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EMERGING TRENDS OF THE OWNER-CONTRACTOR RELATIONSHIP FOR CAPITAL FACILITY PROJECTS FROM THE CONTRACTOR'S PERSPECTIVE

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CENTER FOR CONSTRUCTION INDUSTRY STUDIES

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A Report of the
Center for Construction Industry Studies
The University of Texas at Austin

Under the Guidance of the
Owner-Contractor Organizational Changes Thrust Team

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EXECUTIVE SUMMARY

This document outlines the results of 60 surveys, representing 40 projects from 16 contractor organizations with the purpose of investigating the changes in the owner-contractor organizational structure. The scope of this exploratory research was focused on identifying the organizational changes in the owner-contractor linkage caused by the increased use of business relationship networks to manage outsourcing.

Responses from this survey show that these relationships have changed over the past decade; however, the systems and focus of many of the contractors surveyed have not kept up with the change of relationships. Among the findings:

- Projects performed with collaborative relationships in this sample seem to be more successful.
- Trustworthiness and communication skills were most important in managing collaborative relationships from the contractor perspective.
- Respondents put little emphasis on learning from the relationship, in sharp contrast to one of the stated reasons that owners desire continued, collaborative relationships.
- Contractor's hiring and training practices were not focused on success factors of collaborative relationships.
- In the sample companies, the imminent loss of experience to retirement aligned with other studies, yet these firms were doing little to capture knowledge before it leaves.

These and other findings are presented and provide a snapshot of the issues faced by contractor firms in managing collaborative relationships. It is imperative that successful firms understand the presence of this significant shift and manage relationships accordingly.

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CHAPTER 1: BACKGROUND & SUMMARY OF ACTIVITIES

1.1 BACKGROUND

The Center for Construction Industry Studies (CCIS) is a research center at the University of Texas at Austin's Construction Engineering and Project Management Program (CEPM). CCIS was initiated in 1996 with multi-year support from the Alfred P. Sloan Foundation and initial startup funds from the Construction Industry Institute (CII). The center was created to perform multi-disciplinary, long-range studies addressing construction industry challenges in order to complement the traditionally short-term research process employed by CII and others.

CCIS initially identified and pursued research in four areas of pressing interest for the construction industry. These four thrust areas have been identified as: Owner-Contractor Work Structure, Fully Integrated & Automated Project Processes (FIAPP), Construction Workforce Issues and Technology.

The Owner-Contractor Work Structure initiative is the direct response of CCIS to a major strategic issue identified by CII and the industry. Specifically, the nationwide downsizing of capital facility engineering capabilities has resulted in owner organizations outsourcing capital project functions in an effort to leverage contractor manpower and expertise (CCIS Website).

The scope of this research was focused on identifying the organizational changes in the owner-contractor link caused by the increased use of business relationship networks to manage this "partnership," and the impact of these network business relationships on the contractor organizations in terms of structure, function, performance, and human resources.

In addition to the parallel initiatives of the Owner-Contractor Organizational Changes study (from the Owner's Perspective), the Owner-

Contractor Organizational Changes study (from the Contractor's Perspective) was developed.

1.1.1 Contractor Organizational Changes Study

The Contractor Organizational Changes Study was initiated in November 1998. This investigation assessed the changing nature of the owner-contractor relationship from the contractor perspective. Its objectives included: identifying the nature of the changes in the relationship, understanding what practices contribute to the effectiveness of the relationship, and whether the nature of the relationship affects the tangible outcomes of a project and its human resource requirements.

To date, the study team has completed one phase, Contractor Phase I Study, published in April 2000 (Gibson and Ryan 2000). Contractor Phase II findings are the subject of this report, and the research methodology was derived from the findings and guidance of the Phase I Study and the Owner Organizational Studies.

1.1.2 Outsourcing Trends (Benchmarking) and Demographics

Benchmarks of demographics and owner outsourcing were the subject of several studies, and taken together, these studies baseline the current status of many industry practices (Davis-Blake et al. 2001 and Gibson et al. 2001).

The first study developed outsourcing trends from 1994 to 1998 and utilized the CII Benchmarking and Metrics database (Gibson et al. 2001). Three project phases, pre-project planning, design, and procurement were analyzed, along with a rollup metric that combined the three phases. Outsourcing baselines were developed in this study.

A second study by Davis-Blake et al. (2001) analyzed data received from a survey of Construction Industry Institute (CII) member firms concerning project engineering professional demographic data. It was conducted with the help of CII

from October 2000 to April 2001. Motivation for this study came as a result of working closely with the construction industry and the serious problems that may exist within the construction industry's professional engineering workforce**.**

1.1.3 Owner-Contractor Work Structure Process

Anderson et al. (October 2000) performed a Delphi study and a series of case studies, and the research resulted in modifying a CII tool for determining work relationships between owners and contractors.

In the current highly competitive business environment, owner organizations developing capital projects have had to balance the demands for reduced costs and high profitability while delivering quality products and services. These effects have frequently been accompanied by: (i) downsizing; (ii) reducing or eliminating central project engineering organizations; (iii) shifting project responsibilities to business units or operating facilities; or (iv) outsourcing more work to contractors. Concurrent with this phenomenon is the gradual attrition through retirement of a whole generation of experienced managers having a solid background in engineering. The combined effect of such changes may leave owners inadequately equipped to develop and execute capital projects. Two reports were generated and provided validation that organizations respond to the changing business environment by adapting to the demands of that environment, either through unstructured or structured processes. The OCWS tool and process can help organization structure work relationships to improve this transition.

1.2 PURPOSE OF PHASE II CONTRACTOR STUDY

The purpose of this report is to explore emerging trends within the owner-contractor working relationship and document the changing nature of the owner-contractor relationship towards the successful completion of capital facility

projects from the *contractor's* perspective. This is deemed the first step towards trying to understand the very dynamic nature of owner-contractor relationship and should aid in developing a set of industry specific management philosophies and principles for contractors.

Today's owners have adapted their engineering and management principles to reflect the changing environment of the construction industry. The owners, driven by changes in the global business environment, have downsized capital facility engineering capabilities and outsourced capital project functions in an effort to leverage contractor manpower and expertise, reduce costs, and improve their competitive advantage. The overall impact of this shift in owner-contractor organizational functions in design, construction management, internal core management functions, and procurement of goods and services has had a significant impact on the contractors that service this industry.

1.3 RESEARCH QUESTIONS ADDRESSED

The primary purpose of this research was to build on previous research in the areas of organizational change, business relationship development, network management, and organizational learning to develop construction industry specific principals and practices to enhance the performance of contractor firms as they transition into "partnership enterprises." Consequently, the following hypotheses are given.

1.3.1 Organizational Change

Organizational Change - The Contractor Phase I Study noted that among the individuals interviewed, the most defining change in the owner-contractor organizational structure over the last five years has been the explosive increase in the outsourcing of design, engineering and construction management services by owner firms (Gibson and Ryan 2000). This increase in outsourcing by owner firms has been accompanied by changes in types of services requested and a change in

the classification of these services from a custom to a commodity product. All of the firms in the Phase I Contractor Study reported that they were involved in some form of owner-contractor collaborative relationship. Many noted that these relationships have become the major source of their business.

H1: *The outsourcing of design, engineering and construction management services by owner organizations has caused the relationship structure between owners and contractors to change significantly. The inability of the work processes and resources needed to manage these changes to keep pace with the changes in the relationship structure has created a secondary inter-organizational boundary that defines the owner-contractor work relationship continuum.*

1.3.2 Business Relationship Development

The Phase II Owner Study found that the owner-contractor relationship appears to have many purposes, not all of which are fully recognized by owners. One of the things that makes managing the owner-contractor relationship difficult is that the kinds of leverage the owner firm expects are often not made explicit and may not even be agreed upon within the owner firm. Communication difficulties between the owner and contractor are the most commonly cited problem in the owner-contractor relationship (Davis-Blake et al. 1999). While owners and contractors use a wide variety of formal and informal coordinating mechanisms, it appears that existing coordination mechanisms are not sufficient to meet communication needs (Gibson et al. 1998). Although increasing dependence of owners on contractors means that good communication between owners and contractors is more critical than ever, there appears to be little systematic attention by owner firms to designing coordination mechanisms that fully meet their communication needs. Monitoring and evaluating contractor performance is another area where work structures have not kept pace with the changing nature of the owner-contractor relationship. Although owners have at least some metrics for

project performance, few instances were found where owners had clear metrics that could be used to assess the performance of relationships.

The Phase I Contractor Study found similar issues with the owner-contractor relationship from the contractors' perspective (Gibson and Ryan 2000). All contractor firms interviewed in the Phase I Contractor Study reported formal processes for coordinating, monitoring and measuring *project* performance. Formal programs for coordinating, monitoring and measuring the performance of their strategic owner-contractor *relationships* were rarely reported. The contractor community also cited issues with the quality, frequency and timeliness of communications. Lack of familiarity with the project process by the owner, issues of staffing compatibility and organizational objective alignment further complicate the contractors' abilities to service their clients. Each of these items can be a unique problem within the context of a collaborative relationship.

H2: *Contractors and owners have different perceptions of the nature of collaborative relationships. Since neither party understands the intricacies of why a collaborative relationship is successful, they are unable to manage their collaborative relationships. They default to managing the relationship outcomes.*

1.3.3 Network Management

The Phase II Owner Study reported that many owner personnel saw goal conflict as a symptom of difficulty with the contractor or with the owner-contractor relationship. In fact, goal conflict may not be a symptom of difficulty but may instead be a natural outgrowth of the fact that owners and contractors have different business objectives (Davis-Blake et al. 1999).

The Phase II Owner Study also found that owner personnel are unanimous in their view that changing owner-contractor relationships require owner personnel to have new skills. It is fairly widely recognized in owner firms that the skill sets required to manage and work on projects from the owner's side has changed dramatically (e.g., more "soft" skills are important; deep technical knowledge is

less important). In order to work effectively in an environment where contractors are used extensively, owner personnel must possess a variety of skills. Although the skill set required of owner personnel has changed radically, owner firms have invested relatively little systematic effort into methods for ensuring that their personnel have the required skill sets. A major shift from technical skills to communication and interpersonal skills within the competency requirements for contractor project personnel was also noted in the Phase I Contractor Study (Gibson and Ryan 2000). Contractor personnel, regardless of their position, have to "wear so many hats" and interface with so many different types of people that their primary skills have to be the ones that allow them to interact with the myriad of people who now compose the typical project team.

