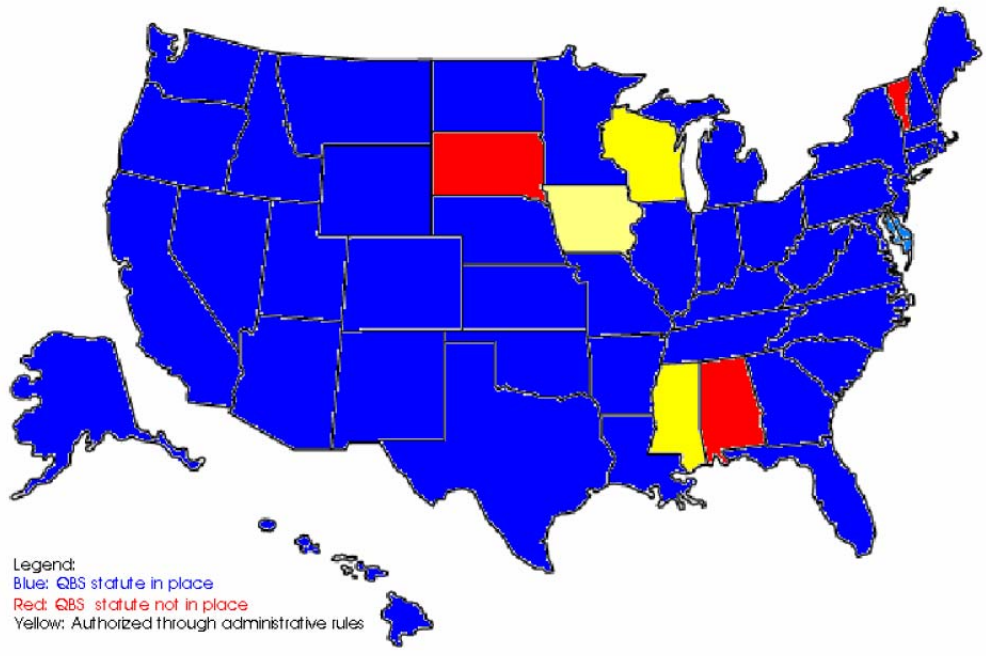

Figure 3-1: Current status of QBS statutes by state (AIA 2006).

project portfolios rather than individual projects, alternative procure methods are being advocated by outsourcing advocates.

The agendas and issues presented above are having an overall effect of challenging the traditional QBS perspective. Although almost all states have what is considered a "Mini-Brooks Act" as the core of their procurement law, the extent to which this core has exceptions varies from state-to-state and is the basis of the QBS challenge in some areas. As states continue to examine issues such as alternative delivery strategies, these examinations appear to provide opportunities for legislators and lobbying bodies to weaken provisions in their procurement laws.

4.0 Project Nomination Summary

Upon the completion of the QBS status research, the project nomination process commenced in January 2007 and was completed in April 2008. The research team used a diverse set of resources for obtaining project nominations. The primary tool in the first phase of the process was a direct e-mail campaign from ACEC Member Organizations to individual member companies. This campaign resulted in a diverse set of projects, but failed to reach the required number for a sufficient population. Building on this campaign, APWA members were contacted to provide additional projects as well as broaden the scope of the population. Finally, a second round of e-mail and phone contacts, carried out by the researchers, was made to ACEC and APWA members in the first quarter of 2008 to complete the project population.

After eliminating incomplete nominations and nominations that did not fit the specified criteria, the final number of projects in the population was 195. These projects represented 37 states that were geographically distributed throughout the United States. The projects were predominantly public projects with an 87% representation, reflective of the types of projects commonly designed by the core membership in the study. As illustrated in Table 4-1, the projects were divided into 5 categories, with transportation having the greatest representation in the nomination pool.

Project Type	Percent Representation
Transportation	54%
Water/Wastewater/Environmental	23%
Commercial and Institutional	14%
Industrial, Process, Energy, Power	3%
Land Development	6%

Table 4-1: Representation of the market sectors in the QBS study.

In addition to the required geographic and project type distribution, the projects also contained diversity in cost, procurement process, construction procurement, and project delivery methods. Although the majority of projects were QBS-based procurement, additional methods including best-value and low-bid were also represented. Although the design fees ranged from under $100,000 to over $10,000,000, the average design fee for the projects was just over $2 million.

The cross-section of projects represented in the nomination pool provided the foundation required to obtain additional detail for the final statistical sample and case studies. Although the projects represent only a fraction of the total constructed facility base put in place each year, the projects are representative of the contracts and processes employed by design firms in the given population.

5.0 Detail Project Summary

The population of 195 projects was used to select the final projects for the data analysis phase. To obtain the final random sample, the researchers employed a two-stage process. In the first stage, the projects were divided according to geographic, procurement, cost, and sector variables. In each of the four cases, a random sample of 50% was selected from the projects to obtain a representative sample. The four sets of projects were then compared to ensure no duplications existed and project diversity was included in the final sample. Where a duplicate was detected, a substitute project was selected that retained similar characteristics as the duplicate. At the completion of the process, 89 projects were included in the final sample pool.

The final sample pool represents projects from 29 states. The projects remain heavily focused on public projects with an 86% representation. As illustrated in Table 5-1, the focus on transportation was reduced from 54% to 40%. The remaining categories remained somewhat stable to reflect the overall nomination pool.

Project Type	Percent Representation
Transportation	40%
Water/Wastewater/Environmental	31%
Commercial and Institutional	18%
Industrial, Process, Energy, Power	2%
Land Development	9%

Table 5-1: Representation of the market sectors in the QBS detail project sample set.

The design contacts for each of the 89 projects were directly contacted by phone or e-mail communication. Each of the individuals was asked to complete the project detail survey on Survey Monkey and illustrated in Appendix A. The questions covered 10 areas as follows:

- Demographics
- Cost and Schedule
- Project Risk
- Design Complexity
- Project Complexity
- Social Factors
- Embeddedness
- Trust
- Transaction Costs
- Performance

The response rate for the survey was 47% with 41 of the projects receiving detailed information from the project contacts. The characterization of the respondents is provided in the demographics section.

5.1 Demographics

The data presented in this section is based on the 41 projects for which in-depth data was provided by the participating design firms. The projects originate from 23 states, providing geographic diversity in the sample pool. An overview of the project demographics is provided as follows:

- Owner Type: Public – 95% Private – 5%
- Project Type: Transportation – 44% Water – 39% Commercial – 15% Industrial – 2% Land Development – 0%
- Delivery System: Design-Bid-Build – 90% Design-Build – 5% Other – 5%
- Design Procurement Process: QBS – 78% Best Value – 10% Low-Bid – 5% Sole Source – 7%
- Construction Procurement Process: QBS – 12% Best Value – 17% Low Bid – 59% Sole Source – 2% Other – 10%
- Design Fee: Minimum – $2,500 Maximum - $9,000,000 Median - $441,500
- Construction Cost: Minimum - $25,000 Maximum - $900,000,000 Median - $4,500,000

In summary, the projects are primarily public projects with strong focus on infrastructure development. The delivery system reflects a traditional emphasis on design-bid-build with design procurement emphasizing QBS and a construction procurement emphasizing low-bid. This combination is characteristic of the dominance of public infrastructure projects in the professional engineering domain at this time.

