

CRITICAL SUCCESS FACTORS FOR THE CONSTRUCTION INDUSTRY

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ABSTRACT

The traditional approach to success in the construction industry, both in academia and in industry, places great emphasis on the ability to plan and execute projects. In the past, companies completing projects in a timely manner within an established budget and meeting required quality considerations have been considered successful companies. Minimizing an emphasis on management practices and organizational stability, companies with a track record of successful project completion have been considered the construction industry's top-performers. However, the future environment of the construction industry will be significantly different from today's project-oriented environment due to technological and economic changes that are changing construction from a local and regional business to a global business. Therefore, a shift in emphasis from project success to corporate success must be examined for construction organizations to compete in an ever-changing marketplace. This paper advocates the adoption of a critical success factor (CSF) methodology to enhance construction organization success and identify elements that are essential for organizations to achieve this success. Initially adopted by the software industry, critical success factors are the limited number of areas in which results, if they are satisfactory, will ensure competitive performance of the organization. This paper addresses the adoption of the CSF methodology in construction by introducing the findings of a study of ENR Top-400 contractors to identify the current state of critical success factor implementation within the industry. The paper addresses the data collected, the areas of strength and weakness within the industry, and the need for construction enterprises to adopt a focus on corporate success in addition to project success.

KEYWORDS

Management, Strategic Planning, Organizations, Professional Development

1. INTRODUCTION

In the AEC industry, emphasis on project success often leaves little time for construction organizations to look to their future. Constantly changing needs at the project sites require immediate attention from all components of the construction organization. Due to project demands such as budgets, schedules, and quality issues, long-term objectives and corporate issues receive far less attention. Concurrently, extensive academic and industry study in identifying project critical success factors (CSF) has resulted in less attention being given to corporate management

practices. For example, Pinto and Slevin (1987) identified fourteen factors related to implementation success that cover many types of projects including project schedule/plans, client acceptance, monitoring and feedback, communication, trouble-shooting, and characteristics of the project team leader. However, according to industry literature outside of the construction industry, CSFs need to include issues vital to an organization's current operating activities and its future success (Boynton and Zmund, 1984). In response to this need to expand the AEC industry project-oriented focus on success, this paper provides a starting point for the extension of established CSF methodology to the construction industry.

This paper introduces the findings of a portion of this study, the identification of critical success factors utilizing information from the top-400 contractors as identified by ENR 2000. This research effort includes the identification of the focus group selected, the data tabulations, and the analysis of the data collected. Additionally, this effort identifies the need for movement within the AEC industry to begin a focus on corporate success in addition to project success.

2. WHAT ARE CRITICAL SUCCESS FACTORS?

In management literature, critical success factor methodology was first identified in the MIS industry. In 1982, Rockart examined four existing approaches of identifying executive information needs. After close examination, he drew the conclusion that the identification of critical success factors for this industry provided a much more useful analysis for executives running the organization than any of the four existing methodologies. Once identified, CSFs became a gauge by which the MIS executives could evaluate their companies. CSFs allowed the executives to implement standard organizational management skills to improve company performance. From this basis, Rockart (1982) advocated that to ensure future success, a company and its industry should identify its CSFs. Critical Success Factors thus are, for any business, the limited number of areas in which results, if they are satisfactory, will ensure competitive performance of the organization (Rockart 1982). This CSF methodology has subsequently been implemented in a wide range of project-oriented industries, including computer software development and management information systems (Sanvido et.al. 1982). The intent of the current CSF research is to utilize the same type of methodology to determine the influence of CSFs on construction companies and the industry.

2.1 Construction Industry CSF

Based on a combination of the above-noted literature and results of interviews conducted by the authors with construction organization executives, the current study establishes the following critical success factors for the AEC industry:

- Structure of Industry – The interactions, relationships, and operational characteristics established between multiple organizations in a particular market place
- Competitive Strategy – Market differentiations which the organization cultivates to establish unique positioning and sets the organization apart from others in a particular market niche
- Market Conditions – The analysis of the marketplace in which an organization operates or has interest in developing a position
- Political Environment – The political forces influencing project decisions, community development and fiscal policy
- Organizational Structure – The form in which an organization is internally structured
- Technical Applications – The use of technical applications for advancement of the company
- Employee Enhancements – The life long learning process for employees tied to personal, professional, and cultural growth
- Process Benchmarking – The identification of processes and procedures and their continual improvement