H3: *Contractor organizations have not provided their personnel with the human resource requirements or organizational structure required to transition to the network management of business relationships.*

1.3.4 Organizational Learning

Although owners desire to learn from contractors and cite increased learning as an important benefit of alliances and preferred provider relationships, the Phase II Owner Study reported that owner firms still do not have systematic structures for assessing and documenting their learning from contractors (Gibson and Ryan 2000). The Phase I Contractor Study noted a similar trend in the contractor community. Contractor firms are currently much more adept at converting individual *project* knowledge to organizational *project* knowledge than they are at converting individual owner-contractor *relationship* knowledge to organizational or inter-organizational *relationship* knowledge (Gibson and Ryan 2000).

H4: *The contractor community is still employing the "traditional" organization knowledge creation process but operating in an "imaginary organization" environment.*

1.4 SUMMARY

It is apparent that the construction industry and specifically the contractor community have been embattled in the marketplace on two fronts; first, by the changing structure of their market in the form of the customer-contractor link and second by the changing nature of their industry. Being able to successfully negotiate this dynamic market-industry interface will be fundamental to the survival and success of the contractor community. Yet, the boundaries of this interface are becoming increasingly blurred as it is constantly reformed, becoming more dynamic and trying to keep pace with the ongoing changes in both the owner and contractor components of this business environment. It is also apparent from the literature review, that scant research has been done on owner-contractor organizational changes in general. Furthermore, no research on this subject from the perspective of the construction industry and the contractor community has been done. Documenting the effect of this turbulence in the market-industry interface from the contractor's perspective is the initial step in developing an industry specific management philosophy, principles and practices.

CHAPTER 2: METHODOLOGY

2.1 METHODOLOGY OVERVIEW

Due to the lack of any substantive research in this area, the study team was formed and developed a two-phase research plan: a pilot study followed by a more comprehensive structured exploratory study based on the findings of the pilot study. The source of data for this research was from three surveys sent to various contractor-owned companies. Supporting documentation was gathered from the Center for Construction Industry Studies (CCIS) which includes: CCIS Report No. 11, and other Owner Organizational related documents from CCIS.

2.2 PHASE II CONTRACTOR STUDY INVESTIGATION

The population for this study is all of the organizations that are providers of commercial and/or industrial architectural, engineering and construction management services to owner firms. For the purpose of this study, an owner firm is defined as a direct user of these services for the development, construction, renovation or maintenance of facilities or infrastructure owned, occupied, operated and maintained directly or indirectly by the owner firm in support of their primary business function.

2.3 STUDY SURVEY OVERVIEW

This research, Contractor Phase II Study, used a survey format combining Likert scale statements with open-ended questions administered via mail to obtain preliminary data on the research hypotheses (Geertsema 2003). The first survey collected data on the strategic nature of owner-contractor collaborative relationships from management representatives of the candidate firms. The second survey collected data on the tactical nature of owner-contractor collaborative

relationships and project specific data for projects developed and executed with and without the benefit of an underlying collaborative relationship. The third, and final survey, specifically targeted information on the recruiting, hiring and career paths of the professional staff within the contractor organizations. It was administered exclusively to the human resources representative for each candidate firm. Each of these surveys was pilot-tested on one or two respondents to ensure they worked effectively. Additionally, for cross validation with the human resources survey, both surveys concluded with several questions on training, skill development and career path opportunities.

To provide a quantitative measure for this research study, the performance of capital facility projects in the candidate firms has been selected as the unit of analysis. As a result of studying capital facility projects the research might further identify how collaborative relationships exist in the business environment and achieve tangible results for their partners.

The causal relationship that is the focus of this research is that capital facility projects developed and executed within a collaborative relationship are more successful. In order to test this relationship, there must be variability in the variables. To insure this variability, the management of each of the candidate firms for the Management and Project Manager surveys was requested to select four capital facility projects for this study according to the following criteria:

- Owner-contractor relationship: to provide variability within the independent variable, each candidate firm will be requested to identify four completed capital facility projects. Two of the capital facility projects should have been developed and executed with owner firms that the candidate firm had no formal or informal owner-contractor relationship. Two of the capital facility projects should have been developed and executed with owner firms with which the candidate firm had an existing formal or informal owner-contractor relationship.

- Project performance: to provide variability within the dependent variable and within each owner-contractor relationship category, each candidate firm will be requested to identify a completed capital facility project with an above average performance and a completed capital facility project with a below average performance.
- Project size: the total project cost for each of the candidate projects was at least $2 million. This was to insure that the candidate projects are all of comparable strategic importance to both the owner and contractor firms. Projects at or above this threshold typically require formal management review and approval.
- Project location: the project had a domestic (North American) location. This requirement sought to minimize variability in the project delivery process, project costs, construction means and methods, and team roles and responsibilities by taking advantage of the legislative, judicial and industry standardization that exists in the domestic construction industry.
- Project timing: the project had been completed within the last two years. This requirement sought to minimize the variability in the project performance from the time series effects of changing monetary valuation, technology, labor availability, and other market factors.
- Project team: the primary project manager was still employed by the company. This was to insure the study team had access to the relationship data for each firm. The Phase I Contractor Pilot Study indicated that contractor firms are very effective at converting project performance data into organizational explicit knowledge, but relationship data is usually stored as individual explicit data. To recover this data, the study needed access to the repository.

2.4 SURVEY SAMPLE

For this study, the research team selected as the sampling frame the 1998 Engineering News Record listings of the top 100 domestic design, engineering and construction management firms. The sampling frame was limited to domestic firms for expediency, convenience, access and cost.

Based on the study schedule, a target sample size of 20 firms was established. The sample element for this study is a specific architectural, engineering or construction management firm. The study sample elements were selected from the sample frame using a non-probability convenience sampling method. Starting with the number one firm, an architectural, engineering and construction management firm, additional firms were added to the sample listing in alternating sequence until 23 firms or sample elements had been selected and the sample was reasonably balanced among firm types. Since participation in this research is on a strictly voluntary basis, over-sampling was used in anticipation of attrition among the sample elements. See Appendix A for a list of participation. Note that the firm names were removed for confidentiality.

Once the sample elements were selected, an appropriate contact within each candidate firm was identified either through industry sources or through the firm's literature. Once a non-participant in the original sample was identified, a second sample group of candidate firms was selected using the same sampling frame and method. Total sample sizes for all three surveys are given in Table 2.1.

Table 2.1 Total Surveys from Participating Companies

PARTICIPANT	OWNER-CONTRACTOR RELATIONSHIP	SAMPLE SIZE
Management Interviews		9
Project Management Interviews	No Existing Collaborative Relationship	40
	Existing Collaborative Relationship	
Human Resources Interviews		11

2.4.1 Sample Characteristics for Human Resources

A total of 11 companies participated in the Human Resources (HR) portion of this research study. All but one company participating in this portion of the study provided information for the Management and Project Management portions of this research. Of the 11 respondents, six provided construction management services, three provide project engineering design services, one provided additional architectural design services, and two did not provide enough information to ascertain primary business focuses.

2.4.2 Sample Characteristics of Management and Project Manager Groups

The sample for the Management and Project Manager surveys consisted of 16 companies resulting in responses (sample surveys) from nine and 40 respondents, respectively. Each of the Management and Project Manager survey respondents, were asked to provide information on one to four projects. The nine Management surveys yielded data from 28 projects and the Project Manager surveys resulted in 40 projects. Therefore, for each of the sections within Chapter Three, when differentiating between sample size of figures and tables for overall, collaborative, and non-collaborative relationships, it might be possible for some sub-samples to include more or less than the total sample size of the survey numbers listed above.

2.5 STATISTICAL ANALYSIS

When possible, the analysis utilized descriptive statistics to provide a breakdown of the respondent answers. Some of the descriptive statistics provided in the analysis of this report include the mean, median, standard deviation, and when applicable, Analysis of Variance-One way (ANOVA). The reason for such measures was to provide a statistical verification of difference in means required to determine if a possible difference between various variables (factors) occurred.

The author selected a level of significance of 0.05 for all ANOVA trials. This value represents a generated p-value or level of significance to determine whether there is a difference among at least two of the population means. Additional analysis utilizing confidence interval analysis, Tukey method, a very robust test, was used and is commonly used for pair-wise comparisons between differences of means when considering small populations. The researcher utilized a test confidence interval of 95 percent (Geertsema 2003).

2.6 SOURCES OF ERROR AND BIAS

The Phase II Contractor study employed a non-probability sampling method to establish the sample frame. While the sample frame could have been randomized, and a probability sampling method applied, the research team felt that the reduction in external validity was justified by the access to more extensive project and owner-contract relationship data anticipated within the larger candidate firms. Despite this, the lack of external validity caused by the use of a non-probability sampling method will compromise the ability of the study to generalize about the population from the sample data. The Phase I Contractor Pilot Study and the Phase I and II Owner Studies will be available for use in establishing the internal validity of the Phase II Contractor Study findings.

Unlike the Phase I Contractor Study that used open-ended questions as its primary measure, the Phase II Contractor Study used a combination of Likert scale statements followed by open-ended questions. The open-ended questions were intended to give additional information and to clarify the Likert scale statements.

CHAPTER 3: KEY FINDINGS OF PHASE II STUDY

3.1 OVERVIEW

The Phase II Owner Study found that owner personnel are unanimous in their view that changing owner-contractor relationships require owner personnel to have new skills (Davis-Blake et al. 1999). It is important to understand that just as owner organizations change so must the contractor organizations to support the new working trends within the industry. In order to work effectively in this new highly dynamic environment, contractor companies and personnel must adapt and change in order to possess the variety of skills required to succeed.

This chapter discusses the major findings of the three surveys: Human Resources, Management, and Project Manager's. Additional information and findings, which pertain to the three surveys, can be found in Geertsema's thesis (2003).

