

DESIGN-BUILD PARTNERSHIP ATTRIBUTES

SURVEY ANALYSIS

by

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Nielsen noted "The viability of design-build is dependent upon the successful formation of partnerships between the design[er] and the builder." He also stated that although many concepts taken from traditional business joint ventures also apply to design-build, design-build has several peculiarities which differentiates it from standard business partnerships. Accordingly, the survey was designed to rate the partnership attributes and characteristics most important to the design-build industry. Upon reviewing the results and determining the importance of these attributes, firms can better evaluate the risks and potential rewards of design-build in general, and by extension, of the potential opportunities of design-build in the transportation construction market. From Nielsen:

"...[with] very different backgrounds, a designer and contractor must make decisions about the type of partnership they wish to form and who to choose for a partner. To make these decisions both sides need to understand the attributes and qualities that make a design-build partnership successful. By understanding these attributes and qualities, designers and contractors can position themselves to take advantage of the new realm of opportunity in design-build contracting for transportation facility owners."

Within the scope of Nielsen's study, two basic hypotheses were investigated:

1. Finding these attributes for success for a design-build partnership may be accomplished by transferring concepts and ideas from business research on partnership formation.
2. The other direct source is research on design-build itself. Design-build is a common procurement method in private industry and should be applicable to design-build contracting in transportation.

Business literature provided some information regarding partner selection for joint ventures, although the limited information available on joint ventures in developed economies such as the United States is acknowledged in the few texts available on the subject (Harrigan 1986). The literature did suggest partner attributes and resources, or "critical success factors", that offer the greatest likelihood of success (Geringer (1988).

Following personal interviews of both large and small construction industry firms within the public and private sector and his review of business joint venture literature, Nielsen proposed 23 attributes that may be found in successful design-build partnerships. These attributes formed the basis for his survey. He also segregated the attributes into the three categories of marketability, workability, and project organization. These categories, and the attributes each encompasses, are discussed in detail in Chapter 4. Nielsen's report presents the sources of his findings and theories. The results of the survey will provide additional insight and information related to successful design-build partnerships.

## 1.2 THE SURVEY

The survey was mailed primarily to firms in the western Washington area although many of the firms operate nation-wide. The surveys went to design-build firms not currently engaged in transportation construction, transportation contractors from the traditional design-bid-build arena, and design-build firms also involved in the transportation construction sector. Designers and constructors were sent essentially the same survey, although there were a few subtle differences particular to each in order to account for their different roles in construction. The survey seeks to meet the following objectives, as stated in Nielsen's report:

1. Measure the type of bargaining agreement and risk sharing that contractors and designers feel most comfortable with for a design-build partnership. It will also find if the ideal [preferred] forms of agreements are different between contractors and designers.
2. Establish relative importance of the proposed attributes of successful partnerships.
3. Measure the reactions and concerns with design-build in transportation.

The survey asked designers and builders to rate four types of partnership agreements. Respondents were also to rate sixteen aspects of their past or potential partners, and then

to rate seven project management factors that may significantly impact the partnership. Finally, they were to rate seven concerns with design-build in transportation construction. The option to chose "Other" was also available for each question. The last question in the survey asked for detailed comments relating to significant experiences on design-build projects.

### 1.3 SPECIFIC SURVEY QUESTIONS

The questions and characteristics from the survey are listed in the sections below. Complete versions of the survey may be found in Nielsen's report.

1. Which type of agreement with your partner do you feel to be the best?

- Design partner is engaged on a fee basis alone
- Design partner is engaged on a fee basis with an incentive payment
- Design partner is paid a proportion of the project's profit
- Design partner and contractor share risk in a binding contract

2. What aspects of your partner do you feel are most important to you?

- Past work experience together that was favorable
- Marketability to clients in proposals
- Close geographical location
- Their contacts with potential clients
- Technical ability
- Similar comparative size and dominance in construction industry
- Similar corporate objectives and business plans
- Similar operating procedures
- Respect and influence of local regulatory authorities
- Financial strength to weather difficult periods
- Similar management structure and organization
- Trust and partner's integrity
- Awareness of construction schedule requirements
- Overall management skills of partner
- Partner's personnel

Ability to effectively manage on site construction (Designer variation)

Ability to provide a representative on site during construction (Contractor variation)

3. For managing a design-build project what factors are important to you?

A single manager responsible for both design and construction

Working from a combined project office

Completeness of drawings for submitting a proposal

Compatible office procedures and filing methods

The contractor as lead partner rather than the designer

The designer should lead the presentation of the proposal to the client

The contractor handles the contract administrative work

4. What concerns do you have about design-build in transportation?

Do not have suitable partners to form a project team

High cost of submitting a proposal that isn't successful

Extra cost of insurance and bonding for a design-build project

Don't see it as a profitable arena

Bank, insurer, and/or bonding company would not be enthusiastic about the venture

Having to work with a [design] [construction] partner

Effort and skill required to present a proposal

Risks associated with changed site conditions not being covered in contract documents

Long-term warranty and maintenance clauses in design-build contracts with owners

Respondents were asked to rate each attribute on a scale of one to seven, with seven being most desirable or important, and one being of low value or interest. They were not asked to rank them in order, but rather to assign an "importance" or "desirability" value to each. Thus, each attribute was to be rated somewhat independently of the others. Their importance levels were used to present them in the ranking implied by the ratings. For this analysis, a mean and standard deviation for each attribute was calculated. Mean values were used to rank the attributes in their relative order of importance. The measure of standard deviation provided insight regarding the level of agreement among the

respondents regarding the importance of the attribute. Due to the limited sample sizes and the nature of the questions, the differences between specific means were not statistically tested. The values were used solely to provide relative rankings in order to compare and contrast each group's responses.

To summarize, the purpose of this paper is to document the results of the survey analysis and to report how the region's construction industry rated design-build agreement types, important partnership aspects, important project management factors, and industry concerns with transportation design-build. Further, by creating separate analysis groups for designers and contractors, and for firms experienced and inexperienced in design-build, it should provide deeper insight into the different experiences or perceptions of specific groups. The results are presented in relative order of importance, according to the mean value calculated, and in case of common mean values, according to the lowest standard deviation.

## CHAPTER 2 SURVEY POPULATION

### 2.1 RESPONSE LEVELS

The survey was mailed to 100 designers and 160 contractors maintaining offices primarily in the Western Washington State area. Ninety-seven firms responded, a return level of 37%. However, a number of these firms declined to answer the questions because they lacked design-build experience. These responses, in addition to several others judged as invalid or non-responsive to the survey design, resulted in 25 surveys being excluded entirely from the analysis.

### 2.2 RESPONSE DEMOGRAPHICS

Throughout this report, the phrase “experienced contractor” or “experienced designer” refers to firms with *design-build experience* as opposed to indicating their level of experience in their profession. The same is true for references to “inexperienced” firms.

#### 2.2.1 Analysis Groups

Respondents have been separated into four groups in order to better identify important attributes to a greater level of detail and from different perspectives. The groups are: contractors with experience (34), contractors without experience (8), designers with experience (18), designers without experience (11). The data they provided is included in Appendix C.

Although some firms without design-build experience declined to answer all of the survey questions, some of the inexperienced firms did provide data. Because of the relatively low numbers of responses from these firms, and in some cases, their incomplete responses, their data have been segregated and evaluated separately. These responses should be considered as opinions, yet can serve to highlight the difference between what may seem to be important to design-build outsiders and what has been found to be important by firms experienced in design-build partnerships. Their impressions may also indicate the perspective that potential new design-build firms may

hold, and thus the expected response of locally based firms to design-build transportation projects. With the exception of data tables in Chapter 3, responses from inexperienced firms will only be introduced or discussed when their statistics correspond or deviate significantly enough from those of the experienced firms to be of interest.

### 2.2.2 Market Area and Area of Expertise

The firms that responded to the survey vary widely in size and market area. Market area was classified as Washington State, Washington State and neighboring states (NW region), West Coast, and Nation-wide. The market area distribution is illustrated by the pie chart on the left of Figure 1.

Respondents were asked to classify the types of projects with which they are mainly involved, according to the following categories: utilities and public works, transportation and highway development, commercial buildings, industrial construction, civil works, and environmental. The chart on the right of Figure 1 illustrates this distribution. The average annual volume of work was reported to be just over \$900 million, of which, on average, 19% of the contracts were on design-build projects.

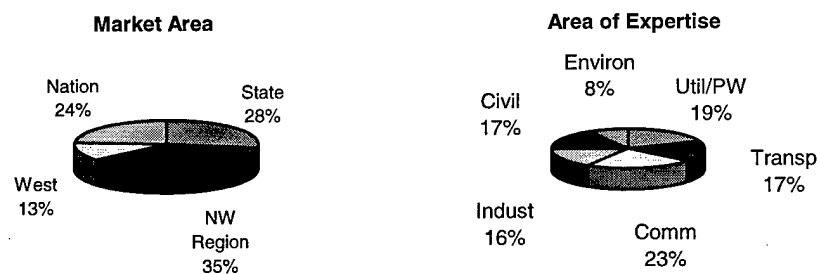


Figure 1. Market Area and Area of Expertise

### 2.2.3 Bid or Negotiated Work, and Design-Build Market Share

Overall, experienced respondents reported 59% of their design-build contracts were negotiated and 41% were awarded through some form of bid process. Designers reported more of their design-build contracts were through the bid process, 56%, while only 44% were negotiated. Conversely, contractors reported 67% of their design-build contracts

were negotiated and only 33% were awarded through the bid process. On average, design-build accounted for 9% of the designer's fee revenue. Contractors reported a much higher level, 24% of their workload was on design-build projects.

#### 2.2.4 Most Common Design-Build Agreement Type

The majority of design-build partnerships were formed with different partners picked for specific projects, at 62% and 56% on average for contractors and designers respectively. The average use of binding long-term agreements to perform design-build as partners was only 11% for designers and 12% for contractors. However, on average, 33% of a designer's design-build projects were based on informal understandings with specific contractors to work on design-build projects. Contractors appeared slightly more reluctant to rely on informal understandings. On average, only 26% of a contractor's projects were based on informal understandings.

## CHAPTER 3 STATISTICAL RESULTS

### 3.1 SURVEY SCOPE

Although Nielsen was interested in design-build in transportation, including the potential for increasing the use of this procurement strategy in the transportation sector, the survey results offer insight relevant to the entire design-build industry. Even the responses to the question specifically concerning design-build in transportation could be seen as industry wide concerns with design-build on any type of construction project, especially public works projects. Additionally, the survey covers four essential areas important to any design-build endeavor: the agreement; the partner; project management factors; and project concerns. The means and standard deviations of the individual elements in these areas were used to rank their relative importance.

### 3.2 RESPONSE IRREGULARITIES

Although the results are ranked in relative order, individuals may feel that certain traits have equal levels of importance. To provide for this, the survey was designed so that each selection could be rated independently. Unfortunately, this also resulted in several irregular responses.

#### 3.2.1 Scale Reversals

Some respondents appeared to misunderstand the directions, and not only ranked the attributes relative to each other, they also appeared to do so with the scale reversed. For example, the attribute they rated with a 1 appeared to be their most important, and the attribute they rated with a 7 appeared to be their least important. This was obvious in most cases of suspected scale reversal because at least two survey questions had been answered, and the questions that had more than seven attributes had blanks left unmarked. Additionally, each attribute rated with a one was consistently rated with very high importance levels by the majority of the other respondents, and the seventh ranked selection was given very low importance rates by the majority. The rest of the traits on each of these questions also tracked the majority rating when the scale was reversed. Six

responses exhibited this reversed scale and were revalued prior to the analysis. There were no instances in which suspected scale reversals were revalued based on one question or when it was otherwise unclear. In cases where it was suspected, but not clear the scales were rated in the reverse, the questions were retained but have had an impact on relative rankings to within one or two positions. Their largest impact was on the measures of standard deviation.

