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A PUBLICATION BY

PERFORMANCE BASED STUDIES RESEARCH GROUP & CIB TASK GROUP 61

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EDITORIAL BOARD

June 30, 2008

A Changing World Environment

We live in a constantly and quickly changing environment. The speed of change is overriding the effectiveness and efficiency of traditional research models. In the past ten years, it has led to a disconnect between publicly funded academic research and industry practice. A literature search of publications in the construction research arena has identified the following:

1. Most of academic research is in the generation of hypotheses, but not in hypothesis testing. Repeated testing to confirm a hypothesis is rare.
2. Most research publications are based on survey information of industry personnel and not actual test results.

Publishing papers in refereed conferences and journals has led to the following observations:

1. Sometimes reviews are being done by individuals who have very little experience in the proposed test or in hypothesis testing.
2. Rather than reviewing the logic, the test methodology, and results, the reviewers are contesting the "correctness" of the ideas based on their understanding.
3. Publications seem to be based on who you know rather than what you know.
4. The current review process can be perceived as a methodology to protect the status quo and minimize change.

This discourages the proliferation of performance information, trends and changes based on data, and the results of hypothesis testing which can lead to change.

The Performance Based Studies Research Group (PBSRG)

The Performance Based Studies Research Group (PBSRG) was founded in 1994, with the purpose to create a new research model. The PBSRG was setup to become a source of: benchmarking performance information, testing the use of performance information in changing the behavior of the contracting community, and proposing solutions to construction clients, designers, contractors and manufacturers to minimize nonperformance, maximize profit, and increase the value of construction systems. The research model was different in the following ways:

1. A new business model was used instead of the traditional research model. Funding would come from the construction industry participants who were at risk.
2. Theoretical, prototype testing, and implementation would happen simultaneously to cut down the time to determine impact in the industry.
3. Research would only be done in the areas of best value, use of performance information, benchmarking, and supply chain analysis.

The PBSRG has become the world leader in benchmarking, testing of performance information, changing the structure of construction delivery using performance information concepts, and performing hypothesis testing. The results include:

1. Duration of program: 14 years.
2. Number of hypothesis tests: 530.
3. Test value in terms of construction services: $683M.
4. Test value of non-construction services: $451M.
5. Areas of testing: delivery of construction services, design services, non-construction delivery of services, and facility management services.
6. Developed ASU licensed leadership based delivery model which aligned construction resources and resulted in: 98% performance, minimized up to 90% of construction management, and increased contractor profit by an average of 5% (after-tax).
7. Research funding: $6.8M.
8. Number of research partners: 50.
9. Research staff (total of 18): three professors, three PhD students, a program manager, three full time researchers, one full time coordinator, film/internet division (four), and three administrative support personnel.
10. Presentations to the construction industry: 350.
11. Built a network of over 1,000 construction industry personnel in the United States.
12. Produced three editions of the book *Best Value Procurement* which has sold over 800 copies worldwide.

Birth of Task Group 61 and Joint Effort Between the CIB and the PBSRG, DEWSC, IAF School of Engineering, and Arizona State University

In 2005, the editor met Wim Bakens, general secretary of CIB (International Council for Research and Innovation in Building and Construction), and proposed that the PBSRG and CIB join forces, and bring the successful PBSRG model to the CIB. Instead of only documenting results in the US, the results would be worldwide through the CIB. The partnership resulted in the commissioning of Task Group 61 (TG61), who's activities would be funded by construction clients who were at risk, and were recipients of the hypothesis testing research results. The research would be successful enough to fund the alignment of experts, documents, industry participants, and academic research in their area of expertise, to maximize the contribution and value to the worldwide construction community.

In 2006, TG61 was approved, and in the next year, over 20 meetings were held all over the world to receive the input of academic researchers and industry participants. Meetings were held in the United States, Canada, the United Kingdom, Norway, Finland, Netherlands, Germany, South Africa, Australia, Malaysia, and China. A strategic plan was crafted with the major tasks to compile the following information:

1. Experts in the area of performance information usage.
2. Documents pertaining to the use of performance information.
3. Documentation of major advancement/impact to the construction industry using performance information.

4. Creation of a journal which identified the latest concepts/uses of performance information in the various countries around the world.

The major tasking of TG61 is to compile a one stop source for anyone seeking information, assistance, and expertise in performance information. Initially, the methodology of TG61 was by consensus to:

1. Identify experts in every major construction country.
2. Encourage them to collaborate by identifying all research work and documents using performance information.
3. Build the database and turn over documents to CIB.

However, after a year of effort and meetings, the following results were obtained:

1. The level of expertise worldwide was very limited.
2. The experts did not collaborate with each other but were in fragmented efforts.
3. Coming to a consensus was impossible.
4. No one expert knew more than five other experts in the world and their major contribution.
5. Even though the industry had talked about using performance information for many years, the number of documents with case studies, hypothesis testing of performance information in systems and impact to the industry was limited.
6. There were publications with significant discussion on what performance information should be, but very little hypothesis testing on the proposed performance information to determine a potential impact to the industry.
7. Journal submittals on performance information, which did not identify previous significant work (repeated hypothesis testing) done by other research groups in other countries, were being approved.
8. Some of these journal submittals were approved in journals of "significant ratings of academic value and prestige" even though the work was not new, and did not offer significant contribution.

These findings quickly aligned the purpose of TG61 to the following:

1. The database of knowledge would be a living and growing database.
2. The TG61 would form a group of very active researchers and industry participants whose main focus was in the use of performance information.
3. The TG61 would form an initial database compiled from the knowledge of the TG experts and an extensive literature search of journals, conferences, and industry documents.
4. The TG61 would apply to be a Working Commission (WC) and continue to maintain, grow, and analyze the database to make it more user friendly.
5. The database would be then used by experts to impact the industry and assist in the improvement of industry performance.

The effort has picked up much interest, as the TG61 identifies more participants in the performance information subject area (70 individuals). An integral part of the TG61 and the

future WC efforts would be the journal. The Journal for the Advancement of Performance Information and Value would differ from traditional journals in the following ways:

1. Peer review will be done by both academics and industry personnel.
2. Peer review will be refereed by the editorial board. Contrary reviews will have to be supported by expertise and documentation, or the review will be overturned.
3. Peer reviewers will be responsible to be accurate and have supporting documentation.
4. Submittal, peer review, and publication will be done in less than six months.
5. Publication standard is to add significant knowledge or impact to the industry in the area of use or documentation of the use of performance information. Peer review will not be to judge the theoretical content for correctness, but rather to judge if hypothesis is supported by information, and the hypothesis testing was done correctly.
6. If the proposing author submits references within their paper, the paper must either be in the TG61 database, or the author must show how the referenced individual is in a position to make the referenced statements.

The TG61 journal shall accept all submittals, and will be looking for descriptions from countries on the use of performance information, case studies on the application of performance information and the test results, and theoretical hypothesis supported with hypothesis testing. All journal papers and major referenced works shall be in the CIB TG61 database.

The combination of the CIB Journal and database will be attempting to open a new operating procedure for journals and give new researchers a tremendous research tool. It will be a single location for information on the use and impact of performance information in the construction/services industries. It will have the following characteristics:

1. It will encourage the documentation of all uses of performance information.
2. It will not only have academic research results, but industry results captured by credible sources such as the Engineering News Record (ENR) in the United States.
3. It will minimize personal bias, by ensuring the expertise of the peer reviewers.
4. All peer reviewers will have their vitas posted in the accompanying database of information.
5. It will maintain integrity of the peer reviews by forcing reviewers to document any criticism of author's assumptions and hypothesis with references that are in the accompanying database.
6. The peer review itself will be reviewed by the editors to maintain fairness.
7. All major references in the journal papers will either be in the database of performance information kept by PBSRG/CIB TG61 or require the supporting information from the reference.
8. Papers will be reviewed and published within six months.
9. Access to journal papers and performance information database will be by over 1,000 construction clients, contractors, and designers within the US, and by researchers worldwide who are subscribers of the PBSRG/CIB TG61 journal.

The journal and performance information database shall be a "one stop" location for all researchers looking for the latest information and status of the use of performance information worldwide. We heartily thank the research clients of the Performance Based Studies Research

Group for funding the publication and database operation, the Ira A. Fulton School of Engineering at Arizona State University (ASU) for their encouragement of the partnership with the CIB, and the vision of Wim Bakens, who saw the need to capture the use and impact of performance information in the worldwide construction industry in the CIB.

We also applaud the vision of Wim Bakens to align the resources of the PBSRG, the Del E. Webb School of Construction and the Ira A. Fulton School of Engineering at ASU, and CIB TG61, to produce a new working model using a major research group as the hub, using a journal in conjunction with a database of performance information of researchers, documents, and performance information case studies, and a worldwide network of experts in both academic research and the industry to document a continually changing environment. The model takes the position of inclusion, rather than exclusion, taking information from all credible sources in a timely fashion. The database will include project reports from all over the world documented by the industry, as well as case studies and hypothesis testing in the research arena. The model will also use simplicity and dominant information at a macro level to identify the trends and direction of the worldwide industry.

We welcome all to join this new research endeavor of the CIB. If there are any contributions or comments, please email Kenneth Sullivan at Kenneth.Sullivan@asu.edu.

Dean Kashiwagi, Ph.D, P.E.
Professor
Director, Performance Based Studies Research Group
Del E. Webb School of Construction
Ira A. Fulton School of Engineering
Arizona State University

The Construction Industry in China: Its Bidding System and Use of Performance Information

Wenjuan Zhang, Dongping Cao, Guangbin Wang
Tongji University, Shanghai, China

This paper describes the rapid development of China's construction industry and especially its bidding system. After summarily depicting the history, scope, employees and contractors in China's construction industry, the paper identifies that even after nearly thirty years' development, the sector is still harassed by the problems of low productivity, unskilled employees, unsophisticated technologies, inadequate legal framework and flawed mechanism. This paper also points out that the status quo of performance information in China's construction industry still leaves much to be desired, and that in order to merge into the global market, China has made much effort to introduce the competitive bidding mechanism and the method of evaluated lowest bidding price to the industry. Via picturing the course of using the method of evaluated lowest bidding price in China's construction industry, the paper also characters why and how the performance information is used in the sector. At the end of the paper, it is pointed out that although some certain district has made some efforts to use performance information, most Chinese scholars and government officials are still convinced that the method of evaluated lowest bidding price does accord with the market-oriented trend and should certainly be widely adopted in the future.

Keywords: Construction industry; China; Bidding system; Performance information

1. Introduction

Since the implementation of the reform and opening-up policy in the early 1980s, the Chinese economy, and in particular its construction sector, have seen some very dramatic changes (MOC 2003, MOC 2007b). As a key component of the construction industry, the bidding system has also changed greatly (Lai et al. 2004, Song et al. 2006).

This paper aims to describe these changes and analyze the status quo of China's construction industry and particularly its bidding system. Since China is a vast country, with many autonomous and distinct parts, there are major differences between regions. The paper focuses on mainland China.

2. Overview of China's construction industry

2.1 History since 1949

Before 1980 the construction industry was just regarded as a subordinate work force giving effect to the state's fixed capital investment program (Lu et al. 2001). Many people, including certain top government officials, believed that construction activities only involved simply assembling the materials made by other economic sectors to form building and civil engineering works, adding no value to the total social product. The construction enterprises were under the direct supervision of the central ministries or local governments, and their operations were

restricted by the supervisory government agencies to certain sectors and/or geographical areas. As a result, most of them lacked horizontal mobility and experience in other sectors. The enterprises had little autonomy with regard to obtaining workload, and they had to wait for the government agencies to assign construction works to them. The technical and managerial personnel and the skilled field workers and laborers were allocated by the supervisory government agencies. Building materials, construction equipment, working capital and other inputs were also allocated by the government as part of the central planning process. The entire industry could thus be viewed as a single large enterprise with a centralized hierarchical organization where factors of production and other resources were allocated almost exclusively through administrative channels.

The obvious weaknesses of the system hindered the healthy development of the construction industry and the problem became more serious as time went on. The central government eventually realized this problem when Mr. Deng Xiaoping pointed out in 1980 that the construction industry could be a profit-making industry as an important productive sector and should be treated accordingly. Subsequently the situation started to change in the early 1980s and a series of reform programs have been introduced into the construction industry. By introducing a market mechanism into the construction market and moving away from the constraints of the planned economy, these reform programs have greatly accelerated the development of the construction industry, already one of the backbones in China's economy (MOC 2006, Chen et al.2005).

2.2 Scope over time

In terms of its size, China's construction industry is relatively huge. As shown in Fig. 1, the annual production from the construction industry between 1978 and 2007 ranged from 3.8% (1978) to 5.6% (2007) of the Gross Domestic Product (GDP) with output value of up to 1185.11 billion Renminbi (RMB) (NBSC 2007).

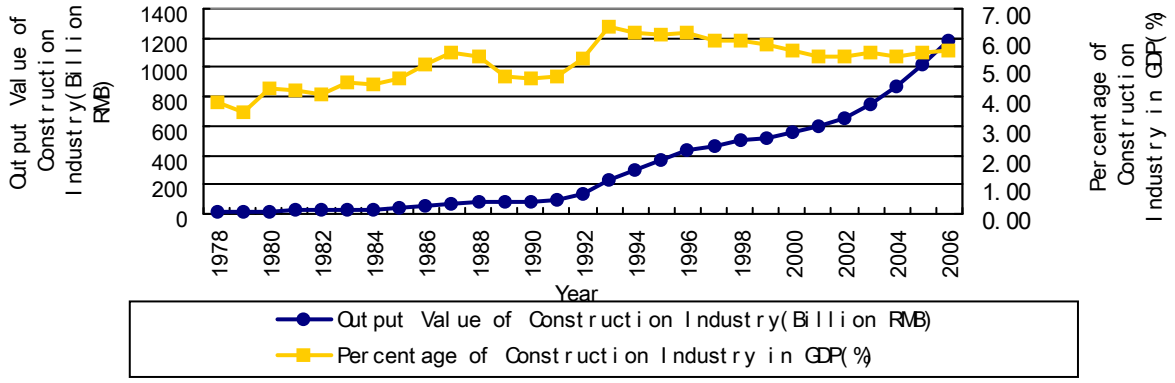

Figure 1: Contribution of the construction industry to GDP.

From Fig. 1 it can also be seen that there was fall in construction's contribution to GDP in 1989 relative to 1988. This fall is attributable to the austerity program that the Chinese government was forced to implement in order to cool down the overheated economy and the inflation in

1988. The 'property heat' that occurred following the speeches made by Deng Xiaoping when making his tour of southern China in the spring of 1992, urging reform and economic development, accounts for the sharp growth of construction's contribution to GDP in 1992 and 1993 relative to the previous years.

2.3 Employees

Since China has the biggest rural population in the world, the increasing agricultural productivity and decreasing arable land are releasing and pushing the rural population to the urban centers. Therefore, there is plenty of labor available to the construction industry. The overall status of workforce employed in China's construction industry is shown in Fig. 2.

The number of employees in the construction industry (shown in Fig. 2) covers everybody who is working in the construction industry at the end of each year, whether they are being paid a salary, wage or otherwise. It includes all the work force that takes on construction activity in both urban and rural areas. It can be seen that in 2004 in excess of 42 million people were involved in construction activity, comprising almost 5.61% of the total employed persons in all sectors (NBSC 2007).

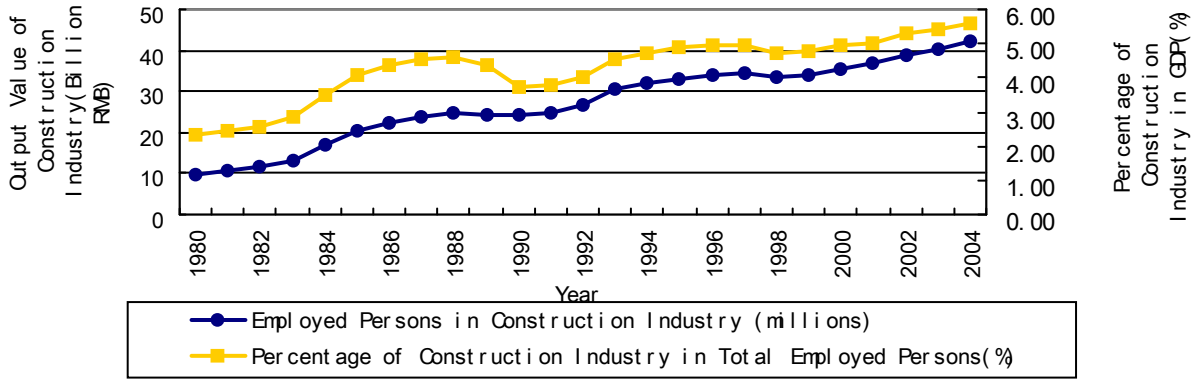

Figure 2: Employees in China's Construction Industry.

2.4 Contractors

At present, the contractors in China's construction industry can be classified into eight distinct types in terms of ownership. They are state owned enterprises, urban and rural collectives, private firms, joint venture, Hong Kong, Macao and Taiwan contractors. The construction work force other than the above seven types is referred to as other firms. Among all of these contractors, state owned enterprises in the construction sector are the primary undertakers of the national fixed capital investment program and dominate the domestic construction market.

