DESIGNERS AND CONTRACTORS: IMPEDIMENTS TO INTEGRATION

By Michael S. Puddicombe,[1] Affiliate Member, ASCE

ABSTRACT: The adversarial nature of the relationship between designers and contractors is recognized as one of the most serious problems in the building industry. Research in this area has centered on integration issues related to the implementation of partnering and contracts. This paper takes a step back. It argues that the adversarial nature of the designer/contractor dyad may be attributable to differences on a set of perceived project critical dimensions. An understanding of these dimensions and how the dyad members differ is important for the successful implementation of integration methods. In addition, it is suggested that a lack of a holistic conceptualization of the contract and its relation to integration hampers the ability to achieve improved project performance. This paper reports on a large-scale survey and analysis that tests propositions related to these issues.

INTRODUCTION

Construction accounts for approximately 10% of the gross national product of the United States and holds a similar position in most world economies (Gordon 1994). The size of the industry is, unfortunately, exceeded only by the inefficiencies that have become an accepted part of the construction process. Designers and contractors are often adversarial, inefficient, and resistant to innovation (Tarricone 1992). Consensus estimates indicate that 30% of the cost of a project can be attributed to failures in the design-construct-manage process (Brown and Beaton 1990).

A significant portion of these failures may be attributable to "incongruent goals and (the) consequent divergent behaviors of various organizations participating in a construction project" (Nam and Tatum 1992). This condition has been labeled "disintegration" by prominent industry researchers. Tatum (1990) suggests "integration" through the application of information technology as a method for linking the traditionally discrete phases of design and construction. However, the performance of the industry is not addressable solely through the use of technology (Nam and Tatum 1992). A major stumbling block to increased performance is the required change in the roles and expectations of the project participants. A combination of organizational and technological integration is required.

The major tools for achieving organizational integration can be broadly classified as contractual and social psychological. These two approaches embody different assumptions about interfirm dynamics and as a consequence develop different approaches for integrating the project team. The social psychological approach attempts to integrate project members through efforts such as partnering (Larson 1995). Partnering has received significant attention in the literature (Abudayyeh 1994; Albanese 1994; Larson 1995), and these efforts have produced a conceptual model (Crowley and Karim 1995) that has received wide support. The contractual approach (Gordon 1994; Macomber 1989) attempts to match the characteristics of the project with the appropriate contract. The ubiquitous nature of contracts, however, has resulted in a diverse set of conceptualizations (Thomas et al. 1994; Gordon 1994), with little agreement on the contracts' importance.

Most research that applies these integration tools emphasizes mitigating the effects of adversarial relationships. Project managers, however, would benefit from an understanding of the underlying factors the tools address as well as the tools themselves. This knowledge would enable appropriate integration of design and construction, and as a result an improvement in project performance.

It is suggested that a lack of consensus on what constitutes the contract and its relationship to integration, as well as a lack of understanding of the underlying dynamics that cause adversity, hamper progress toward an effective model of integration. The present paper begins to address both these concerns. First, a holistic conceptualization of the contract is suggested. Second, it is proposed that fundamental differences between designers and contractors on a set of perceived project critical factors could explain the observed adversity in the designer-contractor dyad.

The present paper reports on a large-scale survey of industry professionals that examines three propositions related to the basis of designer-contractor adversity. The first section of the paper reviews the changes that are occurring in the industry and develops a framework for the contract and its link to integration. The second section develops and operationalizes the critical factors, integration, success and goals, and control, which could be the source of adversity between the respondents. Specific hypotheses are proposed. The third section presents the methods, analysis, and discussion of the results.

CONCEPTUAL FOUNDATION

Stinchcombe (1959, p. 183), in his seminal study of the organization of the building industry, noted that due to the fractured nature of project responsibilities the critical managerial input "was the planning of the product for ease of production, rather than in the planning of the productive process." Unfortunately, the nature of the industry is such that a single proposal for the integration of design and construction is an overly idealized solution to improving project performance. There are some projects where early or extended integration is unnecessary and unproductive, and therefore a waste of limited managerial resources. Barriers and costs associated with integration may outweigh the benefits. Liker and Fleischer (1992) in research in the manufacturing sector point out that there are significant organizational barriers to the integration of design and production. In the building industry these barriers can be much more difficult to surmount. The separation between design and construction is much deeper than that between functional departments. Here we may deal with separate companies with widely divergent cultures. In bringing these functions together there is a high risk of cultural clash, resulting in a negative impact on the project (CMC 1991). Despite these difficulties, the increasing complexity and competitive pressures of the industry indicate that efforts at integration are necessary and will continue.