### 3.2.2 Incomplete Responses

Another common occurrence was partially answered questions. This was especially true when the respondents ranked their answers, scaled in reverse or not, and when respondents simply placed a check mark or 'X' next to one or more traits. One could assume the unmarked selections were less important than the other selections, essentially having zero importance on the scale of one to seven. And in the case of the checked selections, an assumption could be made that the checked attribute were the most important and merited an importance level of seven. Unfortunately, some respondents failed to rate over half of the selections, while others placed checks in over half of the selections. Rather than extending the scale to include a zero value, or by arbitrarily assigning an importance level of seven to all check marks, partially answered questions were pulled from the survey analysis. This decision accounts for five of the invalid responses cited in Section 2.1.

## 3.3 DETAILED RESULTS

This section provides the detailed results of each of the survey questions. Chapter Four includes discussion of each of the individual attributes from Nielsen's report compared to the results found in the survey responses.

### 3.3.1 Best Agreement Type

The responses of both experienced contractors and designers suggest they generally agree that the designer should be a fee based partner rather than a partner who shares the profit and/or risk.

Table 1 reports the best agreement type means and relative rankings by experienced firms, as well as the breakout by designer and contractor groups.

When experienced firms are grouped collectively, the difference between a preference for a simple fee or a fee with incentive partnership is relatively minor, with a difference between means of only 0.16 on a scale of 1-7. Yet a different relative rating is immediately discernable when the responses of experienced contractors and designers are grouped separately. Figure A1 illustrates the differences in means and standard deviations for these groups. Contractors rated design service for a fee payment with an incentive much higher than design service for a straight fee. Designers were approximately evenly split by number regarding the strict fee agreement versus the fee with incentive, however, the mean importance level they assigned was significantly higher for the strictly fee based partnership.

Both contractors and designers rated sharing the project risk in a binding contract as third in the list of four. However, designers saw this type of agreement as significantly less desirable than contractors.

Table 1. Best Agreement Type

<b>Best Agreement Type</b>								
<b>Experienced Firms</b>								
	<b>All</b>			<b>Contractors</b>			<b>Designers</b>	
	<b>Mean*</b>	<b>Rank</b>		<b>Mean*</b>	<b>Rank</b>		<b>Mean*</b>	<b>Rank</b>
Fee Only	4.82	1		4.67	2		4.91	1
Fee w/ Incentive	4.64	2		5.05	1		3.92	2
Risk-sharing	3.24	3		3.67	3		2.50	3
Percent of Profit	2.61	4		2.76	4		2.33	4

\* Higher number indicates greater importance.

Interestingly, both professions rated paying the designer a proportion of the profits as the least desirable partnership agreement. Perhaps more notable was the fact that not only

did contractors and designers agree on this low rank, they also had the closest agreement (lowest standard deviation) that this was the worst type of agreement.

The differences of opinion regarding the best and worst rated agreements are illustrated by the distributions in Figure 2. These are the ratings of experienced contractors and designers combined. Note the distribution over the scale for the highest ranked partnership agreement, compared to the tighter distribution at the lower end of the scale for the least desirable partnership agreement. Experienced firms had relatively little agreement over whether the fee with incentive partnership was best, but were much more convinced that paying the designer based on a proportion of the profit was not desirable. An equal number of designers rated the fee with incentive at an importance level of 1 and at an importance level of 7. This increased the standard deviation significantly, and is the primary reason for the lack of consensus on the most popular agreement type.

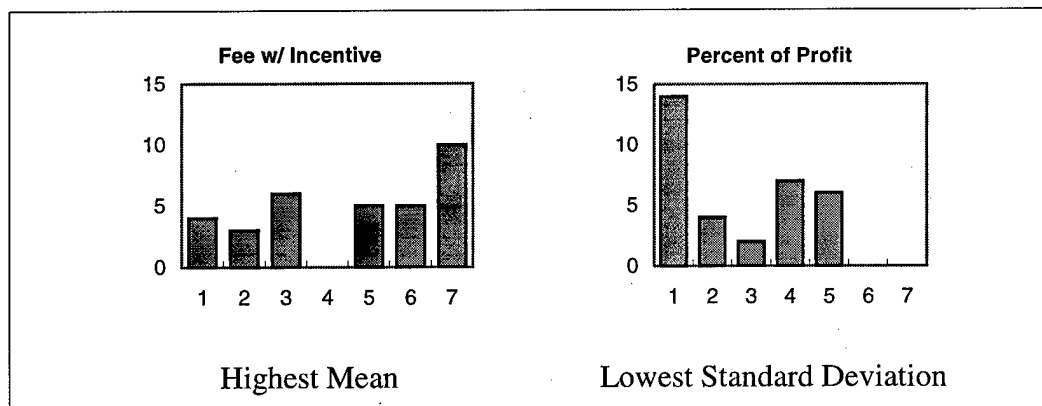


Figure 2. Highest and Lowest Ranked Forms of Agreement

### 3.3.2 Important Partner Characteristics

The results shown in Table 2 and in Figure A2 indicate both experienced contractors and designers have found essentially the same characteristics important in their design-build partnerships. Both groups ranked the same characteristics in the top half of the partner attributes, with only slight differences in sequence. They also ranked the same characteristics in the three lowest positions. Perhaps more significantly, both experienced groups rated trust and integrity, and favorable past work experience first and second. Inexperienced firms also rated trust and integrity in the top position.

Interestingly, the partnership aspect contractors rated third most important was rated sixth by designers, and conversely, the third most important trait according to designers was rated sixth by contractors: contractors rated their design partner's technical ability third, while designers rated their construction partner's marketability to the client in the third position.

Both contractors and designers ranked awareness of the construction schedule requirements as the fourth most important partner aspect. Their partner's personnel, management skill, and financial strength to weather difficult periods rounded out the top eight characteristics.

Table 2. Desired Partner Attributes – Experienced Contractors and Designers

Partnership Characteristic	Experienced Contractors		Experienced Designers	
	Rank	Mean	Rank	Mean
Trust, Integrity	1	6.63	1	6.69
Past Work Experience	2	6.30	2	6.44
Technical Ability	3	6.20	6	5.56
Schedule Awareness	4	5.93	4	5.75
Marketability to Client	6	5.83	3	5.94
Partner's Personnel	5	5.83	8	5.38
Management Skill	7	5.53	5	5.56
Financial Strength	8	5.30	7	5.50
Respect of Regulators	10	5.03	10	4.81
Contacts	9	5.07	11	4.81
Site Mgmt. Or On-site Rep.	13	3.93	9	5.31
Located Close	12	4.10	12	3.56
Similar Objectives	11	4.20	13	3.06
Similar Size	15	3.77	16	2.63
Similar Operations	14	3.93	15	2.69
Similar Organization	16	3.69	14	2.94

Low sample populations preclude a quality comparison of inexperienced contractor and designer results, however, their combined responses differed only modestly from the collective rankings by experienced firms. The greatest difference is the high importance inexperienced firms placed on a partner's personnel and financial strength. Table 3 reports the differences in rankings, and Figure A3 shows that inexperienced firms tended to place higher overall importance rates on the attributes.

Table 3. Desired Partner Attributes - Experienced and Inexperienced Firms.

Partnership Characteristics	Experienced Firms		Inexperienced Firms	
	Rank	Mean	Rank	Mean
Trust, Integrity	1	6.65	1	7.00
Past Work Experience	2	6.35	3	6.38
Technical Ability	3	5.98	7	6.13
Schedule Awareness	4	5.87	6	6.25
Marketability to Client	5	5.87	5	6.25
Partner's Personnel	6	5.67	2	6.38
Management Skill	7	5.54	8	6.13
Financial Strength	8	5.37	4	6.38
Contacts	9	4.98	11	5.38
Respect of Regulators	10	4.96	9	5.63
Site Mgmt. Or On-site Rep.	11	4.41	10	5.63
Located Close	12	3.91	14	4.13
Similar Objectives	13	3.80	12	4.75
Similar Operations	14	3.50	16	3.38
Similar Organization	15	3.42	15	3.75
Similar Size	16	3.37	13	4.25

### 3.3.4 Important Project Management Factors

The responses to the question dealing with project management factors were the most inconsistent. Table 4 summarizes these results. Experienced designers and contractors

disagreed on four of the seven rated factors. Contractors felt the most important factor was that they be the lead partner, while designers rated this factor fifth. And designers ranked having a single manager responsible for both design and construction as most important, while contractors rated this factor second. Other than ranking compatible procedures and working in a combined office as the least important, the only factor ranked the same was that the contractor should handle the contract administrative work. Figure A4 illustrates the factors with significantly different mean importance rates.

Table 4. Project Management Factors – Experienced Contractors and Designers

Project Management Factors	Experienced Contractors		Experienced Designers	
	Rank	Mean	Rank	Mean
Contractor as Lead Partner	1	6.06	5	3.65
One Responsible Manager	2	5.33	1	5.35
Contractor Does Admin.	3	5.30	3	4.06
Completeness of Drawings	4	5.06	2	4.53
Designer Leads Presentation	5	3.88	4	3.76
Compatible Files	6	3.67	6	3.47
Combined Project Office	7	3.06	7	3.00

As Figure A5 indicates, the variability in this area is even more noticeable when comparing inexperienced contractors and designers. The two groups rated five of the seven selections at least two importance ranks apart. For comparison, the attributes in Table 5 are listed in the same order as Table 4.

Table 5. Project Management Factors – Inexperienced Contractors and Designers

Project Management Factors	Inexperienced Contractors		Inexperienced Designers	
	Rank	Mean	Rank	Mean
Contractor as Lead Partner	1	6.00	4	4.50
One Responsible Manager	3	5.75	1	5.71
Contractor Does Admin.	2	6.00	7	3.43
Completeness of Drawings	5	4.50	2	5.29
Designer Leads Presentation	6	4.50	6	3.86
Compatible Files	4	4.50	3	4.57
Combined Project Office	7	3.75	5	4.29

### 3.3.5 Concerns with Design-Build in Transportation

Although this question specifically asked respondents to rate their concerns with design-build in the transportation sector, virtually all of the questions were applicable to design-build in general and especially with public works design-build. Both experienced firms and inexperienced firms had very similar concerns, with the very understandable exception that inexperienced firms were much more concerned with their lack of experience. Table 6 and Figure A6 compare the concerns of experienced and inexperienced firms.

The high cost of submitting an unsuccessful proposal was rated as the greatest concern with design-build, regardless of profession or experience. Additionally, the groups unanimously ranked having to work with a partner as the least important concern. The risks associated with changed site conditions and the issue of long-term warranty and maintenance clauses were the two highest ranked concerns after the high cost of the proposal.