Table 1 enumerates the top 10 Chinese contractors ranked by their total 2006 construction contracting revenue, both at home and abroad. All of these top 10 contractors are state owned enterprises. The world rank in table 1 shows that these state owned contractors still could be described as huge while compared with their international counterparts.

Table 1

The Top 10 Chinese Contractors in 2006

Rank	World Rank	Company	General Contracting Gross Revenue ($millions)	Domestic ($millions)
1	3	China Railway Engineering Corporation	21,295.9	20,637.6
2	6	China Railway Construction Corporation	17,326.8	16,912.0
3	7	China State Construction Engineering Corporation	16,146.9	13,190.8
4	10	China Communications Construction Group (Ltd.)	14,734.4	11,353.7
5	18	China Metallurgical Group Corporation	11,628.0	11,321.0
6	30	Shanghai Construction (Group) General Co.	6,276.3	5,696.3
7	63	Dongfang Electric Corporation	2,803.0	2,650.0
8	66	Beijing Construction Engineering Co., Ltd. (Group)	2,782.5	2,687.1
9	68	Zhejiang Construction Investment Group Co., LTD.	2,715.3	2,573.2
10	76	China National Chemical Engineering Group Corporation	2,100.4	1,733.1

Note. Source: ENR (2007).
Companies are ranked by their total 2006 construction contracting revenue, both at home and abroad.

Prior to 1984 most of the state owned construction enterprises were general contractors executing all trades needed to complete construction works. It was subsequently found that it is an inefficient industrial organization. A reform program called "Separation of management from field operations" was launched in 1984. Some of the enterprises were reorganized as specialty companies, while the others were management-oriented. As a result, the construction enterprises now in China can be classified as general contracting enterprises, specialty enterprises and labor-only enterprises. General contracting enterprises normally act as general contractors and represent the majority of the construction enterprises in China. Specialty companies are further sub-classified into several subcategories based upon their specialties, such as excavation, piling, foundation, mechanized construction, equipment and machinery installation, fitting out and finishing, urban utilities and public works.

Some main economic indicators of general contractors and specialty sub-contractors in China's construction industry in 2006 are shown in Table 2.While the ratio of pre-tax profit to gross output value of all Chinese construction contractors in 2006 is 5.98%, the ratio of net profit is only 2.62%, which is much lower than that of enterprises in other sectors (NBSC 2007).

Table 2

Main Economic Indicators on Contractors in 2006

Item	Total	General Contractors	Specialty Sub-contractors
Number of Enterprises (unit)	60166	33175	26991
Number of Employed Persons (million persons)	28.78	25.26	3.52
Gross Output Value of Construction (billion RMB)	4155.72	3603.33	552.39
Ratio of Pre-tax Profit to Gross Output Value (%)	5.98	6.05	7.51

Note. Source: NBSC (2007).

2.5 Major problems

While enjoying booming development, the construction industry is still harassed by many problems, making the construction industry ranked as a weak sector of the economy by international standards. Some of these problems are low productivity, unskilled employees and unsophisticated technologies, inadequate legal framework and flawed mechanism (MOC2007, MOC 2006, Xu et al. 2005, Low et al. 2003).

2.5.1 Low productivity

In China's construction industry, output per employee is a measurement of productivity (NBSC 2007). The productivity measured by output per employee in the Chinese construction industry is much lower than that in developed countries. In 2000, the average number of employees of Chinese construction enterprises was 31 times more than that of the United States, while the output per person of Chinese construction enterprises was approximately 23 times less than that of their U.S. counterparts that year (Xu et al. 2005).

2.5.2 Unskilled employees and unsophisticated technologies

China's construction industry is a highly labor-intensive sector and lacks high-level talents. Most of the employees in the construction industry are unskilled or semi-skilled workers who previously were farmers with no proper training for construction. At the end of 2000, out of 35 million employees, the engineering technicians and management professionals only accounted for 5.34% and 4.92% respectively, which are below those of other sectors in China (MOC 2003).

The sector is also characterized by inaction in adopting state-of-the-art technology for construction and management, such as the use of advanced equipments and information technology. Table 3 shows that power of machines per laborer of construction enterprises grows very slowly, to the extent that virtually no improvement occurred between 1995 and 2006 (NBSC 2007). Although the value of machines per laborer increased from 4264 RMB/person in 1995 to 9109 RMB/person in 2006, it is very low while compared with that of other sectors.

Table 3

Machines Owned by Construction Enterprises

Year	Value of Machines per Laborer (RMB/person)	Power of Machines per Laborer (kilowatts/person)
1995	4264	4.7
2000	6304	4.6
2005	9273	5.1
2006	9109	4.9

Note. Source: NBSC (2007).

2.5.3 Inadequate legal framework and flawed mechanism

To move away from the constraint of the planned economy, China's construction industry has achieved significant improvement through the reform of its industrial legal framework and mechanism; but this is far from enough. At present, the roles of government, construction

enterprises, and design institutes in the construction market have not been well defined, the mechanism and environment for the market-oriented construction enterprises have not yet been perfectly established, equal opportunity rules have not been fully applied to the construction market, and thus further discipline is needed for the desirable behaviors and relationships among the competing bodies in the construction market. As the status of the legal framework and mechanism are the key underpinnings of a country's construction industry, all of these macro problems need to be resolved as soon as possible.

3. Bidding system

3.1 History of the bidding system

Contracting in construction in China dates back to the middle of the 19th century, when China was defeated in the Opium War (1839-1842) and was forced to open up to Western countries. Since then, many western contractors have come into China and set up many incorporated construction enterprises in major cities. They have tendered for construction contracts in a manner similar to that practiced in Western countries. The construction contracting practice was still in use before China began to adopt the planned economic system in the 1950s (Lu et al. 2001, Wang et al. 1998).

Under the old planned economic system in place from 1950s to 1980s, the Chinese government was not only responsible for freely providing all of the finances for construction works but was also responsible for assigning construction projects to contractors. The jobs of survey, design, construction and installation were all allocated by the governments according to the annual fixed investment plans. The contractors were various state owned enterprises or firms and their managers were not responsible for extensive delays in the planned schedule, cost overruns, quality problems, and so on. There was no competition among contractors and therefore no motivation since the contractors were not allowed to make profits as the construction industry was considered to be a nonprofit-making sector of the national economy (Lai et al. 2004). At the beginning the method worked quite well but it became less and less efficient as time went on. The major drawback was a lack of adequate incentive for the construction enterprises to make efficient and effective use of their resources.

In 1981, Shenzhen Special Economic Zone was chosen to try competitive bidding for the procurement of works. In 1982, a World Bank financed project, Lubuge Hydropower in Yunnan province used international competitive bidding for its procurement of works. Both of these attempts turned out to be very successful. Encouraged by the successes in Shenzhen and Lubuge Hydropower, the Chinese Ministry of Construction (MOC)[1], in June 1983, issued "The provisional bidding procedure for construction and installation works" to all the local governments, encouraging construction enterprises to compete for their construction and installation works through competitive bidding. On 7 November 1984, the State Planning Commission and the MOC jointly issued a more detailed "The provisional regulations on bidding for construction works". This document was designed to promote competitive bidding in order to

[1] Since 2008 March, the Ministry of Construction in China has been renamed as the Ministry of Housing and Urban-Rural Development.

shorten completion time, ensure quality, cut down costs and make more effective and efficient use of capital investment.

The two central government agencies also issued, on 14 June 1985, "The provisional procedure of bidding for design work" which stipulated that any large and medium-sized construction projects should be awarded by construction owners or the consulting company appointed by the construction owners through competitive bidding systems. It also stated that any organizations with design certificates, such as state-owned enterprises, collective and individual enterprises, could participate in bidding for projects for which they had been approved as being suitably qualified.

In December 1992 the MOC issued “Management methods of bidding for works of building and civil engineering construction” which stipulated that any newly built or rebuilt projects, projects to be expanded, and technology transformation projects to be financed by the government, publicly owned enterprises or institutions, should be delivered through the tendering procedure mentioned above.

As one of the most important pieces of legislation regulating market activities, “the Law of the People's Republic of China on bid invitation and Submission” was adopted by the 11th Meeting of the Standing Committee of the 9th National People’s Congress on 30 August 1999 and took effect 1 January 2000. According to the law, fundamental facilities, public facilities, construction projects (including the project’s survey, design, construction and supervision) and important equipment and materials relevant to the projects should be awarded through the system of inviting bids if the scales prescribed by the State are reached. This law is an important milestone in procurement market administration. Since its adoption, the competitive bidding system has been popularized over the whole country and has been applied not only to the construction and implementation of projects in the construction industry, but also in other fields such as design procurement, material supply, labor force supply, project supervision procurement and equipment supply. As shown in Table 4, the competitive bidding system has already become the dominant delivery method in China’s construction industry.

Table 4

Construction Projects Delivered through Competitive Bidding System in December 2006

	Number (unit)	**Proportion by Number (%)**	**Value (million RMB)**	**Proportion by Value (%)**
Delivered Projects	2519	100.00	38466.08	100.00
Projects Delivered through Competitive Bidding System	2145	85.15	35429.83	92.11
Projects Delivered through Open Bidding System	1193	47.36	17297.47	44.97
Projects Delivered through Selective Bidding System	952	37.79	18132.36	47.14

Note. Source: MOC (2007a).
Data in this table only cover some main cities in China.

3.2 Project delivery systems

Evolving from the planned economy to a socialist market economy, the majority of the construction projects in China are now delivered through the traditional design/bid/build route (Zheng et al. 2006). It was estimated in 2005 that only 10% of the domestic construction projects in China were using the general contracting mode at that time (Xing 2006).
There is no universal best delivery method. Every delivery method has its advantages and disadvantages (Wang et al. 2002, Sun 2003, Ding 2006). The Chinese government has also recognized that to optimally utilize resources, alternative delivery methods should be adopted according to different contexts and clients' needs (Yu et al.2005). Although the general contracting mode has not been widely applied in China, the Chinese government has really made much effort to promote this mode in the construction industry since the middle of the 1980s (MOC 2003, Xing 2006). At the beginning of 2003, the MOC issued a guideline named "Instructive opinions on cultivation and development of the general contracting enterprises and project management corporations" which discussed the importance of carrying out general contracting. This guideline recommended placing general contracting into qualified projects and encouraged the corporations with the according qualification to develop the general contracting work. The general contracting referred in the guideline is mainly about the modes of Design/ Build and Build/Operate/Transfer (BOT) (He 2004).

3.2.1 Design/Build

The Design/ Build general contracting mode was first used in China, in 1984. This mode is particularly suitable for complex public sector projects where technological expertise is not available or when cost and time considerations are paramount. With its particular advantages, this mode has already entered into a rapid developing process and has been used by more and more projects, including the Jinmao Skyscraper, one of the tallest buildings in China.

3.2.2 Build/Operate/Transfer

The first BOT project in China, the Shajiao B Power Plant in Guangdong Province, was successfully transferred to the Chinese side in September 1999. The project, which was started in the beginning of 1989, had generated a total of 46.2 billion kWh of electricity by July 1999 (Zhou 2000). Due to the pent-up demands of infrastructure and the prospective private financing for China's long-term economic development, the BOT delivery route for infrastructure is now more attractive to local governments (Xu et al.2005).

4. Performance information

At present, the overall performance information in China's construction industry still leaves much to be desired. Some available performance information is listed in Table 5. Although quantitative data on overall project performance statistics seem to be in short supply, but reported instances of project failures to achieve promised quality, cost, or schedule do abound.

Table 5

Performance information in China's construction industry

Item	Performance information
Quality performance	Only 13% could be ranked as "good quality"
On Budget Rate	27%
On Time Rate	12.85%

Note. Source: MOC (2006), Wang (2006).
The "On Budget Rate" and "On Time Rate" are only based surveys to some government investment projects.

4.1 Quality performance

Between September and November 2005, 200 construction projects all over the country were selected by the MOC at random to inspect the construction quality. The result showed that 24.3% of all inspected projects had violated related regulations, while only 13% could be ranked as "good quality" (MOC 2006).

4.2 On Budget Rate

China's construction industry is also suffering from the "Three Excesses" in investment, which can be described as that the budgetary estimate exceeds the provisional estimate, the budget exceeds the budgetary estimate and the final accounts exceeds the budget. The phenomenon of "Three Excesses" is particularly prevalent in the government investment projects. According to the Audit Bureau in Zhejiang province, the final accounts of 22 projects, accounting for 73% of the all 30 government investment projects they have audited since 2004, exceeded the budgets, and the total exceeded value amounts to 20.3% of the total budgets.

4.3 On Time Rate

Even with the introduction of some advanced construction technologies and more effective management techniques, delays in construction projects are still very common in China's construction industry. The result of a questionnaire survey on the schedule performance of 515 government investment projects in Shenzhen and Hong Kong showed that only 12.85% of the projects completed building contracts within the scheduled completion date, and that the average overrun reached 21.34% (Wang et al. 2006).

5. Use of performance information

5.1 Bid evaluation methods

According to "the Law of the People's Republic of China on bid invitation and Submission" issued in 1999, two main bid evaluation methods, i.e., the method of evaluated lowest bidding price and the method of comprehensive evaluation, are now used in China's construction industry (Wang 2007).

Generally the method of evaluated lowest bidding price is applied to the bid invitation projects that have general technological and performance standards or when the bid inviter has no special requirements for the technology and performance. According to this method, the bidding that has satisfied the substantial requirements of the bid invitation documents and has been evaluated to have the lowest bidding price shall be recommended as the candidate for bid-winning.

The method of comprehensive evaluation is often adopted for the projects that are not suitable to adopt the method of evaluated lowest price. According to the method of comprehensive evaluation, the bid that satisfies the various comprehensive evaluation standards prescribed in the bid invitation documents to the maximum limit shall be recommended as the candidate for bid-winning. To evaluate whether the bidding documents have satisfied the various evaluation standards prescribed in the bid invitation documents to the maximum limit, the method of currency conversion, the method of scoring or other methods may be adopted. After quantifying the technological part and the business part, the bid evaluation commission shall weight the quantification results of the two parts, figure out the comprehensive evaluation price or comprehensive evaluation score of each bidding, and select the best bidding.

5.2 Use of performance information

As described in Section 3 of this paper, under the old planned economic system in place from 1950s to 1980s, construction works in China were directly assigned to contractors by government. In 1980s and 1990s, the bidding system began to be introduced to the industry and the method of comprehensive evaluation was advocated for construction projects bidding. During this time, however, many construction works were still awarded through “relationship”, and construction works were often awarded to contractors who had the “best relationship” with the bid evaluators rather than those who are the most competent, as a result, the problem of “Three Excesses” and construction corruption became more and more serious, urging the industry scholars and government officials to find some better bid evaluation methods.

Having realized that the method of lowest bidding price is being widely used in most Western countries, more and more Chinese scholars are convinced that this method should also be advocated in China (Wu 2002, Fang 2004, Li et al. 2005, Pan 2006, Wang 2007, Qin 2007). They argue that only in this way can China’s construction industry ameliorate its market-oriented system, save he investments, reduce corruption, merge into the global market and catch up with those one-up international competitors.

At the same time, the practice of using the method of evaluated lowest bidding price has been implemented in some districts. On 1 April 2003, Xiamen, a municipality in Fujian province, issued “The procedure for adopting the method of evaluated lowest bidding price for construction projects” and became the first district in China to push the method of lowest bidding price forcibly. According to this procedure, projects that are totally or dominantly funded by the investment of State-owned funds should be bid by the method of evaluated lowest bidding price.

On 17 Feb. 2003, “The specification for the method of valuation with bill of quantities for construction projects (GB 505002 2003)” was issued by the MOC. Compared with the fixed price quotation method traditionally used in China, the method of valuation with bill of

quantities advocated in this specification is more compatible with the method of lowest bidding price. Since then, the method of evaluated lowest bidding price has been more and more used in China's construction industry.

While having taken many benefits to the industry (Pan 2006, Qin 2007), the method of evaluated lowest bidding price has also generated lots of problems (Yuan 2007, Song et al. 2006). On the one hand, compelled by the fierce competition, most of the bidders have to lower their bidding prices and reduce their profits, which may subsequently force them to: default the workers' wages and suppliers' payments, lower the quality of products or services, lodge more claims, and invest less to renew their equipments. On the other hand, as it is very difficult to judge whether the bidders' bidding prices are lower than their costs or not, the bid inviting parties always have to take on the risks of contracting with unqualified bidders and suffering from lower quality and increased claims.

In the process of using the method of evaluated lowest bidding price, the government has already realized the problems and has taken some measures to solve these problems. On 10 March 2004, about one year after adopting the method of evaluated lowest bidding price, Xiamen issued "Some regulations on further ameliorating the method of evaluated lowest bidding price for construction projects". According to this regulation, Xiamen decided to establish a database to record the performance information of contractors and use the bidders' performance information to judge whether they have the qualification to bid.