[1]Doctoral Candidate and Lect., Operations Mgmt., Boston Univ. School of Mgmt., 595 Commonwealth Ave., Boston, MA 02215.

Note. Discussion open until February 1, 1998. To extend the closing date one month, a written request must be filed with the ASCE Manager of Journals. The manuscript for this paper was submitted for review and possible publication on October 5, 1995. This paper is part of the ***Journal of Construction Engineering and Management***, Vol. 123, No. 3, September, 1997. ©ASCE ISSN 0733-9364/97/0003-0245–0252/$4.00 + $.50 per page. Paper No. 11768.

Transition and Integration

Historically, the most notable response to increasing complexity was the move toward functional specialization and "professionalism" (Kostoff 1977). The design and construction functions separated from each other. These functions, which had previously been the responsibility of one firm (the master builder) separated into design and construction companies. Along with the organizational separation each group of specialists developed its own unique culture. The design function became a professional occupation (architects and engineers) while the actual construction was the province of craftsmen-businessmen. This resulted in an institutionalized, functionally separated, project structure that affected all stages of the design-construct process and is still the dominant form today.

This traditional structure implicitly assumes a set of finalized plans that determine the boundaries of the project. Despite the notion of a finalized solution, changes and extras are an accepted part of the construction process. The designers of a project cannot be cognizant of all the construction-related conflicts in their design. The original schedules and costs can become little more than benchmarks. The general contractor and the subcontractors experience difficulty integrating the changing requirements of the project with the shifting requirements of other projects. The divergent goals of the contractor and designer result in a lack of cooperation and an adversarial relationship (Nam and Tatum 1992). Concerns for cost, time, and quality come into conflict.

The members of the industry are beginning to recognize the limitations of this traditional approach. In response to competitive pressures, and the demands of its customers, the state of the entire architecture, engineering, and construction industry is changing. Information technology is increasingly introduced to the construction process to link formerly functionally isolated members of the project team. Tatum (1990) refers to these efforts as part of the trend towards integration, the sharing of knowledge and data across the traditionally discrete phases of a project. Integration is seen as having a significant potential for improving the performance of the highly fragmented members of the industry. However, integration through information technology alone will not be able to overcome the effects of disintegration (Nam and Tatum 1992). Organizational integration is critical in order for information integration to succeed. A structure that organizationally links the project participants as well as allowing the efficient sharing of information is necessary.

To address this need the construction industry is moving toward nontraditional organizational forms between designers and contractors. There is an increased use of the construction management and design/build approaches. Although varied in legal and technical details, these contracting methods all encourage interaction between the design and construction functions at the earlier stages of project development. They reinforce organizationally and legally what integration attempts to accomplish with technology.

The Contractual Form

The form of the contract is a critical component in the integration of the design-construct dyad. Gordon (1994) proposed the compensation scheme as the defining contractual variable. Here three variables, the organizational form, the compensation scheme, and a conflict resolution procedure are argued to interact to define the contractual form.

The contract is not simply a legal document. The development of the form of the contract is the arena in which the parties attempt to reconcile their views of the evolving relationship and their perception of the future course of the project

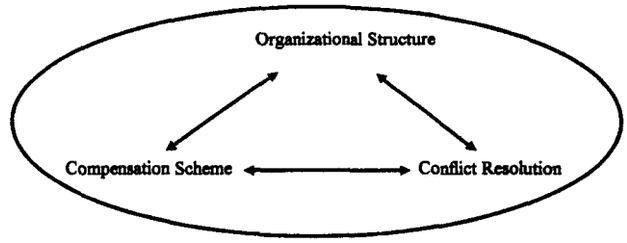

FIG. 1. The Contract

(Dixon et al. 1994). Contracts between firms address three issues that can be critical to the achievement of successful outcomes for a project.

The first issue deals with the governance structure of the relationship—Who will do what and how do we integrate these efforts? The need to integrate efforts is a basic part of a multifirm project. Who will do what, while on the surface a rather simple concept, can become the source of major misunderstanding, especially as the complexity of the project increases and the inputs become harder to define.

The second issue deals with the compensation scheme associated with the relationship. The compensation scheme needs to consider two principle components: (1) how do the participants get paid for their inputs; and (2) who bears the risks and who reaps the rewards of the project. The compensation scheme considers the disposition of risk and reward as it relates to the individual input and equity, and the overall project outcome.

The third issue deals with conflict resolution. Given bounded rationality in a complex environment, there is little doubt that the contracting parties will encounter situations they did not anticipate. What methods will the parties employ in resolving conflicts? The selection of a conflict resolution method affects both the outcome of the specific conflict and the longevity and nature of the relationship.