Table 6. Transportation Concerns, Experienced and Inexperienced Firms

Project Management Factors	Experienced Firms		Inexperienced Firms	
	Rank	Mean	Rank	Mean
Proposal Cost	1	5.78	1	5.56
Changed Site Cond. Risk	2	4.83	2	4.88
Long-term Warranty Risk	3	4.65	3	4.44
No Suitable Partner	4	3.97	5	4.19
High Cost of Insure/Bond	5	3.76	7	3.69
Proposal Effort and Skill	6	3.65	6	3.88
Not Seen as Profitable	7	3.38	9	2.69
No D-B Experience	8	3.13	4	4.31
Bank or Insurer Reluctance	9	2.98	8	3.00
Need to Work w/ Partner	10	2.59	10	1.88

The greatest relative difference between experienced contractors and designers was the importance they placed on the extra costs for bonding and insurance, and with the potential for design-build in transportation being a profitable arena (the only transportation specific question). Designers were much more concerned with the extra costs of bonding and insurance, and contractors were less likely to see transportation design-build as profitable. These results are shown in Table 7 and Figure A7.

Immediately prior to this survey question, respondents were asked if they had proposed or performed on a transportation design-build project, and also if they were interested in continuing or beginning to do design-build projects in transportation. Although only 27% had either proposed or performed on a transportation design-build project, 62% were interested.

Table 7. Transportation Concerns, Experienced Contractors and Designers

Project Management Factors	Experienced Contractors		Experienced Designers	
	Rank	Mean	Rank	Mean
Proposal Cost	1	5.88	1	5.53
Changed Site Cond. Risk	2	5.17	3	4.33
Long-term Warranty Risk	3	4.63	2	4.67
No Suitable Partner	4	4.29	5	3.64
Proposal Effort and Skill	5	3.92	6	3.07
Not Seen as Profitable	6	3.92	8	2.53
High Cost of Insure/Bond	7	3.65	4	4.07
No D-B Experience	8	3.46	7	2.60
Bank or Insurer Reluctance	9	3.29	9	2.47
Need to Work w/ Partner	10	3.08	10	1.80

### 3.3.6 Survey Comments

Appendix B contains a transcript of respondent's comments, essentially unedited. Seventeen responses included comments (19%). Three of these were deemed irrelevant to the survey and were discarded. Ten responses were from firms with design-build experience, four from contractors six from designers. Of the four responses from firms without design-build experience, two were from contractors and two were from designers. Most were general statements, observations, or opinions rather than the "detailed comments relating to specific experiences" the survey solicited.

The issue of ethics and integrity was particularly important to designers. This may be tied to the partnership agreement since the apparent preference is to have the designer hired for a fee, or for a fee with an incentive. This essentially makes the designer an "employee" of the contractor rather than a full partner. Interestingly, contractors were more likely to consider sharing the project risk, while the designer's concern of being subject to the contractor's pressure, rather than advocating the owner's interests, could be aggravated by their preference to being hired for a fee.

Several comments related specifically to the selection process, with particular concern over the proposal cost and the impartiality of the selection criteria. This is also apparent in the rankings of transportation design-build concerns since the cost of an unsuccessful proposal was ranked the most important.

Several respondents did provide specific comments regarding design-build on public works projects. They tended to question the cost effectiveness of design-build, and the impact that bureaucratic processes may have on the project. The high concern contractors display regarding profitability in transportation design-build is consistent with these comments.

## CHAPTER 4 ATTRIBUTES FOR SUCCESS

### 4.1 OVERVIEW

Nielsen grouped the proposed success attributes into three categories. The definition that he gave for each category immediately precedes the section that relates and compares each attribute's importance, as he found it in literature and interview, with the results of the survey. Reasonable explanations are offered for some of the comparisons. Marketability and workability encompass the 16 partner traits in the survey, and project organization encompasses the seven project management factors. All of the rankings cited in this chapter are by experienced contractors and designers

### 4.2 MARKETABILITY

*Marketability.* "Relates to the attributes that enhance the marketing effort of a design-build joint venture. In relation to the selection process for design-build public works contracts the design-builder will most likely be evaluated in some preliminary selection process. The criteria for the initial selection can be based upon the design-builder's experience, size, reputation, and technical ability. Therefore marketing is an important element in design-build construction."

#### **Marketability To Clients In Proposals**

"This is a crucial attribute for both partners. One partner cannot compensate for the poor marketability of another partner and therefore needs to seek out a partner with a similar marketability. Marketability in construction comes from a successful reputation and being able to target the appropriate market."

Ranked 3 by designers and 6 by contractors. Contractors may feel a designer's marketability is somewhat tied to their technical ability, which is the attribute they ranked third most important.

#### **Their Contacts With Potential Clients**

"This attribute is usually a critical ingredient for a successful joint venture in business. However, in the field of public transportation this should not be a factor if the selection process is objective. To ask this question in a survey could provide an interesting insight into the industry's opinion on the issue."

Ranked 9 by contractors and 11 by designers. These rankings are essentially equal (see Table 2). The distance between this ranking and the marketability ranking indicates more concern for market reputation than on having an inside track. This should be exactly the case if public projects are in mind.

### **Respect And Influence Of Local Regulatory Authorities**

“This characterization may be a critical factor in winning the selection process. In making the final evaluation of proposals the selection committee will eventually consider the past experience the owner has had with the designer or contractor. The selection criteria for evaluating design-build proposals often includes a local experience criteria. Therefore, being a local practitioner may help influence an owner’s decision during the selection process.”

Ranked 10 by both groups. This attribute may have been ranked relatively low since many respondents operate primarily within the state or northwest region and already have local regulatory relationships. Additionally, many of the national firms also have site offices in the region.

### **Similar Corporate Objectives And Business Plans**

“Such compatibility will ensure that both partners have a lasting relationship rather than a passing relationship. The business plan guides a company in its future business relationships. For example, if a contractor wants to expand into another state but the designer wants to remain within one state then the partners will be forced to diverge onto separate paths. This maybe manageable for the contractor, by forming another partnership with a designer in the new state but is not an ideal situation.”

Ranked 11 by contractors and 13 by designers. This trait would be clearly more important in a long-term traditional business venture. However, since most design-build firms rely primarily on project specific and/or fee based partnerships, this is probably less important in the construction design-build industry.

## **4.3 WORKABILITY**

*Workability.* “Relates to the daily operation of a design-build venture and [whether] the partners are able to work together effectively. Workability can be thought of as the 'glue' in the partnership, that will ensure its long-term survival. Having workability means partners are able to trust each others abilities and to cooperatively resolve any differences as they arise.”

### **Past Work Experience**

“Past working experience together that was favorable is considered to be one of the most critical attribute for success required for workability in a design build partnership. For the partners to have

Ranked 2 by both groups. Past work experience, even in a bid environment, gives the parties a chance to evaluate all of the other attributes prior to accepting the risk of a partnership. This attribute is

worked together and found it a mutually satisfying experience can only reinforce the likelihood of a successful partnership. The 'working together' may have been in the traditional competitive bid situation, but if both parties were able to get along, the odds are in favor of a successful partnership."

#### **Close Geographical Location**

"This may seem a dated factor for a partnership today with electronic communications able to link business partners in different cities. However remote management has not yet effectively replaced old fashion "eyeball-to-eyeball" meetings. When two partners are remotely located from each other and disputes arise, a stand-off in communication can develop. A more important factor is that the personnel of each partner never really develop a close relationship. Such a situation can only be detrimental to the partnership."

closely related to trust and integrity, which was the top ranked attribute.

Ranked 12 by both groups. Given the nature of construction, the firms may be confident the project management personnel can handle the "eye-to-eye" coordination.

#### **Technical Ability**

"Having a partner that can perform quality work and interpret the requirements of the project can only be beneficial to a project. What a partner wants to avoid, is the situation where the other partner relies upon it for guidance in its own scope of work. For instance, a designer wants a contractor fully competent in concrete curing techniques."

Ranked 3 by contractors and 6 by designers. Since the contractor has to build what the designer designs, not vice versa, they may understandably be more concerned with the designer's ability.

#### **Similar Comparative Size And Dominance In The Construction Industry**

"This desired attribute comes from wanting to avoid the 'elephant and ant complex'. Though the partners do not need to be of the same financial size they need to have personnel and resources that place them on an equal footing with each other. To have one partner disproportionately smaller would disrupt the essence of a joint venture. The larger partner may take a superior attitude to the weaker partner and cause animosity to develop."

Ranked 15 by contractors and 16 by designers. This attribute is clearly one of the less important traits. This result may be reflective of the fact that many firms routinely obtain extra personnel as they are required. It is also difficult to justify a high importance level for this attribute given that the partners serve a common market but provide drastically different services.

### **Similar Operating Procedures**

“This feature could be a critical element to a partnership if extensive communications are required between partners.”

Ranked 14 by contractors and 15 by designers. Respondents may feel that effective project interface precludes any need for in-house similarities.

### **Financial Strength To Weather Difficult Periods**

“This attribute would help to ensure the long-term survival of the partnership. Some projects will not be as profitable as planned and the partnership needs to absorb such losses and have the resources to forge ahead. A partnership would be unstable if one of the partners lacked the necessary financial strength and was to rely upon the other partner for financial backing during difficult times. No partner wants to be making cash advances during lean periods.”

Ranked 8 by contractors and 7 by designers. Although this is not a low ranked attribute, it may be less important since many design-build partnerships are project specific rather than long-term.

### **Similar Management Structure And Organization**

“This feature will ensure that personnel are able to meet and come to decisions in a compatible manner. For example, in international joint ventures problems often arise when one party has a centralized decision making process and the other party delegates decision making to its field staff. It is therefore important that the respective equals on each side of the partnership have equal authority. A project manager from the contractor needs to be able to deal with a project manager from the designer and make mutual decisions without consultation.”

Ranked 16 by contractors and 14 by designers. Routine experience on various project teams may partially account for the lower ranking.

### **Trust And Partner's Integrity**

“Trust is a basic prerequisite for any type of business partnership. When a designer and a builder enter into a joint venture they are placing a degree of their future business success in the hands of the other.”

Ranked 1 by both groups. This is perhaps the most obvious of all of the results. Several designer survey comments concerned a potential conflict of interest when designers are working for contractors rather than the owners.

### **Awareness Of Construction Schedule Requirements**

“This element is something both sides need to appreciate in order to maximize the partnership's efficiency. The designer

Ranked 4 by both groups. Contractors and designers may see the schedule from different perspectives, but they clearly

in a traditional professional relationship with the owner is not usually contractually bound to a schedule for completing the contract documents. The designer therefore needs to be aware of the consequences to the construction scheduling that late documentation could have on a design-build project. On the other hand the contractor is not normally involved in a transportation project prior to bidding and is personally unaware of the extensive time and effort required of the designers and planners to get a project underway and ready for construction.”

recognize its importance, and the potential impact if their partner doesn't.

#### **Overall Management Skills Of Partner**

“Management skills rather than technical ability as a designer or contractor may be crucial to the partnership. For example the designer may be a very competent bridge designer but has not had to be involved in the difficulties of contract administration. Even if the contractor assumes the role of a contract administrator the designer will still need to participate in the management of the contract in order for the partners to understand the issues and work together. It could be detrimental to the partnership if one partner could only bring technical ability to the project team and relied upon the other partner to manage their effort.”

Ranked 7 by contractors and 5 by designers. However, the means for each group are not very different. Since the majority of the management effort will be applied to the construction phase, designers may be more concerned with the contractor's management skills. This follows with the contractor's higher ranking of their partner's technical skills.

#### **Partner's Personnel**

“Compatibility of the people that will be interacting in the design-build joint venture is important. Senior management may decide that their companies are compatible in forming a joint venture, but the actual personnel interacting in the partnership on a daily basis also need to be comfortable with each other.”

Ranked 5 by contractors and 8 by designers. This may indicate that contractors may have experienced more of their work being impacted by the conduct of designers than vice versa.