In 2005, Ningbo, a municipality in Zhejiang province, even officially abolished using the method of evaluated lowest bidding price to bidding construction projects. Meanwhile, Ningbo also decided to establish an information system to reveal the credit ranks of construction enterprises. The credit information system is supposed to be renewed every year and be referred to while using the method of comprehensive evaluation.

After researching into the problems generated in using the method of evaluated lowest bidding price, many experts have also realized that hindered by the unhealthy market mechanism of China's construction industry, this method should not be simply used in China without adopting some supporting measures, including ameliorating the insurance mechanism, establishing the credit system and so on.

However, most scholars are still convinced that the method of evaluated lowest bidding price does accord with the market-oriented trend and should certainly be widely adopted in the future. At present, they are focusing their research on how to ameliorate the method to make it compatible with the reality in China.

6. Conclusion

Over the last nearly 30 years China's construction industry has gone through an extraordinary phase of development, however, harassed by its low productivity, unskilled employees, unsophisticated technologies, inadequate legal framework and flawed mechanism, the industry still has few advantages to compete with its foreign counterparts. What's more, since China's

entering into the post WTO transitional period on December 11th 2006, the competition has become fiercer. Facing the fierce competition, the industry has no choice but to continue to reform and improve.

One of the most important things needed to be improved is the bidding system. To merge into the global market and catch up with those one-up international competitors, China has made much effort to introduce the competitive bidding mechanism and the method of evaluated lowest bidding price to the construction industry. However, after being frustrated by the problems generated in using the method of evaluated lowest bidding price, many people have realized that the method should not be simply used in China without considering the reality of China's construction industry. Moreover, in order to solve these problems, some districts in China have already made some attempts to establish databases to record the contractors' performance information and ameliorate the credit system in the industry, and Ningbo even officially abolished using this method to bidding construction projects and decided to establish an information system to reveal the credit ranks of construction enterprises. However, most Chinese scholars and government officials are still convinced that the method of evaluated lowest bidding price does accord with the market-oriented trend and should certainly be widely adopted in the future, and now they are focusing their research on establishing supporting mechanisms to guarantee the method could be healthily adopted in the industry.

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Industry Transformation: Testing Best-Value and Leadership in Non-Construction Industries

Kenneth T. Sullivan and John K. Michael
Arizona State University
Tempe, Arizona

The Performance Based Studies Research Group (PBSRG) in the Del E. Webb School of Construction at Arizona State University has conducted research in the development and application of best-value and leadership based process models in construction for the past 14 years. Despite significant success in terms of construction performance, the concepts and ideas of the best-value/leadership process models have met consistent resistance. Due to the construction industry's characteristics, fragmented system, and inability to change easily, documenting industry impact has been difficult. The PBSRG has embarked on an effort to test their research concepts of best-value/leadership process models in industries outside of construction, with a less fragmented system, but with similar characteristics. In this way, the authors hope to gain a better understanding of the research models' impact on an industry. This paper presents the initial testing of the best-value/leadership process model in the area of dining services, specifically on a $300+ million contract for one of the largest campuses in the United States, Arizona State University. The initial results show a significant increase in guaranteed money, performance, and risk minimization. The expanse of the effort seeks to create an industry transformation model to be first tested in dining services and then brought back to the construction industry as an example to drive change in the future.

Key Words: Risk minimization, best-value, leadership, industry transformation

Introduction

Over the past fourteen years the Performance Based Studies Research Group (PBSRG) in the Del E. Webb School of Construction at Arizona State University has conducted research in the development and application of best-value and leadership based process models (Kashiwagi 2008). The process models, like most construction research, seek to enhance efficiency, performance, and minimize risk; however, the developed process models accomplish this by uniquely (and somewhat counter-intuitively) attempting to:

- Reduce client management requirements, direction, and control;
- Create an effective risk transfer and minimization framework;
- Assist in defining performance and value (for entities, departments, vendors, or individuals)
- Establish accountability through measurement;
- Motivate continuous improvement,
- Develop a supply chain mentality/mode of operation;
- Minimize any contractual leverage; and
- Increase organizational efficiency through a win-win environment.

The process models provide a cyclical method to define, measure, analyze, improve, and control (Pande and Holpp 2001) the performance of services, vendors, and personnel. The research group's best value model based on principles of efficiency to deliver construction and has been documented to minimize management by up to 90% and increase performance at an average of 98% (with 530 construction project valuing $683 Million, finishing 98% on time, on budget, and with 100% client satisfaction) (Sullivan et al 2007). The PBSRG's best value and leadership concepts have been implemented within organizations and overlaid across most construction procurement and delivery structures including design-bid-build, CM at Risk, Design-Build, IDIQ, JOC, and low bid, providing enhanced results.

Beyond the project level, the leadership based models have been observed to create a type of "paradigm shift" in organizational culture due primarily to the rigorous and data driven analysis, alignment, measurement, and accountability required by the process models. Due to performance and risk based data produced by the models, bureaucratic inefficiencies are spotlighted and required to be minimized or eliminated. The models are not designed to reconfigure or drastically change any existing systems, only to enhance and incrementally adjust processes to encourage an increase in performance.

In the field of construction, the concepts have repeatedly met resistance from the majority of the industry that the PBSRG has proposed to. The reasons for resistance vary but primarily center on opposition to: 1) the claimed research results, 2) the requirement for reduced client involvement and control, and 3) the consistent measurement and updating of performance to drive accountability. Additionally, like any new system, there is a natural resistance to change, which seems to often manifest itself in a form based upon the reasons previously mentioned.

Since the research is "research," all participating clients and research partners are strongly encouraged to not trust or "take at face value" any of the proposed concepts or results; but instead are encouraged to test the concepts in some way within their organization. While the partners must rely on PBSRG and their expertise for the education of the correct application of the concepts and tools, the client results experienced should be consistent with the historical testing. It is from "pioneering" research clients that the effort has grown to over $1.3 Billion of total construction and services procured, managed, and tested. The results, albeit academically substantial, are insufficient to truly impact and improve the construction industry, let alone change any entity's behavior or standard business practices at face value.

For an industry that is plagued by poor performance, decreasing productivity, questionable quality, low profit margins, high levels of risk, high levels of competition, and an overall disappointing image, change is needed. The proposed changes and research conducted by the PBSRG have consistently experienced high levels of performance improvement, profit increases, cost decreases, better quality, and reduced client management costs; but the changes needed to reshape and improve the entire construction industry, though perceivable, are yet unlikely if the PBSRG research effort continues with a traditional research model.

In order to gain greater understanding of the research's impact on an industry, the authors propose to test the concepts and developed process models in other industries with less fragmentation and perhaps lower levels of change resistance when compared to construction. As

such, the PBSRG has embarked on an aggressive research testing platform for industries outside of construction so a more complete industry wide analysis can be achieved, the concepts tested, and models improved based on industry transformative change. Once verified, the research will return to the construction industry with more results and test data that can be used to persuade potential research clients, push the research forward, and help realize industry wide improvements in construction.

This paper highlights the initial results of the authors' efforts in industries outside of construction and concludes with the path forward for the research effort.

Research Methodology

The methodology employed to test best value and leadership based process models outside of construction consisted of three primary steps:

1. Examination of the outsourcing process (and literature) to find suitable non-construction test industries
2. Development and application of best-value/leadership based process models derived from the PBSRG research concepts
3. Evaluation of results and modification of process models based on collected data.

Over time, as the testing increases and expands, the research will focus on the impacts on the industry transformation and the most successful strategies to realize sustainable change.

Identifying Test Industries: Outsourcing is Outsourcing

Outsourcing is defined as, "Send[ing] out (work, for example) to an outside provider or manufacturer in order to cut costs (Outsourcing, 2008)." Construction is an outsourcing industry. Clients outsource design and construction to architects and general contractors, respectively, who in turn outsource it to engineers/consultants and subcontractors. These sub-trades then complete the majority of the "actual" work. Whether it is IT Outsourcing, Application Service Providers, Business Process Outsourcing, Knowledge Process Outsourcing, or Person-to-Person Outsourcing, the act of outsourcing continues to grow in popularity across all industries, including those of the built environment. The strategy or business practice of outsourcing is finding a home in a growing number of industries, and is predicted by many studies to continue doing so. (Clancy, 2006; "Customers admit blame," 2007; Collins, 2006; Taylor, 2007; "Offshore Product Design," 2007; Mukherjee, 2007; Kanth, 2007; Sankappanavar, 2007).

Despite the number of outsourcing growth projections, a consistent and robust outsourcing strategy has yet to be developed. For example in construction, many methods exist to outsource construction: design-bid-build, CM at Risk, design-build, etc.; however, no substantial research exists empirically proving one method is better or worse than another. Each has its strengths and flaws, but the underlying problems remain consistent across all avenues of delivery. In other

industries, a large number of companies that choose or have chosen the outsourcing route are learning that, based upon the current methods, it is more challenging than anticipated. This common issue was captured in the following PricewaterhouseCoopers (2005) report excerpt. "Most senior executives are not blind to the risks of outsourcing, but many consider them as having been addressed in the course of their company's due diligence review. Some recognize that critical risk factors change continuously, but, under pressure to achieve the business benefits of outsourcing, they can still be persuaded to approve outsourcing initiatives that lack an effective risk-management process. Others simply don't know how to manage such complexity."

Most accounts of outsourcing failures were defined by unmet expectations and/or premature contract terminations. Multiple studies conducted by separate entities have identified outsourcing failure rates reaching frequencies of up to fifty percent (PricewaterhouseCoopers, 2006; "Providers and users alike," 2005). One of the most extreme cases was found in a study conducted by Compass Management Consultants, which claims "Some 65 percent of outsourcing deals worth more than £20 million are failing before the contract expires (Snell, 2007)."

While many conclusions indicated that outsourcing has had high rates of failure, none of the rates were 100 percent. Therefore, some researchers have identified a sample of clients satisfied with their outsourcing results and experiences (PricewaterhouseCoopers, 2007; Lepeak, 2007). Reading further into each report, among the researchers who found satisfaction in outsourcing ventures, none could disagree that there is a need for improvement in the outsourcing process. Identifying the inefficiencies and/or the sources of outsourcing failures, similar areas in need of improvement were found across a number of outsourced services. It was seen that there are a number of common problems faced as a result of the current outsourcing business strategy, which cause negative affects regardless of the technical nature of the service being outsourced ("Gartner," 2006; Ruggles 2007; PricewaterhouseCoopers, 2005; PricewaterhouseCoopers, 2007; "Customers admit blame," 2007; "Providers and users alike," 2005; FMLink, 2002; Cao & Wang, 2006; Click, 2004).

Summarizing the predominant or common inefficiencies identified in the literature, the authors captured the following:

- A lack of formal strategy or pre-planning
- Ineffectiveness in differentiating vendors' performance levels/capabilities
- Excessive client decision making, and therefore acceptance of risk
- Poorly defined project scope and service requirements
- Unrealistic/misaligned expectations that lead to adversarial relationships
- A lack of effective risk identification and management process
- A lack of performance measurements
- Inability to develop an appropriate level of relationship control/management (governance)

The key problem continuously surfacing in the available past research is that most outsourcing models require the clients to make too many decisions. The advice to create detailed contract terms and a governance structure based upon direction and inspection, in an attempt to control the vendor, requires the client to accept all risks associated with each of their decisions. By telling the vendor exactly what to do, how to do it, and by when it needs to be done, the client

becomes accountable for the success of the service. In other words, the party that makes the decision(s) becomes accountable for the result(s). To outsource a function is to hire an outside individual/vendor, which possesses greater efficiency than personal/in-house capabilities. It is illogical for a client, who is consciously transferring an aspect of their business to a specialist or expert to feel comfortable telling the specialist what to do and how to do it.
The problem therefore identified is that the current outsourcing methods rely too heavily on client decision making. The effect of which is a difficulty in differentiating between the value of each competing vendor, and the responsibility of minimizing project risk being retained by the client (who is less capable/qualified than the expert/specialist, because they would not be outsourcing otherwise). This problem, seen in most outsourcing industries with available literature, is prevalent and key in the inefficiencies of construction. So in seeking a comparable industry to construction to begin the authors' non-construction research and testing, the literature and past research indicated that any industry that outsources seems to be comparable. Table 1 below shows a side-by-side comparison of general outsourcing inefficiencies and construction inefficiencies.

Table 1

Inefficiency Comparison/Similarities

General Outsourcing Inefficiencies	vs.	Construction Inefficiencies
A lack of formal strategy or pre-planning		Reactive; A lack of pre-planning
Ineffectiveness in differentiating vendors' performance levels/capabilities		Inability to differentiate contractors' performance level/capabilities
Excessive client decision making through detailed requirements and service level agreements		Excessive client decision making through detailed requirements
Poorly defined project scope and service requirements		Unaligned expectations/Excessive client decision making
Unrealistic expectations that lead to adversarial relationships		Unaligned expectations that lead to adversarial relationships
A lack of affective risk identification and management process		A lack of affective risk identification and management process
A lack of performance measurements		No performance information; Lack of accountability
Inability to develop an appropriate level of relationship		Inappropriate/ineffective level of client control

The Dining Service Industry

The traditional dining service vendor selection process is very similar to most service procurement methods. The opportunity is advertised, a request for proposal (RFP) is created, proposals are submitted, and interviews are conducted. The vendor is most commonly selected based upon the dollar amount proposed, their skills in sales and marketing, and their relationships within the industry. Once the selection is made, a contract is then negotiated, executed, and managed by the client.

More specifically, large dining service contracts start with the creation of a RFP that is hundreds of pages in length. The hundreds of pages contain detailed specifications that address every component of the dining service. Vendors are usually evaluated by means of their proposals and interviews. In most public projects, the traditional selection criteria are broken down into three categories (Sutton 2007):

- The vendors' financial projections
- The vendors' dining program (i.e. types of food/brands)
- The vendors' qualifications (i.e. the project team, the company history, safety program, training program, etc.).

The usual weights given, in a public contract, are roughly (Sutton 2007):

- 40% for financial projections
- 30% for the vendor's program
- 30% for the qualifications

Because roughly 70% of the selection criteria weight is given to proposed finances and the future dining program, the choice is strongly based upon dollar amounts and marketing information. The vendors' proposed finances are built around the client's requirements and are not guaranteed values. They are non-binding figures that are built to be changed in the negotiation period. The general outcome of this structure is the submittal of proposals containing over 1000 pages of (non-binding) marketing information, (non-binding) sales intensive interviews, and minimal pre-award effort from the project teams. Because the selection focus is on sales and marketing, the project team is often not committed to seriously considering the project execution and risk until after an award has been made. This often leaves them ill prepared for the transition (Scotty, 2007).

Riley (2006) explains the selection process from the owner's view. Interviews typically consist of vendors feeding the evaluation committee with exquisite foods and making idealistic promises. With their limited information, the evaluation committee then ends up choosing the vendor that presents the highest quality of food (which may have no relationship to the food serviced by the contract) and makes the biggest promises. Upon negotiation, the vendor's lawyers battle to keep the promises out of the contract. At this point, there is often not enough time to re-bid or negotiate with another vendor before dining services are needed, and the client is forced to proceed with the selected vendor. This situation creates the beginning of a long, tedious, and often adversarial relationship. This approach to differentiating and selecting vendors ultimately gives the competitive advantage to those with the most talented sales and marketing personnel, instead of those capable of delivering the greatest value.

As soon as a contract is signed, the client begins managing the vendor. Even though the client has hired the vendor for their expertise, they direct the vendor's service through the detailed contract specifications, which outline exactly what to do, how to do it, and how often it needs to be done. This structure encourages the vendors to minimize risk by ignoring their personal expertise and simply doing what the client thinks is best. The client's attempt to take control over the service requires them to pay employees in their organization to manage the outsourced service provider. These positions are used to inspect the vendor's compliance with the client's specifications and manage any client directed changes to the service. As challenges arise, the client decides how to solve the problems and their responsible personnel oversee the solutions' execution. Because the majority of clients manage their outsourced services in this fashion, the market underutilizes vendor expertise and creates a safeguard for unskilled service providers.

This structure gives no competitive advantage to high performing vendors and, because the outcome of the service is the result of client decisions/control, the client retains the risk.

The characteristics of the traditional construction delivery environment are comparable to the traditional dining service selection process (Kashiwagi 2008):

1. Contractors are competed as a commodity and selected primarily on the amount of their proposal.
2. No competitive advantage is given to contractors with experience, training, ability to preplan, or satisfy the customer's needs.
3. Specifications are relied on by the client to ensure quality level, but are often used by the contractor to provide the minimal amount of service required. These conflicting views support an adversarial environment.
4. Performance is viewed as adherence to prescribed technical requirements, even though they may not satisfy the needs of the client.
5. Once a contract has been signed, the contractor is heavily directed, managed, and controlled by the client.