5.2 Cost and Schedule

The first category of analysis resulting from the project data focuses on cost and schedule. As stated in the demographics, the median constructed cost of the projects is $4.5 million. The questions in the study were intended to obtain a relationship between the QBS process and the project cost. Data was collected on projected costs, actual costs, and change orders. Figure 5-1 illustrates the types of design procurement strategies that were used in relationship to the design fees for the projects. As illustrated, a preference for procurement type was not related to the projected design fee.

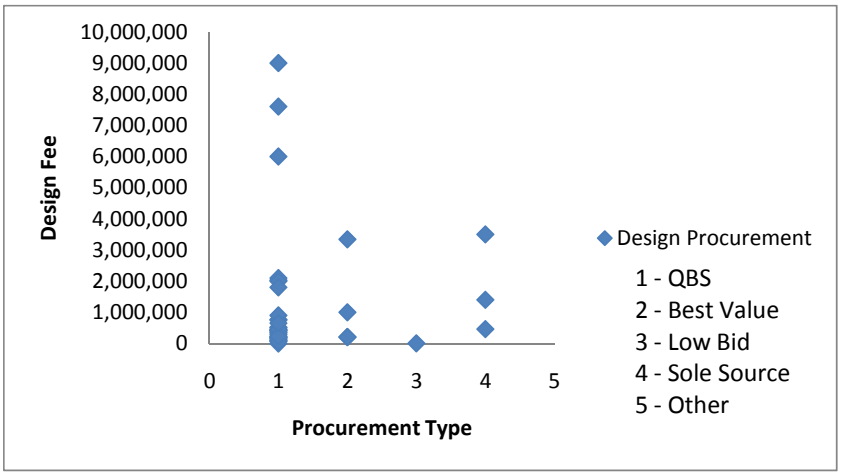

Figure 5-1: Design procurement strategies for the sample set projects.

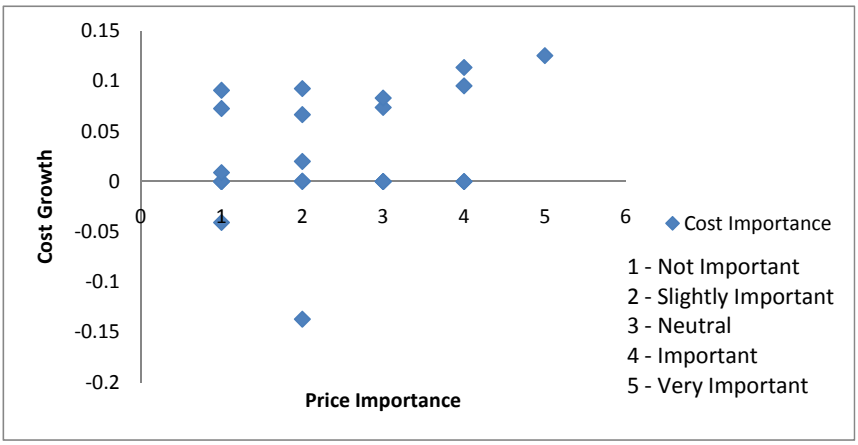

Figure 5-2: The importance of cost in the design procurement process for the sample set projects.

The first question examined in the cost-schedule category is the issue of impact of QBS on construction costs. In this area, the specific concern is cost growth as defined by the value of cost change orders as a percentage of the final construction cost. In this factor, the industry average is accepted to be about 10% based on current data. In the QBS population, this average drops to only 3%. The reduction in cost growth exhibited by the QBS projects is present throughout the spectrum of indicated price importance to the project. As illustrated in Figure 5-2, a similar cost growth performance can be seen throughout the values of price performance.

The complement to the cost question is the relationship between QBS and schedule growth. Once again, the national average is about 10% schedule growth in a given project. The QBS projects in the current study improve upon that number with an average schedule growth of 8.7%. As illustrated in Figure 5-3, 60% of the projects had a schedule growth of less than 3%. This result indicates that experience in the design domain can provide design solutions which are not only cost effective, but also have a positive impact on controlling the project schedule.

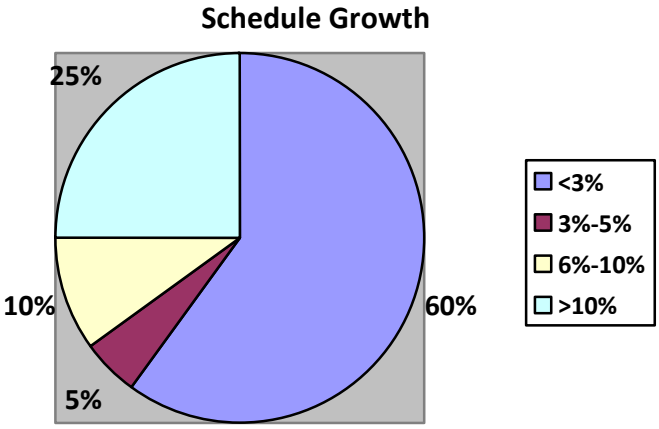

Figure 5-3: An overview of schedule growth for the projects.

5.3 Project Risk

The third area of data analysis conducted for the study is in the area of project risk. This area is significant because the greater the perceived risk on a project, the greater concern from an owner and the design team that the project can run into difficulties. In the context of the current study, risk was analyzed in four specific areas; cost and schedule, social, political, and owner relationship. Table 5-2 summarizes the responses received for the sample QBS-procurement based population.

As illustrated in the table, cost and schedule was considered the highest risk area with 27% of the respondents indicating a high or very high level of risk associated with the project. This may have significance if it is found through further study that projects that are deemed to have high levels of cost and schedule risk have a high correlation to a QBS-based procurement method. This relationship may indicate that owners have a greater feeling of comfort using QBS on projects with high risk values. Additional data is required to verify this potential link.

In contrast to the higher levels of risk associated with the QBS projects, the respondents indicated a low level of risk toward working with the owner. As will be seen later in this section,

this could be correlated to the strong relationship that design firms have with the owner organizations in QBS-based projects.

Finally, a mixed response was received for social (community) and political risks. The respondents did not believe there was a high level of risks in these areas, but they did recognize that some level of risk was present. This relationship is intuitive based on the large percentage of QBS projects that are in the public domain, thus making them susceptible to community and political influence. Once again, this relationship can be examined further to determine whether owners prefer QBS in projects that are susceptible to outside risk.