#### **Ability To Effectively Manage On-Site Construction, Or To Provide An On-Site Representative**

“This maybe a crucial deciding factor for either the designer or contractor about to form a partnership. For a contractor who

Ranked 13 by contractors and 8 by designers. The difference may indicate the success and/or profitability of a project can

has witnessed substandard engineering supervision in past projects, a design firm that knows its way around site and is willing to provide a site engineer maybe a critical attribute for success.”

be largely influenced by contractor site management, and is less dependent upon having a designer on-site full-time. This is also consistent with the rankings for management skills.

#### 4.4 PROJECT ORGANIZATION

*Project Organization.* “Relates to the actual performance of a contract during the design and construction phase. Project organization differs from workability, as it relates to the specifics of how a project is organized and managed. If a project is to be successful (and the partnership to be successful in the long-term), then its organization must be agreed upon prior to commencing work. This would avoid the situation of the partners being successful in submitting a proposal only to find out later, during the project's execution, that they have fundamental differences of opinion concerning its organization.”

##### **A Single Manager Responsible For Both Design And Construction**

“This element is seen as an attribute that is crucial to the management success of a partnership. Partners at a senior management level still have control over the direction of the partnership, but at the project management level one individual needs to be appointed with overall authority concerning the design and construction of the project.”

Ranked 2 by contractors and 1 by designers. The only attribute contractors felt more strongly about was that they be the lead partner.

##### **Working From A Combined Project Office**

“This relates to the attribute in the workability category of a close geographical location. At a project management level when staff are devoted to the project solely, combining the personnel into a single office will improve communication and efficiency of the staff. The combined project office should begin at the proposal stage to maximize its benefits. The preliminary stages of submitting a proposal are an intensive period for the partnership and many important decisions will be made that will affect later work.”

Ranked last by both groups.

### **Completeness Of Drawings For Submitting A Proposal**

“Relates to the comfort level that both designer and contractor have about submitting bids on incomplete designs and drawings. Some design-builders will be comfortable with a 30 to 50% complete design, while others will seek 80% completeness. To select the right partner for a design-build venture both partners need to share a common understanding of risk. For design-build the completeness of drawings has a different measure than that of a traditional design-bid-build project. The design/drawings of a design-build project may be 80% complete but only 50% of the drawings are at a constructable stage. This is possible so long as the details and coordination have been hammered out to ensure the design works and can be built.”

Ranked 4 by contractors and 2 by designers. May have been ranked higher by designers since they are the partner responsible for the drawings.

### **Compatible Office Procedures And Filing Methods**

“Compatible systems could become a critical attribute for partners when they enter into a complex project with extensive written communications and the usual paper trails that are all the more prevalent in construction today. Though design-build is meant to reduce the paperwork, a robust system needs to be in place to ensure all information gets to where it belongs and is retrievable.”

Ranked next to last by both groups.

### **The Contractor As Lead Partner Rather Than The Designer**

“For making the decisions for the project the contractor’s personnel usually have a greater expertise. This attribute is linked to the first attribute in this category of having a single manager responsible for both design and construction.”

Ranked 1 by contractors and 5 by designers. This could be a fundamental difference of opinion. Designers agree on the importance of having a single responsible manager, but are less convinced the contractor needs to be that lead.

### **The Designer As Lead In The Presentation Of The Proposal To The Client**

“This attribute is considered because owners will often have dealt directly with designers in past projects but have had an arms-length relationship with the contractor.”

Ranked 5 by contractors and 4 by designers. This relatively high ranking and agreement are expected.

**The Contractor Handling The Contract Administrative Work**

“This attribute relates to the idea of the contractor as lead partner rather than the designer.”

Ranked 3 by both groups. Contractors want to handle the administrative workload, and designers are willing to let them do it.

## CHAPTER 5 CONCLUSIONS

### 5.1 OVERVIEW

Several of the basic differences in relative rankings between the groups can be linked to the different business characteristics inherent to contractor and designer's professions. "The contractor and designer serve a common market but provide drastically different services." (Nielsen 1997) These firms bring different interests and concerns with them when they meet at the design-build partnership table. Firms considering forming a design-build partnership can benefit by exploring the results of this survey, and by considering the issues their potential partner may be facing. By recognizing significant partnership and partner attributes which may be different than those common to their own profession, they may be better able to create and foster a more successful partnership, or to at least decrease the likelihood of entering into an unsuccessful one.

### 5.2 AGREEMENT TYPE

From Nielsen's literature research, profit sharing was highly recommended in order to ensure a true partnership exists, as opposed to engaging a professional on a fee basis only. However, the survey results suggest the opposite is more desirable in today's design-build industry. Payment based on a proportion of the profit, and a binding contract to share risk were the lowest ranked partnership agreements for both designers and contractors. These results seem to indicate that design-build firms would rather have the designer engaged as a fee for service partner. This represents a fundamental difference from traditional business joint ventures, and may have an impact on how owners and public agencies regard design-build partnerships. When the designer simply provides their services for a fee, they no longer work for the agency, they work for the contractor.

Standard deviations were highest regarding the preferred type of partnership agreement. This suggests that while desired partner attributes are relatively inflexible, agreement types may be more subject to review or revision. Also, as one respondent commented,

the size of a project may significantly change needs and perspectives that firms have with design-build.

### 5.3 ATTRIBUTES FOR SUCCESS

Of all of the survey traits analyzed, trust and integrity not only had the highest absolute mean, it also had the lowest standard deviation. This indicates that, regardless of background or experience, being able to trust a partner and be confident of their integrity may overshadow all other attributes found in a successful partnership. Several of the survey comments also indicated the high degree of concern some designers have with this aspect of a design-build partnership.

Of the four main questions, standard deviations were lowest overall in the ratings for important partner characteristics. This indicates the respondents are in greater agreement with the type of partner they prefer than with the type of partnership they have, either contractually or operationally.

### 5.4 CONCERNS WITH DESIGN-BUILD IN TRANSPORTATION

Clearly, the results indicate firms are primarily concerned with the bottom line. Costs and potential costs topped the list of concerns consistently. Additionally, high proposal costs were the subject of several of the survey comments. This may indicate the design-build, especially in the public works and transportation sector, is an area that firms still have questions about. The risks, liability, and profitability of these projects are more in question than with traditional design-bid-build projects. However, the level of interest in transportation design-build, at 62% of the respondents, compared to the only 27% that have been involved in these projects, indicates the supply of firms willing to entertain public works transportation design-build is not lacking.

The least important concern, working with a partner, is consistent with the marks found with partner attributes. In other words, if you join with a firm that exemplifies your desired attributes, then you are less concerned when working with them.

## 5.5 SUMMARY

As with any attempt to rate qualities, factors, and concerns that are inherently subjective in nature, the results themselves are somewhat subjective. However, by reviewing literature, conducting interviews, and statistically reviewing the survey responses, a clearer picture of successful design-build attributes is available. Rather than relying solely on experience or perception, Nielsen's study and this report provide an overview which is broader than the limited information available to an individual firm engaged in or considering design-build. Additionally, it provides contractors, designers, and owners a chance to see design-build concerns and successful design-build partnership attributes from other industry perspectives, perspectives that are independent of any single project.

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APPENDIX A FIGURES

Contractor
  Std. Dev.
  Designer
  Std. Dev.