Initial Tests

The adage of "the first time is always hardest" could not be truer in the case of transferring a construction based best-value/leadership driven process model into another industry. After numerous unsuccessful proposals, presentations, and discussion with numerous clients and different potential users, the authors succeeded in convincing several key vice presidents and directors at Arizona State University to allow the test application of the PBSRG best-value/leadership model onto the procurement, setup, and management of the university's new ten-year, $300+ Million dining services contract (set to commence Fall 2007). This was a groundbreaking opportunity as it afforded the initial test to be on the largest campus dining contract ever signed. Several important theories and hypotheses would begin to be tested as a result of this opportunity:

1. *Theory:* If the problems in construction and other outsourcing industries are process based, then a process correction is needed.
2. *Hypothesis:* An efficient and effective leadership model is transferable to any industry as leadership processes are not dependent upon any technical details or specifics of an operation, they are based on correct principles and concepts.
3. *Hypothesis:* As in construction, vendors/contractors struggle with risk identification and minimization due to the clients' traditional requirement and system structure that encourages reactive behavior as opposed to proactive behavior.
4. *Hypothesis:* Adaptation of a performance measurement and risk measurement driven accountability system requires a significant change from traditional modes of business and will correlate with an increase overall performance.
5. *Theory:* In an outsourced system where a high performing vendor has been selected based upon performance information, and risk minimization has been conducted prior to

contract award, the majority of issues, problems, and inefficiencies during the course of the service will be due to the client.

Overview of the Best-value/leadership Test in Dining Services

The first action in testing the construction based best-value/leadership model in dining services was to examine the predominant inefficiencies in the traditional vendor selection/management process as described to the authors by consultants and client managers in the dining services industry. This information was used for a benchmark as well as to identify how the best value principles needed to be applied to fit the needs of the dining service industry. The problems found to take place during the outsourcing of dining services were identified as the following:

- Vendors commonly misunderstand the client's needs and intent, as expressed within the RFP.
- [There is] a disconnect between promises made by [the vendor's] sales team and the responsibility for program delivery.
- Too much focus on marketing and fluff. What is presented in the proposal is never realistic of the actual contracted service.
- The selection criteria and eventual service provided are not based on performance or measurement.
- [W]e have seen where high quality individuals are presented, but do not actually commit to being part of the team (commonly referred to as bait and switch).
- The traditional process results in adversarial relationships where the objectives of the client and the provider are not aligned.
- Lack of involvement of the management team in preparing the proposal; typically, food service proposals are prepared by Business Development folks who are more concerned with winning the bid than creating a win/win outcome.
- When a dining service contract is awarded to a non-incumbent vendor, the winning firm is usually not prepared for the transition.

Beyond the inefficiencies identified by the client and consultant, the authors identified or interpreted the following:

- An abundance of client directed specifications that require client decision making and acceptance of risk.
- Excessive client management - direction, inspection, and control.
- An excessive use of non-binding information (marketing) in proposals and interviews. Beyond this problem creating unrealistic and misaligned expectations, it becomes difficult to objectively differentiate the vendors' value.
- The interviews/presentations are given by sales and marketing personnel, not critical team components.
- Large promises made by the vendors that were kept out of the contract by the vendor's lawyers (lack of accountability).

These inefficiencies or problems resulting from the industry closely align with the literature and those of the construction industry, providing confidence in the original conclusion that dining

services is indeed a comparable industry to construction as it faces the same outsourcing problems.

The Selection of the Vendor

As discussed previously, traditional RFPs, and the technical requirements within them, were found to commonly be comprised of hundreds of pages. The purpose of such detailed terms was an attempt by the client to control the service level received, and for the use of leverage throughout the life of the contract. These traditional detailed requirements serve the same purpose and generate the same inefficiencies as the construction industry's minimum standard specifications. They create unaligned expectations and lead the client to believe that extremely tight terms would force every vendor to perform the same. The service providers were therefore seen as commodities, and the only evaluation criterion taken seriously by the client was price.

Upon understanding the concerns, constraints, and identifying the intent of the university, the best-value/leadership principles were tailored to fit the dining service selection and contract management and a new process model was created. Figure 1 illustrates the process described in the RFP, which include past performance information, risk and value analysis, interviews, and financial proposal (min guaranteed commissions). Once selected the chosen vendor moved into preplanning and eventually weekly risk reporting once the contract began. Tables 2 & 3 presents the evaluated categories and results (raw and weighted scores respectively) of the selection.

Vendor B was award the contract and moved into the preplanning component of the best-value/leadership model. As is evident in Table 2, the incumbent (Vendor A) was substantially lower in its financial proposal than the other two proposers. The other two proposers, conversely, were within $300,000 of each other for minimum guaranteed commission and investment in the university across the ten year time horizon. It is possible that the incumbent was not able to see the university changing its behavior to move into a best-value/leadership based process where the vendor is afforded greater control and responsibility. This is an additional theory that was spawned from the initial non-construction test and must be examined further.

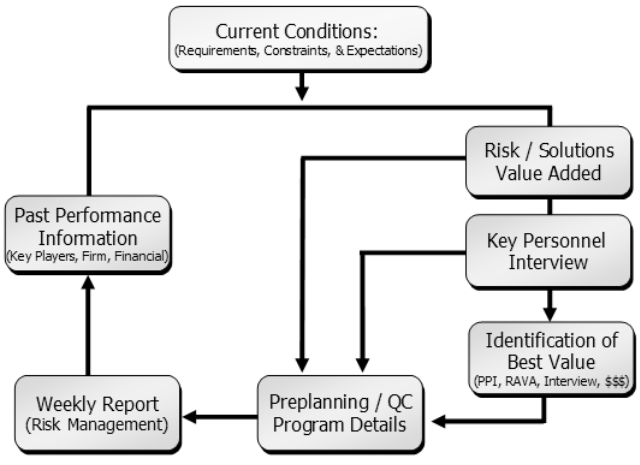

Figure 1: *Dining service procurement best value process*

Table 2

Raw Data for Dining Services Selection

No.	Selection phase criteria	Unit	Vendor A	Vendor B	Vendor C
1	RAVA Plan	1-10	5.91	7.09	6.31
2	Transition Milestone Schedule	1-10	5.17	6.96	6.33
3	Interview	1-10	5.41	6.71	6.31
4	Past Performance Information – Survey	1-10	9.80	9.99	9.82
5	Past Performance Information – Survey	Max	5.67	3.00	4.42
6	Past Performance Information – Financial	1-10	7.02	8.67	6.90
7	Financial Rating	1-10	4.00	8.00	8.00
8	Financial Return – Commissions	Max	$30,254,170	$60,137,588	$64,000,000
9	Capital Investment Plan	Max	$14,750,000	$20,525,000	$12,340,000
10	Equipment Replacement Reserve	Max	$7,213,342	$4,100,001	$8,171,811
	Total Minimum Guaranteed Financial Return		$52,217,512	$84,762,589	$84,511,811

Table 3

Weighted Data for Dining Services Selection

No.	Selection phase criteria	Weight	Vendor A	Vendor B	Vendor C
1	RAVA Plan	28	16.55	19.85	17.67
2	Transition Milestone Schedule	2	1.03	1.39	1.27
3	Interview	25	13.53	16.78	15.78
4	Past Performance Information – Survey	9	8.82	8.99	8.84
5	Past Performance Information – Survey	1	1.00	0.53	0.78
6	Past Performance Information – Financial	15	10.53	13.01	10.35
7	Financial Rating	5	2.00	4.00	4.00
8	Financial Return – Commissions	7	3.31	6.58	7.00
9	Capital Investment Plan	6	4.31	6.00	3.61
10	Equipment Replacement Reserve	2	1.77	1.00	2.00
	Total Sum	100	62.84	78.13	71.28

Preplanning (Quality Control)

A critical component of the best-value/leadership model is the identification and minimization of risk prior to the start of an activity (also known as Quality Control). In the case of dining services the vendor was required to identify the risk that it did not directly control, what would be done to minimize the risks if the should be realized, and at what point the impact from the risk event would revert back to the client. This component of the best-value/leadership model alleviated one of the common outsourcing predicaments of misaligned expectations. Alignment is a necessary and key part of effective leadership (Collins, 2001).

It was found that the neither the vendor nor the client had ever participated in as rigorous effort to indentify and minimize risk, align expectations, and provide a framework where there is substantial goal alignment between the vendor's financial success and the university's satisfaction.

Performance Measurement and Accountability (Weekly Risk Reporting)

The final and most extensive component of the best-value/leadership model is constant performance measurement and the implementation of an accountability system. The application

of this piece of the best-value/leadership model was and continues to be the most difficult. The initial non-construction test has yielded the measurement of numerous financial, environmental, productivity, and customer satisfaction metrics. A summary of the initial reports of the key financial results is presented in Table 4. Prior to the application of the best-value/leadership process, the information presented in Table 4 had never been available to the university.

Table 4

Initial Financial Performance Summary

Metric	FY 06-07 (Year Prior)	Sept 07	Projected (65% of 12 mn)	Projected Difference	% Difference	Vendor's Internal Projection
Retail Revenue (in $M's)	$10.20	$2.30	$17.94	$7.74	76%	$15.92
Catering Revenue (in $M's)	$1.80	$0.15	$1.19	($0.61)	(34%)	$2.52
All Other Revenue (in $M's)	$4.10	$2.00	$15.60	$11.50	280%	$17.12
Total Revenue (in $M's)	$16.10	$4.45	$34.73	$18.63	116%	$35.56
Total Commissions to ASU (in $M's)	$1.94	$0.34	$2.63	$0.69	35%	$2.69
Total sales per labor hour	$37.03	$54.05	$54.05	$17.02	46%	
Total number of transactions (#M's)	3.95	0.72	6.06	2.11	54%	
Total revenue per transaction ($)	$4.08	$6.17	$5.73	$1.65	40%	
Voluntary meal plan participants		2,651				2,241
Mandatory meal plan participants		6,228				6,531
Total participants		8,879				8,772

Evaluated Results of Initial Test in Dining Services

To evaluate the initial test of the best-value/leadership process model on a non-construction outsources service, a 17 question survey was created and distributed to the key clients and users involved in selection process and dining contract operation (eight individuals). For each question or statement, the survey taker was asked to rate their level of agreement on a one-to-ten scale, with ten being completely agree and one being completely disagree. Table 5 shows the 17 questions and the averages of their responses.

It is clear by looking at the responses that the client committee members found the best-value approach to be superior to the traditional approach, in each of the 17 questions compared. It was found that the average difference between the ratings received for the best value process in excess of the traditional process was approximately five points on each question.

Initial Results & Conclusions

The initial results of the dining services test have yielded data allowing preliminary analysis of the research hypotheses and theories: 1) By adjusting the process to a best-value/leadership model dining services efficiency was increased, 2) The existent best-value/leadership process was successfully transferred from construction to the ASU dining services contract with no adjustment to the fundamental concepts, 3) As is evident in the risk plan scores, the vendors struggled in identifying and minimizing risk, and 4) The performance measurement system and

risk report (no shown here due to space constraints) have been completely foreign to the dining services participants.

The fifth theory/hypothesis proposed by the authors was the idea that the majority of issues would arise from client inefficiencies. This has been the case in the dining services contract. The vast majority of issues, risk, and inefficiencies have come as a result of internal client misalignment, bureaucratic tendencies, and overall lack of accountability. Using the vendor maintained risk and performance report, the process has begun to drive accountability into the university structure by holding individual personnel accountable for there actions, inactions, and decisions forced upon the vendor. Specific issues include untimely transfer of meal dollars from the university to the vendor although the vendor has all ready incurred all cost to service the meals, delinquent and negated client required maintenance and service to facilities, financial misunderstanding between university contracting and accounting, and inefficient expansion of dining contract from main campus to all campuses.

Table 5

Evaluation of Initial Test in Dining Services

No	Criteria	Traditional Method	Best-Value/ Leadership	Δ
1	Your Confidence in the chosen vendor	5.88	9.38	3.50
2	Your knowledge of the vendors' capability, before contract award	5.13	8.88	3.75
3	Your satisfaction with the proposal (expectation of "promises" being executed)	5.00	8.38	3.38
4	Your understanding of project risks, before the contract begins	3.00	9.38	6.38
5	Ease in differentiating between vendors' capabilities/values	4.13	9.00	4.88
6	The amount of pre-planning, risk minimizing, and value added by the vendor, before contract award	3.38	9.25	5.88
7	The process is logical	5.88	9.00	3.38
8	The process transfers a large amount of meaningless information	2.63	9.13	6.50
9	The process promotes win-win situations (benefits all parties)	5.25	9.00	3.75
10	The process minimizes unnecessary management and decision making efforts on the part of the client	2.88	8.75	5.88
11	The process minimizes adversarial relationships (unaligned interests/motives)	2.88	8.13	5.25
12	The process encourages risks to be identified by all parties	2.75	9.63	6.88
13	The process transfers risk to the most appropriate party	2.63	9.63	7.00
14	The process generates a contractually binding flow of efficient communication, throughout the life of the contract	3.50	8.75	5.25
15	The process documents performance via contractually binding measurements, which create accountability for all parties involved	3.29	9.13	6.25
16	The process is fair for all parties involved	4.63	9.13	4.50
17	The process is a step in the positive direction, in the world of service procurement	2.00	9.38	7.38
	Overall average	3.81	9.05	5.28

Future Research & Industry Transformation

The university has expanded the use of the best-value/leadership process model onto other services including sports marketing and furniture, and plans to continue the expanse. In regards to the industry transformation efforts discussed in the introduction, dining services has emerged as the initial and most likely candidate for testing. With the small number of large vendors and the results of the Arizona State University dining services contract having spread, the dining services industry is a convenient and efficient test group. Also another university is already into procurement using the model with several others soon to follow suit. The industry wide research effort is underway.

The transformative goal of the authors includes the creation of a network of best-value/leadership based dining service universities where real-time performance measurements are available. These metrics systems will be linked into a national performance network that will affect, real-time, a vendor's ability to compete for future work at another campus. So, for example, if ten universities have tested and are running a best-value/leadership based dining services contract, their weekly performance numbers would be inserted into a performance database updating every vendor's and critical individuals personal performance score. A new university wanting to participate in the network would run the best-value leadership model and use the networked performance score as a major criterion in the selection model. Thus accountability for performance would stem beyond any one campus to include all potential future work. This accountability system, along with the campus level best-value/leadership model, is predicted to help transform the dining services industry. If this model is successful, a similar application can begin to be testing in construction, with innovative clients and users building a nationwide performance measurement and accountability system. This however, is in the distant future of the research effort.

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Design-Build Project Delivery in Military Construction: Approach to Best Value Procurement

Birtice Garner, Kathleen Richardson and Daniel Castro-Lacouture
Building Construction Program
Georgia Institute of Technology
Atlanta, Georgia, USA

Design-Build is rapidly becoming one of the most commonly used project delivery methods in the facility construction industry. The United States Air Force and the Air Force Reserve Command (AFRC) are expected to establish a target of 75% of all Military Construction (MILCON) projects delivered using the Design-Build method. The use of this delivery method will bring significant changes in the relationships between the various parties associated with facility project delivery when compared to the traditional Design-Bid-Build method. This paper demonstrates that Design-Build delivery with a best value selection is an important tool in accomplishing AFRC's cost efficient, rapid response transformation goals applicable to facility construction. Three hundred thirty two projects in program years 2002 through 2006, constructed using both traditional Design-Bid-Build or Design-Build delivery methods, were examined. Parameters used for comparisons were construction cost and schedule growth, project cost, vertical versus horizontal construction, and number of days required to prepare solicitation documents, advertise and accomplish construction award. This research reveals significant project schedule advantages with Design-Build best value selection delivery. The advantages are apparent in both pre and post construction award activities. Potential Design-Build cost advantages are hindered by Defense Federal Acquisition Regulations requiring firm fixed price contracts at construction award.

Keywords: Design-build, MILCON Transformation, Project Delivery, Best Value

Introduction

Design-Build is a method of project delivery in which one entity forges a single contract with the owner to provide architectural/engineering design and construction services (Webster 1997; Allen 2001). While the private sector has been using Design-Build since the 1940's, military use of this alternate project delivery method is still in its formative years. The Department of Defense (DOD) has been employing Design-Build since 1987, receiving the authorization via the Military Construction Authorization Act of 1986. This congressional sanction limited DOD to a maximum number of three projects per year delivered by the Design-Build method. In 1993, The National Defense Authorization Acts removed limits on the number of projects that could be executed using Design-Build procurement techniques. The Air Force permission to utilize Design-Build delivery, approved by the Secretary of the Air Force in 1995, came with strict limitations and guidelines regarding the types of projects that can be considered as candidates for this non-traditional procurement method. The choice to use Design-Build can now be based on its merits for each individual project in a military service's Military Construction (MILCON) program.

A number of factors contribute to the increased use of Design-Build for Air Force (AF) facility construction procurement including some that are extraneous to the inherent characteristics of the

project itself. Two of these external factors are the diminishing supply of available MILCON design funds and the increased number of MILCON projects congressionally inserted into AF programs each year. MILCONs are Military Construction Projects that are congressional funded at a specific authorized monetary amount. The authorized sums are established based upon historical data for projects of similar scope and functional use classifications. Frequently, traditional procurement methods employed by United States Corps of Engineers are not feasible project delivery options.