3.2 HUMAN RESOURCES STUDY

The human resources survey focused on hiring, training, and evaluation methods in the subject organizations as outlined in subsequent sections.

3.2.1 PERSONALITY TRAITS FOR HIRING

Regardless of the methods used for hiring or what background the applicants brought forth during the hiring and interview process it was important to look at issues of hiring that companies felt were important. Therefore, the survey requested information on specific personality traits, if any, companies assessed when hiring. When asked the following question, respondents utilized the personality traits listed in Table 3.1, as a source for possible responses:

Indicate whether or not you formally screen prospective applicants for the following personality traits.

Table 3.1 Traits to Consider during Selection of Owner Personnel (Source: Davis-Blake et al.1999)

Trait	Definition
Agreeableness	Ability to get along with others and be open minded to new ideas.
Assertiveness	Willing to take risks and aggressively pursue a goal to its completion.
Confidence	Trust in one's own ability to perform the required tasks and in the abilities of others to fulfill their responsibilities.
Conscientiousness	Perseverance, responsibility, and thoroughness in completing task.
Judgment	Ability to differentiate between trivial and important details. Awareness of abilities and limitations of people and ideas.
Trustworthiness	Personal integrity and honesty. Ability to inspire others to have trust in one's self.

All respondents utilized at least one of the personality traits when hiring new applicants for specified project functions. Figure 3.1 reflects the percentage, with the highest percentage reflecting most utilized, the respondents regarded as the most important personality traits.

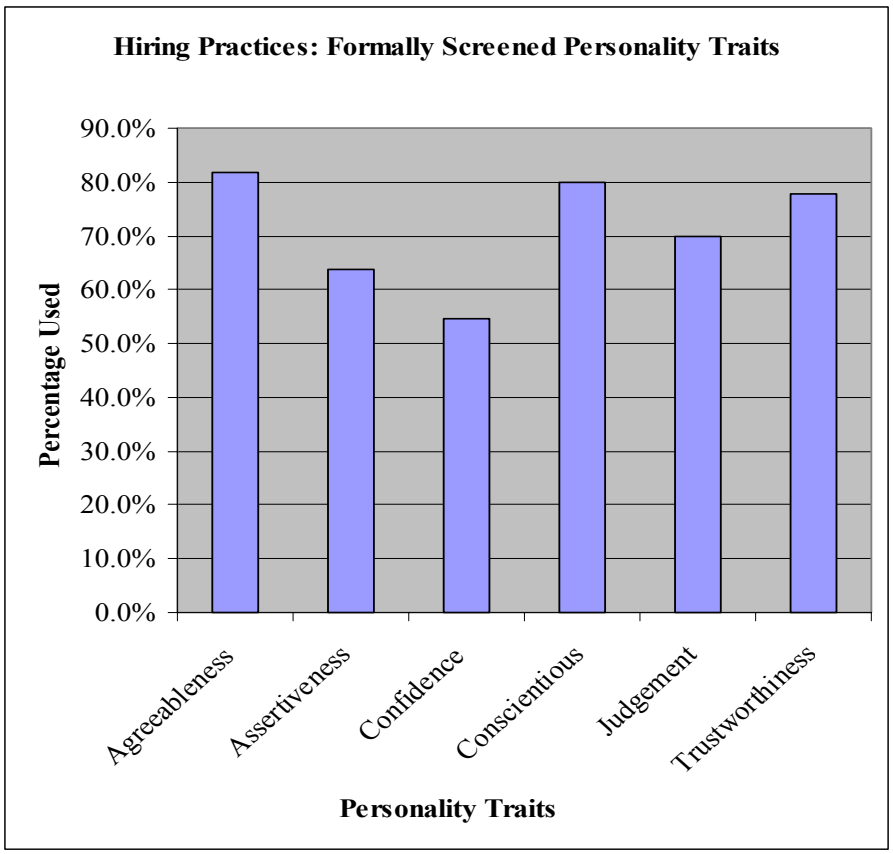

Figure 3.1 Traits to Consider during Selection of Contractor Personnel

This section of the survey did not demonstrate a statistically significant difference between usage of the different personality traits. However, it should be noted that the traits important to fostering and developing stronger collaborative relationships (Agreeableness, Conscientiousness, and Trustworthiness) are being utilized more often than the other three "individual" traits. No formal method of rating these traits was utilized during the hiring process at any of the firms. Basically, these traits are assessed during hiring interviews and in some cases during reference checks.

3.2.2 TRAINING PRACTICES

The question below and the list in Table 3.2 were utilized to identify the current contractor company training practices in order to determine how contractor companies of this sample were dealing with meeting owner company requirements for a broader range of Project Management functions.

Indicate how much training that personnel in this project function receive for the following skills during their first year on the job and annually thereafter (in days). If training is ongoing over a person's career, please estimate the number of days of training in a given year.

Table 3.2 Skills Required by Successful Owner Project Personnel (Source: Davis-Blake et al. 1999)

Category of Skills	**Examples of Skills**
Business Skills	Writing and managing contracts Negotiation Managing budgets and schedules
Communication Skills	Coordination/liaison Conflict management Cultivate broad network of relationships
Influence Skills	Mentoring Motivating Change management
Managerial Skills	Team building Delegating Politically aware/see big picture
Problem Solving Skills	Continually analyze options/innovation Planning Consider both sides of issues, risk management
Technical Skills	Understand entire construction process Multi-disciplined (knowledge of several areas of engineering) Information technology skills

The results of the survey question were broken into two figures: Figure 3.2, New Contractor Training, and Figure 3.3, Annual Contractor Training.

Contractor companies appear to be placing a significant amount of emphasis on technical training. Companies on average allocated 14 days training new employees on technical skills with the next closest topic being less than two days on new business skills.

For annual training, on average, no company provided more than one week of annual training in any category. Similarly, training for technical skills exceeded all other skills training by 100 percent as given in Figure 3.3.

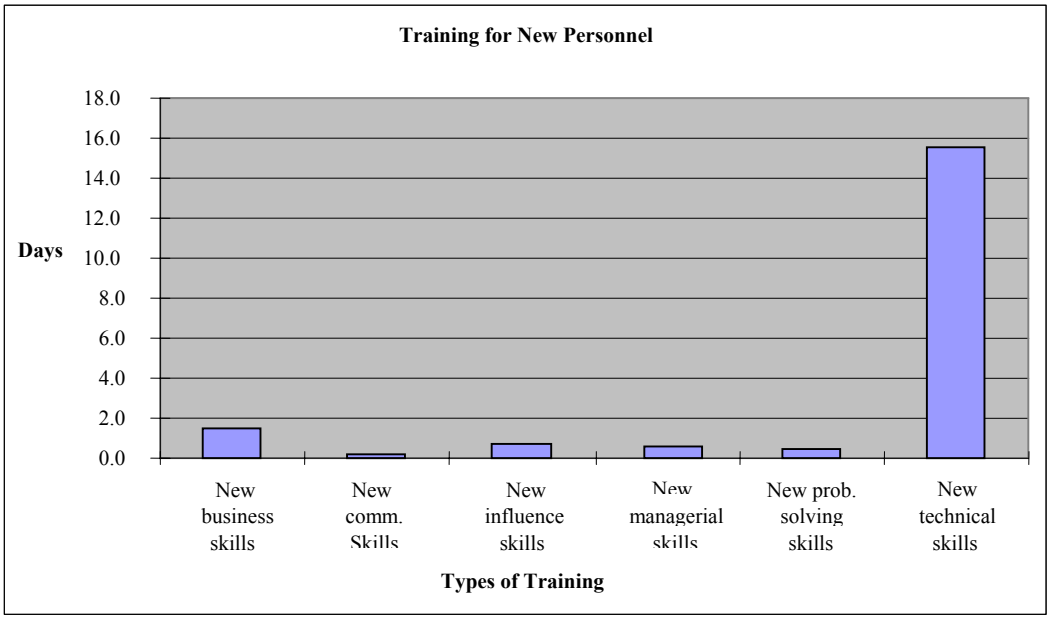

Figure 3.2 New Skills-Training for Contractor Personnel

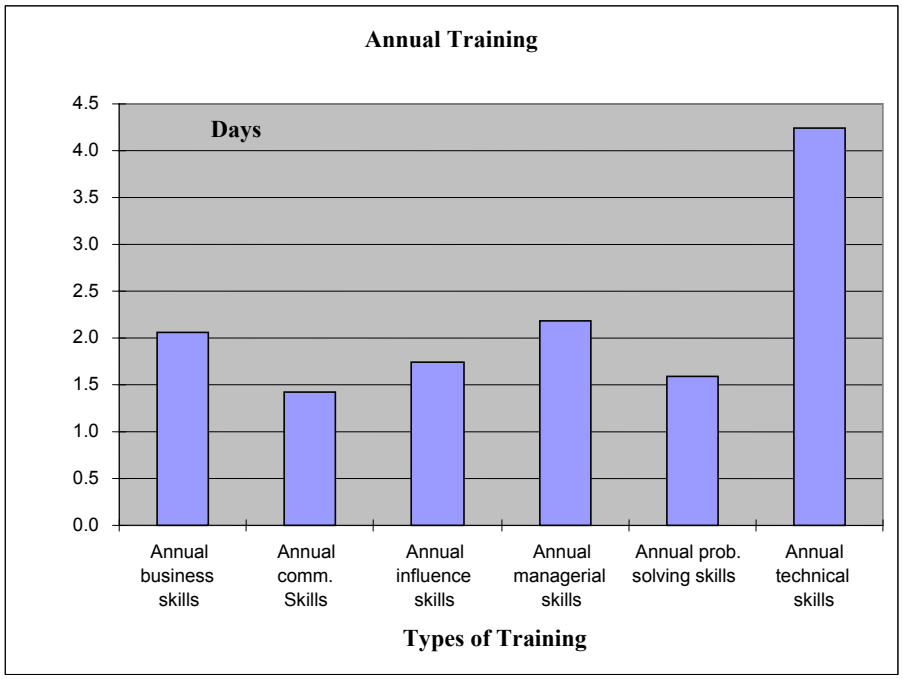

Figure 3.3 Annual Skills-Training for Contractor Personnel

It is evident that companies are striving to improve their ability to meet owner requirements for additional skills by providing technical skills training. However, they appear to be falling short on training new and current employees in many skills, designated by both owners and contractor companies, that are necessary to develop and maintain successful collaborative relationships.