Fig. 1 models a holistic conception of the contract. The choice of different contractual components is seen as being representative of the contracting parties perception of the appropriate degree of organizational integration.

CRITICAL DIMENSIONS

Drawing on literature from organizational economics, contract law, and social psychology as well as construction and engineering management, a set of three project critical dimensions upon which the contractor and designer may vary is developed. The first is the integration of the project participants, which deals with issues related to the contract. The second, goals and success, draws from the traditional concerns for cost, quality, and schedule as well as specific operational goals. A third area, control, deals with the traditional perceptions of the designer and contractor.

Integration

The organizational structure is viewed in terms of transaction cost economics (Williamson 1975, 1979, 1985, 1991). Under this view, sets of exchange conditions call for a specific type of governance structure, which in turn defines the interorganizational structure of the relationship. This is operationalized in terms of a traditional, construction management, or a design/build approach to the design construct relationship.

The compensation scheme uses agency theory as its theoretical underpinning (Reichelstein 1992; Baker 1992; Eisenhardt 1989). Though agency theory uses the metaphor of a contract, it has dealt primarily with compensation contracts directed at individuals within a hierarchical structure. Conceptually, the contract framework applies agency theory at a more

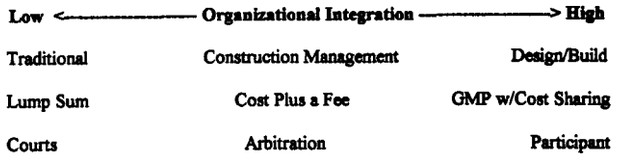

FIG. 2. Contractual Dimensions

macro level. Baker (1992) proposed a set of three compensation schemes and orders them in a manner that is particularly applicable to a contractual environment. These schemes parallel lump sum, cost plus a fee, and a guaranteed maximum price with cost sharing.

The conflict-resolution procedure is examined in terms of Macneil's (1974, 1978, 1980, 1981) work on contract law theory. These theories have come into being as a response to "the constant clash in modern economic structures between the need for stability and the need to respond to change" (1978, p. 854). Macneil proposes that when a given set of economic conditions interacts with the specific contractual desires of the contracting parties, classical, neoclassical, or relational contract law theory will be most appropriate. This is operationalized with the court, an arbitrator, or the participants being the primary actor toward conflict resolution.

Fig. 2 consolidates the dimensions of the three contractual components. The theoretical frameworks for these components suggest that as the contractual dimensions proceed from left to right they exert a stronger force toward the integration of the contracting parties. It is argued that the contractor and the designer will have different preferences as to the form of the contract. This difference will be observed in both prime contracts and subcontracts. Let us state then hypotheses 1: The design and construction function differ in their beliefs as to the proper degree of integration between their functions.

Goals and Success

Management of the trade-off between the goals of cost, quality, and schedule has been one of the central concerns of project management. Sanvido et al. (1992) operationalized these goals to incorporate specific success criteria for owners, designers, and contractors. Working from these criteria nine operational variables for measuring project success were examined:

- Met schedule
- Met general contractor profit goal
- Met subcontractor profit goal
- Cost savings for the owner
- Met quality specifications
- No claims by contractors
- No claims by owner
- Safety
- Minimal surprises

Differing prioritization of cost, quality, and schedule as well as differing success criteria will cause conflict as to the definitions of a successful project. This can lay the groundwork for conflicting courses of action and adversity between the project participants. Thus we state hypothesis 2: The design and construction function have different goals and success criteria for a project.

Control

The traditional separation of powers in a construction project establishes an arena where control of the project is a potential source of conflict. The architect is responsible for design issues but the contractor is responsible for all methods and materials for actual construction. It is argued that this separation is an artifact that denies the intrinsic link between design and construction. Design and construction are extensions of each other and project participants perceive control of the overall project as being crucial to the achievement of a successful outcome.

The traditional view, expressed by one respondent to the survey, is that "the Archs are the most idealistic and naive [and] the builders are the most cynical and worldly." They will use different methods to control the project. This view parallels the dimensions operationalized in Christie and Geiss's (1970) work on Machiavellianism. They developed an instrument that measures a person's perceptions of the appropriateness of manipulating others for their own purposes. Applying this measure (referred to as Mach) to the building industry, contractors and architects are stereotyped as high and low Mach respectively. The traditional stereotype suggests that designers must act in a manner that protects the owner from the contractor, who will operate in a devious and manipulative manner. This idea is stated in hypothesis 3: The design and construction function have different beliefs as to the appropriate conduct of interorganizational relations.