The purpose of the research and this paper is to show that Design-Build construction procurement can be an effective tool to assist the Air Force Reserve Command in meeting Air Force DIRTKICKER MILCON project execution criteria for design and construction schedule and cost control.

Research Methodology

Project data was obtained from the Air Force's Automated Civil Engineering System (ACES) database. This database tracks the milestones of all Air Force facility projects from program development through design and construction to beneficial occupancy, construction completion and finally financial closeout. After closeout projects move to a historical file within ACES and completed milestone data is available for projects executed over a period of time. At present Air Force projects spanning the last 10-12 years are available for review, report writing and analysis.

Three hundred thirty-two Air Force MILCON projects in program years 2002 through 2006 were drawn from the database, compiled into reports and analyzed. Schedule and cost growth comparisons for Design-Build and other than Design-Build delivered projects with programmed dollar values less than five million, five to ten million, and more than ten million were analyzed. Growth comparisons for vertical and horizontal construction type projects executed via the two delivery methods were also evaluated for the same five year Air Force MILCON program period. Analysis results were compiled and comparisons were graphed to detect trends. It was anticipated that this compilation of information would be beneficial for predicting future execution results using the two project delivery methods.

Challenges

It is reasonable to ask why the federal government in general and DOD and Air Force Reserve Command (AFRC) specifically have been slow to implement Design-Build alternative delivery for construction services. The reasons are copious with the restrictive language of the Federal Acquisition Regulations (FAR) often being cited. FAR Subpart 36.209 states that "No contract for the construction of a project shall be awarded to the firm, its subsidiaries or affiliates, which designed the project except with the approval of the head of the government agency or an authorized representative." (FAR 2005a) This statement does discourage utilization of Design-Build project delivery, however, perhaps the single most common reason this delivery method is avoided is because people involved in the procurement process simply do not want to change the way current business is conducted. Additionally, the Two Phase selection method, applicable

when a large number of prospective bidders are anticipated, is cumbersome, time consuming and lacks regulatory contractual guidance. It is basically a procedure used to short list the number of bidders eligible for award consideration to a maximum of five highly qualified firms. Each bidder is initially screened for compliance with a series of prerequisite criteria. This unwieldy FAR directed process further thwarts government agency enthusiasm for this alternate project delivery method.

Another reason for the reluctance to use Design-Build project delivery is the preponderance of small business and small disadvantaged business firms encouraged to participate in the DOD construction program process. These firms frequently lack the expertise and experience to efficiently execute facility project construction using processes other than traditional methods in which bid proposals are based upon fully designed scopes of work. This rational is especially pertinent to small projects, or less than $5,000,000, and those with less complicated requirements. Currently the primary Air Force Reserve Design-Build project delivery option vehicle is the Multiple Award Task Order Contract (MATOC). MATOCs are pools of pre-qualified contractors, already under contract to USACE to deliver broadly specified construction services according to specific technical and contractual standards. Each contractor is asked to submit a proposal to perform a particular construction project. Typically each MATOC contractor pool is comprised of firms qualifying as small disadvantaged businesses (SDB) as defined by the federal Small Business Administration. Air Force Reserve projects are especially targeted to meet SDB execution goals since these projects tend to be less complicated and of a lower dollar value when compared to those of other USACE military customers. Small, disadvantaged contractors are learning to be competitive in the construction contract profession; alternative project delivery methods can be an additional challenge for them.

AFRC has lagged in adopting non-traditional Design-Build facility construction project delivery methods compared to most DOD commands. Yet, in order to keep up with mission demand and military transformation goals, Design-Build must become a viable alternative to long-established Design-Bid-Build delivery. Figure 1 illustrates the typical MILCON execution process from inception planning through Congressional notification and issuance of a field design instruction to the construction agency (COE).

Figure 2 represents an AFRC Design-Build MILCON project delivery process prototype. This method initiates with an Acquisition Strategy Meeting. The decision to use Design-Build delivery would establish an execution process as visualized below.

To provide the anticipated Design-Build bridging Architect/Engineer (A/E) with sufficient information to prepare a cost offer for Request for Proposal (RFP) prep, a Pre-Definition conference is conducted. Attendees at this meeting include representatives from AFRC, Corps of Engineers (COE), facility occupants and the installation's technical staff. At the conclusion of this meeting, and upon subsequent resolution of all questions and concerns, contract negotiations are conducted. A contract for professional A/E services is awarded at the successful completion of contractual discussions. The COE will then issue a Notice to Proceed (NTP) to this bridging A/E to accomplish the RFP. The fundamentally crucial component of the Design-Build method is the RFP. Preparation of these documents typically begins with a face-to-face meeting of all parties: COE, AFRC, installation technical staff and pertinent customers. The AF uses the

expression "charrette" to describe this gathering. The term describes a period, generally one week or less, of intense design exercise characterized by brainstorming and the development of concept design solutions based upon performance requirements contributed by the influential participants. RFP development generally starts with three A/E submissions, 35%, 65% and 95%, each with a subsequent review by contributing parties. When comments and corrections to all requirements have been incorporated into the document and it includes a construction cost estimate, the RFP is declared to be a final document acceptable to all entities. The COE and AFRC will then prepare a source selection plan, a public announcement is made and the RFP is issued for solicitation of construction proposals (U.S. Air Force Project Manager's Guide 2000).

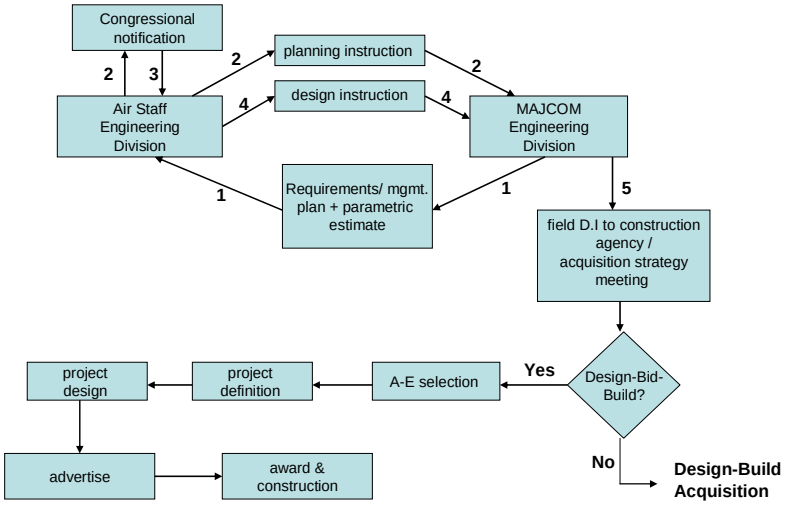

*Figure 1***:** Typical MILCON execution process (United States Air Force 2000)

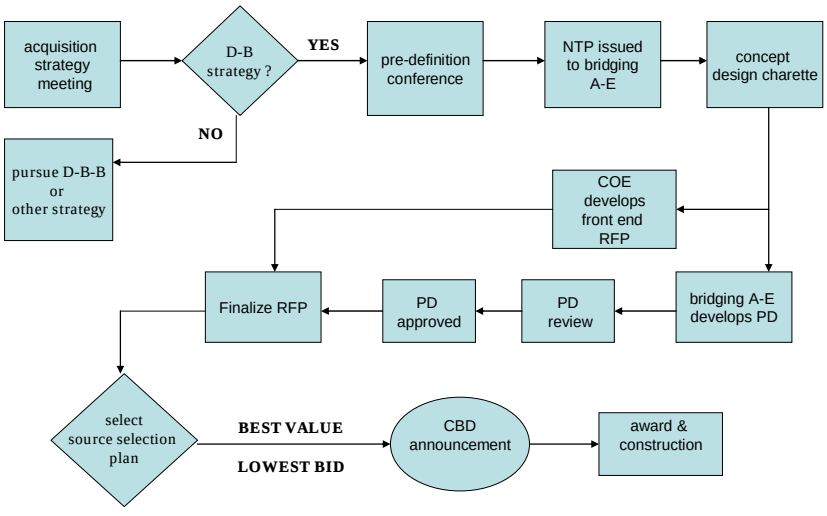

Figure 2: AFRC Design-Build MILCON project delivery process prototype (United States Air Force 2000).

Past Performance Models

Below are charts and tables that show calculated cost and schedule growth data for active duty Air Force projects between 2002 and 2006 inclusive (ACES 2007).

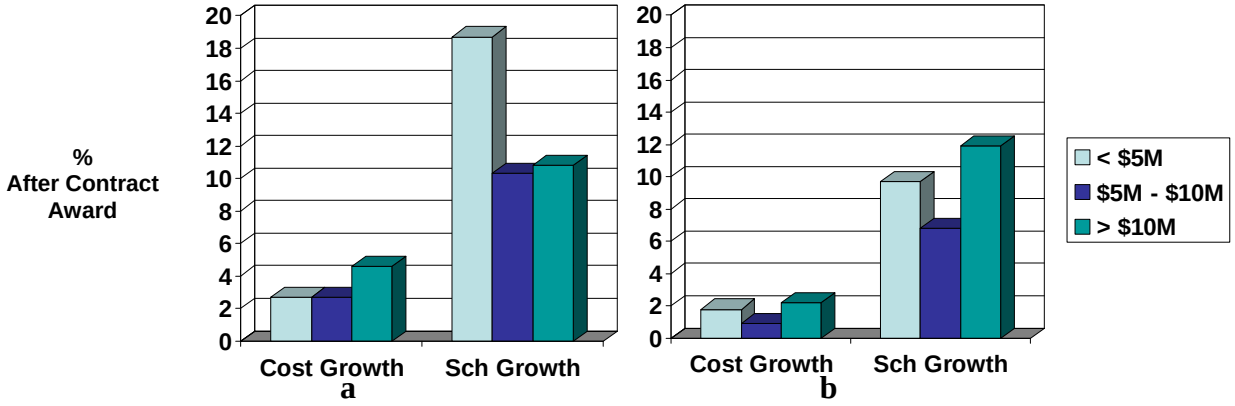

Figure 3: Cost and schedule growth for AF MILCON projects:
a. Other than Design-Build, and b. Design-Build.

Figure 3 shows that for the traditional delivery methods including Design-Bid-Build there is essentially no difference in cost growth for projects less than $5,000,000 and projects between $5,000,000 and $10,000,000. A 4% cost growth is observed for projects over $10,000,000. Schedule growth is most notable in projects under $5,000,000 with a rate of almost 19% while projects valued between $5,000,000 and $10,000,000 and greater than $10,000,000 experienced relatively the same schedule growth of approximately 11%. As indicated in Figure 4, Design-Build significantly reduced the schedule growth by almost 10% for projects with values less than $5,000,000. This reduction is principally the result of the ability to incorporate performance specifications into the RFP. Projects between $5,000,000 and $10,000,000 and greater than $10,000,000 did not exhibit any appreciable schedule growth reduction advantages using Design-Build when compared to traditional methods. This might be explained by the degree of design complexity and difficulty in adequately identifying the customer's requirements using performance specifications in the RFP process as projects become larger and more complex. Cost growth differences between the two methods were minimal. For projects valued at $10,000,000 and less, Design-Build cost growth was slightly less than traditional. For projects worth more than $10,000,000, Design-Build cost growth was approximately 50% less.

A comparison of horizontal and vertical projects reveals larger schedule growths in vertical projects delivered from 2002 to 2006. Vertical projects, primarily facilities and upright structures, generally are expected to require more complex designs than horizontal construction projects. This comparison suggests possibly schedule advantages using Design-Build project delivery for these more complex design projects when customer requirements are adequately defined in the RFP. These schedule advantages do not translate for horizontal construction projects. Analysis of this data clearly shows the potential benefits of choosing Design-Build delivery for projects requiring complex, multifaceted designs when controlling schedule growth is important. RFPs that are lucid, precise and that comprehensively define all performance requirements are essential to success in maintaining the construction schedule.

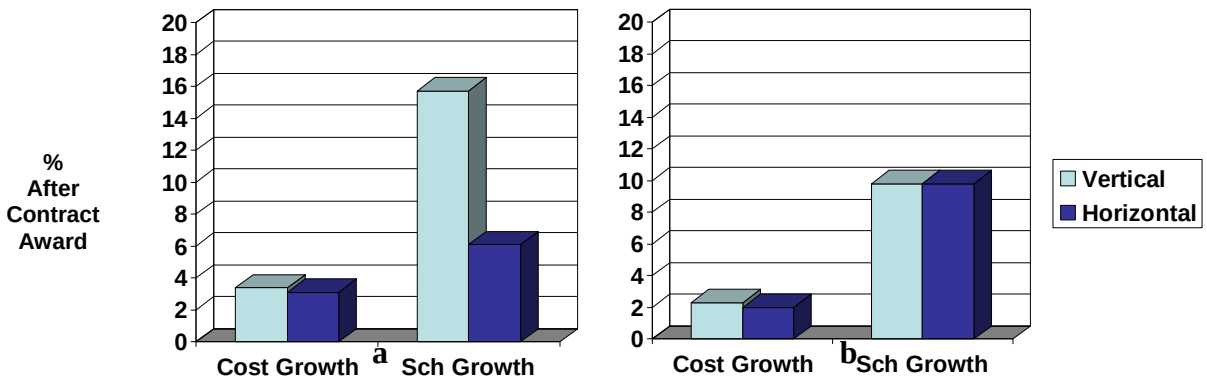

Figure 4: Cost and schedule growth per construction type for AF MILCON projects: a. Other than Design-Build, and b. Design-Build.

The AFRC MILCON program over the six year study period was largely comprised of projects valued at less than $5,000,000. Extrapolated active duty Air Force MILCON data used to construct the charts above show that projects in this dollar value range experience a significant measure of success in reduction of construction schedule growth by using Design-Build project delivery when compared to Design-Bid-Build and other traditional methods.

Schedule growth is due to a several factors: construction changes, unforeseen visits to the installation, weather delays, unexpected heightened security measures, request for technical information from the designer, sub-contractor coordination issues, or failure to perform according to the specifications. Adjustments are made for differing site conditions, availability of existing infrastructure support, inflation and geographic location. The initial contract amount cannot exceed the authorized amount minus statutory, construction agency contingency and supervision and inspection overhead expenses (FAR 2005b). If construction changes cause the cost of a project to exceed the amount appropriated or authorized, savings from other projects must be found to fund the modifications.

AFRC use of the traditional Design-Bid-Build delivery method has resulted in unacceptable schedule growth upwards of 60% for projects worth less than $5,000,000 and 50% schedule growth for projects worth between $5,000,000 and $10,000,000. A unique advantage of using Design-Build project delivery is that a single entity is responsible for both project design and construction. Discussions regarding schedule growth related to design intent and adherence to specification issues are eliminated since the contractor and the designer are under one contract. Table 1 represents the Air Force historical average for design periods. These time intervals are primarily based upon traditional project delivery execution methods. Projects in monetary ranges above $5,000,000 are usually more complex and require twice as long to develop the project definition firmly establishing the project requirements in technical terms. Design-Build delivery with its RFP reduces this time interval to construction award by allowing the Design-Build contractor to complete the development of project requirements during the design phase of his contract.

Table 1: Air Force Historical Average Design Period

Programmed Amount	Time in Days from Design Start to		
	Project Definition	Ready to Advertise	Construction Award
<$5M	60	150	240
$5 - $10M	120	180	270
>$10M	120	210	300

The annual Air Force DIRTKICKER award is presented to the command in each size category that best demonstrates the ability to execute its MILCON program in an efficient manner exhibited by cost and schedule control. A set of metrics used to analyze MILCON execution and provide a fair and balanced approach to determination of the Air Force's best performing commands has been developed and implemented. The criteria embrace the full spectrum of engineering and construction management statistics related to cost and schedule. These activities include design, construction and financial closeout. DIRTKICKER requirements for projects with values under $5,000,000 are especially stringent. The construction contract timeline performance metric for these projects has a target of 365 days. The construction contract performance period for projects valued from $5,000,000 to $20,000,000 is 540 day. Extra points are assessed for the ability to construction award projects in early quarters of the fiscal year of congressional appropriation.

Figure 5 shows total execution time including planning, and comparisons between Design-Bid-Build and Design-Build for projects with values of $5,000,000 and less, between 2002 and 2006 (ACES 2007). The data clearly shows an estimated 138 day reduction (13.7%) in completion time for projects delivered with the Design-Build method.