3.2.3 ORGANIZATIONAL DIVERSITY

Organizational diversity for age and gender are considered very important to the industry's future and has been the subject of past CCIS studies (Davis-Blake et al. 2001). Therefore, this survey addressed age distribution and percentage of gender (male) representation within each age group. The following question was asked.

Describe the distribution of this project job function by age and describe the distribution of each age factor by gender.

The various percentages for age groups (10 year increments) and for gender (male) breakdown can be found in Figure 3.4 and Figure 3.5, respectively.

Analysis of the question with regard to the age distribution presented a similar percentage breakdown when compared to the results of the CCIS Demographics Study (Davis-Blake et al. 2001). The following data were extracted:

- Age 39 years and under: 31% (CCIS 2001) vs. 35% for this research
- Age 40 years to 59 years: 62% (CCIS 2001) vs. 59% for this research
- Age 60 years and older: 7% (CCIS 2001) vs. 5% for this research
- Age 40 years and older: 69% (CCIS 2001) vs. 65% for this research

The results support previous work showing that contractor companies have an aging workforce and that the potential problem of the retiring workforce within this decade and the early part of the next decade will become significant.

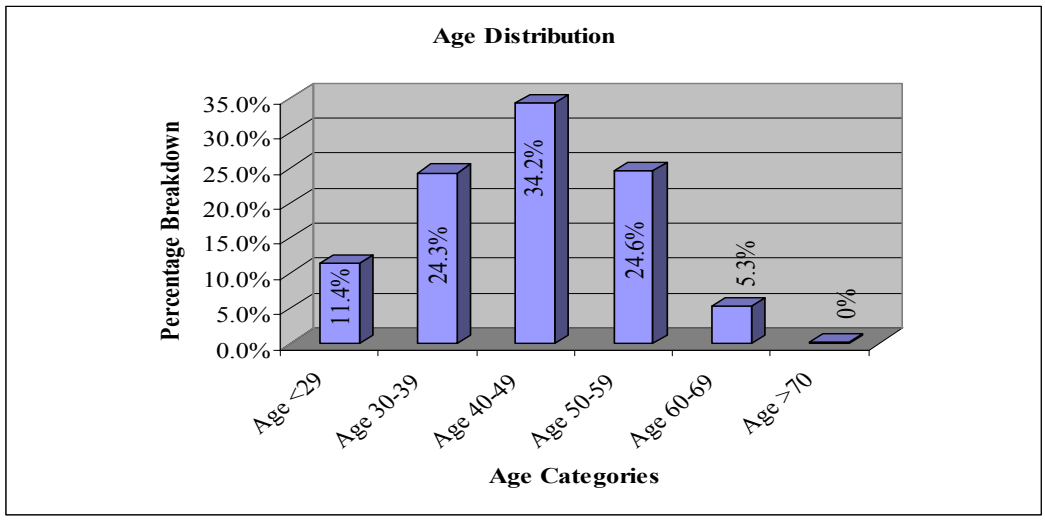

Figure 3.4 Age Distribution for Contractor Personnel

Interestingly, it was found in the analysis of gender distribution that for entry level personnel in this sample, women exceeded the approximate 9.0 percent work force representation found in the earlier CCIS study (2001) with an approximate 26 percent representation. However, as shown in Figure 3.5, the percentage decreases significantly between the ages of 30 and 40 years and becomes nonexistent around 60 years of age.

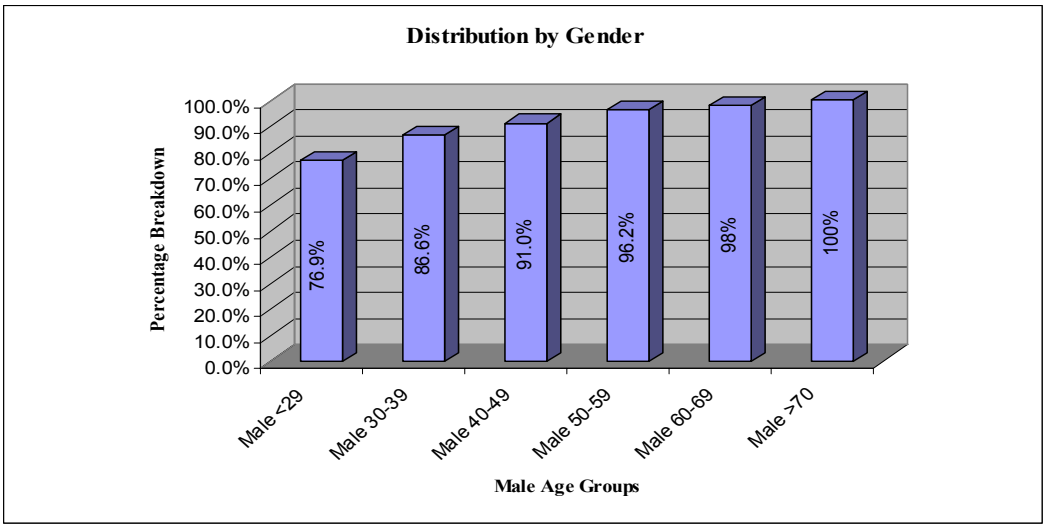

Figure 3.5 Percentage Distribution for Male Employees by Age

3.2.4 SUMMARY

As previously stated in the background chapter, the Phase II Owner Study found that owner personnel are unanimous in their view that changing owner-contractor relationships require owner personnel to have new skills (Davis-Blake et al. 1999). Additionally, it was found under CCIS, No. 11, Organizational Change Phase I Contractor study, that specific human resource issues are becoming increasingly relevant and need to be addressed (Gibson and Ryan 2000). As these issues are being acknowledged as important, it is becoming more

important that contractor companies adapt and change in order to succeed in today's industry.

Although a small sample, the results of this Human Resources survey provided some interesting insights into how contractors are currently hiring new employees, developing new skills, addressing age and gender within the workforce, and how these areas apply to the fostering of new and stronger collaborative relationships. The findings of the survey are as follows:

- The higher percentage traits of "team work skills," i.e., agreeableness, conscientiousness, and trustworthiness, are being utilized more often than the other three "individual" traits of assertiveness, confidence, and judgment. However, these traits are being assessed via interviews and without a formal method or process.
- A significant amount of new employee training and annual employee training is being provided to employees. Less emphasis is being placed on business, management, communication, and problem-solving skills in the training than on technical issues.
- The aging workforce is very similar to the previous CCIS study and will cause problems in the near future with loss of institutional knowledge and the possible breakdown of relationships with longtime clients.
- Male gender distribution for entry-level personnel in this small sample has dropped since the last CCIS study (Davis-Blake et al. 2001). Women exceeded the approximate 9 percent work force with a 26 percent representation in entry-level positions shown in previous reports (Davis-Blake et al. 2001). However, the percentage decreases significantly between the ages of 30 and 40 years and becomes nonexistent around 60 years of age.

Additional findings of the research study (Geertsema 2003):

- When hiring new personnel, structured and unstructured interviews are utilized much more than formal or structured skill and personality tests.
- Experience and the ability to work with others generally outweigh education in choosing new employees.
- Company appraisal practices for performance are in contrast to the training and compensation practices of their companies. Appraisals are management-, client-, and, team-based, while training and compensation are based on technical skills and individual performance, respectively.
- Contractor companies are placing a significant amount of importance on individual success and performance over team, and corporate performance.
- The amount of time spent within each job title was between five and six years and the percentage of internal hires progressing through company lines was very consistent at around 70 percent.
- Entry level employees, Level I, are being hired from outside the company while subsequent follow-on positions (Level II and above) are generally hired from within the company.

In conclusion, the findings, as related above, are very similar to past studies of owner organizations conducted by CCIS. The issues seem to cut across both the owner and contractor community.

3.3 MANAGEMENT AND PROJECT MANAGER SURVEYS

The following sections describe findings from the Management and Project Manager surveys.

3.3.1 OVERALL OWNER-CONTRACTOR RELATIONSHIP

As previously utilized in the Owner-Contractor Organizational Changes Study, five types of possible collaborative relationships exist (Davis-Blake et al. 1999). The five levels, and their collaborative relationships, described in Table 3.3 demonstrate models of contractor involvement, along a relationship continuum, with the owner. One extreme is noted when the owner and the contractor have a formal document providing terms for a highly specified alliance that is agreed upon and managed at fairly high levels in both firms. Such an alliance specifies many features of the owner-contractor relationship including mechanisms for sharing information about future construction needs with the contractor, methods for allocating work between different contractors, and payment and incentive plans that apply across projects. At the other end of the continuum, the contractor forms a relationship with the owner via a winning bid or first use. Typically, these contracts are executed under the low bid premise. The intermediate form of owner-contractor relationships are classified as being the preferred provider. Under this method the owner tends to work with the same small number of contractors over time, thereby working to develop good relationships with those contractors. However, this type of relationship does not bind the owner to future obligations with the contractors.

For the purposes of this research, collaborative relationships encompassed the categories of formal alliance, informal alliance, and preferred provider. Non-collaborative relationships entailed winning bid and first use categories.

Table 3.3 Possible Owner-Contractor Relationships

Relationship	Description
Collaborative	
Formal Alliance	You and the owner have an alliance with written terms and conditions.
Informal Alliance	The owner is considered an alliance partner but no written agreement exists.
Preferred Provider	Your organization is a first choice contractor, but there is no alliance.
Non-Collaborative	
Winning Bid	No special relationship.
First Use	No previous relationship.

In each of the two surveys for Management and Project Managers, three questions were asked to determine the following: the current type of relationship, whether the relationship with this owner has changed over time and if so, what was the relationship in the past. The three questions with associated data are presented below. Figures 3.6, 3.7, and 3.8 summarize the results of the question pertaining to the current relationship and Figures 3.9, 3.10, and 3.11 address the relationship as it was in the past, prior to the survey or current relationship.

What phase best describes the relationship between your employer and this project's owner organization?