	Risk Level 1- Low to 5-High				
	1	**2**	**3**	**4**	**5**
Cost and Schedule	0%	20%	53%	23%	4%
Social Risk (Community Acceptance of Project)	30%	30%	27%	7%	6%
Political (Political Officials Will Require Design Changes)	23%	30%	23%	18%	6%
Owner Relationship	23%	40%	30%	7%	0%

Table 5-2: A summary of responses to project and design risk in the sample set.

5.4 Complexity

The fourth area of data analysis focuses on project complexity from both a design perspective and an overall project perspective. The data collection process required respondents to indicate perceived levels of project complexity in a number of areas including location, the number of participants, and traditional cost factors.

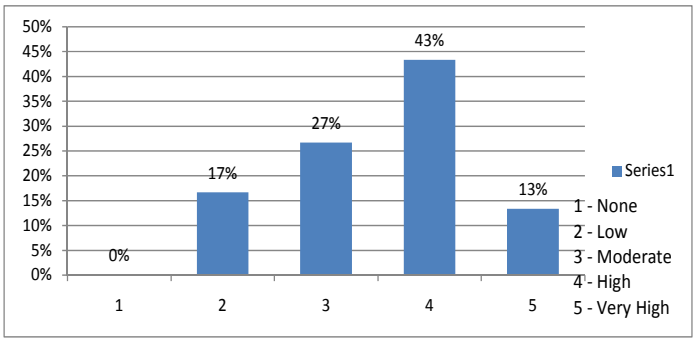

Figure 5-4: The technical complexity of the projects as rated by the respondents.

The first of these complexity factors is technical complexity (Figure 5-4). The importance of this factor lies with the potential relationship between QBS and the complexity of the project. As illustrated, the respondents believed that the QBS projects were predominantly in the high to very high level of technical complexity.

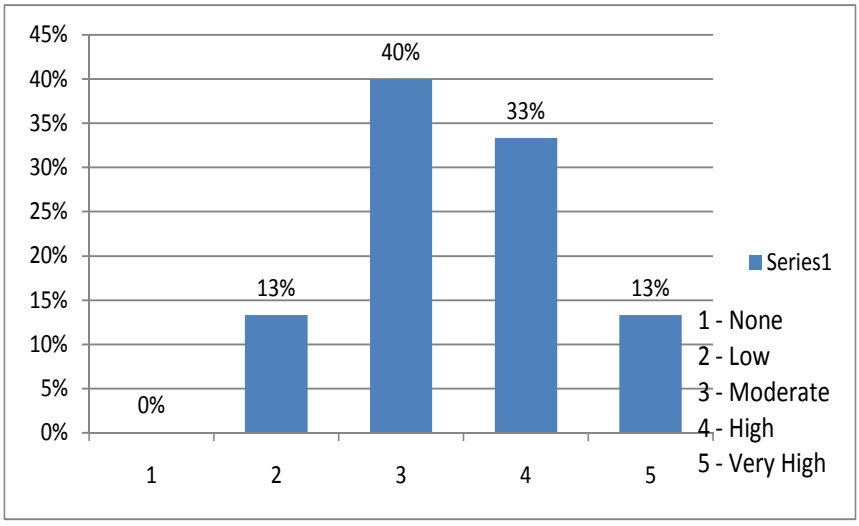

Figure 5-5: The performance complexity of the projects as rated by the respondents.

Similar to the level of design complexity in the projects was the level of performance complexity (Figure 5-5). In this category, 47% of the respondents indicated a high to very high level of performance complexity. Together with technical design complexity, these two categories received the highest rating in the complexity issue. Once again, the relationship can be examined between project complexity and the role of QBS in selecting firms that are believed capable of addressing the identified project concerns.

The remaining four complexity areas are summarized in Table 5-3. As illustrated, the respondents indicated that the project risks in these areas were predominantly moderate to low. The respondents believed that the primary complexity was in the design solution and not in the construction phases of the project. Although there was recognition of some complexity in terms of project location on a segment of the projects, the overall perspective was that design solutions should make construction less complex. Additionally, the complexity associated with interdependency and the cost should be minimized if a successful design solution was developed.

This relationship between complexity and design solution is strengthened when the cost and schedule information is included in the analysis. As indicated previously, QBS-based procurement resulted in projects that had below average cost and schedule growth patterns. These cost and schedule growth factors are directly related to the quality of the design solution. Thus, the contention that the complexity issue is addressed in the design phase to make the construction phase less risky and less complex is strengthened by the result of reduced cost and schedule growth.

	Complexity Level 1- Low to 5-High				
	1	**2**	**3**	**4**	**5**
Project Location	7%	20%	40%	33%	0%
Project Cost	0%	30%	50%	20%	0%
Number of Firms Participating	7%	40%	43%	10%	0%
Firm Interdependency	0%	27%	40%	27%	7%

Table 5-3: The complexity variables for the sample set projects.

5.5 Social Factors

The next area of concern for the data analysis study moves away from project issues to the impact of the project on social issues and the degree to which social factors were considered during the design process. This area is significant due to the increasing levels of focus on non-technical issues such as sustainability, community impact, and long-term facility flexibility; these issues impact the community as a whole and not just the project itself. The concern to a project owner is whether the design firm is acknowledging these broader impacts and is providing input to the owner on how to incorporate these concerns within a reasonable project scope and budget.

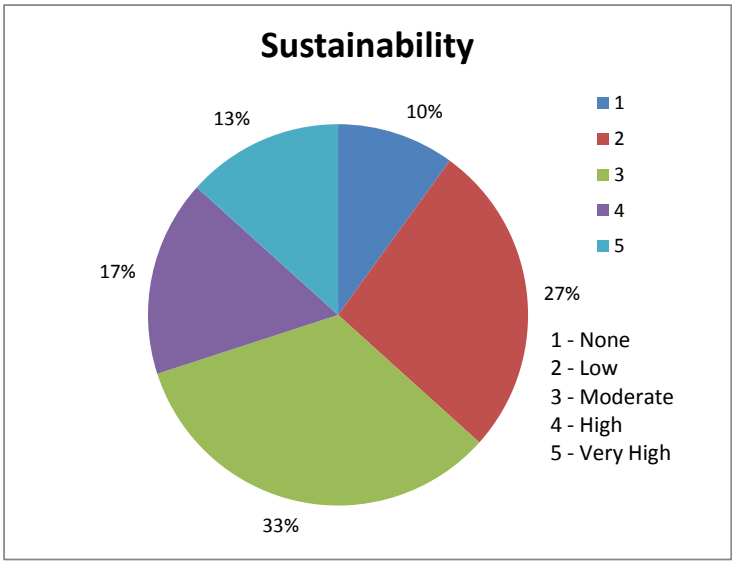

Figure 5-6: The level to which sustainability was addressed in the selected projects.