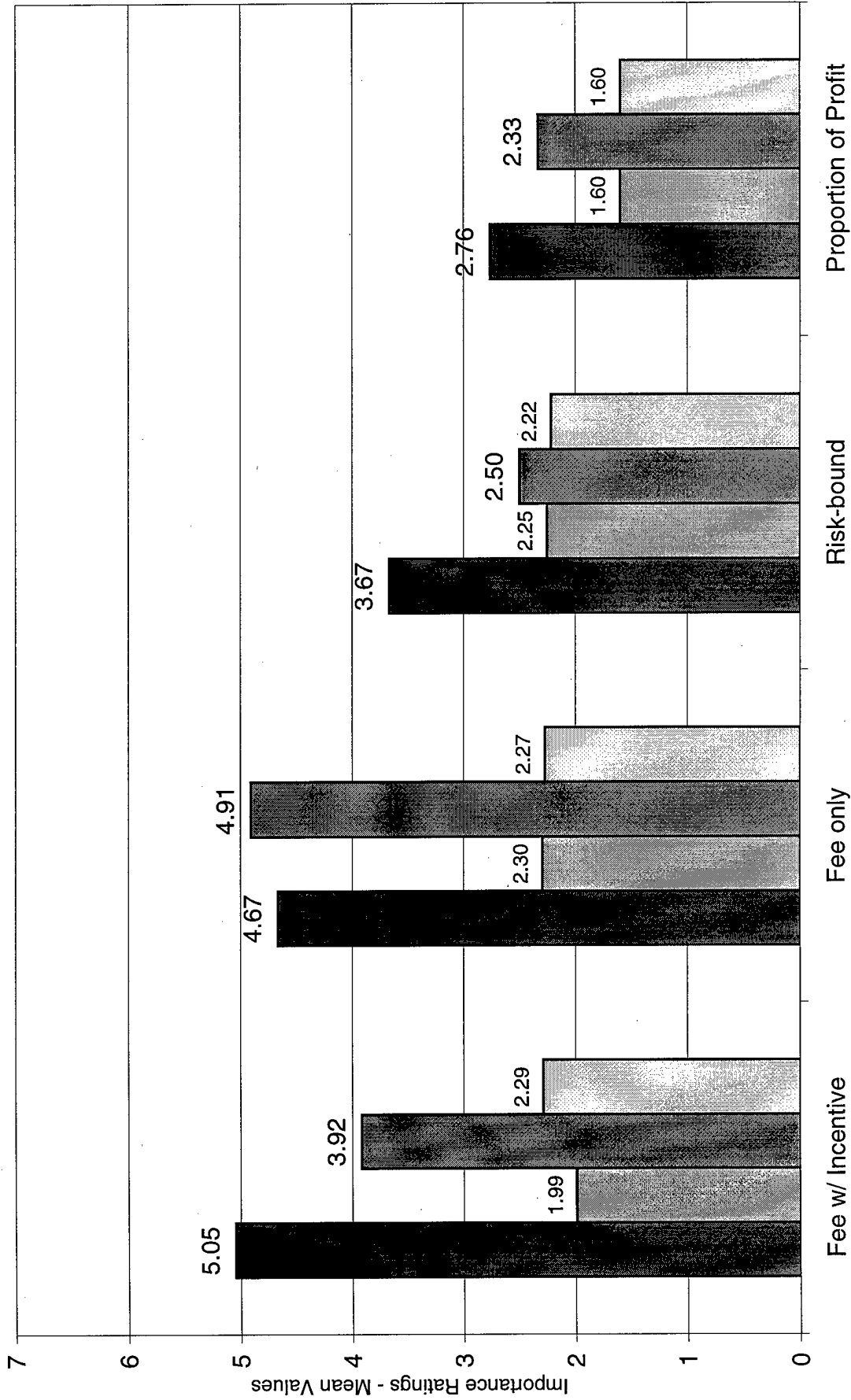


Figure A1. Best Agreement Type - Experienced Firms

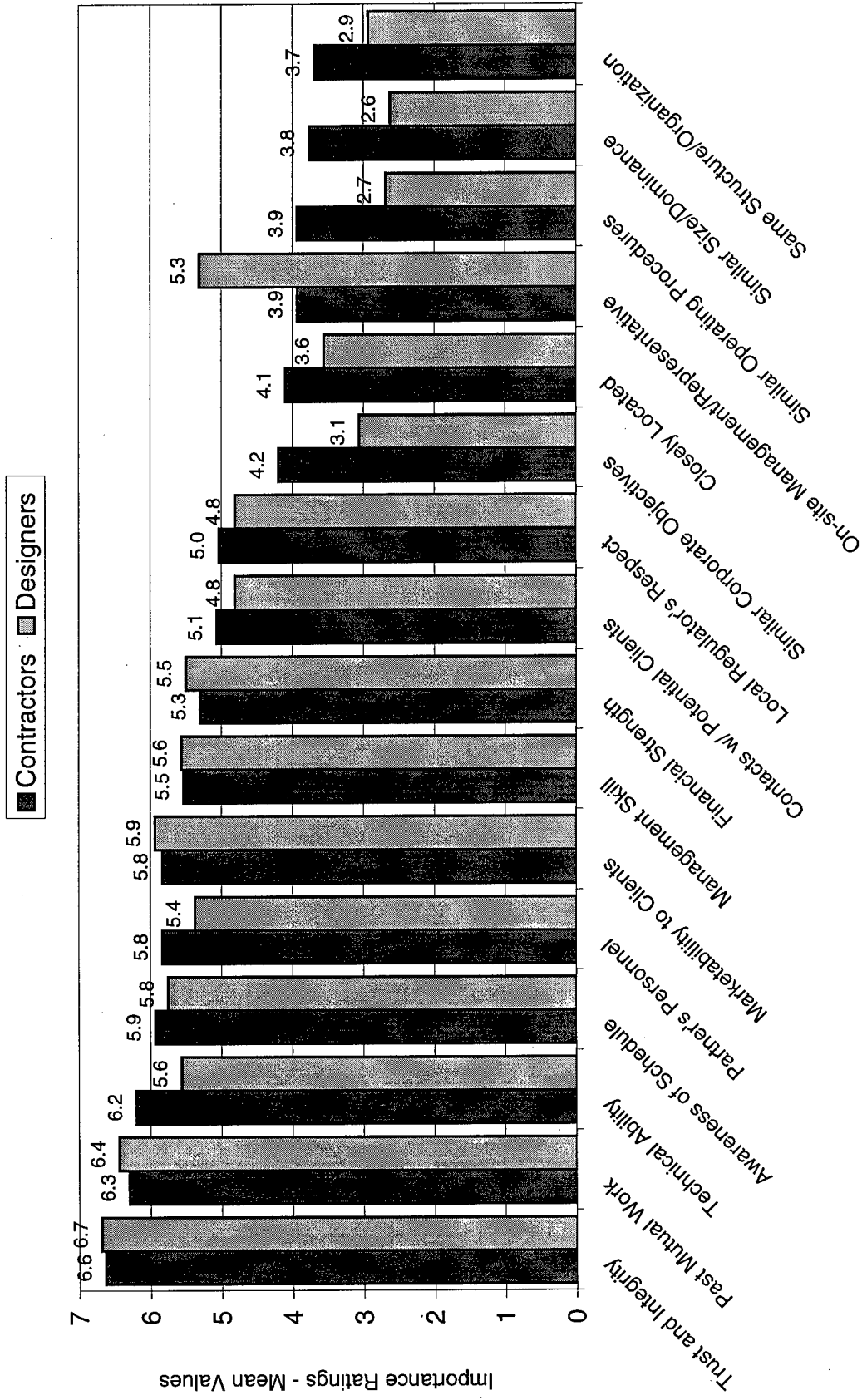


Figure A2. Desired Partner Attributes - Experienced Contractors and Designers

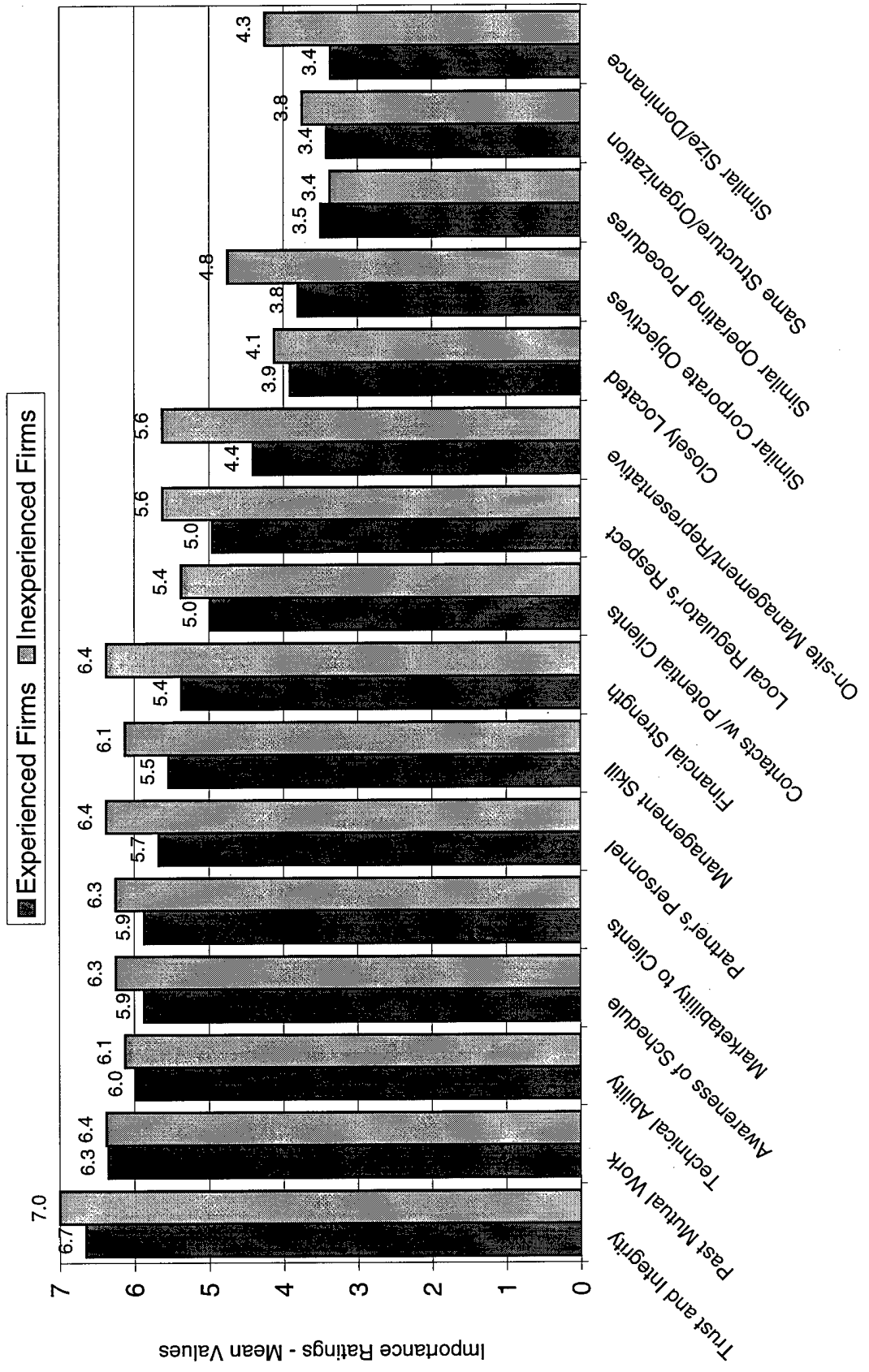


Figure A3. Desired Partner Attributes - Experienced and Inexperienced Firms

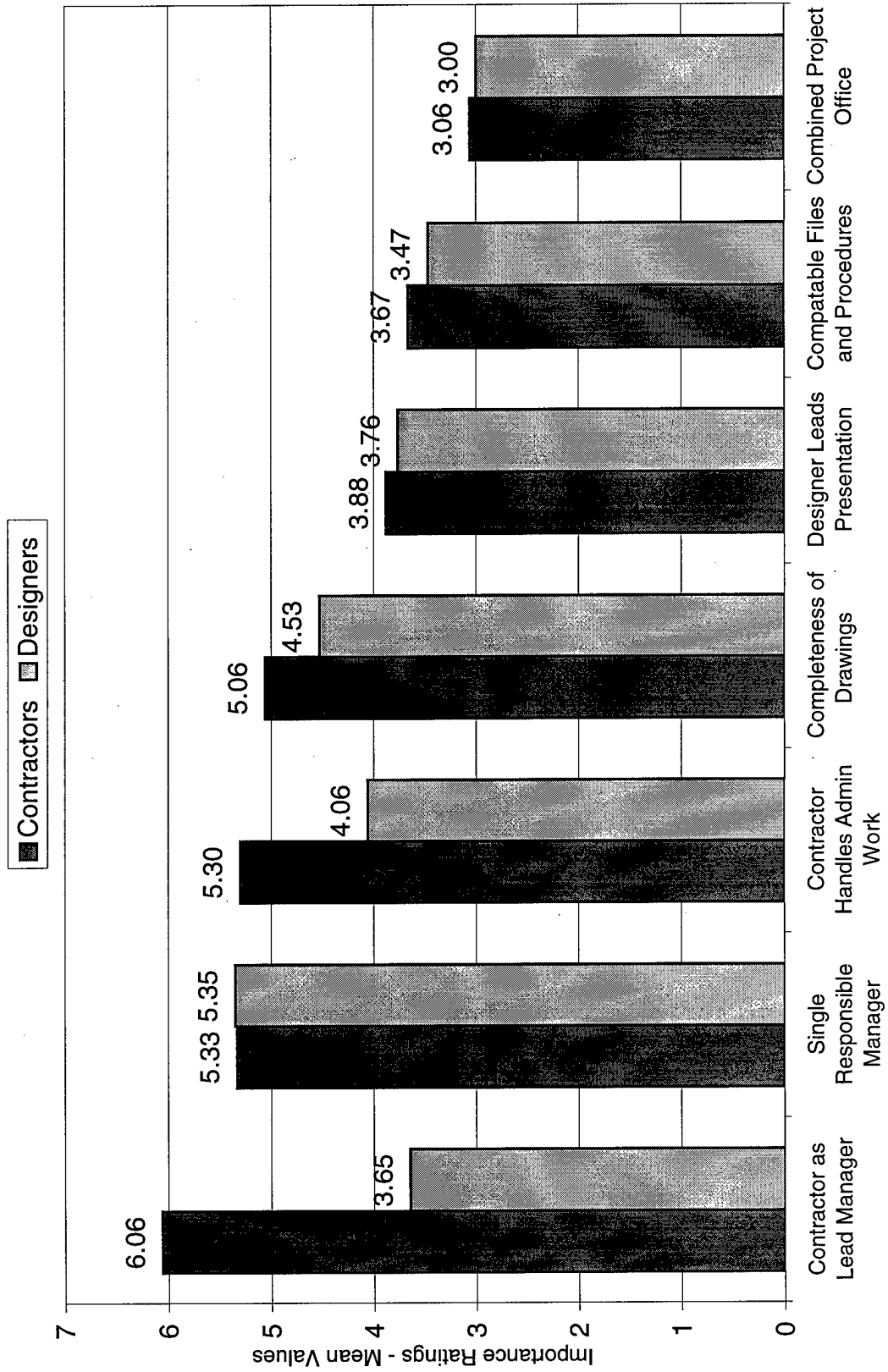


Figure A4. Project Management Factors-Experienced Contractors and Designers

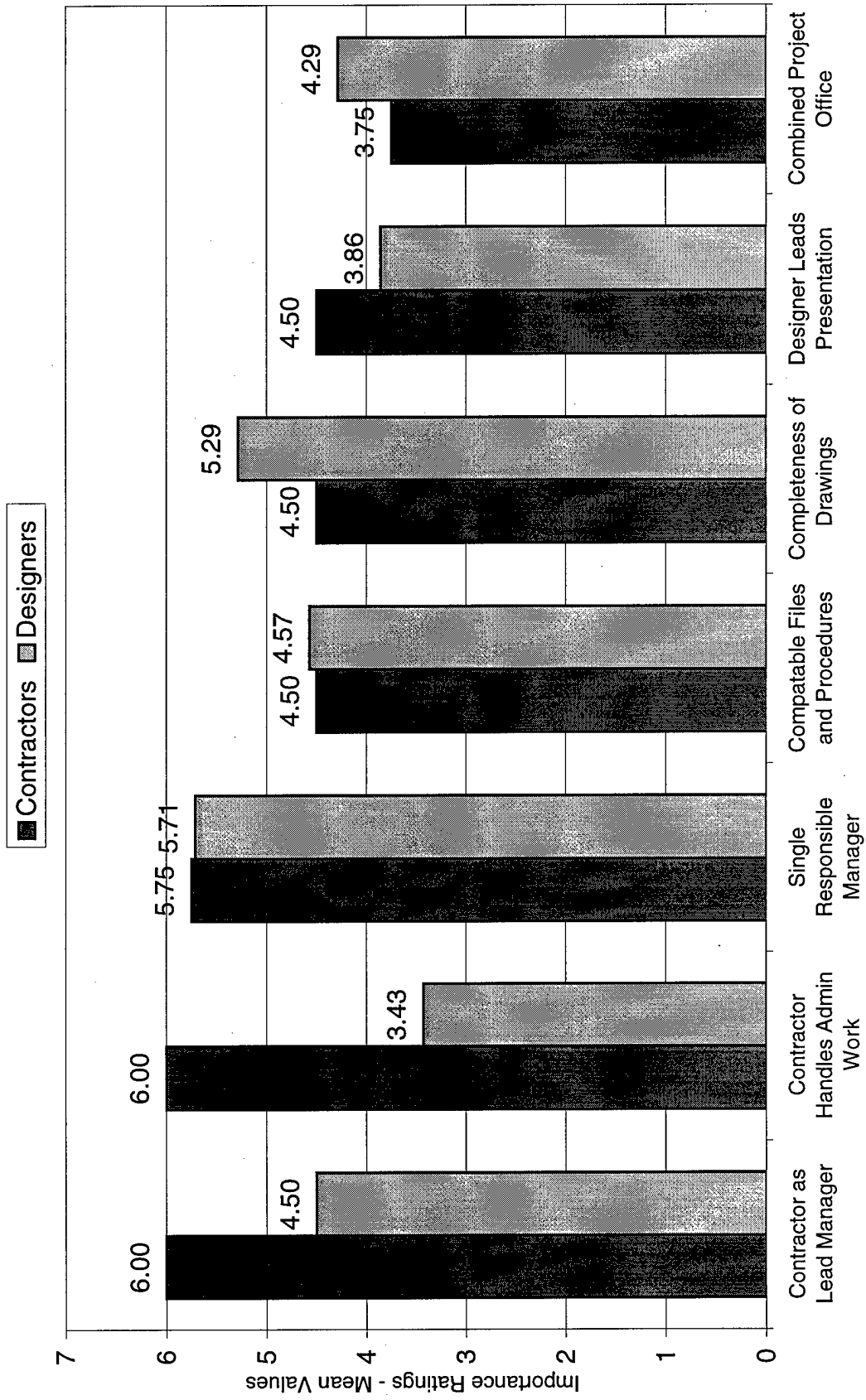


Figure A5. Project Management Factors-Inexperienced Contractors and Designers

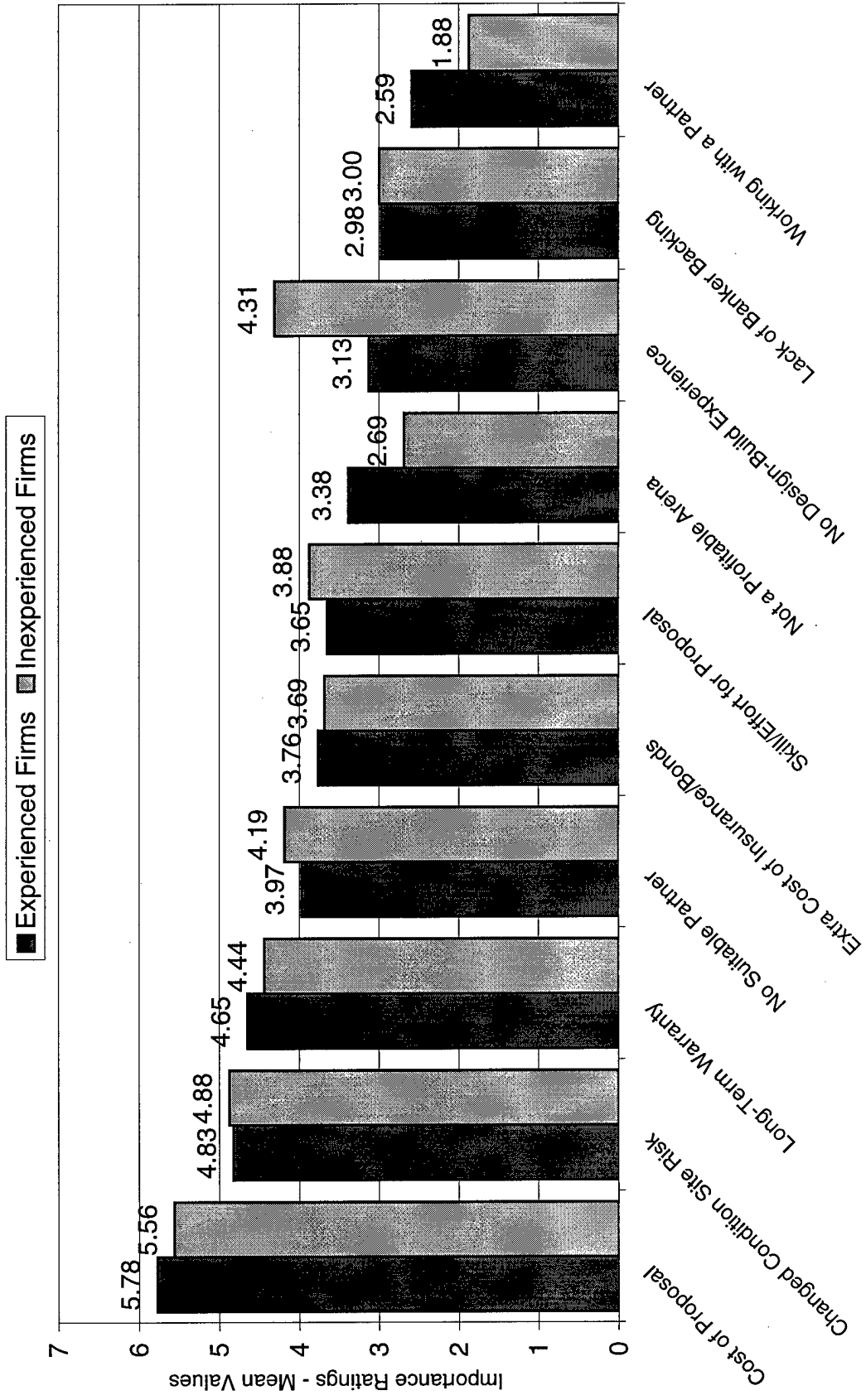


Figure A6. Transportation Concerns - Experienced and Inexperienced Firms