Respondents for both the Management and Project Manager surveys were asked to provide project information based on their "current" relationships with the client. The following information from the surveys was provided:

The current relationships for management showed 43 percent non-collaborative and 57 percent collaborative. Project Manager data for current relationships with projects submitted under the title of "Current Collaborative Relationship" resulted in an 82 percent use of collaborative relationship categories vice a 16 percent usage of collaborative relationship categories used in "Current

Non-collaborative Relationship." This confirms somewhat, the internal consistency of these self-reported data.

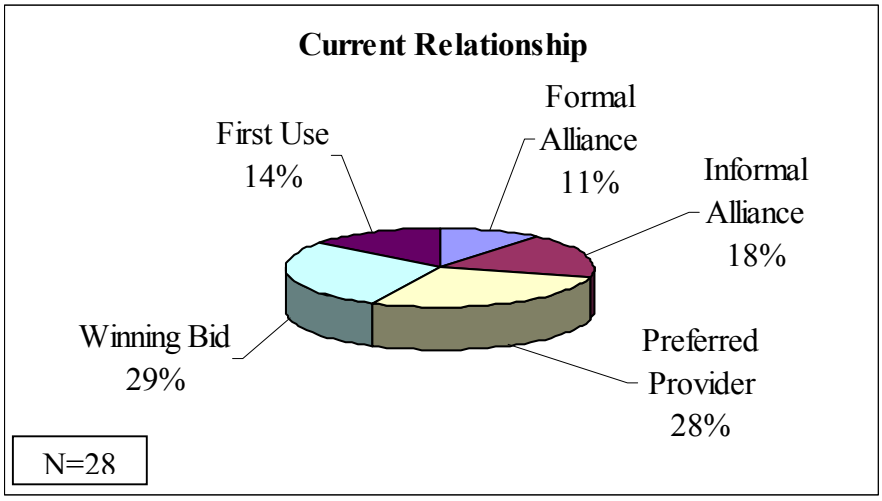

Figure 3.6 Management Survey: Current Owner-Contractor Relationship

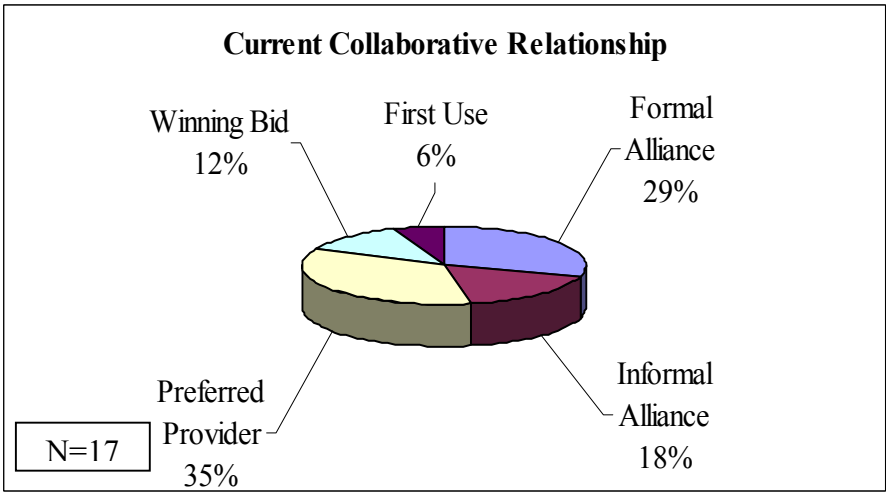

Figure 3.7 Project Manager Survey: Current Owner-Contractor, Collaborative Relationship

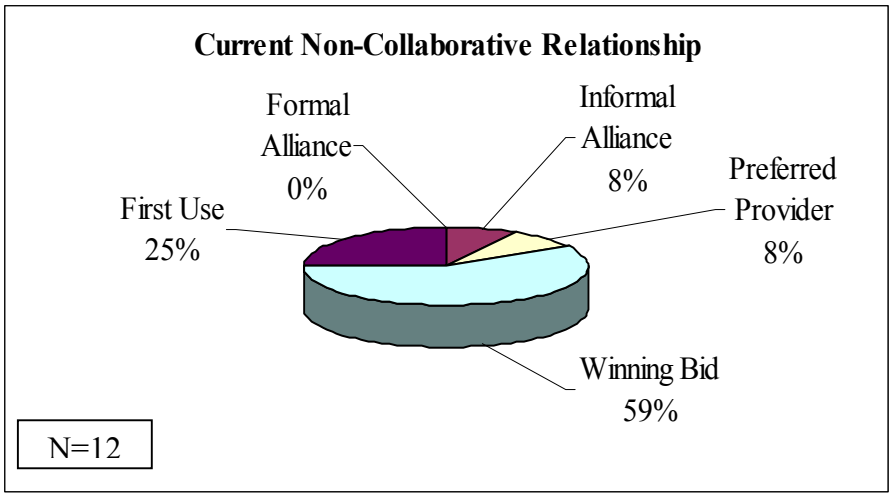

Figure 3.8 Project Manager Survey: Current Owner-Contractor, Non-Collaborative Relationship

Has the nature of your relationship with this owner changed over time?

When addressing the question of "changed relationship," for this sub-sample it was found that both the Management and the Project Manager's surveys had witnessed a relationship change from past relationships to the current state.

Management (in their survey) had witnessed 56 percent of the "current" projects reported shifting from a non-collaborative relationship to a collaborative relationship. Of the projects submitted under the Project Manager's survey, 80 percent of either the collaborative or non-collaborative relationships had witnessed a positive shift in the relationship continuum as compared to past projects with this client.

Recognizing this, it was then important to address what type of relationship, if any had existed in the past. So, the following question was asked:

If so, what best describes the relationship in the past?

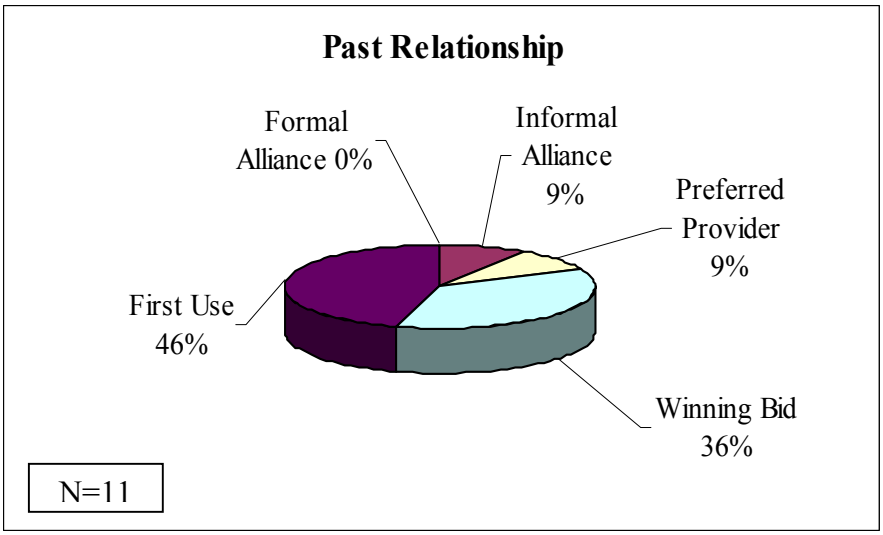

Figure 3.9 Management Survey: Past Owner-Contractor Relationship

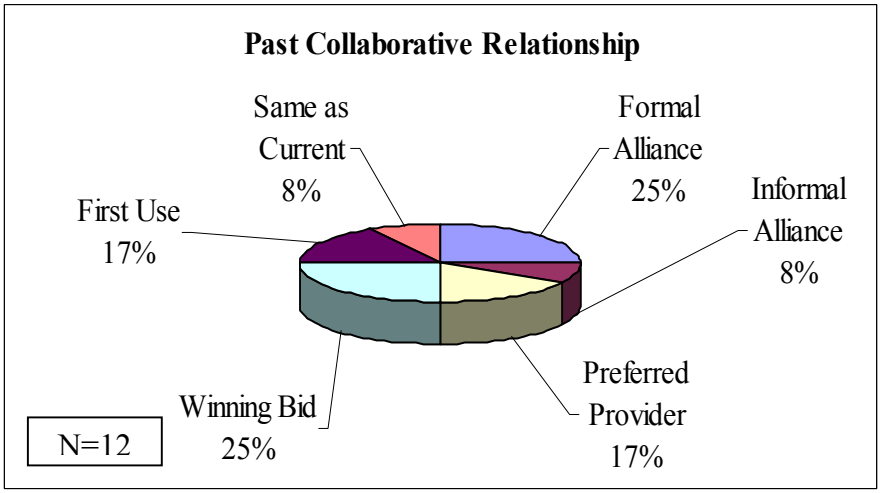

Figure 3.10 Project Manager Survey:
Past Owner-Contractor, Collaborative Relationship

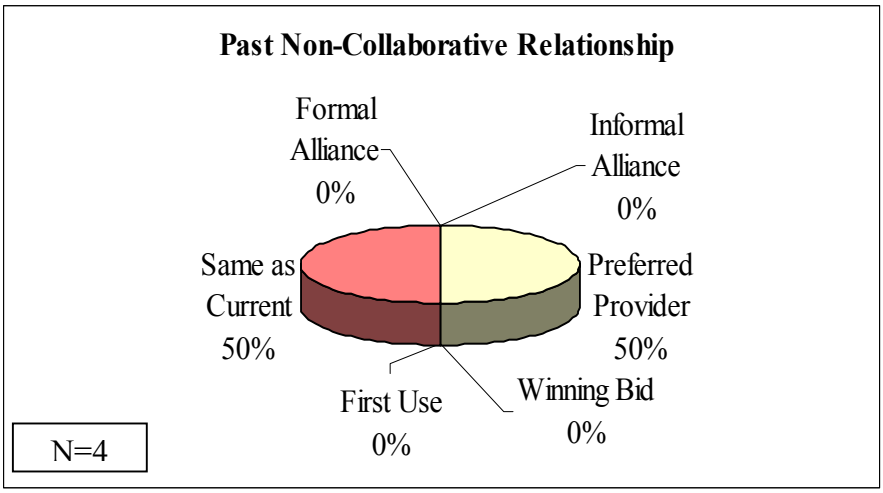

Figure 3.11 Project Manager Survey:
Past Owner-Contractor, Non-Collaborative Relationship

Data for Figures 3.6 through 3.11 suggests that working relationships over time have a natural tendency to progress towards collaborative working relationships.