These three hypotheses detail a basis for significant conflict. If they hold true they could begin to explain the embedded state of industry disintegration. This would establish a foundation from which integration tools could be developed and appropriately implemented.

METHODOLOGY

Data

The study used a repeated measures experimental design (Judd et al. 1991) administered in the form of a survey (see Appendix I). The respondents were requested to choose a contractual form consisting of an organizational structure, a compensation scheme, and a conflict resolution procedure. They selected a separate contractual form (operationalized as described earlier) for three different types of generic projects, that have been shown to vary in complexity: (1) a simple warehouse; (2) a midrise apartment; and (3) a major hospital (Macomber 1989). The complexity of a project was defined in terms of its end-product complexity (Kotha and Orne 1989). The respondents repeated this process for both a prime contract and a subcontract. The subcontract was not of direct interest, rather it served as a standard against which the responses could be measured.

The survey also collected data on the respondents' rankings of the importance of the nine operational success criteria as well as the goals of schedule, quality, and cost. Lastly, the survey included the 20-item Mach IV scale (Christie and Geiss 1970). The scale measures the overall degree of Mach as well as more specific measures of the respondents view of tactics.

The respondents consisted of contractors and architects from firm headquarters in the northeast. All were highly placed in their firm with most involved in overall corporate as opposed to individual project concerns. The respondent firms covered a broad range of sizes. The final response rate of 49% (78 surveys) for the contractors and approximately 39% (74 surveys) for the architects, was quite high for this type of research. The high response rate is attributed to the endorsements received from the respective trade associations. In addition, a number of comments on the survey indicated that the issues addressed were an area of great interest to the respondents.

Analysis

Different statistical tests were used to test each proposition. The appropriate test was selected to maximize the power of

TABLE 1. Contractural Responses Expressed in Percentage Terms

Contract parameter (1)	General Contract			Subcontract		
	Warehouse (2)	Apartment (3)	Hospital (4)	Warehouse (5)	Apartment (6)	Hospital (7)
(*a*) Architect response						
Governance—traditional plans and specs	34%	79%	37%	38	85	56
Governance—construction management	11	13	61	10	7	42
Governance—design-build	55	8	2	52	8	2
Compensation—lump sum	49	63	32	62	72	54
Compensation—cost plus a fee	16	6	17	7	3	10
Compensation—GMP w/cost savings-sharing	35	31	51	31	25	36
Conflict—court	13	17	14	11	15	14
Conflict—arbitration	55	58	66	58	59	66
Conflict—participants	32	25	20	31	26	20
(*b*) Contractor response						
Governance—traditional plans and specs	49	53	20	64	76	80
Governance—construction management	6	33	73	3	10	15
Governance—design-build	45	14	7	33	14	5
Compensation—lump sum	79	47	14	82	79	74
Compensation—cost plus a fee	4	10	40	4	4	8
Compensation—GMP w/cost savings-sharing	17	43	46	14	17	18
Conflict—court	8	8	4	16	18	15
Conflict—arbitration	41	45	49	35	35	49
Conflict—participants	51	47	47	49	47	36

the results while acknowledging the different levels of measurement (categorical, ordinal, ratio, and interval) embodied in each scale.

The categorical nature of the choice of contractual form indicated the use of the nonparametric chi-square statistic to test for differences between the two groups (Siegel and Castellan 1988). Table 1 details the response breakdown on a percentage basis.

In simple projects there was no significant statistical difference between architects and builders on any of the contractual dimensions. The organizational structure was split between traditional and design/build. The compensation scheme favored lump sum and GMP. The conflict resolution methods selected were arbitration and project-based resolution.

In projects of medium complexity a highly significant difference ($p > 0.00$) on the organizational structure and the conflict resolution structure was observed. Architects clearly preferred a traditional structure, whereas contractors were divided between traditional and construction management. The conflict resolution process had the contractors supporting a project-based resolution process versus the architects' choice of arbitration. The compensation scheme showed a marginally significant difference ($p > 0.09$), with both parties favoring a lump sum and secondly a GMP.

The complex project showed significant differences ($p > 0.00$) on the compensation scheme and the conflict resolution method. Conflict resolution exhibited the same pattern observed in the medium case. The compensation scheme had contractors moving to a GMP and cost plus scenario, whereas the architects remained with a lump sum and GMP approach. Both parties supported a construction management structure.