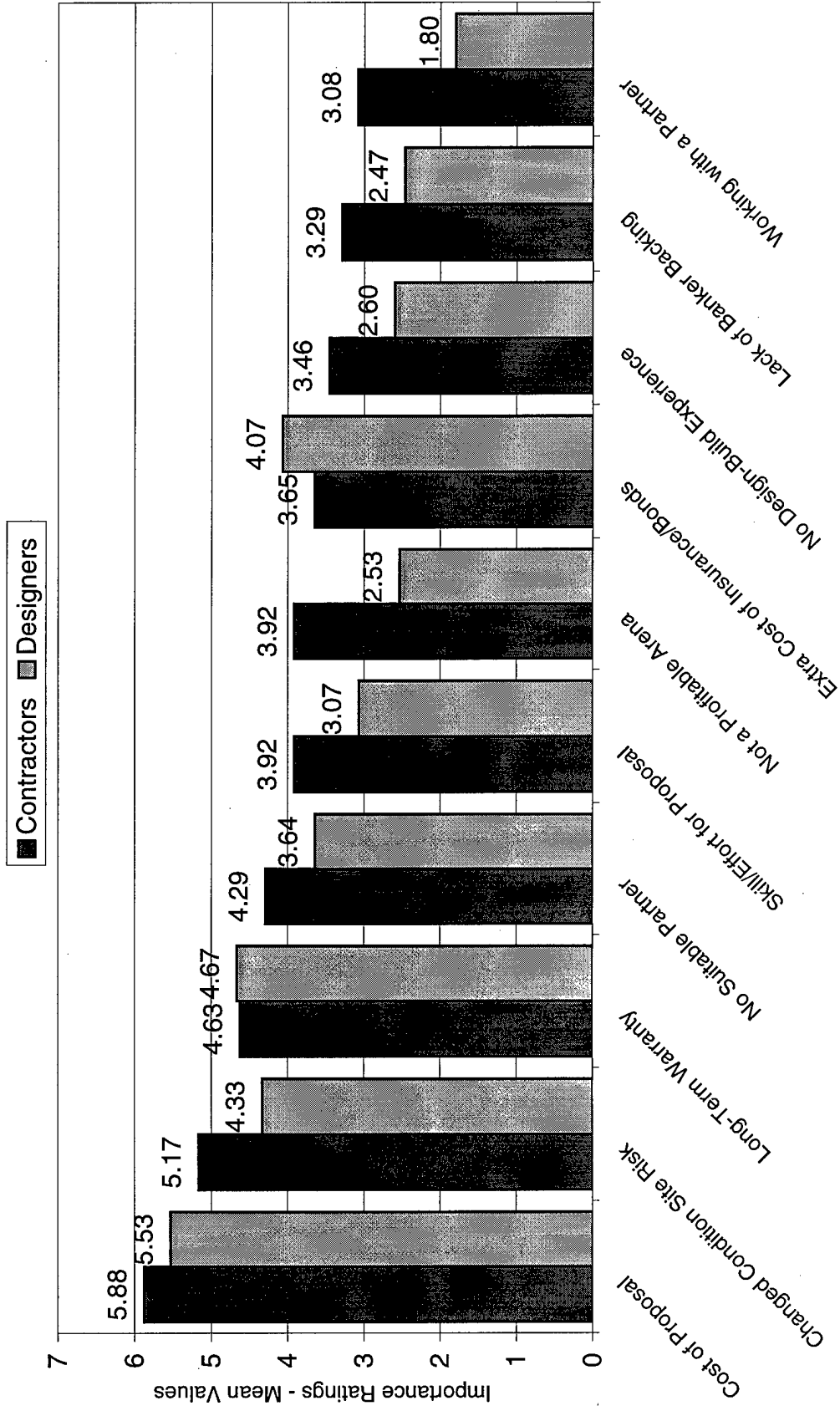


Figure A7. Transportation Concerns - Experienced Contractors and Designers

APPENDIX B SURVEY COMMENTS

## SURVEY COMMENTS - As Written

### **Contractors with Design-Build Experience:**

We can prove that, by using the design build process along with negotiating, that owners save significant total dollars as opposed to the traditional design/bid/build process, especially on multiple-project programs. I see no reason why similar results can't be obtained in transportation projects, if all of the parties are ready, willing and able to make the design/build - negotiate process work.