- Management survey: The past collaborative relationship categories increased from a usage of 18 percent to a current collaborative relationship value of 57 percent.
- Project Manager's survey: The past collaborative relationship categories increased from a usage of 58 percent to a current collaborative relationship value of 82 percent.
- For the past non-collaborative relationship projects in the sample, only four sample projects were provided, however, it should be noted that the relationship category either remained the same, from past to current, or showed a reduction in positive collaborative relationship categories from past to current working relationships.

Both the Project Manager and Management survey results demonstrated that over time when working with the same client, if a collaborative relationship exists, it either started out as such or was fostered and had shifted to a more positive collaborative relationship. Whereas, for projects currently in a non-collaborative relationship, if not fostered, the relationship was likely to remain in a non-collaborative relationship.

The shift from one end of the continuum to the other was in some cases highly significant and resulted in a positive working relationship. The collaborative working relationships shown in Figure 3.7 and Figure 3.10 showed the biggest gain when compared to the Management and Project Manager survey non-collaborative relationships. Greater than a 32 percent gain was realized when moving from one point on the continuum (First Use/Winning Bid) to another (Alliance/Preferred Provider).

Regardless, all three categories, informal alliance, formal alliance and preferred provider, witnessed a shift in one form or another from a non-collaborative nature to a more collaborative working relationship for this sample. Therefore, it is the opinion of the authors that because of the shifting environment it is apparent that contractors are best served trying to foster stronger working ties with current and future clients and that clients perhaps are expecting this shift as well.

3.3.2 OVERALL SUCCESS FOR MANAGEMENT & PROJECT MANAGER

To understand the overall success of the owner-contractor working relationship, the respondents (Management and Project Manager surveys) were asked to answer the following question using a Likert scale, from one to seven, to indicate the level of success.

Indicate the success of the working relationship with this owner firm on this project.

The results from the Management and Project Manager perspectives are presented in Table 3.4 and Table 3.5, respectively.

Table 3.4 Overall Success of Working Relationship from Management Survey: Collaborative and Non-Collaborative

Collaborative				Non-Collaborative			
Category	Frequency	%	Rating	Category	Frequency	%	Rating
1	1	6%	Not at all successful	1	2	17%	Not at all successful
2	1	6%		2	2	17%	
3	0	0%	Moderately successful	3	0	0%	Moderately successful
4	5	31%		4	4	33%	
5	4	25%		5	1	8%	
6	4	25%	Very successful	6	3	25%	Very successful
7	1	6%		7	0	0%	
	16	100%			12	100%	

Table 3.5 Overall Success of Working Relationship from Project Manager Survey: Collaborative and Non-Collaborative

Collaborative				Non-Collaborative			
Category	Frequency	%	Rating	Category	Frequency	%	Rating
1	0	0%	Not at all successful	1	0	0%	Not at all successful
2	0	0%		2	2	14%	
3	1	6%	Moderately successful	3	1	7%	Moderately successful
4	3	18%		4	2	14%	
5	2	12%		5	3	21%	
6	5	29%	Very successful	6	5	36%	Very successful
7	6	35%		7	1	7%	
	17	100%			14	100%	

For the Management Surveys, the overall success mean and median response for collaborative relationships, seen in Table 3.4, were 4.6 and 5.0, respectively. For non-collaborative relationships, seen in Table 3.4, the mean and median were 3.8 and 4.0, respectively; these relationships did not demonstrate a statistically significant difference, although better in collaborative relationships.

As for the Project Manager surveys, the collaborative relationship results seen in Table 3.5 were more optimistic. The collaborative relationship mean and

median were 5.7 and 6.0, respectively, and the non-collaborative relationship mean was 4.8 with a median value of 5.0. Project Managers had a statistically stronger tendency to rate their projects "very successful" and it is the opinion of the authors that the use of a collaborative relationship affected the working relationships for the projects in this sample.

For both the Management and Project Manager surveys, the difference between the collaborative and non-collaborative nature of their relationships was visible from the data. Therefore, at least based on this sample, it appears to benefit contractor companies to invest in practices and processes which foster more collaborative relations.

3.3.3 OVERALL WORKING EXPERIENCE WITH THE OWNER

To understand the reasons a contractor firm may or may not reach the goals and objectives of the owner firm, the following question was asked utilizing a scale that ranged from strongly disagree (one) to strongly agree (seven).

How well do the statements below describe your experience with this owner?

The results of the two surveys, Management and Project Manager, are provided in Table 3.7 and Table 3.8, respectively. Each table provided the mean and median values and is separated between collaborative and non-collaborative relationships. For these tables, the bolded text values, from the authors' perspective, are areas of interest and demonstrate a significant level of difference.

Table 3.6 Management Survey: Overall Working Experience with Owner

Statements	Collaborative (n=16) Mean / Median	Non-Collaborative (n=12) Mean / Median
We are the primary source of design, engineering and/or construction management services for this owner.	4.2 / 4.5	N/A
This owner is requesting that we supply a more diversified assortment of services.	**3.7 / 4.0**	N/A
Our organizational cultures are strongly aligned.	**3.9 / 4.0**	**2.7 / 2.0**
We entered our relationship with a strong-shared vision.	**4.6 / 4.5**	3.7 / 4.0
We meet regularly to address emerging issues.	**4.6 / 5.0**	**4.2 / 5.0**
We defined specific goal for our relationship.	**4.8 / 5.0**	**3.9 / 4.5**
The owner actively participates in the capital facility project process.	**5.6 / 6.0**	**4.2 / 5.0**
We evaluate our relationship performance against our goals on a regular basis.	4.5 / 4.5	3.8 / 4.0
We focus on learning and continuous improvement.	4.2 / 4.5	3.7 / 4.0
The owner understands the capital facility project design and construction process.	4.4 / 4.5	3.8 / 4.0
The owner provides positive feedback on our performance on regular basis.	**4.6 / 5.0**	**3.2 / 3.0**
There is a budget set up to cover the internal costs of maintaining and developing this owner relationship.	**2.8 / 3.0**	N/A

Table 3.7 Project Manager Survey: Overall Working Experience with Owner

Statements	Collaborative (n=21) Mean / Median	Non-Collaborative (n=15) Mean / Median
We are the primary source of design, engineering and/or construction management services for this owner.	4.7 / 5.0	3.3 / 2.0
This owner is requesting that we supply a more diversified assortment of services.	4.1 / 5.0	**2.5 / 2.0**
Our organizational cultures are strongly aligned.	4.5 / 5.0	3.5 / 4.0
We entered our relationship with a strong-shared vision.	**5.8 / 6.0**	**4.3 / 4.0**
We meet regularly to address emerging issues.	**5.4 / 6.0**	**5.3 / 5.0**
We defined specific goals for our relationship.	**5.6 / 6.0**	**4.6 / 5.0**
The owner actively participates in the capital facility project process.	**5.8 / 6.0**	**4.8 / 5.0**
We evaluate our relationship performance against our goals on a regular basis.	5.0 / 5.0	**3.1 / 2.0**
We focus on learning and continuous improvement.	5.2 / 5.0	4.1 / 4.0
The owner understands the capital facility project design and construction process.	**5.7 / 6.0**	4.1 / 4.0
The owner provides positive feedback on our performance on a regular basis.	**5.6 / 6.0**	3.9 / 4.0
There is a budget set up to cover the internal costs of maintaining and developing this owner relationship.	**3.6 / 4.0**	**3.0 / 3.0**

For the collaborative and non-collaborative management relationships only, the collaborative relationship demonstrated a significant difference when

comparing the sub-sample means between the groups. As such, management was very adamant about important benefits of collaborative relationships. When the owner participates in the capital facility process, defines goals, shares a common vision with the contractor, meets regularly, and provides feedback, then the relationship has a higher chance of being successful. However, money and time are not being invested by the owner to develop and maintain such relationships, and it was found that owner and contractor cultures are still "misaligned." Additionally, for the non-collaborative portion of the management survey, similar results were found to be true and are presented in bolded text.

For both collaborative and non-collaborative Project Manager relationships a statistically significant difference occurred when comparing the sub-sample means between the groups of statements. The Project Manager's results were very similar for this question when comparing collaborative and non-collaborative relationships. Therefore, it could be said that the owners are doing the right things, and contractors, regardless of the relationship, feel that both sides are working together once the project has started. It is important to note that internal consistency exists for collaborative relationships. However, opportunities exist in terms of improving learning processes, alignment of organizational cultures, continuous improvement practices, and additional funding/resources towards fostering new and improved relationships.

3.3.4 OVERALL GENERAL ATTRIBUTES OF A SUCCESSFUL OWNER-CONTRACTOR RELATIONSHIP

When owners were asked as to identify attributes that made for successful owner-contractor relationships, a list of seven different attributes dominated their responses (Davis-Blake et al. 1999). To be consistent with what owners were asked and had provided, this survey asked each of the respondents the following question:

Please rank the following list of relationship indicators based on their importance to the success of an owner-contractor relationship. (Using a scale of 1 to 7, where 1 is the most important and 7 is the least important.)

Table 3.8 represents the results from both the Management and Project Manager surveys and ranks the information in order from highest importance to lowest importance. Note the consistencies for the areas between the most important and least important. Additionally, note the difference between the results for "operating for mutual benefit."