Five areas of social concern were included in the data collection phase of the study: sustainability, impact on the community quality of life, human factors for employees in the facility, human factors for users, and long-term flexibility of the facility. Of these five factors, the factor receiving the lowest

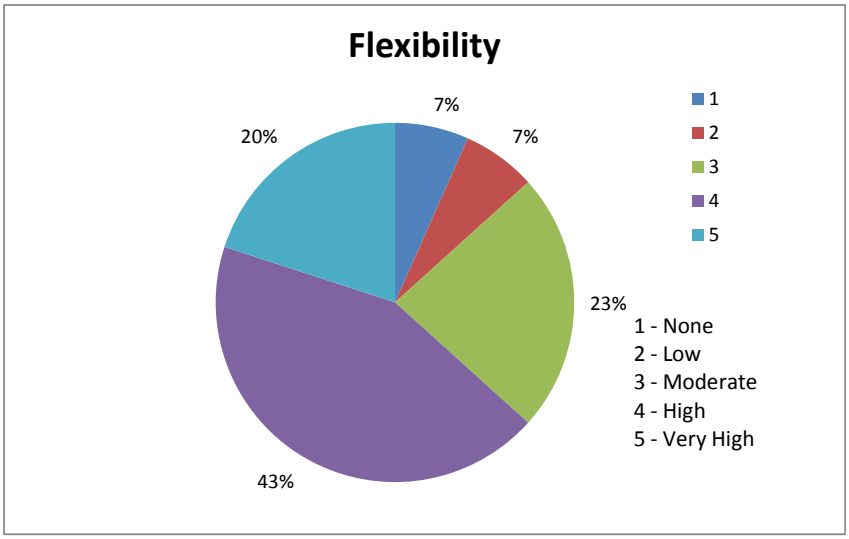

Figure 5-7: The level to which long-term flexibility was addressed in the selected projects.

attention was sustainability. As illustrated in figure 5-6, only 30% of the QBS respondents indicated a high or very high focus on sustainability in the projects. The reasons for this may be varied, but the greatest likelihood is that sustainability is still a relatively new concept for many owners and the ability to influence this area may not be as significant as other social factors.

In contrast to the sustainability issue, long-term facility flexibility received the highest scores in terms of attention to the design factor (Figure 5-7). In regards to long-term flexibility, 63% of the respondents indicated a high or very high focus on long-term flexibility. This attention is significant because it indicates that the design firms are concerned about their long-term perception by the owners and not just worried about a quick project and then an exit strategy. It is likely that these firms are using their experience as a foundation for long-term relationships and believe that long-term project success is a key to continuing this relationship.

The remaining social factors and their responses are indicated in Table 5-4. In each case, the social factors are receiving moderate to significant attention by the design team in terms of a final design solution. Although there is room for improvement in these areas, the awareness that social factors are a significant and growing concern by many public and private owners is a significant step for design firms. The anecdotal evidence in this study indicates that these non-traditional factors are being given a high priority by design firms who support QBS as they believe these will be a differentiator between experienced firms and ones who are new to given market segments.

	Focus Level 1- Low to 5-High				
	1	**2**	**3**	**4**	**5**
Quality of Life Impact	3%	13%	33%	27%	17%
Human Factors for Employees	17%	17%	27%	30%	7%
Human Factors for Users	13%	7%	23%	40%	13%

Table 5-4: Summary of data for the social factors in the selected projects.

5.6 Embeddedness

Embeddedness is a measure of the extent to which design firms and owners have on-going professional relationships. One of the current policy debates is whether agencies should develop long-term and large scale contractual relationships with firms. As noted earlier in this report, many state governments are actively engaged in this debate. This in turn has produced challenges to the reliance upon QBS processes in the procurement process. Embeddedness is one way of assessing the strength of the working relationship between the design firm and the owner organization.

At the heart of the policy debate is a question as to how agencies can best make use of market forces in the implementation of policy. Government agencies have been encouraged to use the market as a means of securing the best value either through price or quality competition. QBS is consistent with these competitive processes by privileging quality competition over price competition in the procurement of professional services.

However, as government agencies have outsourced more services to the private sector they have also experienced higher transaction costs in the procurement process. This has created an incentive in large-scale contracts to cover multiple projects and tasks in an effort to drive down transaction costs. This approach is also known as relational contracting. From a policy perspective relational contracting has the benefit of being a more efficient procurement process, but it also contains the danger of dampening competition and creating a dependency between the agency and the firm.

We use measures of embeddedness to assess the strength of the relationship between design firms and owners. One measure of embeddedness is the number of contractual relationships that exist between owners and designers. We also assess the degree to which the firm relies upon the owner as a source of project work. Another set of measures focuses upon the personnel involved in the contractual relationship examining the types of meetings as well as tracking whether there is significant movement of personnel from one organization to another. Finally, we examine the length of time that owners and firms have been working together.

In Figure 5-8 we see that over half of the respondents (22 out of 41) have had 10 or more contracts with the owner organization over the last 10 years as either a prime contractor or as a subcontractor. Similarly 33 out of the 41 respondents have had 5 or more contracts with the owner organization. This is an indication that the embeddedness between the firm and the owner organization tends to be high and that the organizations have a significant history of working together.

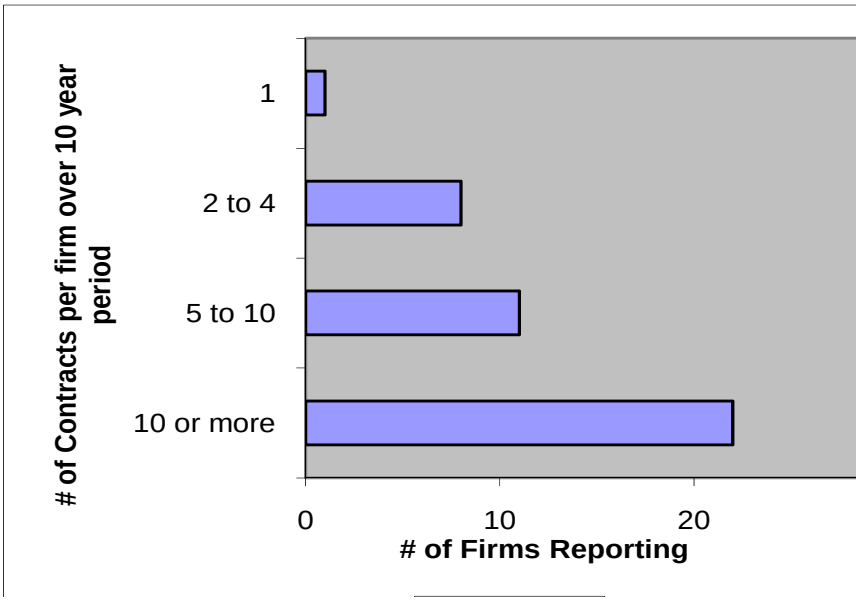

Figure 5-8: Enbeddedness as reflected by relationship with owner.