Design build on transportation projects will only be cost effective if the government will allow a "true" design build and keep the bureaucrats out of the process. An excellent example of successful projects of a design build nature in transportation are Developer's Extension type projects where a developer will design and build a road or traffic signals or ramps, etc., and then donate them to the city or county or WSDOT. This had been done on existing state right-of-way where traffic was maintained during construction. Original plans are approved by the agency and material sources are approved. Actual construction is performed with private engineering/inspection forces and private testing labs. No bureaucratic inspection or oversight. // Competitive bid laws make design build difficult on the typical government transportation project due to high cost of proposal preparation. // We avoid public works projects due to tremendous manpower requirements for government paperwork and social welfare programs: EEO, minority subcontracts, apprenticeship utilization, training, claims administration, etc., etc.

Concern over the selection process on public sector design-build projects: Subjective factors driven by favoritism; the emerging dominance of the big contractor in the selection process, and the playing field not being "level"; a tendency of public officials to look at the "eyewash" of a qualification proposal vs. the actual focused capability of a construction firm - a bigger firm is not always a better firm.

The cost of construction is in the design, if you expect to control cost the contractor needs to control design.

**Contractors without Design-Build Experience:**

I believe design build has been over-promoted by public agencies to compensate for lack of management control by the agency. Historically, owners have given the designer the legal responsibility of contract interpretation which has not worked. I believe design build is a good option for fast track situations but not the answer for other situations. The competitive bid process is the best dollar return a public agency gets. We do believe that design build is a market we need to pursue if it can be made economically feasible.

Personally, I believe that design build offers tremendous benefits to all parties due to the formation of a cohesive team and which each member has a vested interest. Can do quicker, with less cost, and fewer disputes. But, key team members must have ability and willingness to make decisions. Integrity of each member is vital to success.

**Designers with Design-Build Experience:**

A good delivery system when owner understands the process

Many/most of the methods of contracting between designer and builder put designer in a conflict of interest situation (after bidding and award). E.g., does designer cut costs to benefit his client (the builder) while sacrificing prudent design to benefit the owner? Incentive and shared profit arrangements can make this conflict of interest worse and can lead to ethics problems for the designer and unsatisfactory project results for the owner. Contractors and designers often have different sets of ethics. // Most designers are having a difficult time (we believe) acquiring adequate compensation for the time and effort required to prepare a bid design/build proposal (an unsuccessful bid and proposal). Compensation for such losses may eventually be acquired by including excess fees in subsequent design/build proposals - thus increasing owner's costs.

(We) have participated in design-build projects with both prime contractors and subcontractors with projects up to \$30 million over the last 20+ years. The most important element is the trust and working relationships between the designer and contractor. We strongly believe the designer and contractor need to have worked together in a more traditional fashion before engaging in design-build projects. Our design-build experiences have in general been very good, but we are selective about projects we undertake and who we undertake them with.

Designer cannot insure himself for professional liability. This effects insurance. // Contractors cannot purchase professional liability insurance. // Past experience by listening to design-build contractors they include project insurance and go after the designers E/O insurance. The deductible for this is high and premiums very high, possibly up to 10X normal professional liability. // Believe selecting a qualified designer and having the designer assist in selecting the CM contractor is the best solution to insure teamwork. // On some cases (foreign work), design-build is the way to go. It eliminates the politics of assigning final design to a local firm. Best to work with US contractor and US engineering team in this work. // Design-build is not in favor of most Washington State general contractors since they are not set up to handle the clients but build to meet plans and specification. // As an engineering firm, we (in our) specialties are considering on leading the design-build team. We will have no problem in getting contractors to guarantee costs per our drawings and specs. We can even take competitive bids and increase our fee substantially on taking this further risk. // The role of the design professional will need to be expanded to make design-build projects to deliver quality work. The design professional will have to rely on this integrity to give his clients a value project. // From attending a design-build conference last year, contractors all went after the designers project insurance for errors.

The cost of competing can be quite high and lower tier consultants seldom see any part of an honorarium or competition fee. This makes involvement of smaller firms and MWDBE businesses pretty difficult. // Clear selection criteria, and adherence to them are important to the success of design-build. We have seen selections that were don at the whim of the selection board in conflict with the stated goals of the project. Glitz sells... // As a designer we are sometimes pressured by contractors to come up with less stringent designs and specifications. The owner needs to be very conscious of such tendencies, especially in design-build where the contractor is the one paying the designer. Money talks...

[Desired attributes and concerns are different depending upon the size of the project.] A \$1M project vs. a \$1B project has different needs.

#### **Designers without Design-Build Experience:**

As I recall design build projects were fairly common a few decades ago and then fell out of favor to the current system in which engineers design and contractors build and each assumes (each) knows his own level of risk/reward.

Most important aspects of design-build I think are: 1) Excellent coordination between contractor, designer, and owner; 2) excellent communication between same; 3) education of, and continuous participation by, owner.

APPENDIX C DATA TABLES

**Statistical Comparisons**

	All Responses				All w/ Design-Build Experience				All No Experience					
	Rank	Mean	Std. Dev.	Med.	Mode	Rank	Mean	Std. Dev.	Med.	Mode	Rank	Mean	Std. Dev.	Med.
<b>Best Agreement Type</b>														
Fee w/ Incentive	1	4.82	2.08	6	6	2	4.64	2.17	5	7	1	6.00	0.00	6
Fee only	2	4.68	2.30	5	7	1	4.82	2.29	5	7	2	4.20	2.32	3
Risk-bound	3	3.37	2.33	3	1	3	3.24	2.31	3	1	3	4.20	2.32	5
Proportion of Profit	4	2.61	1.53	2	1	4	2.61	1.61	2	1	4	2.60	0.80	2
<b>Important Partner Characteristics</b>														
Trust and Integrity	1	6.70	0.74	7	7	1	6.65	0.79	7	7	1	7.00	0.00	7
Past Mutual Work	2	6.35	1.14	7	7	2	6.35	1.20	7	7	3	6.38	0.70	6.5
Technical Ability	3	6.00	1.28	6	7	3	5.98	1.36	6	7	7	6.13	0.60	6
Awareness of Schedule	4	5.93	1.03	6	6	4	5.87	1.08	6	7	6	6.25	0.66	6
Marketability to Clients	5	5.93	1.23	6	7	5	5.87	1.33	6	7	5	6.25	0.43	6
Partner's Personnel	6	5.78	1.07	6	6	6	5.67	1.10	6	6	2	6.38	0.48	6
Management Skill	7	5.63	1.51	6	7	7	5.64	1.56	6	6	8	6.13	1.05	6.5
Financial Strength	8	5.52	1.17	6	6	8	5.37	1.17	5	5	4	6.38	0.70	6.5
Local Regulator's Respect	9	5.06	1.35	5	5	10	4.96	1.41	5	5	9	5.63	0.70	5.5
Contacts w/ Potential Clients	10	5.04	1.36	5	6	9	4.98	1.62	5	6	11	5.38	1.11	5.5
On-site Management/Representath	11	4.59	1.77	5	6	11	4.41	1.73	5	6	10	5.63	1.65	6
Closely Located	12	3.94	1.60	4	5	12	3.91	1.46	4	5	14	4.13	2.26	4
Similar Corporate Objectives	13	3.94	1.98	4	2	13	3.80	1.95	4	2	12	4.75	1.92	5
Similar Size/Dominance	14	3.50	1.82	3	3	16	3.37	1.57	3	2	13	4.25	1.71	4
Similar Operating Procedures	15	3.48	1.79	3	2	14	3.50	1.83	3	2	16	3.38	1.58	3.5
Same Structure/Organization	16	3.47	1.56	3	5	15	3.42	1.63	3	5	15	3.75	1.09	3.5
<b>Important Management Factor</b>														
Single Responsible Manager	1	5.41	1.77	6	7	1	5.34	1.77	6	6	1	5.73	1.71	7
Contractor as Lead Manager	2	5.22	1.88	6	7	2	5.24	1.97	6	7	2	5.10	1.37	5
Completeness of Drawings	3	4.90	1.38	5	4	3	4.88	1.38	5	4	3	5.00	1.35	5
Contractor Handles Admin Work	4	4.79	1.37	5	7	4	4.88	1.99	5.5	7	5	4.36	1.82	4
Designer Leads Presentation	5	3.89	1.74	4	4	5	3.84	1.67	4	4	7	4.09	2.02	4
Compatible Files and Procedures	6	3.77	1.79	3	3	6	3.60	1.75	3	3	4	4.55	1.72	5
Combined Project Office	7	3.30	1.64	3	2	7	3.04	1.59	2	2	6	4.09	1.68	4
<b>Concerns in Transportation</b>														
Cost of Proposal	1	5.89	1.52	6	7	1	5.78	1.47	6	7	1	5.56	1.62	6
Changed Condition Site Risk	2	4.85	2.03	5	7	2	4.83	2.06	5	7	2	4.88	1.90	5.5
Long-Term Warranty	3	4.58	1.99	5	7	3	4.65	2.03	5	7	3	4.44	1.80	4.5
No Suitable Partner	4	4.09	2.18	4	7	4	3.97	2.15	4	1	5	4.19	2.30	4.5
Extra Cost of Insurance/Bonds	5	3.77	1.91	4	5	5	3.76	1.87	4	5	7	3.69	1.99	3.5
Skill/Effort for Proposal	6	3.67	1.86	4	2	6	3.65	1.92	3.5	2	6	3.88	1.73	4
No Design-Build Experience	7	3.47	2.17	3	1	8	3.13	2.07	3	1	4	4.31	2.20	5
Not a Profitable Arena	8	3.18	2.02	2	1	7	3.38	2.13	3	1	9	2.69	1.61	2
Lack of Banker Backing	9	2.98	1.88	2	2	9	2.98	1.88	2	2	8	3.00	1.84	2
Working with a Partner	10	2.38	1.51	2	1	10	2.59	1.64	2	2	10	1.88	0.93	2