3. THE CURRENT STUDY

The identification of CSFs provided a basis on which to formally survey a segment of the industry. Two previous surveys have been performed regarding strategic management practices in the AEC industry. In 1998, a survey was performed on the ENR Top 400 contractors regarding strategic management practices. The results of that effort

provided a baseline for an additional survey of the ENR Top 500 design firms. These survey efforts provided initial information on management practices within the AEC industry. (Chinowsky and Meredith, 2000; Chinowsky and Byrd, 2001). The management practices survey coupled with critical success factor and organizational behavior literature review established a baseline for the CSF survey. Once again, the ENR Top 400 contractors were selected as the segment of the industry to survey. The population was selected for three reasons; 1) it is an accepted measurement and list within the construction industry, and 2) the organizations within the list span a significant revenue base and 3) the management practices information received from the previous survey. (Chinowsky and Meredith, 2000). The specific individuals within the organizations that were identified for the survey were executive-level individuals who are responsible for organization-level concerns.

Once the CSFs and population were identified, the survey illustrated in Appendix A was mailed to the 400 organizations. It should be noted at this point that the intent of this survey is not to characterize the CSF in the contracting community as a whole. This survey was not performed on smaller contracting organizations. However, this survey provides information on CSFs from top-performing construction corporations as ranked by revenue in ENR (2000).

4. THE SURVEY RESULTS

To present the analysis of the survey results, the analysis is divided into two overall categories: Critical Success Factors and Personnel Resource Allocation. In each of these categories, the following discussions present a detailed description of the category, the data obtained from the survey, and a summary of the statistical significance derived from the survey data.

4.1 General Information

To obtain the data for the CSF portion of the survey, each respondent was asked to answer questions regarding components of internal and external critical success factors based on a scale from 1-7. This scale indicates stages of development of the concepts questioned by the survey. The respondent then could answer the question based on the level of awareness or implementation that is occurring or has occurred within their organization. For example, a 1 indicates that the respondent is not aware of the concept. A 7 indicates that a full action plan is implemented and evaluation measures are in place to check the success of the plan. This methodology was chosen to focus on the degree of implementation of the plan or process, not on the amount of resources devoted to this concept.

In the second portion of the study, the focus of the query turned to resource allocation to the CSF areas within the organization. To gather this information, a simple methodology was utilized. The respondents were asked to identify if an individual or a department was in charge of the areas of interest. The respondents simply indicated by circling a response entitled “Individual” or “Department” (Appendix A).

5. CRITICAL SUCCESS FACTORS SURVEY RESULTS

5.1 External Critical Success Factors

Table 1: Averages and Standard Deviation Values for the Critical Success Factors in the Survey

Critical Success Factor	Average Score From All Respondents	Standard Deviation
Competitive Strategy	5.45	1.42
Market Conditions	5.35	1.28
Political Condition	3.18	1.82
Organizational Structure	5.82	1.36
Technical Applications	5.18	1.44
Employee/Cultural Enhancement	5.04	1.68
Feedback System	4.76	2.02
Process Benchmarking	4.31	1.95

Table 2: Statistical Analysis of Average Response and Criticality of Size of Organization on Response Average

Question	Respondent Average	χ^2 ¹	Criticality Factor
Competitive Strategy	5.45	7.718	31.410
Market Conditions	5.35	14.751	31.410
Political Conditions	3.18	20.210	31.410
Organizational Structure	5.82	8.786	31.410
Technical Applications	5.18	11.724	31.410
Employee Enhancement	5.04	28.122	31.410
Feedback/Evaluation System	4.76	9.118	31.410
Process Benchmarking	4.31	29.913	31.410

The first category of interest in the critical success factor survey is external issues. Questions F through H focus on issues that affect success of an organization through external influences or actions. These issues are based in the industry itself and cannot be addressed with internal organization changes alone.