High levels of embeddedness do not seem to be creating dependency by firms upon owners of the nominated projects. The average percentage of the firm's design work portfolio accounted for by the owner organization is 13.9%. However, a small number of firms skew this distribution. The median value of the design portfolio accounted for by projects with the owner organization is 5%. In this sample only five of the 41 firms reported having a portfolio dependency of greater than 50% with the highest value being 80%.

Among respondents the mobility of personnel between design firms and owners is relatively rare as only five of the 41 indicate having ever worked for the owner organization. Respondents were also asked about the types of venues in which they were most likely to interact with personnel from the owner organization. Table 5-5 provides a summary of the scales used by respondents where the range covered "frequently" valued as a 1 and "never" valued as a 5. On average respondents were most likely to interact with owner organization personnel over a range of venues with varying degrees of formality. The most frequent venue of interaction, "audits", is also the most formal. However, respondents were also likely to interact with owner organization personnel in "consultant relations groups" and in "training sessions". Respondents were least likely to interact with owner personnel in the prequalification process, negotiations, and in professional association meetings. The finding on negotiations is particularly interesting and indicates a maturation of the procurement process where firms and owners alike have separated out the contract negotiation function from the project management function.

Firms in our sample have been interacting with owner organizations over a long period of time. The average firm began working with the owner organization in 1982. The median firm began working with the owner in 1991. Collectively these measures indicate high levels of embeddedness where most firms have had numerous contracts with owner organizations and

have been interacting with them over a long period of time. However, the majority of firms do not indicate that they are developing portfolio dependency upon owner organizations. Similarly, there appears to be relatively little movement of personnel between organizations. There also appears to be some separation of roles between contract negotiations and contract management (our respondents come from the ranks of management). And there appears to be a healthy blend of venues for interaction between firms and owners ranging from formal to informal.

	Interaction Frequency				
	Frequently	Somewhat Frequently	Somewhat Infrequently	Infrequently	Never
Meetings of Professional Organizations	15%	30%	20%	26%	9%
Consultant Relations	32%	30%	22%	12%	4%
Training Sessions	34%	31%	22%	9%	4%
Negotiations	4%	27%	27%	21%	21%
Pre-Qualification Process	15%	21%	24%	24%	15%
Audits	39%	34%	21%	6%	0%

Table 5-5: A summary of the embeddedness factors in the study.

5.7 Trust

Trust is a variable that is often referred to by contract officers in terms of believing that a design consultant can complete a given project, but is less often quantified or explored in terms of the relationship between owner and consultant. This lack of attention is addressed in the current study by bringing trust out as a focus of the QBS relationship. Specifically, the study examined how close the trust relationship was between the owners and the design team.

In contrast to any of the other factors examined in this study, the trust variable appears to be one that receives consistently high scores from the design team. There appears to be a high level of trust in each of the trust factor variables that were studied. Although this trust

relationship may not be exclusive to QBS procurement relationships, it is valued highly by QBS-focused teams and is considered a significant benefit by these organizations.

Table 5-6 summarizes the responses for the six trust variables. As illustrated, a high level of trust exists in each factor with 86% of the respondents indicating a positive experience when working with the contracting organization.

	Agreement Level 1- Low to 5-High				
	1	**2**	**3**	**4**	**5**
Evenhanded Negotiations	0%	17%	10%	47%	27%
Act Opportunistically	23%	43%	13%	20%	0%
Lack of Confidence	30%	53%	13%	3%	0%
Hesitant With Vague Specifications	23%	40%	30%	7%	0%
Trustworthy	3%	0%	17%	40%	40%
Positive Experience	3%	3%	7%	43%	43%

Table 5-6: A summary of the trust factors in the study.

5.8 Transaction Costs

One of the concerns associated with the QBS process is the perception that transaction costs can be high for both firms and owners. This concern has led many state agencies to consider alternative forms of QBS as well as non-QBS forms of contracting in an effort to contain transaction costs.

In this section we examine transaction costs from three perspectives: the amount time that is associated with stages of the QBS process; perceptions of the levels of red tape experienced in the relationship; and respondent perceptions with regards to the fairness of interactions between firms and owner organizations. We assume that high levels of red tape and low levels of fairness will be associated with perceptions that the transaction costs are high.

Agencies across the country have been working to streamline QBS processes and reduce the amount of time devoted to key stages. We examine the amount of time devoted to three key points in the life of a project: the time devoted to contractor selection, the amount of time needed to get a notice to proceed, and the amount of time required to secure a supplemental agreement. On average, respondents report that it takes just over 6 weeks for owners to select contractors. Responses ranged from a 26 week process to a 1 week process. Once the contractor is selected it may take over 7 weeks to secure a notice to proceed on a large scale project and slightly over 5 weeks for a small scale project. The range on the notice to proceed for a large scale project was a high of 36 weeks to a low of 1 week. Awarding supplemental agreements that extend the life of a project takes less time with an average of 5 weeks. The average times do not appear excessive and are comparable with experience found in private contracting.

Respondents are not experiencing a significant amount of red tape in their working relationships. For this study red tape was defined as burdensome rules and regulations that create a compliance burden but achieve no functional objective. We asked respondents if they experienced red tape in the working relationships between design firms and owners. As a point of comparison we also asked about the level of red tape that they experienced in their organization. On a ten point scale (10 being a high level of red tape, and 0 being no red tape) respondents report experiencing a level of 4.5 in their working relationships with owner organizations. In contrast they report a 3.4 level of red tape in their home organization. Only two respondents indicated that their home firm had a higher level of red tape than that experienced working with the owner organization. Overall, working with public sector owners exposes firms to greater levels of red tape than they experience in their own firm, and the difference in means between the two types of red tape is significant ($t=6.9$). However, respondent perceptions of the magnitude of the level of red tape are low both within their own firm and in their working relationship with owners.

The trust variables reported above are also reflective of the level of transaction costs experienced by firms as they work with owner organizations. On average, respondents found that owner organizations are trustworthy (mean = 1.8) and have had a positive working relationship (mean = 1.7). Similarly, they disagreed with the idea that owners behave opportunistically (mean = 3.8) or fail to keep promises (mean = 4.2) or are difficult to work with when specifications are vague (mean = 3.9). Respondents tended to agree (but also had a more neutral view) with the evenhandedness of owners in negotiations (mean = 2.2) These variables are direct evidence of the levels of trust that have built up between firms and owners. The positive working relationships also mean that lower levels of monitoring and defensive tactics are required in the relationships which, in turn, help keep transaction costs in acceptable levels.