The major differences observed concerned the choices made for the prime contracts and subcontracts. Contractors indicated that the contract for a subcontractor should be substantially different than the contract for a prime contractor. They indicated a desire to integrate the design and general construction functions while maintaining a traditional orientation towards subcontractors. Architects on the other hand choose the same contractual components for both types of contracts in all cases except for the compensation scheme on complex projects. There, a lump sum approach was the dominant form for subcontractors while a GMP was chosen for the prime contractor ($p > 0.05$).

The ordinal nature of the rankings of the operational goals indicated that a test for between-group differences using the Mann-Whitney U-test was appropriate (Siegel and Castellan 1988). Statistically significant differences ($p > 0.000$) on the rankings of six of the nine success criteria were observed. As can be seen in Table 2 the architects ranked quality, owner and contractor claims, and minimal surprises higher, and the contractors ranked prime and subcontractor profits higher. The greatest difference was observed on the prime contractor profit variable, which was ranked third in importance by the contractors and eighth in importance by architects. The variable minimal surprises reversed this order.

Analysis of variance (ANOVA) (Nester et al. 1990) was used to test for differences between the goals, schedule, quality, and cost (Table 3). The data was collected on a ratio scale

TABLE 2. Success Criteria

Operational success (1)	Architect			Contractor		
	Rank (2)	Average value (3)	WMW[a] rank (4)	Rank (5)	Average value (6)	WMW[a] rank (7)
Met quality specifications[b]	1	2.5	59	2	3.4	83
Met schedule	2	3.0	77	1	2.5	67
Minimal surprises[b]	3	4.3	55	8	6.3	86
No claims by owner[b]	4	4.5	59	6	5.5	83
Safety	5	4.7	75	4	4.3	68
No claims by contractors[b]	6	5.1	60	7	6.0	82
Produced cost savings for owner	7	5.4	71	5	5.3	72
Met general contractor profit[b]	8	7.3	98	3	3.8	48
Met subcontractor profit[b]	9	8.3	90	9	7.6	55

[a]Wilcoxon-Mann-Whitney.
[b]Significant difference $p > 0.000$.

TABLE 3. Goals Criteria

Goals (1)	Average Weighting[a]	
	Architect (2)	Contractor (3)
Quality	0.54	0.49
Cost	0.27	0.30
Schedule	0.19	0.21

[a]Average weighting using analytic hierarchy process weights.

(through the use of analytical hierarchy process) indicating that ANOVA was an appropriate statistical test. A one-way ANOVA showed no differences between the two groups on these measures. A one-way ANOVA also used to test for differences on the interval Mach IV scale. This analysis showed no differences on the measure of overall Mach or any of its submeasures.

Analysis

The results of this investigation offer some provocative insight into the validity of the initial set of hypotheses. Hypothesis 1 received fairly strong support. Architects and contractors do appear to differ as to the appropriate degree of integration. The architects appear to support a traditional arm's-length orientation while the contractors prefer integration. This could reflect a belief on the architects' part that they can plan and design for most eventualities. Of even greater note was the lack of differentiation, on the architects' part, between prime contractors and subcontractors. If the architect does not differentiate between these two parties what is his or her perception of the prime contractor's role? Is the prime contractor little more than an administrative sub or a vehicle to employ in shifting risk?

Hypothesis 2 receives mixed support. There are differences on the success criteria but there is no difference in the judgment of the appropriate project goals. Both groups rank quality, cost, and schedule from one to three. When the success criteria are examined the biggest differences are consistent with the results observed with hypothesis 1. The architects place minimal surprises very high on their list (third). This would support their belief (hope?) that the plans actually do present a final solution to the project. The lack of importance placed on general contractor profitability (eighth) coincides with the lack of differentiation placed on the prime and subcontract contractual components.

Hypothesis 3 is not supported. Based on the results of the MACH IV scale there is no significant difference between architects and contractors in their views of the appropriate conduct of interorganizational relationships. Both groups recorded scores of approximately 80 (scale low Mach = 40 and high Mach = 160). This is significantly below the neutral point of 100. The interpretation of a score of 80 is that the respondents tend toward a positive view of others and feel manipulative practices are inappropriate. [See Christie and Geiss (1970) for a full exposition of the development and validation of the scale.]

The analysis of the three hypotheses lends mixed support to the basic proposition that differences on perceived project critical dimensions may be the basis for the adversarial relationship observed between designers and contractors. The results support this conclusion in that, contrary to the contractors' position, the architect does not appear to consider the prime contractor to be a significant member of the project's management team. The architect wishes to maintain a more traditional arm's-length relationship both in terms of the organizational structure and the compensation. In contrast, there appears to be no difference in the dyad's beliefs as to the appropriate project conduct. They both indicate a positive view of others and it would therefore appear to be unnecessary for the "designer to protect the owner from the contractor." Additionally, both parties express the same hierarchy of goals for the project. Where the success criteria vary, it is minor, except for the firm-oriented criteria of surprises and general contractor profitability. These results suggest that differences with an organizational, rather than project-specific, foundation, may be the progenitor of disintegration.