The first question, Question F, asked the respondents to indicate whether or not the company has developed a competitive strategy. This strategy ensures the companies longevity by developing, pursuing, and maintaining a program to successfully compete with other rivals. Additionally, with a competitive strategy in place, an organization can protect itself from changing market conditions and entrepreneurs entering their field of expertise. As shown in Table 1, the overall average of the scores was 5.45 with a standard deviation of 1.42, indicating that most respondents have initially implemented an action plan regarding this component. Additionally, regardless of the size of the organization, no statistical impact was evidenced (Table 2). With a high score of 5.78 in one quartile and a low score of 5.18 in another quartile, the overall impact of size of the company did not affect the outcome of the survey as evidenced by Chi square testing.

The second issue of concern for organizations from external forces is the constantly changing market conditions within the AEC industry. The emphasis of this question is to determine if the company is identifying new market opportunities to expand their share of the marketplace. The average score for this question is 5.35 with a standard deviation of 1.28. This standard deviation is the smallest of the survey, emphasizing that market conditions is an issue that receives similar attention as the first question (Question F) from the group sampled. Similar to the competitive strategy question, the score shows that the construction firms are addressing this issue and are actively pursuing new market opportunities.

The final question of this category examines the external political environment in which the organizations operate. This query (Question H) asked the respondents to identify if the organization is utilizing any process to assess the current political conditions. Political environments can significantly influence construction opportunities. In order to explain this political environment question, an example follows for illustrative purposes. In the State of Georgia in 2001, a significant political agenda item for Governor Roy Barnes is to improve public school education. Gov. Barnes currently appropriated \$468 million dollars to school construction. With proper examination of the political environment, construction firms positioned themselves to capture a portion of this expanding market. Of particular interest is the low score this question received. The average score was 3.18 with a standard deviation of 1.82, indicating that few firms are properly addressing this issue.

5.2 Internal Issues

The second category of interest in the critical success factor survey is internal issues. Questions I through M focus on issues that affect success of an organization which are organization specific. In other words, these issues are internally based, within the organization itself, and can be addressed within internal organization or internal cultural changes. The first of these questions is Question I. This query asks the respondents whether or not the company evaluates the organizational structure of the company to ensure it operates as efficiently as possible. The main emphasis of this question is to determine if the organization reviews internal structure to accommodate change,

¹ The χ^2 number must exceed the Criticality Factor to indicate statistical significance.

whether the change is economic, political, or environmental. The response for this question received the highest score in the survey of 5.82 with a standard deviation of 1.36 (Table 1). This score indicates that the firms are assessing their internal structure, through action plans that are in partial or full implementation.

The second question within the internal CSFs category investigates the application of technological advancement within the organization. Instead of focusing on knowledge resources, this question asks if technical applications are being assessed for future use and/or implementation. With a constantly changing marketplace, technology has moved to the forefront for advancement potential in the AEC industry (Chinowsky 1999b). Scheduling and estimating software is commonplace. Web-site for projects, project and management software are becoming more prevalent as well. As indicated by the response of 5.18, these firms have also identified technical applications as an important tool for the future.

Question K turns the focus to the organizational environment. This question's focus was on the need for continued cultural enhancement of the organization through education for the employees, skill development, and other employee enhancement activities. This survey indicated that an action plan had been developed and was in initial implementation. The average response was 5.04 with a standard deviation of 1.68. This average was just slightly lower than the technology question, signifying that technological emphasis is receiving the same attention in these organizations as employee enhancement and cultural advancement.

Another area of concern for organizational internal issues is the utilization of a feedback or evaluation system for the above-mentioned areas. A feedback/evaluation system allows the organization to evaluate internal and external issues to improve cultural environment and organizational structure. This evaluation system allows an organization to determine if its strategies and implementation plans are meeting their potential and achieving organizational vision, mission, and goals. This area received one of the lowest average scores in the survey with the highest standard deviation. As indicated in Table 1, the average score was 4.76 with a standard deviation of 2.02. This indicates that the organizations have developed a plan and steps have been taken to start implementation. However, with such a high dispersion in response, the companies were as likely to answer with a 3 or 7. Furthermore, some companies have identified this as an important aspect to obtain their goals while others have only identified the concept and are in the process of developing an action plan to begin a feedback and evaluation system.