5.9 Performance

The final area of focus in the data analysis is the performance and quality of the completed facility. Ultimately, it is the performance of the facility that determines the success of the project. This is the final determination of how well the design team worked with the owner and whether the owner will seriously consider using the design team on future projects. As such, the data analysis looked at three key indicators for performance; project quality, designer perspective on project success, and owner perspective on project success.

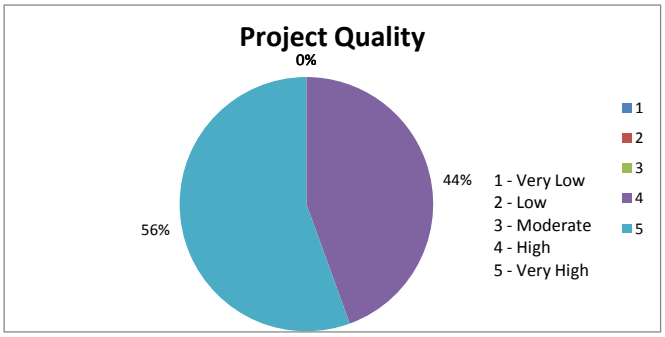

Figure 5-9: A summary of the project quality outcome

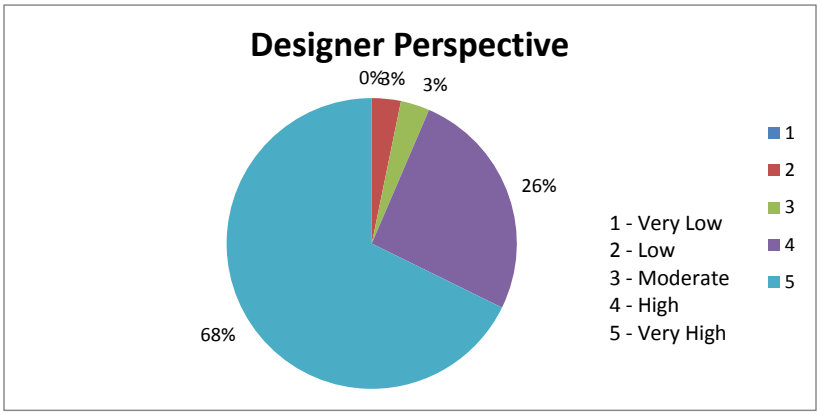

Figure 5-10: The project success rate from the designer perspective

The first of these areas, project quality, is a cumulative measure that asked the design team to provide a perspective on overall project quality. Figure 5-9 illustrates the result of this inquiry. As indicated, 100% of the respondents indicated that the project had a high or very high level of quality when completed. This result should be compared at a future date to projects where a higher focus is placed exclusively on cost-based procurements. At this time, it is possible to state that QBS projects have a very high level of quality when completed.

The second area of focus is the perceived success of the project by the design team. Similar to the quality metric, the designer perception of success is very high with 94% of the respondents indicating a high or very high level of success (Figure 5-10). Although this data

point is self-reporting, it is an indicator that the consulting firm has a strong belief that their projects were successful.

Finally, complementing the designer perspective is the owner perspective of success. Once again a significant metric is achieved with a 93% rating of high or very high success (Figure 5-11). This rating indicates a strong potential correlation between owner and designer perspectives and further data should be examined for this factor.

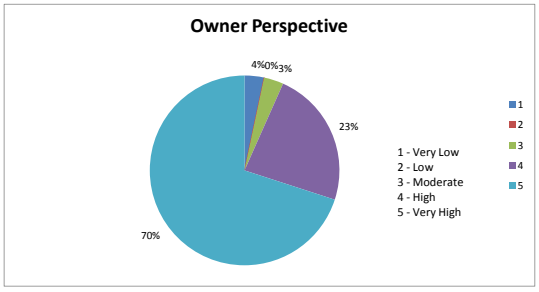

Figure 5-11: The project success rate from the owner perspective

The next section will build upon this data to provide an analysis of how QBS can be beneficial to projects based on the key areas introduced at the beginning of this report.

6.0 Study Findings

The data collected in this study provides a broad foundation of facts from which to develop several conclusions regarding the impact of QBS on the design and construction process. Although we note certain study limitations including the size of the sample pool, a series of trends, relationships, and judgments are evident and statistically borne out by the data. Using the original justifications for QBS as a framework, the following sections provide support for these justifications based on the projects and data collected in the study.

6.1 Ensures A Competitive and Cost-Effective Process

The selection of a design firm to complete a project should always focus on selecting the best firm from all available in the selection pool. This basic concept is supported and expanded by QBS in that QBS incorporates multiple variables in the selection of professional services, with particular importance being placed on the experience a firm has in addressing projects that have similar concerns to those identified for the current project. A single variable such as cost does not eliminate a firm from consideration in a project. This multiple variable outlook is the basis of the argument that QBS ensures a competitive process.

The data collected in this study supports this fundamental argument from both an anecdotal and a quantitative basis. In terms of the former, the study interviewed both design managers and contract managers to obtain a perspective on how the selection process worked for a cross-section of QBS-based projects. In each case, the interviews explored the competitiveness of the process. The answers were very similar to each query. Contract officials have a broad set of criteria that they examine for each project selection process. In this process, all firms are allowed to participate and are evaluated on all criteria. Thus, the process provides an open competition for all interested parties. Although deviations from this practice may exist, there is strong evidence that QBS retains a competitive process as a base of its implementation.

In terms of the quantitative basis, competition is introduced into a selection process to ensure that the owner is obtaining a solution that meets all of the criteria while recognizing cost and schedule constraints. The data indicates that this result is occurring on several measurements. First, the QBS-based projects are lower than the national average in terms of both cost and schedule growth, a key indicator of design impact on the constructed facility. Second, the projects receive excellent quality ratings with a quality acceptance of over 90%. Third, the projects all receive high scores in terms of designer and owner satisfaction, an indicator that the final solution is meeting the criteria set forth in the project statement. Therefore, from an outcome perspective, the process provides a strong indication that the most qualified firms are being selected for appropriate projects.

6.2 Enhances Project Effectiveness

The final analysis focus centers on the ultimate question for any procurement or delivery process -- does it have the intended positive result? In terms of QBS, the question is whether the initial cost of design is outweighed by the final project performance that results from good design solutions. Based on the results of the current study, this claim is substantiated by the sample pool of projects. The positive results in terms of traditional measures such as cost, schedule, and quality demonstrate that QBS is resulting in above average results in these areas.

In addition to the traditional engineering criteria, the sampled projects also receive high scores in terms of satisfaction from both the designers and the owners. The projects also receive high marks in terms trust in the team and long-term leveraging of the design solution. These are key indicators of a successful process and partnership between the owner and the designer. This is a desirable outcome and an indicator of effectiveness.