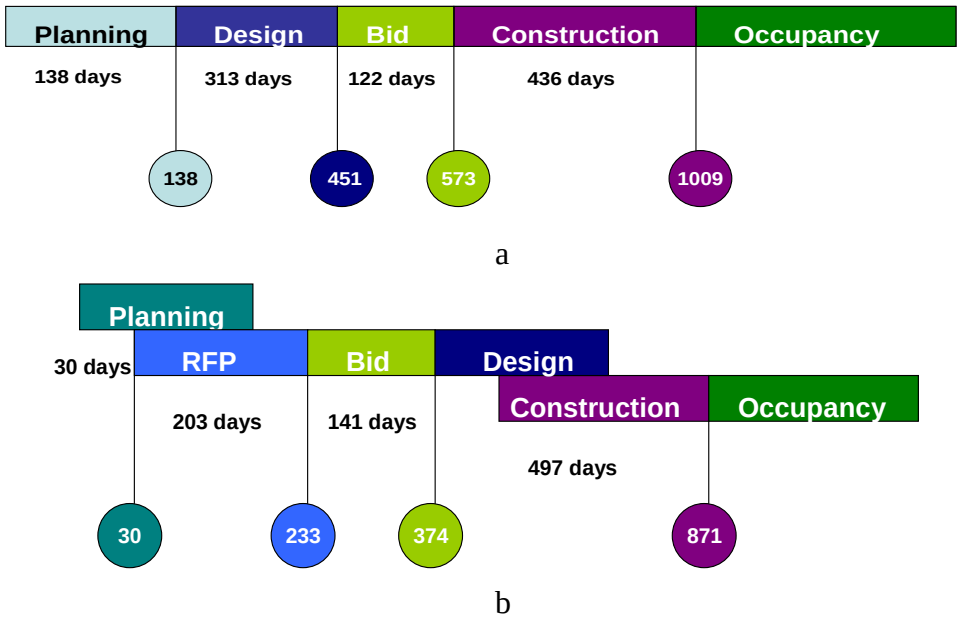

Figure 5: Total execution time: a. Design-Bid-Build, and b. Design-Build.

Design-Build Advantages and Disadvantages

Since this construction procurement procedure appears to offer so many advantages for AFRC and its customers, it is reasonable to ask why this method is used so infrequently as an alternative to the more traditional Design-Bid-Build method. A comparison of the advantages and disadvantages of Design-Build delivery is listed below.

Design-Build Advantages

- Early project completion and occupancy
- Excellent information interchange between design and construction personnel
- Ideal method for projects requiring construction phasing
- One contract for both design and construction – reduced paperwork
- Contractor is responsible for construction changes that are a result of design deficiencies
- Project can be fast-tracked because the schedule is controlled by one entity

Design-Build Disadvantages

- Payment of upfront cost for RFP preparations can be perceived as "paying for the design twice".
- Loss of a significant degree of design and construction control by the construction agency, AFRC and customers.
- When low bid or fixed price is the Design-Build selection method, the amount of front end project program information required is considerable.
- Unique execution challenges for small disadvantaged contractors still learning to perform in the military construction environment.

The disadvantages listed above hinder the Design-Build project delivery as the execution method of choice. Perhaps the greatest anxiety is the fear that, in the final analysis, price will force the selection of the contractor with the lowest cost proposal. This concern is magnified with the increasingly volatile construction price environment resulting from natural and man-made calamities. When price is the only selection criterion, contractual performance at the lowest contractually acceptable stratum is assured. Alternately stated, when firm fixed price is a factor in the selection process, competing contractors sense the award will be based upon the lowest qualified bid and will not labor to produce higher quality technical proposals and management plans in an effort to trump the competition. Under these circumstances the probability of failure to meet the customer's construction quality standards or requirements is high. Additionally, because the contractor is committed to deliver the project at a predetermined fixed price, the construction agency has less control over the entire Design-Build construction delivery process.

Design-Build for Federal Procurement

The Clinger-Cohen Act of 1996 provides guidelines for federal Design-Build procurement. The Act describes the Two Phase selection procedure and the concept of "efficient competition" (Heisse 2002). However, the statutes and regulations supply only a procedure for using best

value as a procurement method; they do not require construction agencies to use it. The traditional Design-Bid-Build method does not allow the government to solicit contractor bids with factors other than price. Elements such as management plans, critical paths which show the ability to complete the project in a shorter time, evidence of similar project experience and referrals from owners and architects on previous jobs could dramatically change the results of the selection process. The federal government and AFRC do not currently have specific legal guidance pertaining to RFP content. The AIA/AGC suggests the following parameters should be included in the scope of work for all public projects (AIA/AGC 1995): Program statements for the facility that describe space needs, design goals and objectives, equipment requirements, other pertinent criteria (accommodations for future expansion, etc), site information, including site survey and soil boring reports, any minority, women or other disadvantaged group enterprise business requirements, an outline of specifications, budget parameters, and project schedule.

Pertinent FAR clauses divulge the following Two Phase operational procedure: Phase One narrows the list of bidders down to four or five contractors. Evaluation factors could include specialized experience and technical competence, past performance and other appropriate factors. Price associated factors are not permitted in Phase One. During Phase One the government can review the proposal without concern that the competitors are trying to out bid one another (Heisse 2002). Phase Two requires submission of technical and price proposals. FAR Part 15 allows the government to negotiate with bidders to achieve "best value". In negotiations each bidder has the opportunity to revise his/her proposal and to submit a "final revised proposal". This best value procurement method allows the government to use a trade-off analysis technique in evaluating technical and price proposals. The objective is to select the offer that will provide the best product for the dollars available. Figure 6 shows the decision matrix for Source Selection Best Value Design-Build Acquisitions.

Future Outlook for AFRC

In May 2007 the Air Force Center for Environmental Excellence (AFCEE) issued a draft execution management plan for all AF MILCON projects. The purpose of this plan is to outline new procedures for executing MILCON and BRAC projects. The AF is seeking to select the most time and cost efficient delivery method for each project. The target goal is to use Design-Build as the delivery method for a minimum of 75% of each year's program. Unless otherwise stated, projects such as dormitories, family housing, general administrative and any standardized designs will be executed using this method. One objective the AF is eager to achieve is a "controlled approach" to construction that will mitigate the increasing construction costs and customer occupancy delays that continue to impact the delivery of MILCON projects. The policy will establish guidelines for awarding projects within the authorized monetary budget or Programmed Amounts (PAs) and within acceptable construction periods based upon those PAs. Design and construction are to be executed in accordance with the metrics established in the MILCON Program Management Plan (PMP). The Construction Cost Limitation (CCL) for all MILCON and BRAC projects will now cap base bid design construction cost estimates at 80% of the authorized PA regardless of programmed scope. Additional scope requirements up to the PA are to be designed as bid options. After allotting 5.7% and 5% of the total project PA respectively for construction agent supervision, inspection and overhead (SIOH) and

contingency, the AF Headquarters engineering staff will set aside the remaining 9.3% of the PA in a general pool to be used to fund bid overages on other MILCON projects, essential bid options, and necessary unforeseen site condition changes (Air Force Center for Environmental Excellence 2007).

The Design-Build method is effective in controlling project cost. Errors and omissions in the design are resolved between the A/E and the contractor; both under the same contract, and seldom, if ever, require the construction agency to negotiate a change. Design-Build is also most effective in meeting fast track project schedules. The overlap of design and construction phases allows the design-builder to begin construction prior to completion of all drawings. The synergism of the relationship virtually assures develop of the design at a pace that meets the construction team's needs. This relationship also helps ensure the design-builder avoids schedule delays resulting from failure to identify and properly plan for long lead items.

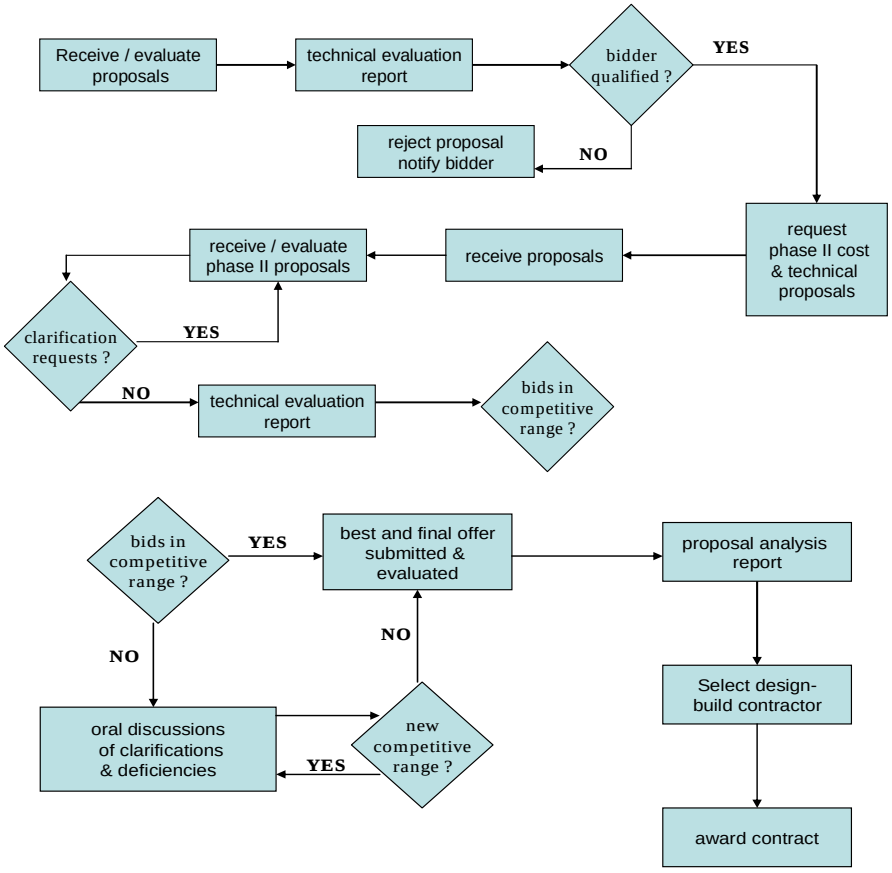

Figure 6: Selection process diagram for Two Phase Best Value Design-Build Acquisitions (United States Air Force 2000)

Best Value Procedures for Evaluation

In order to achieve the optimum value in the use of Design-Build project selection, best value procedures and techniques should be incorporated into the selection process to the maximum extent possible. Many of the best management practices in the construction industry are

management based, inefficient, lack accountability, and have not led to increased construction performance. Best value selection assures identification of the contractors best suited for the particular solicited project and then provides them with an efficient environment to allow them to deliver the highest value at the lowest price. Best value practices transfer project control and risk to those best qualified to control and minimize them. This procedure increasing efficiency by minimizing the effort required to deliver construction. These control and risk responsibilities should reside with those charges with the actual deliver of the project and not the client or client's management representatives. The FAR allows for performance contracting and best value procurement in the federal government. However, the concept of transferring risk and control to the contractor represents a colossal paradigm shift both in the COE contracting and Air Force facility construction management communities (Kashiwagi 2008). At present the incorporation of technical merit into the selection process along with fixed price is the best that can be achieved.

The purpose of a best value selection is to allow the owner to make a conscious tradeoff between price and quality considerations (Chinowsky and Kraft 2005). In a best value selection the owner may select a construction firm that proposes to perform the work at a higher price than other offerors if that firm tenders the superior technical solution. Alternately, the owner has the ability to select a firm whose technical proposal is evaluated lower after deciding that the offer with the highest evaluation is too expensive.

Typically the owner will request Design-Build proposals from several competing firms. Air Force Reserve construction contracts must meet Small Business Administration goals. For projects valued at $5,000,000 and below the competing firms are nearly always limited to those qualifying as small, disadvantaged firms in the Small Business Administration Program. Because of this requirement, proof of this qualification along with past performance in utilization of Small Business Concern subcontractors is generally always one of the selection criteria. This criterion is usually rated as "go" or "no go" and should not vary by scale in rating the various submitting firms. Best value selection criteria are generally segregated into two major categories:

1. Design-technical and performance capability.
2. Price and pro forma information, such as proof of financial ability, bonds, insurance, etc.

Design-technical and performance capability can be sub-divided into up to five sections. These are: experience, past performance, technical proposal information, management, and subcontracting narrative. Experience as a selection rating factor is applicable to both the prime construction contractor and the design team and can include the major subcontractors on the project. The offerors generally are asked to submit descriptions of projects similar in size, scope, and dollar value, complete or substantially complete within the last 5 years, for which they were responsible. Evidence of projects in which the prime construction contractor and design team have accomplished together is encouraged. Past performance refers to the quality of recent construction project experience from the owner's perspective. Offerors provide customer references, company affiliation and current phone numbers on specific project experience sheets. Technical proposal information generally consists of color renderings or sketches depicting the overall appearance of the project to be constructed along with design drawings sufficient to show

facility function, aesthetics, and site layout. This technical proposal should also include a design narrative describing the major systems proposed for the project or facility. The purpose of the subcontracting narrative is for the offeror to demonstrate that a targeted percentage of the first tier subcontracting work will be accomplished by US Small Businesses. The evaluation of this criterion is rated either yes or no. Price and pro forma information is submitted by the offeror in a separate sealed envelope. It is evaluated for reasonableness and realism using cost/price analysis and positive bank references and acceptable sureties.

Upon receipt of all offers, an evaluation board comprised of representatives of the Corps of Engineers, Air Force Reserve program manager, the customer, the contracting officer, and other required personnel will convene and evaluate the proposals. The evaluation process consists of four parts:

1. Proposal compliance review to insure that all necessary forms and certifications are complete.
2. Design-technical and performance capability evaluation.
3. Price evaluation.
4. Cost/technical trade-off analysis.

After listing each proposals strengths, weaknesses and deficiencies, the board will assign an adjective rating of “Unsatisfactory”, “Marginal”, “Satisfactory”, “Good”, or “Excellent” to each factor except those rated as yes/no or go/no-go. The adjectival ratings are as follows:

- Excellent: The proposal demonstrates excellent understanding of the requirements and the approach significantly exceeds performance or capability standards; contains no significant weaknesses or deficiencies and presents very low risk that it will not be successful.
- Good: The proposal demonstrates a good understanding of the requirements and the approach exceeds performance or capability standards; has one of more strong points and any weaknesses noted are minor and should not seriously affect the offeror’s performance; presents a low risk that it will not be successful.
- Satisfactory: The proposal demonstrates an acceptable understanding of the requirements and the approach meets performance or capability standards; acceptable solution. The approach may include both strengths and weaknesses of substance, where strengths are not outweighed by weaknesses. Collectively, strengths and weaknesses are likely to result in acceptable performance.
- Marginal: The proposal demonstrates shallow understanding of requirements and the approach only marginally meets performance or capability standards necessary for minimal, but acceptable contract performance. The offeror may satisfactorily complete the proposed tasks, but there is a high risk that it will not be successful.
- Unsatisfactory: The proposal fails to meet performance or capability standards. Requirements can only be met with major change to the proposal. The risk of unsuccessful performance is very high as the proposal contains solutions which are not feasible and do not meet the solicitation requirements (Louisville District Corps of Engineers 2007).

Past performance risk ratings assess the risks associated with each offeror's likelihood of success in performing the requirements stated in the RFP based on the offeror's demonstrated performance in recent contracts. These adjectival ratings are as follows:

- Unknown Risk: No relevant performance record is identifiable upon which to base a meaningful performance risk prediction. This is neither a negative or positive assessment.
- Low Risk: Based on the offeror's past performance record essentially no doubt exists that the offeror will successfully perform the required effort.
- Moderate Risk: Based on the offeror's past performance record some doubt exists that the offeror will successfully perform the required effort.
- High Risk: Based on the offeror's past performance record extreme doubt exists that the offeror will successfully perform the required effort (Louisville District Corps of Engineers 2007).

The current best value solicitation selection criteria recommended for use by AFRC are: technical solution, experience, past performance, management plan, firm fixed price and subcontracting narrative. A trade off analysis is allowed. If a firm is rated high in all selection factors but does not offer the lowest price, the process allows AFRC to select the contractor that provides "best value" to the government (Louisville District Corps of Engineers 2006). A survey of owners of public and private projects disclosed the consensus opinion that Design-Build reduces a project's delivery time when compared to traditional methods. Other reasons cited for implementing Design-Build, in order of importance, include establishing costs before design is complete, reducing project costs, increased constructability, innovation, and reduced claims (Gransberg and Barton, 2007). The analysis provided in this paper for Air Force projects over the last five years supports these owners' opinion concerning reduced project delivery time. One of the reasons cited for schedule growth in Design-Bid-Build delivery is the inherent checks and balances between the designer and contractors, both under separate contract to the owner, that can create strained relationships and hinder the coordination process. Another reason mentioned for the differences in schedule growth between the two methods is the sequential nature of the Design-Bid-Build delivery process. This method does not offer the opportunities to expedite construction phases. Conversely, Design-Build project delivery brings the designer and contractor together early in the process and they work as a team (Tennant 1998). On the other hand, project quality standards can encourage a conflict of interest when using Design-Build project delivery. The designer is no longer an independent advisor. A tendency to cut corners is likely to occur because the design-builder performs the dual function of interpreting design needs and attempting to control cost. This may result in selection of the lowest cost alternative while sacrificing the owner's definition of a quality project.