Complementing the previous question, Question M focuses on process benchmarking. This particular question emphasizes the continual improvement of internal processes and procedures in an organization. Similar to Question L, the respondents have focused little attention to this particular area of concern. The average score was 4.31, with a high standard deviation of 1.95, demonstrating that an action plan has been developed, but not implemented.

5.3 Personnel Resource Allocation to Critical Success Factors

In order for an organization to move towards its vision and mission, a company must set priorities that complement strategic objectives (Chinowsky 2000). To achieve this goal, an investment of time, money, and resources are required by an organization. The last segment of the survey examined this issue in terms of the personnel resources dedicated to the CSF areas. The objectives of these questions being to determine one indication of the long-term commitment organizations are setting towards CSF areas.

As shown in Table 3, the organizations in this study made departmental personnel commitment in only three of the seven areas, market analysis, technical applications and employee enhancement. In the subject area of market analysis, 57% of the respondents have dedicated departments to analyzing the market conditions in which they operate, indicative of the competitive environment in the AEC industry. 64% of the respondents have departments dedicated to information technology and 67% to employee enhancement or personnel issues.

In the remaining four areas, the firms have indicated that competitive strategy, political and economic environments, and process benchmarking are of lesser importance, in terms of personnel commitment, to the organization. These four subject areas are more likely to have individuals, rather than departments, dedicated to the topics. For example, respondents have individuals committed to the topic, but only 40% have a dedicated department. In the largest disparity between resource assignments, the political environment that surrounds the organizations is receiving little attention from the organizations as indicated by the personnel resource survey as well as the CSF portion of the survey. Only 17% of the respondents have a department that analyzes the political atmosphere. Concurrently, in the CSF portion of the survey, political conditions received the lowest score of all categories (3.18) indicating that an

action plan is primarily in the conceptual stage of development. Although not as severe as the political environment, economic environmental assessment and process benchmarking also rank as less important issues for these organizations with 69% of the respondents devoting an individual to assessing economic actions and 60% of the sample devoting an individual to process benchmarking.

Table 3: Allocation of Resources for Individual Critical Success Factors

Areas of Interest	Percent of Respondents with Department In Charge of Area	Percent of Respondents with Individual In Charge of Area	Average Score of Related CSF portion of survey
Competitive Strategy	39.5%	60.5%	5.45
Market Analysis	57.1%	42.9%	5.35
Political Environment	17.2%	82.8%	3.18
Economic Environment	31.3%	68.8%	N/A
Technical Application	64.1%	35.9%	5.18
Employee/Org. Enhancement	66.7%	33.3%	5.04
Process Benchmarking	40.6%	59.4%	4.31

6. CONCLUSIONS

The results of the construction critical success factor survey provide a basis for analysis in the following areas; 1) critical success factors areas that construction firms are addressing in a positive manner, and 2) critical success factor areas that construction firms need to address with greater emphasis.

6.1 Positive Critical Success Factor Areas

The critical success factor survey provides positive indications of success within the AEC industry in multiple areas, including competitive strategy, market condition awareness, organizational structure, technical applications, and employee enhancement. Five of the eight areas queried have average scores above 5.0, indicating a plan has been developed and has been initially implemented. Furthermore, over 50% of the respondents for each of these five categories either responded with a 6 or 7, indicating that a significant level of attention is being placed on these issues. This implementation-level attentiveness of organizations signifies the importance of these issues and moves these items to the forefront of critical success factor awareness.

Specifically, positive indications from the survey resulted in the areas of organizational structure issues and competitive strategy awareness. With 68% of the respondents indicating that organizational structure issues are in full implementation or evaluation measures are in place to review progress, this action-oriented approach reflects the need for a firm to continually update, change, or renew their organizational structure to operate as efficiently as possible. With overhead and profit margins decreasing in the construction industry, firms must look for innovative methods to decrease costs and increase profits. As illustrated by the results of this survey, organization restructuring for maximum efficiency is an area that most firms have identified as a top priority to reduce expenses.

Secondly, with 63% of the respondents indicating that competitive strategy awareness is also in full implementation and/or evaluation processes in place, this response is a strong indication of the intense competition within the AEC industry. Again, this knowledge indicates AEC organizations focus on implementing strategies that will allow them to remain competitive against their opposition. Additionally, with the lack of statistical significance attributed to organization size, this competitive awareness is understood by organizations at all levels. This survey did not inquire to the types of competitive strategies utilized. Rather, this analysis can state that organizations are positioning themselves to respond to market changes and action is being taken to establish strategies to allow organizations to remain competitive in a constantly changing marketplace.