CONCLUSION

This study sheds light on the nature of the differences between designers and contractors. These differences are significant in terms of the belief in the appropriate degree of integration. The architect tends toward a traditional arms length relationship, whereas the contractor favors integration. However, the participants do not differ as to appropriate conduct or project goals, rather they differ on firm-related priorities of surprises and profitability. The designer's apparent lack of concern for general contractor profitability is perhaps the most prominent difference, as this alone could be a source of significant conflict and disintegration.

The nature of the conflict between the architect and contractor in conjunction with the holistic conceptualization of the contract, developed in this paper, has provided a theoretical base for further research into integration. In addition, three specific issues become prominent as a result of this study. A first addresses the limitations of the experimental methodology used. A natural extension of this work is into the field to investigate whether the attitudes and beliefs expressed by contractors and designers in an experimental environment hold in practice. The relation between a successful project and the financial performance of major participants is also a significant area that requires further investigation. Lastly, the lack of differentiation on project goals and conduct demands a more thorough understanding of the basis for the differences between contractors and designers on integration.

Reduction of the adversarial nature of the design-construct dyad holds significant promise for the improvement of performance in the building industry. This research offers evidence that many of the areas thought to be traditional sources of conflict, are, in fact, areas of unanimity. However, it also indicates that the attainment of improved project performance through integration is not without significant difficulties. The areas most likely to contribute to disintegration appear to be those that have the greatest link to the organization. As a result, improved project performance would require the recognition and synthesis of the requirements of both the participants and the project.

APPENDIX I. SURVEY

Different types of buildings vary in their complexity. On the following pages you are asked to choose the type of contract that would be most appropriate, in general, for the indicated type of building.

The type of contract is defined by three components:

The form, which is defined as
- Construction Management
- Traditional Plans and Specs
- Design-build

J. Constr. Eng. Manage., 1997, 123(3): 245-252

The compensation scheme, which is defined as
Lump Sum
Guaranteed Maximum with Cost Savings/Sharing
Cost Plus Fixed Fee
The conflict resolution process, which is defined as:
The Contract is Law
(The court decides disputes)
The Contract is Law but Excuses Are Considered
(An arbitrator decides disputes)
The Project Is The Law
(The participants will resolve disputes)

The question is asked in relation to both general contracts and major subcontracts. Please respond to both.

MIDRISE APARTMENT

A1) For a midrise apartment type of building please circle your choice for the form of the general contract.

1. Construction management
2. Traditional plans and specs
3. Design build

A2) For a midrise apartment type of building please circle your choice for the compensation scheme for the general contract.

1. Lump sum
2. A guaranteed maximum with cost savings/sharing
3. Cost plus a fixed fee

A3) For a midrise apartment type of building please circle your choice for the conflict resolution process for the general contract.

1. The contract is law (the court decides disputes).
2. The contract is law but excuses are considered (an arbitrator decides disputes).
3. The project is the law (the participants will resolve the disputes).

A4) For a midrise apartment type of building please circle your choice for the form of the major subcontracts.

1. Construction management
2. Traditional plans and specs
3. Design build

A5) For a midrise apartment type of building please circle your choice for the compensation scheme for the major subcontracts.

1. Lump sum
2. A guaranteed maximum with cost savings/sharing
3. Cost plus a fixed fee

A6) For a midrise apartment type of building please circle your choice for the conflict resolution process for the major subcontracts.

1. The contract is law (the court decides disputes).
2. The contract is law but excuses are considered (an arbitrator decides disputes).
3. The project is the law (the participants will resolve the disputes).

In the original survey these six items were repeated for both simple warehouse and major hospital type buildings.
On the following pages are a number of questions that deal with project success. While we all realize that each project is unique, please answer these questions indicating your general beliefs about what makes a project successful.

S1) Listed below are a number of outcomes that have been identified as reflecting project success. Please rank them from 1 to 9 indicating their relative importance to you.

Met project schedule
Met general contractor profit
Met subcontractor profit
Produced project cost savings for owner
Met quality specifications
No claims by the contractors
No claims by the owner
Safety
Minimal surprises

S2) Listed below are three attributes of a project quality, schedule, and cost. Some of these attributes are probably more important to you than others.

Please circle the statement in each pair that you believe to most generally be true.