Table 3.8 General Attributes of a Successful Owner-Contractor Relationship: The Contractor Perspective (Source: Davis-Blake et al. 1999)

Attributes	Definition	Management (n=7) Mean / Median	PM (n=26) Mean / Median
Contractor meets owner's project objectives	**The project is delivered on or ahead of schedule and budget targets with minimal rework in the field. Startup is smooth.**	**1.7 / 1.0**	**1.5 / 1.0**
Contractor responsiveness to changing conditions	**Contractor responds quickly and effectively to owner needs. Contractor informs owner as early as possible about upcoming difficulties**	**2.7 / 3.0**	**2.5 / 2.0**
Operating for mutual benefit	**The relationship benefits both owner and contractor. Gains made through a productive relationship, such as cost savings, are shared between owner and contractor.**	**2.7 / 2.0**	**4.4 / 5.0**
Contractor understands owner's business	Contractor personnel understand owner's business objectives and operating systems and procedures	3.7 / 3.0	3.3 / 3.0
Integration of owner and contractor personnel	Owner and contractor work together repeatedly, using many of the same personnel from project to project. Owner and contractor develop effective communication structures, a shared vocabulary, and a common project culture. Owner and contractor systems are integrated to the extent possible. Trust develops between owner and contractor personnel. Multiple levels of personnel are involved in both the owner and contractor organization	3.4 / 4.0	3.4 / 3.0
Contractor willingness to innovate	Contractor is willing to challenge owner ideas, recommend improvements, and take risks.	4.3 / 4.0	3.7 / 3.5
Learning from the relationship is documented and used	**Owner and contractor explicitly discuss and document the lessons learned from each project. If possible, these lessons are integrated into systems and procedures that can be reused on subsequent projects.**	**5.4 / 6.0**	**5.0 / 5.5**

When performing an analysis of variance, the Management survey sub-sample demonstrated a significant difference between the means of the attributes. The largest difference was the ability to "meet the owner's project objectives" and the ability to "learn from the relationship."

In the Project Manager survey, an ANOVA between the different factors resulted in statistically significant differences. With the most important factor, as ranked in Table 3.8, being the "contractor's ability to meet owner's project objectives" and the least important factor, once again, the ability to "learn from the relationship."

It should be of concern to contractor companies that "learning" is not of importance and "operating for mutual benefit" is not aligned with management's view of ranking "operating for mutual benefit" higher. Some would consider both of these categories as very important in developing and maintaining successful collaborative relationships. Both could potentially pose problems if due attention is not given because goal conflict in internal relationships, the ability to learn from the past, and the ability to meet corporate objectives are all related. It is the opinion of the authors that these two "least important" issues need to be proactively addressed in an effort to improve or strengthen owner-contractor relationships.

3.3.5 SKILLS & TRAITS OF SUCCESSFUL OWNER-CONTRACTOR RELATIONSHIPS

Owner personnel have specific views of the skills and traits their personnel must have in order to be successful. For consistency within the CCIS research group, this study continued with the same list of skills and traits developed for owner organizations.

To analyze the skills and traits necessary for owner-contractor personnel from the contractor perspective the following question was asked:

Rank the following list of skills and traits based on their importance to the ability of: (Scale of 1 to 12, 1 is the most important and 12 is the least important.)

- *Contractor personnel in key project position to successfully fulfill their duties and responsibilities?*
- *Owner personnel in a key project position to successfully fulfill their duties and responsibilities?*

The results of the Management and Project Manager surveys are shown in Table 3.9 and Table 3.10, respectively. Bolded areas represent the most important and least important areas between sub-sample means, within each category of owner and contractor groups.

Table 3.9 Management Survey: General Skills & Personality Traits of a Successful Owner-Contractor Relationship (Source: Davis-Blake et al., 1999)

Skills & Traits	Definition	Contractor (n=7) Mean/Median	Owner (n=7) Mean/Median
Agreeableness	Ability to get along with others and be open-minded to new ideas.	7.4 / 9.0	7.3 / 7.0
Assertiveness	Willing to take risks and aggressively pursue a goal to its completion.	**8.7 / 10.0**	**8.7 / 10.0**
Confidence	Trust in one's own ability to perform the required tasks and in the abilities of others to fulfill their responsibilities.	7.1 / 7.0	6.9 / 8.0
Conscientiousness	Perseverance, responsibility, and thoroughness in completing task.	5.7 / 8.0	6.7 / 7.0
Judgment	Ability to differentiate between trivial and important details. Awareness of abilities and limitations of people and ideas.	5.6 / 6.0	5.3 / 5.0
Trustworthiness	Personal integrity and honesty. Ability to inspire others to have trust in one's self.	**4.0 / 3.0**	**4.3 / 4.0**
Business Skills	Writing and managing contracts Negotiation Managing budgets and schedules	5.7 / 5.0	6.6 / 5.0
Communication Skills	Coordination/liaison Conflict management Cultivate broad network of relationships	**3.6 / 3.0**	**3.1 / 2.0**
Influence Skills	Mentoring Motivating Change management	**10.2 / 11.0**	**8.3 / 8.5**
Managerial Skills	Team building Delegating Politically aware/see big picture	**4.1 / 4.0**	**3.3 / 2.0**
Problem Solving Skills	Continually analyze options/innovation Planning Consider both sides of issues, risk management	4.6 / 4.0	4.4 / 4.0
Technical Skills	Understand entire construction process Multi-disciplined (knowledge of several areas of engineering) Information technology skills	**4.7 / 2.0**	**8.3 / 10.0**

Table 3.10 Project Manager Survey: General Skills & Traits of a Successful Owner-Contractor Relationship (Source: Davis-Blake et al., 1999)

Skills & Traits	Definition	Contractor (n=26) Mean/Median	Owner (n=25) Mean/Median
Agreeableness	Ability to get along with others and be open-minded to new ideas.	6.4 / 6.5	7.0 / 7.0
Assertiveness	Willing to take risks and aggressively pursue a goal to its completion.	**7.3 / 9.0**	**7.4 / 8.0**
Confidence	Trust in one's own ability to perform the required tasks and in the abilities of others to fulfill their responsibilities.	6.6 / 7.0	7.0 / 9.0
Conscientiousness	Perseverance, responsibility, and thoroughness in completing task.	4.8 / 4.0	6.2 / 7.0
Judgment	Ability to differentiate between trivial and important details. Awareness of abilities and limitations of people and ideas.	5.3 / 4.5	4.6 / 4.0
Trustworthiness	Personal integrity and honesty. Ability to inspire others to have trust in one's self.	**3.5 / 2.0**	**3.1 / 2.0**
Business Skills	Writing and managing contracts Negotiation Managing budgets and schedules	5.9 / 6.0	5.5 / 5.0
Communication Skills	Coordination/liaison Conflict management Cultivate broad network of relationships	**4.6 / 5.0**	**4.2 / 3.0**
Influence Skills	Mentoring Motivating Change management	**6.9 / 7.0**	**7.1 / 6.5**
Managerial Skills	Team building Delegating Politically aware/see big picture	**4.3 / 4.0**	**4.6 / 3.5**
Problem Solving Skills	Continually analyze options/innovation Planning Consider both sides of issues, risk management	5.0 / 4.0	5.4 / 4.0
Technical Skills	Understand entire construction process Multi-disciplined (knowledge of several areas of engineering) Information technology skills	**4.1 / 3.0**	**6.0 / 6.0**

For contractor personnel, trustworthiness, communication skills, managerial skills and technical skills were the most important. Assertiveness and influence skills were least important. This is somewhat consistent with the emphasis placed on collaborative relationships, however, as previously stated in the human resources portion of the survey very little training is being provided towards the development of communication skills (verbal or written) and management skills.

For the Project Manager survey, results were not similar. In the respondent's opinion, both owners and contractors need similar sets of skills for either group to succeed. Project Managers were fairly consistent in that trustworthiness, communication skills, and management skills are the most important. They also thought influencing skills and the ability to be assertive are the least important in today's environment.

Additionally, it should be noted that the largest difference between the owner and contractor mean values occurred in the technical skill category. This should come as no surprise since the results of this question are consistent with the owner's desire to procure technical services by outsourcing and the contractor's desire to keep owner personnel away from technical issues.

3.3.6 PROJECT MANAGER'S SURVEY SPECIFIC RESULTS

The next section provides specific results of questions asked in the Project Manager survey and not asked in the Management survey.

3.3.6.1 Project Manager Expectations

Project Manager expectations might easily be considered similar to the question concerning "overall success." However, for this section the two questions utilized took into account project cost and capacity as factors of success. Cost data and change order data presented in Table 3.11 provide a baseline for future discussion.

Table 3.11 Capital Facility Project Costs and Change Order Costs

	Collaborative Project Cost	Collaborative Change Orders	Non-Collaborative Project Cost	Non-Collaborative Change Orders
Count	17	17	13	14
Mean	$ 43.8 M	$ 3.22 M	$ 95.3 M	$ 1.85 M
Median	$ 26.2 M	$ 1.28 M	$ 25.5 M	$ 0.65 M
Standard Dev	$ 51.3 M	$ 3.98 M	$ 238.9 M	$ 2.52 M
Range	$40K - $212M		$188K - $884M	

When asked two questions based on expectations pertaining to "facility / final cost" and "capacity achieved," the following results were found. A scale from "much worse than expected" to "much better than expected" was utilized with values ranging from one to seven, respectively.

Indicate how the completed facility (considering the final cost) compares against expectations.

Indicate how the achieved capacity of the completed facility compares against the expectations documented in the project execution plan.

The means and medians for both the collaborative and non-collaborative relationships for achieving "expectations" were 5.4, 5.0, 4.8 and 4.0, respectively. The ANOVA, however, did not show a significant difference between the collaborative and non-collaborative relationships. Table 3.12 provides additional information concerning the percentages of how Project Managers felt they met expectations when considering final cost.

Table 3.12 Project Expectations: Collaborative vs. Non-Collaborative

Collaborative				Non-Collaborative			
Category	Frequency	%		Category	Frequency	%	
1	0	0%	Much Worse Than	1	0	0%	Much Worse Than
2	1	6%	Expected	2	0	0%	Expected
3	0	0%		3	1	8%	
4	3	18%	As Expected	4	5	42%	As Expected
5	5	29%		5	2	17%	
6	3	18%	Better Than Expected	6	3	25%	Better Than Expected
7	5	29%		7	1	8%	
	17	100%			12	100%	

When looking at the capacity of the facility to "meet expectations documented in the project execution plan," the results of the collaborative and non-collaborative relationships were very similar. The mean and median for the collaborative relationship was a 4.6 and 4.5, respectively, while the mean and median for the non-collaborative relationship was 4.4 and 4.5, respectively and did not demonstrate a significant difference. The collaborative relationships were considered slightly more successful, as a whole.