Finally, the projects receive favorable responses in terms of societal issues and transaction costs to indicate an awareness of the broader issues associated with projects. Although improvement is still required in this area, the awareness of the factors is a strong indication that both the design firms and the owners are progressing in the appropriate direction with a strong desire for continued education.

In summary, the study indicates that QBS is effective in addressing both traditional and emerging issues and that QBS-based projects perform above the national average in traditional measures.

6.3 Addresses Incomplete Scope

A fundamental argument supporting QBS is that when a qualified and experienced firm is selected, the design professionals will provide input to the evolution of the design solution and provide owners with options for completing the project prior to a final price being budgeted. This is opposed to the perspective that a scope must be highly defined and a set price is given based on that scope. From the study perspective, this claim is addressed by both the control of project scope, the control of design fees, and the lack of hesitation by firms to work with an incomplete scope.

The first of these issues, the control of project scope is based on the strong cost and schedule growth control results discussed in the previous section. With QBS-based projects being lower than the national average, the indication exists that the lack of a complete scope does not result in projects that overrun predicted costs and schedules. Rather, it is apparent that the design team works with the owner to develop a scope that ensures the project will meet the required cost and schedule criteria.

The second issue, control of design fees, relates to the concern that an incomplete scope can result in uncontrolled growth in design fees. The data collected in this study does not support this view. Rather, the design fee charges were a median of 10% of the final construction cost on the QBS-based projects. Although this was slightly higher than the 8% found in the non-QBS projects, the small sample size in the study makes this difference statistically insignificant.

Finally, the lack of hesitation that the firms stated in working with owners when an incomplete scope exists for a project reinforces the point that design firms are willing to work with owners to develop a scope that meets all criteria. In anecdotal interviews, this view is reinforced by the statement that design firms would rather assist an owner in developing an acceptable scope than developing design solutions that must be redone in an adversarial position due to the solutions not meeting perceived scope limitations.

6.4 Promotes Capacity Building

One of the claims associated with QBS is that this is a win-win process contributing to building the capacity of firms and owners alike. The focus on quality in the contracting process creates an opportunity for engineering and design professionals to reach a meeting of the minds. This process requires that owner organizations maintain sufficient capacity for engaging the professional community through contract negotiations and project monitoring. However, it also affords owner organizations the opportunity to expand the capacity of talents by drawing upon a range of quality services without having to build large staffs. This dataset focuses primarily on the firms providing the services. And we do indeed see a wide range of services being called upon from the professional engineering design community. However, this data does not allow us to observe the impact of QBS on the capacity of owner organizations.

6.5 Protects Intellectual Property

The foundational argument that QBS provides encouragement for innovation by emphasizing a total evaluative approach over a singular emphasis on price is a difficult point to quantitatively measure. However, the current study obtained data on the level of innovation that the design firms believed was applied to the selected projects. The design firms indicate that the innovation level was a 3 out of 4 on the innovation scale used in the study. This indicates an above average level of innovation and a belief that the intellectual property contained in these innovations was protected during the selection process.

In interviews, the design firms believed that innovations were valued by the owners and believed that innovations were rewarded in the selection process. The firms were not

significantly concerned that intellectual property would not be protected during the process. This follows the QBS basis that multiple variables are included in the selection process. However, it should be noted that the trend toward reuse and standardization of design by institutional owners is challenging this process. Further study is required to determine to what degree this will affect innovation and intellectual property.

6.6 Links to Societal Issues

The intersection of engineering and societal needs within a single project is quickly becoming the norm rather than the exception in both public and private projects. The argument that experience provides a stronger foundation for examining this broader range of issues is one that is emerging by proponents of QBS-based procurement strategies. The current study examined the impact that QBS has on this broader set of issues by exploring the extent to which societal issues are included on a given project.

The results from this data are mixed. On the positive side, projects are displaying a greater awareness of social issues such as sustainability. However, the percentage of projects employing a high focus on societal issues remains low. Therefore, the question must be raised as to whether it is the owners that must be educated on the greater need for societal issues in projects, or whether a greater percentage of designers need exposure to these broader issues. The answer to these questions may reside in the number of courses, lectures, and conferences that are emerging for both owners and designers on societal issues such as sustainability and human factors. The rapid rise in these informational opportunities indicates a strong interest from both sides in obtaining additional knowledge for project solutions.

On a positive note, the awareness of societal issues is being recognized by communities that are spotlighting new projects that achieve societal benchmarks. For example, projects that have exceptional LEED recognition are being highlighted as well as projects that encourage changes in societal patterns to reflect emerging energy realities. These projects require significant design experience to weave the emerging societal concerns with the traditional engineering criteria. It is anticipated that this mix will become a standard component of QBS evaluation and highlight the need for additional attributes in the selection process.

7.0 Conclusion

To conclude this study, it is best to return to the basic fact that the Brooks Act remains the Federal guideline for procuring design services and the majority of states have "mini-Brooks" acts that follow these guidelines at a state level.

The data presented in this study provides a strong indication that QBS has a positive correlation with successful projects. Traditional measures including cost, schedule, and quality all indicate a positive response in projects that employ QBS as a procurement method. Critical measures such as cost and schedule growth indicate the QBS-based projects have results that are superior to the national average. Additionally, non-traditional measures including societal concerns, trust, and embeddedness also indicate a strong relationship between success and QBS procurement. Therefore, by both traditional and emerging measures, QBS projects exhibit positive outcomes.

The positive outcomes exhibited by the QBS-based projects, support the foundational claims that QBS results in projects that have enhanced effectiveness. In areas from competitiveness to societal issues, QBS projects exhibit a positive result for contracting entities that employ the QBS procurement method.

In summary, projects incorporating the QBS procurement method outperform the national average in traditional measures and exhibit positive results in emerging areas. The combination of these results indicates that QBS should continue to be strongly considered as the procurement method of choice for contracting entities. The combination of historical success with continued positive performance should dissuade contracting entities from abandoning this procurement method. The factors that prompted the passage of the Brooks Act have not changed. Rather, the increasing number of factors that design firms must address reinforces the need for Qualifications-Based Selection.

The deteriorating infrastructure within the United States, together with the changing requirements for new infrastructure, establishes a greater demand on contracting officers than previously encountered. Effectively addressing these challenges requires design firms who have the experience and knowledge to introduce innovative solutions to emerging issues. As indicated in this study, QBS provides the foundational elements to achieve this result.

Appendix A – Project Data Questions

ACEC-APWA QBS Survey - Part 2

1. Default Section

Thank you for agreeing to participate in the second phase of the ACEC-APWA QBS study. We have randomly selected a sample of projects from the initial project nominations and are now collecting the information required for a statistical study. Please answer the questions on the following pages in regards to the project indicated on your invitation e-mail

The survey should take about 30 minutes to complete.

As a reminder, the objectives of the study are as follows:

What is the impact of QBS on short-term and long-term project costs?