Experienced Contractors																				
KTR-1	A/E-2	Mutual Work	Marketability	Close	Location	Contacts	Technical	Same size	Same obj.	Same Ops	Reg. Respec	\$\$\$ Strgth	Same Org	Trust	Sched.	Award	Mgmt Skill	Persons	On-site	
																				Import
1	7	7	5	1	3	2	7	1	7	4	5	7	1	7	7	7	7	7	1	
1	7	7	5	1	5	5	5	3	5	3	3	6	5	7	5	7	7	7	4	
1	5	7	7	5	1	5	7	3	5	3	4	5	3	7	7	7	7	5	5	
1	7	7	7	5	1	7	7	6	3	3	5	7	3	6	7	7	7	6	6	
1	7	5	2	2	2	5	2	2	2	2	6	6	1	7	6	6	2	6	1	
1	7	2	5	3	1	5	5	1	5	5	3	3	2	7	6	3	3	5	5	
1	7	6	5	5	5	6	7	4	6	6	7	7	5	7	7	6	6	7	6	
1	7	7	6	7	3	4	7	5	6	6	6	5	5	7	7	7	7	7	6	
1	7	7	7	5	5	6	7	4	3	5	4	4	5	7	7	7	5	7	4	
1	7	7	7	7	7	6	7	7	7	5	5	6	6	7	7	7	5	5	4	
1	5	6	6	2	2	4	6	2	2	2	3	4	3	7	7	6	6	6	3	
1	7	5	5	5	4	5	6	4	4	4	4	6	4	7	5	6	6	6	4	
1	6	6	6	5	5	6	7	5	5	6	7	5	5	6	7	7	7	6	5	
1	6	6	6	4	4	4	7	4	4	4	4	6	4	7	7	6	6	5	5	
1	6	7	2	2	2	3	7	2	2	1	5	5	1	6	5	3	3	6	4	
1	7	2	3	3	6	6	2	6	6	6	6	7	6	5	5	6	6	6	2	
1	6	6	6	5	5	6	6	2	5	3	3	5	4	7	4	4	6	5	3	
1	7	6	7	3	4	6	6	5	5	5	6	6	5	7	6	6	6	6	4	
1	6	7	7	3	3	6	7	4	4	5	6	6	5	7	4	6	6	6	3	
1	6	7	7	3	4	6	6	5	5	5	6	6	5	7	5	5	6	6	4	
1	5	7	7	5	3	7	5	2	1	2	4	5	2	7	6	6	6	6	5	
1	7	6	6	3	3	6	5	3	3	3	5	4	3	6	6	6	5	5	2	
1	7	7	6	6	6	6	7	6	4	5	6	5	5	7	6	6	6	6	5	
1	7	3	3	6	6	6	6	2	1	1	4	5	3	6	5	5	5	5	3	
1	7	5	4	4	5	5	6	2	2	3	6	4	2	7	4	5	5	4	4	
1	7	7	5	5	7	7	7	3	4	2	7	2	2	7	7	7	5	5	3	
1	7	5	2	2	7	4	5	4	1	2	7	4	2	5	4	4	1	4	3	
1	7	7	7	7	7	4	7	5	7	7	5	5	5	7	7	7	7	7	5	
1	4	5	1	1	4	4	6	3	4	4	5	6	5	5	5	5	5	6	6	
1	7	6	5	5	6	6	6	6	6	6	6	7	6	7	6	6	7	6	6	
1	6	6	6	5	5	6	6	5	7	5	5	5	4	7	6	6	6	6	2	
Sums																				
Averet	6.30	5.83	4.10	5.07	6.20	3.77	4.20	3.93	5.03	5.30	5.30	3.69	3.69	6.63	5.93	5.93	5.53	5.83	3.93	
Standt	1.269	1.392	1.557	1.436	1.077	1.627	1.851	1.632	1.129	1.215	1.556	1.556	1.556	0.998	0.998	0.998	1.500	0.820	1.413	
Medial	7	6	5	5.5	6.5	4	4	4	5	5	5	4	4	7	6	6	6	6	4	
Mode	7	7	5	6	7	2	5	5	5	6	6	5	5	7	7	7	6	6	5	

		Experienced Contractors														
KTR-1	AE-2	Important Management Factors				D-B in Interest In				Concerns in Transportation D-B				Site Risk	Long-term	
		Drawings	Same Files	KTR Lead	AE Pres	KTR Admin	Trans/D-B	Trans	No Partner	Proposal \$	More Bond	?Profit?	No Exper			No Bank
1	4	4	6	2	3	7	n	n	7	7	3	7	7	4	7	7
1	6	5	6	5	6	6	1	1	7	7	5	1	3	2	3	5
1	7	5	4	3	4	4	1	1	1	1	7	4	1	1	6	5
1	2	2	7	2	5	4	n	n	6	6	7	7	5	1	2	3
1	6	2	4	2	7	5	n	n	2	2	5	4	4	1	4	1
1	6	1	7	2	5	2	1	1	5	7	2	5	4	4	5	4
1	7	2	6	5	7	4	n	n	3	7	5	6	3	5	6	7
1	7	4	6	7	7	3	n	n	6	7	5	6	3	5	6	7
1	4	2	4	2	7	5	n	n	5	7	2	2	7	3	2	7
1	5	4	6	4	7	1	n	n	1	5	7	2	2	2	7	3
1	1	2	5	3	3	2	n	n	1	4	1	3	1	1	1	3
1	6	4	4	4	4	4	n	n	3	3	3	2	2	2	2	3
1	4	2	5	5	7	4	n	n	4	4	4	5	7	2	2	6
1	1	1	7	3	7	6	n	n	2	2	2	3	3	2	3	6
1	6	4	4	3	6	3	n	n	3	6	5	5	6	5	6	7
1	6	4	5	1	5	3	n	n	4	6	4	3	6	6	5	6
1	7	1	4	3	6	2	n	n	5	7	4	5	7	7	6	6
1	7	7	5	6	7	7	n	n	2	7	6	6	6	7	6	6
1	6	2	4	3	5	3	n	n	7	7	7	7	7	7	7	7
1	4	2	6	5	4	6	n	n	6	6	6	6	6	6	6	6
1	6	4	5	5	7	5	n	n	5	7	5	6	2	2	1	3
1	6	4	5	5	7	5	n	n	7	5	2	1	1	1	3	2
1	7	2	4	4	7	3	n	n	6	3	2	1	2	3	3	5
1	5	1	5	3	6	4	n	n	4	4	2	1	1	1	3	5
1	6	5	6	4	7	5	n	n	7	7	5	4	4	4	6	7
1	6	5	4	4	7	3	n	n	1	1	3	2	1	4	5	7
1	2	2	6	3	6	4	n	n	2	5	3	2	2	2	2	6
1	7	3	5	5	7	1	n	n	7	5	3	2	2	2	7	6
1	7	2	5	1	7	1	n	n	4	7	5	7	1	3	5	7
1	7	5	4	7	7	3	n	n	5	7	7	4	4	7	7	7
1	6	5	5	4	6	6	n	n	6	6	5	4	2	2	5	6
1	5	1	7	5	7	5	n	n	7	7	1	5	4	6	2	1
1	4	2	1	2	6	4	n	n	5	6	4	1	2	3	4	3
Sums:																
Average	5.33	3.06	5.06	3.67	6.06	3.88	0.21	0.53	4.29	5.88	3.65	3.92	3.46	3.29	3.08	5.17
Standard	1.735	1.556	1.229	1.531	1.451	1.696			2.189	1.394	1.549	2.019	2.101	1.903	1.861	1.863
Median	6	2	5	3	7	4			5	6	4	4	3	2.5	3	4
Mode	6	2	4	3	7	5			7	7	5	5	1	2	2	7



**Experienced Designers**

KTR-1	AVE-2	Mutual	Word	Marketability	Close	Locator	Contacts	Technical	Same size	Important Partner Characteristics				Trust	Sched. Award	Mgmt Skill	Persons	On-site
										Same obj.	Same Ops	Reg.	Respect					
2	7	5	4	5	6	3	2	1	3	5	3	7	6	6	6	6	6	
2	7	7	5	7	7	5	3	1	3	6	1	7	7	7	7	7	7	
2	7	6	2	3	5	3	7	2	6	5	2	7	3	5	4	4	2	
2	6	7	3	3	2	3	2	2	5	5	2	7	6	5	6	7	7	
2	7	7	5	6	7	1	1	1	7	7	3	7	5	5	6	2	2	
2	3	7	3	7	7	3	3	3	7	7	3	7	7	7	7	5	7	
2	5	5	3	3	7	3	2	6	7	5	5	7	6	6	4	4	2	
2	7	4	2	4	2	2	2	2	4	4	2	7	4	4	5	5	2	
2	7	5	2	1	5	1	2	5	6	6	4	7	7	1	2	5	5	
2	7	4	4	3	4	3	1	1	2	3	1	3	4	3	3	3	3	
2	7	4	4	5	6	2	1	1	4	6	2	7	6	6	6	6	6	
2	7	6	2	3	4	4	3	1	2	5	1	6	5	6	7	6	6	
2	6	7	4	6	7	2	6	4	5	6	2	7	7	7	7	7	7	
2	6	7	4	7	6	2	3	4	7	5	7	7	6	7	6	6	6	
2	7	7	6	7	7	4	4	2	3	6	5	7	6	7	5	7	7	
2	7	7	4	7	7	1	7	7	7	7	4	7	7	7	7	7	7	
Sums	6.44	5.94	3.56	4.81	5.56	2.63	3.06	2.69	4.81	5.60	2.94	6.69	5.75	5.56	5.38	5.31	5.31	
Average	1.059	1.197	1.171	1.911	1.694	1.111	1.919	1.895	1.810	1.061	1.638	0.982	1.199	1.657	1.452	1.895	1.895	
Median	7	6.5	4	5	6	3	2.5	2	5	5.5	2.5	7	6	6	6	6	6	
Mode	7	7	4	7	7	3	2	1	7	5	2	7	6	7	6	6	7	

**Experienced Designers**

KTR-1 A/E-2	Important Management Factors				D-B In Interest In				Concerns In Transportation D-B				Site Risk	Long-term					
	One Mgr	Same Placel	Drawings	Same Files	KTR Lead	A/E Pres	KTR Admin	D-B In Trans?	No Partner	Proposal \$	More Bond	?Profit?			No Exper	No Bank	Work w Partner	Prop Skill	
2	6	3	4	2	1	6	1	n	1	5	6	1	2	1	1	1	5	2	4
2	7	5	5	3	7	3	5	1	n	1	7	6	1	1	3	2	6	2	3
2	5	2	2	7	3	3	7	1	1	1	3	2	2	1	2	2	2	2	2
2	6	6	4	4	2	6	5	1	1	3	7	4	5	3	2	2	2	2	2
2	6	2	7	1	5	6	1	n	1	5	7	7	1	6	7	1	1	6	6
2	7	2	3	3	1	7	7	1	1	3	3	1	1	1	1	1	3	7	7
2	7	7	7	7	1	7	1	1	1	1	3	3	1	1	1	1	1	1	1
2	3	2	5	2	3	4	6	n	n	2	6	5	2	2	5	2	4	5	5
2	6	4	4	1	7	2	1	1	1	5	6	2	1	3	1	1	6	7	5
2	7	1	3	1	7	1	7	n	n	7	7	7	7	7	1	1	5	3	7
2	2	2	3	1	6	1	6	1	1	4	4	2	1	1	1	1	1	2	2
2	6	4	3	3	4	3	3	n	n	n	n	n	n	n	n	n	n	n	n
2	7	2	3	4	5	1	6	n	n	n	n	n	n	n	n	n	n	n	n
2	5	3	5	6	4	3	5	n	n	3	7	7	6	2	2	2	2	7	7
2	2	2	6	6	3	4	1	1	1	4	7	5	5	2	3	2	2	5	7
2	7	3	7	6	2	4	3	n	1	7	4	1	2	3	2	2	1	1	5
2	2	1	6	2	1	4	4	n	1	1	6	6	1	5	5	6	5	7	7
Sum	5.95	3.00	4.53	3.47	3.65	3.76	4.06	0.44	0.72	3.64	5.53	4.07	2.53	2.60	2.47	1.80	3.07	4.33	4.67
Averag	1.845	1.845	1.576	2.118	2.140	2.016	2.285			1.950	1.586	2.282	2.029	1.890	1.784	1.222	1.843	2.300	2.119
Medial	6	2	4	3	3	4	5			3.5	6	4.5	2	2	2	2	2	5	5
Mode	7	2	3	1	1	3	1			5	7	1	1	1	1	1	2	2	7