3.3.6.2 Importance of Project-Related Issues

To determine the similarity between factors that owners consider important and those that contractors consider important, the following question was asked

utilizing a scale from one to seven with responses ranging from "not at all" to "a large extent," respectively. The results are shown in Table 3.13.

To what extent did you and the owner place a similar level of importance on each of the following issues?

Table 3.13 Project Manager Survey: Level of Importance for Project Specific Issues between Owner-Contractor Relationship

Project Issues	Mean / Median (n=37)
Project Cost	**6.4 / 7.0**
Project Deadlines	**6.4 / 7.0**
Quality of the completed project	**6.2 / 6.0**
Responding to changes in project schedule	**5.6 / 6.0**
Building an ongoing relationship	**5.4 / 6.0**
Responding to changes in project scope	**5.2 / 6.0**

The results placed project cost and project deadlines as the two most important owner-contractor project-related issues. The ANOVA, regardless of collaborative and non-collaborative relationships, demonstrated a significant difference between means among the project issues (annotated by the lightly and darkly shaded areas of Table 3.13). Specifically, "project cost" and "project deadlines" were significantly more important than "responding to changes in scope and schedule" and "building an ongoing relationship." Additionally, "building a quality project" was significantly more important than "building an ongoing relationship" and "responding to changes in scope."

When analyzing only the collaborative relationships, the ANOVA resulted in a significant difference between "project cost," "project deadlines," and

"building a quality project" with "responding to changes in scope." However, with the non-collaborative relationship the ANOVA added, "building an ongoing relationship" to the list of issues with significance.

SUMMARY

As stated in Chapter 1 of this document, the purpose of this report was to analyze and document emerging trends and the changing nature of the contractor-owner relationship for capital facility projects from the contractor perspective. This section specifically focused on how the outcomes of capital facility projects are affected by either Management or Project Manager perceptions or by practices within their collaborative or non-collaborative relationships.

Overall, from the analysis it could be stated that when comparing the results of both the Management and Project Manager surveys, the results of projects with collaborative relationships generally faired better than the non-collaborative relationships. Additionally, it is the opinion of the authors that projects encompassing some form of a collaborative relationship have a better chance for success than those that have non-collaborative relationships.

As a result of the analysis for the two surveys, specific issues brought to light by this research and contained within this report are as follows:

- The sample results demonstrated that over time, when working with the same owner, a shift from a non-collaborative relationship to a collaborative relationship was likely to be established. Both Management and Project Managers in collaborative relationships reported a significant shift in the relationship continuum (non-collaborative relationship to collaborative relationship) when addressing past and current relationships.
- When asked about "the overall success" of the working relationship within a project, both the Management and Project

Manager surveys demonstrated a difference between the collaborative and non-collaborative nature of their relationships. The difference in percentage of responses between what was termed "not at all successful," and "moderately successful" against "very successful" was significant. More responses for the "very successful" were noted between the collaborative relationship and non-collaborative relationship.

- Both Management and Project Manager respondents agreed that for their collaborative relationships when the owner participates in the capital facility process, defines goals, shares a common vision with the contractor, meets regularly, and provides feedback into the relationship, a higher chance of being successful results.
- Both Management and Project Manager respondents stated that developing and maintaining such collaborative relationships requires investment of money and time. It could be pointed out that owner and contractor cultures are still "misaligned." Funding for fostering new and improved relationships might be a place to invest time and money, including improved learning and continuous improvement.
- When addressing the general attributes of a successful project, the Management respondents identified the contractor's ability to "meet the owner's project objectives" as the most important, and to "learn from the relationship" as the least important.
- For Project Manager respondents the most important factor fostering good relationships was the "contractor's ability to meet owner's project objectives" and the least important factor, once again, was the ability to "learn from the relationship."

- "Learning from the relationship" was not important to either set of respondents, which is in sharp contrast to the goals of many owners in outsourcing services rather than performing those services in-house.
- All respondents were fairly consistent in their view of the importance of required skills and traits necessary for project owners and contractor personnel. It was found that trustworthiness and communication skills were the most important skills necessary to manage a project and develop collaborative relationships, with skills needed to influence being the least important, among those tested.
- The results of the survey verified that these answers provided by the contractor respondents are consistent with the owner's desire to procure technical services by outsourcing and the contractor's desire to keep owner personnel away from technical issues.

Project Manager specific results within this report:

- Project cost and project deadline related issues were the two most important owner-contractor project-related issues, regardless of collaborative and non-collaborative relationships.
- Less important project-related issues were "responding to changes in scope and schedule," "building an ongoing relationship," and "building a quality project." This should be of concern to management when "building an ongoing relationship is mentioned as a "less" important issue.

CHAPTER 4: CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS

This chapter presents conclusions based on the results of 60 surveys, representing 40 projects and 16 different companies. The statistical analysis of this exploratory sample provided extensive insight into current emerging trends within the construction industry from the contractor's perspective.

The scope of this research was focused on identifying the organizational changes in the owner-contractor linkage caused by the increased use of business relationship networks to manage this "partnership," and the impact of these network business relationships on the contractor organizations in terms of structure, function, performance, and human resources.

Objectives of the research were: identifying the nature of the changes in the relationship, understanding what practices contribute to the effectiveness of the relationship, and whether the nature of the relationship affects the tangible outcomes of a project and its human resource requirements.

Four hypotheses were created to encompass, characterize, and capture potential areas of future conflict with owners and within contractor organizations. Those four hypotheses for this research are as follows:

The first hypothesis: "*The outsourcing of design, engineering and construction management services by owner organizations has caused the relationship structure between owners and contractors to change significantly. The inability of the work processes and resources needed to manage these changes to keep pace with the changes in the relationship structure has created a secondary inter-organizational boundary that defines the owner-contractor work relationship continuum.*"

Owners are continuing to outsource technical aspects of capital facility projects and contractors are adapting to meet the requirement. Additionally, the

relationship structure for both collaborative and non-collaborative owner-contractor relationships has changed and should continue to change over time.

For this sample, it was found that a significant shift in both collaborative and non-collaborative relationships has taken place from the "winning bid-first use" type of relationship to a more positive relationship of "alliance-preferred provider." Therefore, for contractors to succeed it will be even more important for them to adjust, develop, understand, and maintain such collaborative relationships.

The second hypothesis: "*Contractors and owners have different perceptions of the nature of collaborative relationships. Since neither party understands the intricacies of why a collaborative relationship is successful, they are unable to manage their collaborative relationships. They default to managing the relationship outcomes."*

As for project execution processes and resources, it was found that Project Managers sometimes are aligned with Management views and at other times have different views from Management on what is important to the success of collaborative relationships, success of a project, and success of the contractor organization. The underlying differences between Management and Project Managers for this sample were: understanding why it is important to be involved in the earlier stages of the construction process and how to establish mechanisms for current and future collaborative relationships. Until such issues are properly addressed, the imaginary boundaries that exist between the various levels of management and the owner-contractor organizations will continue to expand, possibly at the expense of project success. To manage such issues the industry must get "smarter" and "leaner" in its ability to adapt to the current and future economic climate and the possible global changes.

The third hypothesis for the surveys was: "*The contractor community is still employing the "traditional" organization knowledge creation process but operating in an "imaginary organization" environment."*

It was found that the collaborative relationships in general as a part of this survey sample are typically more successful than the non-collaborative relationships. However, the results of why such relationships are more successful are still rather elusive to the owner-contractor industry. The various processes, skills, traits, and attributes that were consistently found to be important to the success of such collaborative relationships were also found to not be practiced consistently. The contractor industry seems to understand the importance of such relationships but some firms still lack the "link" to bridge the gap for improving such relationships. The practices for project operations and personnel management being conducted by the contractor firms were found to be at times in conflict with the owner organizations, within corporate practices of the human resources department, and more importantly between the various levels of management. Contractors continually stated that developing and maintaining collaborative relationships was important to their success. However, little time, effort, and money had been placed on the importance of aligning the objectives and goals for various levels of management with current hiring techniques, corporate training practices, performance appraisals, and compensation practices.

Finally, the last hypothesis addresses the human resource issues of the research and posed that "*Contractor organizations have not provided their personnel with the human resource requirements or organizational structure required to transition to the network management of business relationships."*

For this sample, respondents had not properly addressed the continued prospect that the industry is aging, knowledge and expertise will retire in the coming decade, and that new recruits needed to fill the gap of retirement age individuals will be inadequate to meet industry requirements for professionalism and expertise. This finding corresponds to the other studies.

In conclusion, it was determined upon analysis of the sample data that all four hypotheses of this sample were proven to be true. Throughout the analysis of

the sample data the underlying themes of how owner-contractor organizations are operating from the contractor's perspective were examined. The data highlighted trends between owner-contractor organizations, factors important to collaborative relationships, and how those relationships vary among the human resources, Management, and Project Manager elements within contractor companies.

4.2 RECOMMENDATIONS

The authors recommend that additional research be pursued in this area. When conducting future research the sample size should be increased and the survey questions should be reduced to only those elements that were found to be significant in this study. It is important to address the shortfalls of the human resources in terms of hiring practices, new and annual training, and how the aging workforce's knowledge is going to be passed-on and individuals are going to be replaced. Additionally, research could investigate how to shift more effectively from non-collaborative to collaborative relationships and why these might ultimately lead to more successful business outcomes.

APPENDIX A : PARTICIPATION TABLE

Participation Table

Firm	HR Survey	Management Survey		Project Manager Survey
		Number of Respondents	Number of Projects	(Number of respondents equal to Number of projects)
2A	---	---	---	1
2B	---	---	---	4
2C	1	1	4	2
2D	1	1	2	1
2E	1	1	4	3
2F	1	---	---	1
2G	1	---	---	---
2H	1	1	4	1
2I	---	---	---	1
2J	---	---	---	3
2K	1	1	2	4
2L	---	1	2	3
2M	1	---	---	3
2N	1	1	4	2
2O	1	1	4	7
2P	1	1	2	4
Totals:	**11**	**9**	**28**	**40**

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