Does a connection exist between the quality of the design output and the use of QBS?

Does project type have an impact on the success of QBS?

What role does owner policy and processes have in QBS success?

What is the relationship between risk and design costs and QBS?

What is the relationship between project complexity and QBS?

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ACEC-APWA QBS Survey - Part 2

2. Demographic Information

* 1. Enter Your Name

* 2. Enter Your Company

3. Enter your phone number or e-mail for contact information

* 4. What is the Name of the Project

* 5. State where project is being constructed

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ACEC-APWA QBS Survey - Part 2

3. Cost and Schedule

The Following Set of Questions Will Focus on Cost and Schedule Data

1. What is the total actual cost of the project:

2. What is the projected life-cycle cost of the project (i.e., the total cost of the project plus the anticipated operations and maintenance cost of the project over its anticipated useful life):

3. What was the predicted (budgeted) construction cost for the project:

4. What was the actual (final) construction cost for the project:

5. What was the total amount of cost change orders for the project:

6. What was the projected design schedule for the project in weeks:

7. What was the actual design schedule for the project in weeks:

8. What was the projected construction schedule for the project in weeks:

9. What was the actual construction schedule for the project in weeks:

10. What was the total amount of time allotted for change orders:

11. On a scale of 1 to 5 with 1 being the lowest and 5 being the highest, how would you rate the quality of the final constructed project:

	1	2	3	4	5
Final Quality	○	○	○	○	○

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ACEC-APWA QBS Survey - Part 2

4. Project Risk

The Following Set of Questions Will Focus on Project Risk

1. Based on your history of designing similar projects, assign a risk rating for the project in terms of overall risk in completing the project on time and on budget.

	Lowest	2	Moderate	4	Highest
Time and Budget	◯	◯	◯	◯	◯

2. How would you rate the social risk on the project (i.e., the risk that the community will require changes to the proposed design)

	Lowest	2	Moderate	4	Highest
Social Risk	◯	◯	◯	◯	◯

3. How would you rate the political risk on the project (i.e., the risk that the political officials will require changes to the proposed design):

	Lowest	2	Moderate	4	Highest
Political Risk	◯	◯	◯	◯	◯

4. How would you rate the risk of working with this owner on the project (i.e., the risk associated with experience of working with the owner and understanding their requirements versus potentially having everything new in the process):

	Lowest	2	Moderate	4	Highest
Owner Risk	◯	◯	◯	◯	◯

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ACEC-APWA QBS Survey - Part 2

5. Design Complexity

The following questions will focus on design complexity

1. How would you rate the overall technical design complexity of this project (including the range and number of technical specialties required to complete the design):

	Lowest	2	Moderate	4	Highest
Technical Complexity	○	○	○	○	○

2. How would you rate the specific design complexity of this project in terms of performance requirements:

	Lowest	2	Moderate	4	Highest
Performance	○	○	○	○	○

3. How would you rate the specific design complexity of this project in terms of the project location:

	Lowest	2	Moderate	4	Highest
Location	○	○	○	○	○

4. How would you rate the specific design complexity of this project in terms of the project location:

	Lowest	2	Moderate	4	Highest
Location	○	○	○	○	○

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ACEC-APWA QBS Survey - Part 2

6. Project COmplexity

The following questions will focus on the overall project complexity

1. How would you rate the specific project complexity of this project in terms of the project cost:

	Lowest	2	Moderate	4	Highest
Cost	○	○	○	○	○

2. How would you rate the specific project complexity of this project in terms of the number of firms working together:

	Lowest	2	Moderate	4	Highest
Number of Firms	○	○	○	○	○

3. How would you rate the specific project complexity of this project in terms of the project interdependency (i.e., were construction tasks sequential, or was it a very parallel process):

	Lowest	2	Moderate	4	Highest
Interdependency	○	○	○	○	○

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ACEC-APWA QBS Survey - Part 2

7. Social Factors

The following questions focus on social factors related to the project

1. Please rate the level to which the following societal concerns were included in the design of this project:

	Lowest	2	Moderate	4	Highest
Sustainability	○	○	○	○	○
Quality of Life	○	○	○	○	○
Human factors for employees working in the facility	○	○	○	○	○
Human factors for users of the facility	○	○	○	○	○
Long-term facility flexibility	○	○	○	○	○

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ACEC-APWA QBS Survey - Part 2

8. Embeddedness

The following questions relate to how embedded the design firm is with the owner

1. Please indicate the frequency with which you personally interact with the owner employees in the following activities and processes:

	Never	Infrequently	Somewhat Infrequently	Somewhat Frequently	Frequently
Meetings of professional organizations	○	○	○	○	○
Consultant relations groups	○	○	○	○	○
Training sessions	○	○	○	○	○
Negotiation of a contract	○	○	○	○	○
Pre-qualification process	○	○	○	○	○
Auditing	○	○	○	○	○

2. Approximately how many projects has your organization contracted with the owner organization, either as a prime contractor or a sub-contractor over the past 10 years?

- ○ 1
- ○ 2-4
- ○ 5-10
- ○ 10 +

3. Approximately what percentage of your organization's design work is performed working with this owner?

4. Approximately what year did your organization first start contracting with this owner?

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ACEC-APWA QBS Survey - Part 2

9. Trust

1. Please indicate your level of agreement or disagreement with the following statements about your relationship with the owner:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
They have always been evenhanded in its negotiations with my organization	○	○	○	○	○
They often act opportunistically at my organization's expense	○	○	○	○	○
Based on past experience, my organization cannot with complete confidence rely on their organization to keep its promises	○	○	○	○	○
My organization is hesitant to work with them when the specifications are vague	○	○	○	○	○
Compared with other organizations with which my company has worked, they are trustworthy	○	○	○	○	○
My experience working with their organization has generally been positive	○	○	○	○	○

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ACEC-APWA QBS Survey - Part 2

10. Transaction Costs

1. If red tape is defined as "burdensome administrative rules and procedures that have negative impacts on the organization's effectiveness," how would you assess overall the level of red tape in your organization?

○ 0 - Almost No Red Tape ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 - Great Deal of Red Tape

2. How would you assess the level of red tape in the contracting relationships between your organization and the owner?

○ 0 - Almost No Red Tape ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 - Great Deal of Red Tape

3. Have you ever been an employee of the owner's organization?

○ Yes

○ No

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ACEC-APWA QBS Survey - Part 2

11. Performance

Typically, about how much time does it take (in weeks) for the following with the project owner (where applicable):

1. To chose a contractor once a request for a bid has been made public:

2. To get a notice to proceed for a large contract once the contractor has been chosen:

3. To get a notice to proceed for a small contract once the contractor has been chosen:

4. To complete a pre-award audit:

5. To complete a post-award audit:

6. To get approval for final project reports and plans:

7. To get a supplemental agreement to extend the life of a project:

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