How much do you prefer the attribute you chose to the one you did not choose?

1 - EQUALLY PREFER
2
3 - MODERATELY PREFER
4
5 - STRONGLY PREFER
6
7 - VERY STRONGLY PREFER
8
9 - EXTREMELY PREFER

1. The quality is more important than the schedule. Or 2. The schedule is more important than the quality.	1	2	3	4	5	6	7	8	9
1. The schedule is more important than the cost. Or 2. The cost is more important than the schedule.	1	2	3	4	5	6	7	8	9
1. The quality is more important than cost. Or 2. The cost is more important than the quality.	1	2	3	4	5	6	7	8	9

	Strongly Agree			No Opinion			Strongly Disagree
1. Never tell anyone the real reason you did something unless it is useful to do so.	1	2	3	4	5	6	7
2. The best way to handle people is to tell them what they want to hear.	1	2	3	4	5	6	7
3. One should take action only when sure it is morally right.	1	2	3	4	5	6	7
4. Most people are basically good and kind.	1	2	3	4	5	6	7
5. It is safest to assume that all people have a vicious streak and it will come out when they are given a chance.	1	2	3	4	5	6	7
6. Honesty is the best policy in all cases	1	2	3	4	5	6	7
7. There is no excuse for lying to someone else.	1	2	3	4	5	6	7
8. Generally speaking, people won't work hard unless they're forced to do so.	1	2	3	4	5	6	7
9. All in all, it is better to be humble and honest than important and dishonest.	1	2	3	4	5	6	7
10. When you ask someone to do something for you, it is best to give the real reason for wanting it rather than giving reasons which might carry more weight.	1	2	3	4	5	6	7
11. Most people who get ahead in the world lead clean, moral lives.	1	2	3	4	5	6	7
12. Anyone who completely trusts anyone else is asking for trouble.	1	2	3	4	5	6	7
13. The biggest difference between most criminals and other people is that the criminals are stupid enough to get caught.	1	2	3	4	5	6	7
14. Most people are brave.	1	2	3	4	5	6	7
15. It is wise to flatter important people.	1	2	3	4	5	6	7
16. It is possible to be good in all respects.	1	2	3	4	5	6	7
17. Barnum was very wrong when he said there's a sucker born every minute.	1	2	3	4	5	6	7
18. It is hard to get ahead without cutting corners here and there.	1	2	3	4	5	6	7
19. People suffering from incurable diseases should have the choice of being put painlessly to death.	1	2	3	4	5	6	7
20. Most people forget more easily the death of a parent than the loss of their property.	1	2	3	4	5	6	7

APPENDIX II. REFERENCES

Abudayyeh, O. (1994). "Partnering: A team building approach to quality construction management." *J. Mgmt. in Engrg.*, ASCE, 10(6), 26–29.

Albanese, R. (1994). "Team building process: Key to better project results." *J. Mgmt. in Engrg.*, ASCE, 10(6), 36–44.

Baker, G. P. (1992). "Incentive contracts and performance measurement." *J. Political Economy* 100(3), 598–614.

Brown, C., and Beaton, H. (1990). "Looking back at design, looking forward to construction." *J. Mgmt. in Engrg.*, ASCE, 6(3), 342–349.

Chritie, R., and Geis, F. (1970). *Studies in Machiavellianism*. Academic Press, New York, N.Y.

Construction and Management Committee of ASCE Construction Division (CMC). (1991). "Constructability and Constructability Programs: White Paper." *J. Constr. Engrg. and Mgmt.*, ASCE, 117(1), 67–89.

Cook, E. L., and Hancher, D. E. (1990). "Partnering: Contracting for the future." *J. Mgmt. in Engrg.*, ASCE, 6(4), 431–446.

Crowley, L., and Karim, M. (1995). "Conceptual model of partnering." *J. Mgmt. in Engrg.*, ASCE, 11(5), 33–39.

Dixon, R., Nanni, A., and Puddicombe, M. (1994). "Contracts and interorganizational relationships: The roles of governance structures, compensation schemes and conflict resolution mechanisms." *Working Paper Series, 94-12*, School of Mgmt., Boston Univ., Boston, Mass.

Eisenhardt, K. M. (1989). "Agency theory: An assessment and review." *Academy of Mgmt. Rev.*, 14(1), 57–74.

Ettlie, J., and Stoll, H. (1990). "Integrated design management." *Managing the design-manufacturing process*, J. Ettlie and H. Stoll, eds., McGraw-Hill, New York, N.Y.