Design-Build project delivery provides significant advantages in reduced administrative burden. A consistent complaint of Air Force Reserve contractors, both design and construction, is the volume of administrative forms, plans, and documentations that must be maintained and submitted. This administrative workload often necessitates hiring additional employees simply to process and coordinate paperwork. Since administrative overhead increases with the number of contracts, Design-Build delivery, where the owner holds only one contract for both design and construction, has a decided advantage over Design-Bid-Build with its traditional two contracts. Construction professionals note a significant difference in public owner involvement in the design, procurement, and construction phases of projects when comparing Design-Build and

Design-Bid-Build delivery methods. Design and construction owners and representatives are more likely to allocate minimal weekly hourly to contract oversight of Design-Build projects. For projects with undeveloped programs, multiple stakeholders, and those employing in-house design and construction staff resources, the Air Force Reserve may be best served by selecting Design-Bid-Build project delivery. This method allows various interest groups more time to discuss options because of the longer design period. Conversely, Design-Build requires speedy decisions from Air Force Reserve design and construction staff and the need for more experience in the use of alternative delivery methods. To succeed with Design-Build delivery it is imperative that the project program be well developed prior to initiating RFP preparation.

FAR Limitations

In Section 16.3 of the FAR alternatives to the "firm fixed price" solution are addressed in following contracts:

- Cost-sharing contract which is a cost-reimbursement contract in which the contractor receives no fee and is reimbursed only for an agreed-upon portion of its allowable costs.
- Cost-plus-incentive-fee contract which is a cost-reimbursement that provides for an initially negotiated fee to be adjusted later by a formula base on the relationship of total allowable costs to total target costs.
- Cost-plus-award-fee contract which is a cost-reimbursement contract that provides for a fee consisting of a base amount, which may be zero, fixed at inception of the contract and an award amount, based upon a judgmental evaluation by the government, sufficient to provide motivation for excellence in contract performance.
- Cost-plus-fixed-fee contract is a cost-reimbursement contract that provides for payment to the contractor of a negotiated fee that is fixed at the inception of the contract. The fixed fee does not vary with actual cost, but may be adjusted as a result of changes in the work to be performed under the contract.

The annual congressional Military Construction appropriations acts passed by Congress restrict the use of cost-plus-fixed-fee contracts (FAR 2005b). A waiver to the requirement for a firm fixed price must be approved by the Secretary of Defense on a project by project basis. Research has not revealed whether this authority has been delegated down to an agency working level sufficient for waiver application. In DOD the DFAR is the superseding regulation. Until the authority to use cost-plus-fixed-fee contracts is granted to construction agencies, best value selection that excludes low fixed price will remain unavailable to AFRC and other military commands. The FAR continues to reflect traditional roles, responsibilities and lessons learned from the long used Design-Bid-Build approach to A/E and construction contracting.

Conclusions

When a public construction project misses its schedule goal and is over budget, it attracts undesirable attention in the public sector as elsewhere. AFRC is looking for new ways to meet these schedule and budgetary requirements by selecting the best delivery methods available. The

most attractive characteristics of alternative methods like Design-Build are that they can save money, reduce time and can be expected to reduce construction change orders, contractor claims and decrease administrative costs and burden.
Based on an analysis of 287 Military Construction Projects between 2002 and 2006, this research shows significant advantages to AFRC in the use of Design-Build facility project delivery particularly regarding the ability to meet schedule commitments. Further research assessing the possible advantages of Design-Build delivery in reducing construction contract claims and follow-on facility operations and maintenance will complement the findings of this paper. Additional research should address operations and maintenance costs of DB vs. traditional bid facilities during their respective life cycles. User satisfaction surveys spanning six months, one year, three years and five years after beneficial occupancy for DB and traditionally procured projects should be studied. Follow-on remodeling, additions and upgrade projects should also be tracked and compared for the two project delivery methods as a barometer of the ability to meet all customer requirements in the initial project.

The Defense Federal Acquisition Regulations compels the basis of compensation to be firm fixed price. This directive probably negates the cost advantages that could be garnered with the Design-Build method. Contractor price uncertainties concerning requirements and specifications into their proposals as protection against unknowns later revealed while under contract. The Design-Build approach assumes that a substantial number of requirements have not yet been sufficiently addressed to proceed to construction. Asking the contractor to submit firm prices for these undeveloped requirements may appear to be a bit presumptuous. Until AFRC can establish standard requirements for each mission's facility needs, the current Two Phase selection method is the best technique available upon which to evaluation contractor proposals using factors other than simply the lowest priced offered. It is suggested to further this research by comparing bridging documents prepared by in-house Corps of Engineers designers compared to those prepared by outside architect-engineering firms for DB procurement.

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Assessment of Pakistani Construction Industry – Current Performance and the Way Forward

Rizwan U. Farooqui and Syed M. Ahmed
Department of Construction Management,
Florida International University, Miami, Florida, USA

Sarosh H. Lodi,
Professor and Chairman, Department of Civil Engineering,
N.E.D. University of Engineering and Technology, Karachi, Pakistan

The Pakistani Construction Industry has always been of economic and social significance to the country. In contrast to the prospective share of Pakistani construction in the local and global economic market, conversely, the development of the sector has not been at par with the market demands. With the recent rapid economic growth of the country, Pakistan now offers a growing market for the construction industry. The Government of Pakistan has responded to this opportunity by planning extensive infrastructure expansion programs. All of these programs have the potential to lead the local Industry to establish respect, status and international recognition when the appropriate efforts are extended to achieve the same. Even with the opportunity for growth the challenges will be extensive. This research presents the current state of performance of Pakistani Construction Industry and provides directions for strategic improvement of the construction industry on a sustainable basis. Major findings of the research include: a cultural and behavioral shift in the mind-set of all participants in the construction process especially top management is necessary if the construction industry is to improve its performance and competitiveness; the "boom cycle" and corresponding shortage of labor trades has increased the need for industry participants to adopt and apply construction project management philosophy, tools and techniques to help them manage the industry performance and productivity in a sustainable long-term mode. The major obstacles to improving the performance of Pakistani construction industry were found to be lack of expertise/resources in construction project management and its applied areas. A rigid attitude and behavior of executive management toward quality, safety and risk management, plus more management and emphasis on employees' commitment toward project performance, better education and training to drive the improvement process, and tendency to cure the cause of the problem rather than the symptom. If coordination, teamwork, productivity and industry performance in the long run is going to improve, then extensive awareness and training programs to improve the clients' understanding and approach toward construction project management must be initiated without exception.

Keywords: Pakistan, Construction industry, Performance, Risk, Safety, Quality, Delay, Constructability, Low Bid Procurement, Best Value Procurement, Client Satisfaction Index

1. Introduction

The construction industry is an important sector of the economy and has multiple backward and forward linkages with other sectors. The industry contributes significantly to socio-economic development and employment and there is a consensus on certain common issues that plague the construction industry in developing countries.

Pakistan is a developing country that is currently enjoying relatively strong growth in construction activities. Today, construction is the second largest sector in Pakistan's economy after agriculture. Roughly 30-35% of employment is directly or indirectly affiliated with the construction sector. As such, the construction sector in Pakistan has played an important role in providing jobs and facilitating revival of the economy.

After the lost decade of the 1990s, Pakistan's economy has bounced back and has been exhibiting growth rates of above seven percent in recent years (Economic Survey of Pakistan, 2006-07). This, coupled with population growth rates of over two percent (Economic Survey of Pakistan, 2006-07), places an acute demand on basic and advanced infrastructure. The recent power shortages are a classic example of the rapidly growing economy's aging and deficient power infrastructure which is failing to cope with burgeoning demand and resulting in an energy crisis in the country. A similar situation also prevails in the supply of the transport infrastructure in Pakistan.

The Government of Pakistan has responded to this demand by planning extensive infrastructure expansion. The Federal Medium Term Development Framework (MTDF) allocates Rs2, 162 billion (US$36 billion) to the development of large infrastructure – embarking on an ambitious program to upgrade roads, railways, air, power, water and irrigation and other infrastructure. Of this, Rs993 billion (US$16.3 billion) will be through the Public Sector Development Program (PSDP). The MTDF envisages a tripling of the infrastructure PSDP from an average of Rs150 billion per year to Rs440 billion per year. The current FY08 PSDP allocation of Rs520 billion has already eclipsed this target.

There are other emerging infrastructure programs that are required to respond to the rapidly developing economy, and are not entirely included in the MTDF. These include the National Trade Corridor Improvement Program (NTCIP), the construction of large water reservoirs (Kalabagh, Diamer, Bhasha), the rehabilitation of the key barrages, delivery of clean drinking water, sanitation, and electricity to all and the new Islamabad Airport project (which alone require substantial investments over and above the MTDF). In addition, provincial governments, districts and towns/municipalities have also embarked on infrastructure improvements in the face of rapid urbanization.

In formulating these plans, the various tiers of government have primarily focused on identification of the required infrastructure and on the availability of public financing. There is also the growing realization that 'this infrastructure is needed immediately' – that is why; most of the implementation periods for this infrastructure delivery is now or at the latest over the next five to seven years. However, very little analysis has been done to factor in the constraints that may or will be posed by the wider construction industry.

This paper looks at the current state of Pakistani Construction Industry in terms of its performance – schedule, cost, quality, safety, risk, constructability, procurement, client satisfaction, etc. The main objective of the research is to identify the challenges and the bottlenecks that the industry is facing and to provide strategic recommendations and the way forward for sustainable improvement.

2. Pakistani Construction Industry – Historical Development

Since independence (1947) until about 1971, there were very few private developers/ constructors in Pakistan. Housing for public sector was done by the Provincial and Central Works departments through contractors, while the entrepreneurs constructed their residences mostly with the help of unqualified but skilled persons. After 1971, when land was made available in the city of Karachi by Karachi Development Authority (KDA) and larger allocations were made by the Government of Pakistan to Housing Building Finance Corporation (HBFC), a number of entrepreneurs, industrialists, businessmen, importers, consultants, etc., entered in the construction industry. Some of them had experience in building construction while others had neither enough managerial capability nor sufficient technical knowledge. The building construction industry did, however, get a boost.

With this boost, the builders and developers gathered to form associations such as "Association of Builders and Developers" (ABAD) with the objectives of improving the state of the industry as well as to provide a platform to showcase and address pertinent issues. Such associations, however, had to face several problems in dealing with authorities responsible for approving building plans, sale prices, conditions of sale, grant of house-building loans and so forth. For these and several other reasons, these associations largely failed to make serious efforts to improve the building construction industry itself. A few attempts to rectify and enhance the building systems could not be successful as those were applied without the adaptations necessary to make them suitable under the existing conditions prevailing in the country.

In relation to industrial and infrastructure sectors, until 1975, all the major projects such as Indus Basin Replacement Works, Warsak Dam, etc., had been done by foreign contractors. However, there was a change in government policy in 1975 to award more difficult projects to domestic construction industry in order for it to develop the necessary capability and confidence. As a result, these particular sectors were able to expand and develop their operations. Most of the development resulted from the decision of the Pakistan Steel Mills Corporation to entrust nearly all the construction work to Pakistan based contractors. Initially, there was resistance from different sectors as well as reluctance from local contractors because it was felt that local contractors were lacking the necessary capabilities (in terms of skill and equipment) and the experience to undertake such large construction work which demanded high level of performance and quality control. The supervision of Soviet experts in the area of project management helped the Pakistani contractors complete the job satisfactorily. Port Qasim is another example of high capacity work performed by local contractors. Owing to such projects, the physical capacity of the contractors increased and the contractors also increased their investment on training personnel and acquiring heavy construction equipment.

Nevertheless, after a short run of notable performances in the gigantic Indus Basin works which included construction of large dams (Tarbela, Mangla etc), barrages and link canals and the prestigious Pakistan Steel Mills project, the construction sector remained in a state of depression until recently, primarily owing to the negligence of the sector from the government in terms of inadequate policies and insufficient support. Companies like MLC (Pvt) Ltd, National Construction Ltd, Imperial Construction Company (Pvt) Ltd (now ICC) and Gammon Pakistan

Ltd played leading roles in the Pakistan Steel Mills project carrying out major portion of the civil, mechanical & electrical works. On the twilight of the twentieth century, all these companies were on the verge of closure in the overall recessionary environment and paucity of major public development projects. Historically, during this long state of depression, a vast majority of our projects have suffered from time delays, cost overruns, quality non-compliance, and safety failures.

The present government, realized that the engineering infrastructure, housing and building sectors are the backbone of any country's economy and play a vital role in the development of the country, has increased resources to further expand the basic infrastructure in the country. The effect has initiated a number of development projects which have led to increased demands of building and construction activities in the country. The government has acknowledged in the latest Economic Survey that the strengthening of the country's infrastructure is a basic imperative for sustaining growth momentum. During the last two years, the government has taken various budgetary and non-budgetary measures which are now yielding positive results. Construction activity in Pakistan is booming; demand for construction-related materials has surged. Many national and international real estate developers have launched or launching large construction projects in Pakistan which has further accelerated construction activity in the country.

As per the report of the Economic Survey of Pakistan, 2006-2007, Pakistan is in the midst of its strongest economic expansion phase and its growth momentum is broad-based. All the three major sectors, namely, agriculture, industry and services have provided support to strong economic growth. The year's real GDP growth has been powered by stellar growth in construction by 17.2 percent. Brisk pace of activities in private housing, high rise buildings along with large public sector spending on physical infrastructure and the on-going reconstruction activities in the earthquake affected areas have contributed to the sharp pick up in construction value-added. Construction with many forward and backward linkages is also making impact on the economic growth by contributing 5.2 percent or 0.4 percentage points to this year's real GDP growth. Construction is also highly labor intensive sector and a strong growth in this sector has generated a variety of jobs.

Pakistan now offers a growing market for the construction industry. According to Vision 2025, more dams and other projects have been announced for the feasibility and construction. Construction of two mega projects of Dams Bhasha Dam & Munda Dam been announced and will complete up to year 2016. Other projects like Liyari Expressway, Northern By-Pass and several other infrastructure projects are in progress.

Business Monitor International's (BMI) newly released Pakistan Infrastructure Report 2007 forecasts an average construction growth rate in the region of 8% over 2006-2010. Increased spending on infrastructure development programs covering the roads, railways and power segments, in addition to the ongoing reconstruction work in quake-hit areas, is expected to drive construction growth over the next few years.

3. A Point in Time Analysis of Pakistani Construction Industry – Research Rationale and Methodology

3.1 Research Rationale, Objectives and Scope

As identified earlier, compared to the past, the current decade is witnessing massive infrastructure growth in Pakistan. There are numerous infrastructure development projects in progress as well as under planning. With the stage set for an increase in development, the challenges are still higher. The "boom cycle" and corresponding shortage of labor trades has increased the need for industry participants to adopt and apply construction project management philosophy, tools and techniques to help them manage the industry performance and productivity in a sustainable long-term mode.

With the objectives to assess the current level of construction industry *performance* and develop recommendations for improvement, the research was aimed at investigating the industry performance in the following respects:

1. General Construction Project Management Practices – Extent of Application of Project Management Functions, Tools, Techniques and Systems
2. General Construction Project Management Practices – State of Adoption and Implementation of Construction Project Management Procedures
3. Risk Management Performance – Stakeholder Perceptions and Trends
4. Risks Management Performance – Critical Causes of Risks and their Responsibility Allocation
5. Delay Management Practices – Critical Causes of Delays and Delay Responsibility Allocation
6. Safety Culture – Perceptions and Practices
7. Quality Culture – A Way Forward to Total Quality Management Implementation
8. Constructability Practices
9. Contract Management Practices
10. Bid Procurement Practices – Performance Implications of Low Bid Environment
11. Bid Procurement Practices – A Way Forward to Implementing Best Value Procurement
12. Client Satisfaction Index in the Industry

3.2 Research Methodology

Structured surveys and expert interviews were conducted to understand the performance constraints as well as issues and problems that plague the construction industry in Pakistan. The analysis thus focused on identifying measures that could be implemented in Pakistan for enhancing local stakeholder performance as well as provide for sustainable growth of the industry.

The point in time analysis was done in two stages.

In the first stage, extensive literature review was performed to identify the constraints faced by the construction industry in other developing countries, to draw upon their experiences and consider the lessons learnt in the local context.

In the second stage, using the literature review as well as conducting a number of interviews with local experts, structured questionnaire surveys were developed with the objectives to provide tools for the assessment of the construction industry performance and to develop recommendations for improvement. A synopsis of the survey methodology adopted is given as follows:

1. An exhaustive list of industry stakeholders/owners was prepared as a first step using mainly the Pakistan Engineering Council's (PEC) comprehensive list of consultants and contractors.
2. An initial screening was done to identify stakeholders/owners working mainly in the major cities of Pakistan and primarily with commercial building and infrastructure related projects. Certain dominant firms in the industry were particularly included in the sample.
3. The industry wide survey had a sample size of 209, 36 of whom were public clients, 18 engineering and design consultants, 12 construction management consultants and 143 contractors. The clients selected were mainly decision-makers belonging to executing agencies and ministries which are responsible for delivering large infrastructure projects in road, water, power, railways, Civil Aviation Authority (CAA) and port sectors. In the final selection of 143 contractors, 62 were from C1, 41 from C2 and 40 from C3 (PEC Constructors categories are as follows: C1, no limit, average turnover past 3 years of Rs20 million; C2 up to Rs100 million, turnover Rs15 million; C3 up to Rs50 million, turnover Rs5 million; C4 up to Rs20 million, turnover Rs2 million; C5 up to Rs10 million, turnover Rs1.4 million; and C6 up to Rs5 million, turnover of Rs0.5 million). The C4 and lower category contractors were discarded from the survey list owing to the limited sphere of influence these contractors are able to bring to the improvement of the overall construction environment.
4. Almost 80% of the surveys conducted were face-to-face meetings. This approach, although required a much larger effort, proved to be highly successful and the overall response rate was 71%.