6.2 Areas for Greater Emphasis

In contrast to the positive results obtained in the critical success factor survey for five areas, the responses in three categories, political environments, feedback/evaluation systems and process benchmarking, require a greater emphasis from these organizations. The first of these categories, assessment of the political conditions in which you operate, demonstrates the largest need for emphasis. 51% of the respondents indicated that they were not aware of the concept or aware of the concept but no action had been taken. Although political strategy is commonplace in other industries, such as the defense industry, construction organizations in the AEC industry have focused little attention to this area. As illustrated in numerous defense and space industry contracts, political affiliations and associations heavily influence what will be built, who will build it, and what profit will be made. (Logsdon 1986). Rather than concentrate solely on competitive strategy and positioning, other project-oriented industries focus on political relationships as well. (Adams 1987). Of the areas that receive little consideration, this area provides the greatest opportunity to expand an organization's competitiveness and increase its market share.

The final two areas that require additional attention are feedback/evaluation systems and process benchmarking. Even though organizations are directing their attention to organization restructuring to answer efficiency issues, a void is left in the restructuring if process improvements and evaluations of current strategies, system, etc, are not evaluated simultaneously. As shown by this research, organizations are assessing the layout/hierarchy/structure of the firm. However, if changes are made in an organization as a result of these assessments without changing processes to complement the new organizational structural, inevitable systematic issues will arise within the firm (Bovee and Thill, 2001). To accompany the focus of organizational efficiency, greater emphasis needs to be placed on evaluation/feedback of processes and process benchmarking.

Every organization has room to improve. The difference between the organization that is destined to succeed and the one that is destined to fluctuate with the market is the desire to improve the organization. At the same time, the organization needs to be realistic about its efforts to change current practices. Since each of these improvements will require an investment of time, planning, and monetary resources, the organization must determine where the resources will be allocated. To accomplish this, difficult choices have to be made by management teams as to which critical success factor area needs to be addressed first and how the organization will benefit from this decision. However, by making these complicated choices, the organization is responding to the changing marketplace and industry and setting its sights on the future.

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APPENDIX A: SURVEY INSTRUMENT

Part III – Success Factor Focus

Several of the following questions request that you respond with an answer from 1-7. The numbers correspond to the following definitions. Please use these for each of the scaled questions.

1. Not aware of the concept.
 2. The organization is aware of the concept or issue, but no action has been taken.
 3. An action is in the conceptual stage of development.
 4. A formal action plan has been developed.
 5. The action plan has been initially or preliminarily implemented.
 6. The action plan is in full implementation.
 7. Evaluation measures are in place to check progress or success of the action plan.
- A. Has your company developed a competitive strategy?
 1 2 3 4 5 6 7
- B. Does your company actively assess market conditions to expand your market share?
 1 2 3 4 5 6 7
- C. Is your company utilizing a process to assess the political conditions in which you operate?
 1 2 3 4 5 6 7
- D. Does your company evaluate and assess its organizational structure?(e.g. is the company organized to operate as efficiently as possible?)
 1 2 3 4 5 6 7
- E. Is your company assessing new technical applications and their potential use to your company?
 1 2 3 4 5 6 7
- F. Does your company currently have a program for employee enhancement and organizational culture enhancement?
 1 2 3 4 5 6 7
- G. Is your company developing a feedback or evaluation system of your organization in any of the areas mentioned above?
 1 2 3 4 5 6 7
- H. Is your company utilizing process benchmarking to ensure effectiveness of operations?
 1 2 3 4 5 6 7
- I. Do you have an individual or a department in charge of the following areas (Please circle as appropriate)?
- | | | |
|-------------------------------------|------------|------------|
| Competitive Strategy | Department | Individual |
| Market Analysis | Department | Individual |
| Political Environment | Department | Individual |
| Economic Environment | Department | Individual |
| Technical Applications | Department | Individual |
| Employee/Organizational Enhancement | Department | Individual |
| Process Benchmarking | Department | Individual |