Gordon, C. (1994). "Choosing appropriate construction contracting methods." *J. Constr. Engrg. and Mgmt.*, ASCE, 120(1), 196–210.

Harback, H., Basham, D., and Buhts, R. (1994). "Partnering paradigm." *J. Mgmt. in Engrg.*, ASCE, 10(1), 23–27.

Judd, C., Smith, E., and Kidder, L. (1991). *Research methods in social relations*. Holt, Rinehart and Winston, Inc., Orlando, Fla.

Kohn, D. (1991). "Highways: Painful lessons learned on I-595." *Engrg. News Record*, 226(3), 43–44.

Kostoff, S. (1977). *The architect: Chapters in the history of the profession*. Oxford University Press, New York., N.Y.

Kotha, S., and Orne, D. (1989). "Generic manufacturing strategies: A conceptual synthesis." *Strategic Mgmt. J.*, 10, 211–231.

Larson, E. (1995). "Project partnering: Results of 280 construction projects." *J. Mgmt. in Engrg.*, ASCE, 11(2), 30–35.

Liker, J., and Fleisher, M. (1992). "Organizational context barriers to DFM." *Integrating design and manufacturing for competitive advantage*, G. Sussman, ed., Oxford University Press, New York, N.Y.

Macneil, I. (1974). "The many futures of contracts." *Southern California Law Rev.*, 47, 691–816.

Macneil, I. (1978). "Contracts: Adjustments of long-term economic relations under classical, neoclassical, and relational contract law." *Northwestern Univ. Law Rev.*, 72(6), 854–905.

Macneil, I. (1981). "Economic analysis of contractual relations: Its shortfalls and the need for a 'rich classificatory apparatus.'" *Northwestern Univ. Law Rev.*, 75(6), 1018–1063.

Macneil, I. (1980). *The new social contract*. Yale University Press, New Haven, Conn.

Macomber, J. (1989). "You can manage construction risk." *Harvard Business Rev.* Mar.-Apr., 155–165.

Meredith, J., and Mantel, S. (1989). *Project management a managerial approach*. John Wiley and Sons, New York, N.Y.

Nam, C. H., and Tatum, C. B. (1992). "Noncontractual methods of integration on construction projects." *J. Constr. Engrg. and Mgmt.*, ASCE, 118(2), 385–398.

Neter, J., Wasserman, W., and Kutner, M. (1990). *Applied linear statistical models*. Irwin, Boston, Mass.

Puddicombe, M., and Kim, J. (1993). "DFC." *Proc., 1993 Decision Sciences Inst.*, Atlanta, Ga.

Reichelstein, S. (1992). "Constructing incentive schemes for government contracts: An application of agency theory." *The Accounting Rev.*, 67(4), 712–731.

Rittel, H., and Weber, M. (1973). "Dilemmas in a general theory planning." *Policy Sci.*, 4, 155–169.

Saaty, T. (1977). "A scaling method for priorities in hierarchical structures." *J. Math. Psychology* 15, 234–281.

Sanvido, V., Parfitt, K., Guvenis, M., and Coyle, M. (1992). "Critical success factors for construction projects." *J. Constr. Engrg. and Mgmt.*, ASCE, 118(1), 94–111.

Seigel, S., and Castellan, N. (1988). *Nonparametric statistics for the behavioral sciences*. McGraw-Hill, New York, N.Y.

Stevens, J. (1992). *Applied multivariate statistics for the social sciences*. Lawrence Erblum Assoc., Hillsdale, N.J.

Stinchcombe, A. (1959). "Bureaucratic and craft administration of production: A comparative study." *Administrative Sci. Quarterly*, 4, 168–187.

Tarricone, P. (1992). "Cranes, concrete, construction . . . and computers." *Civ. Engrg.*, ASCE, 62(6), 44–47.

Tatum, C. B. (1990). "Integrating design and construction to improve project performance." *Proj. Mgmt. J.*, 21(2), 35–42.

Thomas, H., Smith, G., and Mellot, R. (1994). "Interpretation of construction contracts." *J. Constr. Engrg. and Mgmt.*, ASCE, 120(2), 321–336.

Williamson, O. E. (1975). *Markets and hierarchies: Analysis and antitrust implications*. The Free Press, New York, N.Y.

Williamson, O. E. (1979). "Transaction-cost economics: The governance of contractual relations." *J. Law and Economics*, 12(Oct.) 233–261.

Williamson, O. E. (1985). *The economic institutions of capitalism*. The Free Press, New York, N.Y.

Williamson, O. E. (1991). "Comparative economic organization: The analysis of discrete structural alternatives." *Administrative Sci. Quarterly*, 36, 269–296.