A synopsis of key research findings is given in the section 4 and a portion of the research findings have already been published by the authors in various conference proceedings and will be appropriately referenced in the text.

4. Assessment of the Current Performance of Pakistani Construction Industry – Research Results

The salient results compiled from the research are given in the following sub-sections.

4.1. Construction Project Management Practices – Extent of Application of Project Management Functions, Tools, Techniques and Systems

Lack of professional construction project management implementation is rampant in the industry. Significant project management weaknesses in the client and contractor organizations include: inefficient contract administration; lack of professional planning; lack of competent project control; slow decision making; lack of communication; and lack of leadership. Except for the construction phase, there is a fairly low trend of application of project management functions in various project phases. The Trend of employment of external project management consultants

is low; however, this does not imply strong in-house project management support as is evident by the research results. Also the project management tools and techniques are not used in high frequency among stakeholders/owners for various project management functions. Only the trend of usage of project control tools and techniques is in acceptable range. With computer aided project management tools and techniques are more frequently used only in preconstruction and construction stages, but still not within acceptable range. Lastly the project management data logging and communication system is inadequate and needs considerable refinement.

4.2 Construction Project Management Practices – State of Adoption and Implementation of Construction Project Management Procedures

The implementation of project management has not been at par in most of the organizations and has only moderately succeeded in improving stakeholder relationships and project performance. As evident from the findings of the study, the project management program has not been largely successful by virtue of the following:

- Unsuitable organizational culture for successful project management implementation. Most organizations have a balanced matrix structure; only few are projectized (project-based) – project management organization is still immature in most organizations.
- Lack of project management commitment by top management (lack of project management policies and procedures).
- Inadequate project management team building
- Use of traditional design-bid-build unit price/ lump sum competitive lowest bidding project delivery mechanism, which by virtue is adversarial in nature.
- Lack of application of specialty contracting.
- Lack of emphasis on project documentation submission requirement from contractors as essential bid decision making criterion during the preconstruction stage.
- Lack of focus on formal project planning, scheduling and performance tracking.
- Project decisions mostly made by in-charge of the project based on intuition and personal judgment.
- Project team and managers not extensively subject to audits and evaluation.
- Project lessons learned not logged by most stakeholders/owners for performance improvement purposes.
- Post project performance ratings not being done for contractors/ subcontractors by more than half of the respondents; suppliers also rarely rated for performance.
- Little formal project management training disbursed to employees; only some sort of informal project management training given by moderate number of the respondents to their employees – the major focus of training being project site control.
- Punch list items are usually not resolved in due time.

Compulsory involvement of construction project management consultants for major works in the public and private sectors should be mandated. The present system of construction supervision by engineering and design consultants has not paid off. This is primarily owing to their lack of emphasis on project management as compared to design implementation. Historically, by virtue of their knowledge and experiences, the consultants have proved to be highly technically oriented focusing their time, commitment and skills on design issues rather than management

issues which result in unsatisfactory results on project time, cost, quality, and safety performance.
As major consequence of project management non-performance the clients call the contractors back for warranty claim on almost 50% projects. The results clearly advocate a need for proactive government support for industry capacity building and training in construction project management.

4.3 Risk Management Performance – Stakeholder Perceptions and Trends [Farooqui et al. (01), 2007]

Formal risk management practices are infrequent among stakeholders/owners and the projects suffer from low productivity resulting in project delays and cost overruns. In many situations, stakeholders/owners perceive risks based on their own experience and judgment rather than using systematic procedures to identify, assess and resolve the risk. It can be concluded from the findings that stakeholders/owners in Pakistani construction industry, owing to lack of systematic procedures, do not have adequate capability of retaining and mitigating risks and hence resort to mechanisms such as transferring risks.

The top 5 obstacles in the implementation of formal risk management program, as indicated by the respondents, are shown below in descending order of responses:

1. Lack of expertise/resources in risk management (shortage of risk analysts)
2. Risk analysis of construction projects is seldom formally requested by clients, as they expect project management practice to set up projects risk-free.
3. Lack of accepted industry model for analysis
4. Time constraints

4.4 Risk Management Performance – Critical Causes of Risks and their Responsibility Allocation

A *risk value* and a *risk criticality index* was used to identify the major risk causes in the industry which, in descending order of criticality, were found to be as given in the top part of Table 1. The *criticality ranking* for various risk categories as identified by the research findings is given, in descending order of criticality, in the bottom part of Table 1.

4.5 Delay Management – Critical Causes of Delays and Responsibility Allocation [Farooqui et al. (02), 2007]

A *delay value* and a *delay criticality index* was used to identify the major delay causes in the industry which, in descending order of criticality, were found to be as given in the top part of Table 2. The *criticality ranking* for various delay categories as identified by the research findings is given, in descending order of criticality, in the bottom part of Table 2. The top most category of delay is “Design related delays” with responsibility lying on the design consultants.

Even though stakeholders/owners in Pakistan are aware of the significance of delay in terms of producing adversarial relationships in a project leading to financial implications, they are not

well aware of the concept of formal delay analysis, avoidance and control. The owners do not involve the contractors by most clients in the conceptual and design-procurement phases, but it is believed to an extent that their involvement in the early phases of the project can avoid delay.

Table 1. Major Risk Causes with Responsible Entities– Various Risk Categories (Top); Categorical Risk Criticality Ranking with Responsible Entities (Bottom)

Risk Cause	Category of Risk	Responsible Entity	Risk Criticality Ranking
Price Fluctuation	Financial/ Economic Risk	Contractor	1
Inflation	Financial/ Economic Risk	Owner	2
Underestimation of project cost	Management/ Administrative	Owner	3
Cost overruns due to schedule delays	Management/ Administrative	Contractor	4
Delayed payments	Financial/ Economic Risk	Owner	5

Category of Risk	Major Responsible Entity	Categorical Risk Criticality Ranking
Financial/ Economic risks	Owner (100%)	1
Design related risks	Consultant (100%)	2
Construction site related risks	Contractor (72.5%)	3
Contract related risks	Owner (86.3%)	4
Management/ Administrative risks	No single major responsible entity (Contractor = 45%)	5

4.6 Safety Culture in Pakistan Construction Industry – Perceptions and Practices [Farooqui et al. (03), 2007]

Although construction industry stakeholders/owners in Pakistan are generally aware of the priority of safety as well as its significance to the industry but lack commitment, cooperation, expertise and familiarity with tools to implement safety culture on their projects. Formal safety management practices are infrequent among stakeholders/owners and the projects suffer from accidents resulting in productivity losses, project delays and cost overruns. Therefore it can be concluded that owners/stakeholders/owners in Pakistan construction industry, owing to lack of commitment as well as lack of systematic procedures, do not have adequate capability of maintaining a safe project. The owners are considered to be the key initiators for project safety; without owner commitment to safety, contractors are not willing to accept major responsibility for safety and hence their lack of commitment. A cultural and behavioral shift is needed in the stakeholder perception about safety management implementation and improvement on projects. The major obstacles faced by contractors to the implementation and improvement of safety include – in decreasing order of significance – absence of the following: worker cooperation and behavior, familiarity and expertise with safety management techniques, safety awareness and knowledge, owner commitment, and a safety regulatory framework.

Table 2. Major Delay Causes with Responsible Entities– Various Delay Categories (Top); Categorical Delay Criticality Ranking with Responsible Entities (Bottom)

Delay Cause	**Category of Delay**	**Responsible Entity**	**Delay Criticality Ranking**
Change orders/ directives	Contract Related Delays	Owner	1
Labor productivity issues	Labor Related Delays	Contractor	2
Poor site management and supervision	Management/ Administrative Delays	Contractor	3
Inspections/ Audits	Construction Site Related Delays	Contractor	4
Poor cost estimation & control	Management/ Administrative Delays	Contractor	5

Category of Delay	**Major Responsible Entity**	**Categorical Delay Criticality Ranking**
Design related delays	Consultant (100%)	1
Financial/ Economic Delays	Owner (100%)	2
Contract related delays	Owner (85.71%)	3
Construction site related delays	Contractor (64.29%)	4
Subcontracted work related delays	Contractor (100%)	5

4.7 Quality Culture in Pakistan Construction Industry – A Way Forward to Total Quality Management Implementation [Farooqui et al. (04), 2007]

Although the construction industry organizations in Pakistan are aware of the importance of quality, their knowledge about TQM is limited, as well as their perception about quality is of a 'curative nature' (a means to eliminate defects) rather than a 'preventive nature' (a process improvement approach).

Majority of the construction industry organizations perceive quality as meeting technical specifications in order to satisfy external customers and provide value for money.

Most stakeholders/owners feel that TQM will not work in their organizations because of current organizational and industry culture. However they are aware, to some extent, of the benefits of implementing TQM in their organizations and feel that it will be highly beneficial if it can be implemented. Most of them think that TQM is a means for improving cost estimating, warranty claims and project economy.

Construction industry organizations in Pakistan are less focused on data acquisition. Neither customer suggestions nor customer satisfaction are given due significance and are rarely incorporated or evaluated. Employee suggestions are seldom taken; neither employee empowerment exists in majority of firms. This also refutes their claim that company policy invites employee participation in the quality building effort. Most of the companies do not rate post-project performance of their service providers.

Quality implementation on projects is not the highest priority to construction industry organizations; due to cost constraints, quality is mostly compromised.

The majority of construction industry organizations either do not have a code of ethics or even if they do have, the implementation of this code is highly questionable because they do not have any disciplinary process for its implementation.

While no unique trend was found in those organizations who have implemented a quality management program, most organizations prefer QA/QC and informal quality management programs. No organization has TQM implemented as their quality policy. Most of the organizations are implementing periodic short-range solutions or motivational programs rather than more formal long-term programs.

Most of the construction industry organizations do not provide any formal training to their employees about quality management systems.

The top 5 obstacles in the implementation of TQM program, as indicated by the respondents, are:

1. Lack of expertise/resources in TQM
2. Rigid attitude and behavior of executive management toward quality
3. Lack of top-management commitment/understanding
4. Lack of employee commitment/understanding
5. Lack of education and training to drive the improvement process

The organizations in Pakistan are generally neither willing nor prepared to adopt Total Quality Management (TQM) as a management philosophy within their organizational cultures.

Most organizations are unenthusiastic regarding TQM implementation and are unwilling to invest in it; in terms of both capital and time.

Only few organizations identified the procedure for TQM implementation that should, through persistence, allow the Pakistan construction industry to adopt TQM philosophy successfully.

4.8 Constructability Practices [Farooqui & Ahmed (01), 2008]

The general perception of stakeholders/owners about constructability needs to be improved as most stakeholders/owners believe that:

- Constructability efforts should typically begin during construction phase, which is a wrong perception.
- Constructability should be implemented only on large projects and not all projects, which is also a wrong perception.

The extent of usage of constructability in Pakistan construction industry is fairly low, particularly during preconstruction (where it's mostly needed).

The main reasons for low extent of usage of constructability practices, as found by the research study, are:

- Constructability is not usually required/ encouraged by project owner (or owner's representative).
- Stakeholder perception about constructability is not totally correct.
- Stakeholder perception about potential constructability benefits needs is not totally correct.

Many constructability procedures are of very simple nature and are not very difficult to practice but the need is to evoke the importance of this to the local professionals. The prevailing project practices are mostly outdated. There is an urgent need of introducing innovative and state-of-the-art tools and techniques that have been developed in advanced countries to Pakistan.

Contractors extend moderate level of participation in constructability operations during construction phase and most of this involvement is self-motivated and self-supported rather than owner required.

The top 5 major barriers (in descending order of criticality) towards implementing constructability are identified as:

- Lack of documentation and retrieval of "lessons learned"
- Lack of owner awareness of benefits, concepts, and so forth
- Satisfaction with status quo ("Over satisfaction" with current performance)
- Lack of designer awareness of benefits, concepts, etc.
- Failure to search out problems and opportunities

A fair number of stakeholders/owners believe that:

- major project problems can be resolved by the early application of constructability and
- Construction should be included as another specialty during the early project phases.

4.9 Contract Management Practices

Equitable basis of bidding at the time of contract be achieved through proper prequalification/ prescreening. Presently, most of the contracts are one sided, giving the government agency overwhelming control. This is generally treated as a major negotiating achievement, but in most cases practically promotes corruption. In order to make undue profits, contractors carry out substandard work, which is passed as satisfactory by the supervisory authority. Prequalification process of contractors should be improved by ensuring that only qualified contractors are prequalified.

Contractors should be given reasonable payments to perform the work. Because of high competition, a substantial number of contractors quote minimum rates and at times quote on the basis of performing substandard work, but most likely to be accepted by the consultants/ owner. The contractors thus cut corners at the time of quoting rates. When contracts are called, the difference between the lowest and the highest bidders is at times as great as 75%. This large difference, apart from other factors, does in fact, to a great extent, reflect the difference in quality

of work that the contractors are offering. The work is awarded to the lowest bidder and hence the quality of work suffers.

The contractors who work for organizations such as Public Works Department face additional financial problems because these organizations award contracts on the basis of scheduled rates which are, in most cases, lower than the prevailing market prices of labor and material. Contractors, having left with no other alternative, quote on the basis of this realization and rely heavily on claiming for changes and extra works arising during the course of the contract as well as try to compensate and make profits by producing work which is lower than the specifications. Corruption has also been reported in approvals of substandard works.
Since scheduled rates are unrealistic and are a source of considerable malpractices, situation may be improved if the contracts are based on the bill of quantities rather than the scheduled rates.

Furthermore, while lowest bidding in itself is not a suitable method for award of contracts primarily because it compels the industry as a whole to compromise on low quality standards and not strive for continuous quality improvement, the way it is applied under the present circumstances in Pakistan, further reduces its effectiveness to a point that in most cases it would be economical to reject the project proposal. If the bid evaluation techniques take into account the underlying problems, improvements in the competitive bidding structure are possible.

Low estimates should be looked at utmost care and if it is determined that the contractor is not capable to produce the desired quality of output at the quoted rates, the bid should be rejected outright. It must be ensured that the bidders are quoting for approximately the same quality of work and that they will obtain reasonable profit.

Delays in contractor payments should be avoided. One of the most common complaints of the contractors is the delay in payments by the owners. These delays mainly occur because decisions concerning “extras” are not taken timely. Since matters remain pending, construction cost goes higher causing further problems for the contractors.

Contractors should be given reasonable time to carry out the work. In most cases, the time provided by the owner to the contractor for work completion is not reasonable. This is primarily because the deadline is more based on time decisions taken by the higher ups with their own bureaucratic and political reasons, rather than a structured management approach to project time analysis based on the scope and complexity of work involved as well as considering the industry work productivity. Provision of unreasonable time not only affects the quality of work but also reduces the probability of project completion on time. With little organized structure of resolving disputes and claims, these issues usually remain unresolved pending court decisions for a significantly long period of time.

Drawings, specifications and project supervision should be improved to ensure better productivity and quality. Provision of detailed drawings is one factor which needs attention. In many projects, detailed drawings are either missing or are inadequate and provide the contractor very little information about the job.

Engineering and design consultants usually require that the construction work be done as per given specifications. However, in the absence of locally developed standards by the parties involved, these requirements often come from U.S. or British construction standards manuals. In many cases, the contractors do not have sufficient knowledge and understanding about these standards. Some may not even have a copy of these standards. This is one of the basic and common inadequacies among the contractors. Most contractors perform work as per their idea of standard practice rather than standard specifications. Another common issue is that the set of specifications provided by consultants in several cases lack clarity. Basic details such as acceptable tolerance levels tend to be missing. Improvement in specifications writing and compliance is required for improved construction output. There is a need for professional construction project management consultants to improve the management scenario.

As regards project supervision, contractors are usually faced by the following issues:

- Essential information related to the project is not disbursed timely to them resulting in unnecessary costs to the contractor.
- The program of work framed by the consultants is, in many cases, unreasonable resulting in idle labor and equipment on site.
- Prompt measurement of work is not done.

In summary, prequalification of unqualified contractors, unfair quotations, lack of adequate specifications and working drawing details, delays in decision making in various stages of the project, and delays in making payments are some of the reasons which are preventing the construction industry from growing at a faster pace. Each of these problems has grown to such an extent that corrective action by the government is absolutely essential to improve the efficiency of the construction industry.

4.10 Bid Procurement Practices – Performance Implications of Low Bid Environment [Farooqui & Ahmed (02), 2008].

Barring a few exceptions, most client agencies are plagued by outdated, defective and non transparent procurement rules and regulations. Stakeholders/owners strongly desired that the enlistment procedures and selection criteria should be uniform across all executing agencies. They said that same inefficient consultants and contractors continue to get work due to the absence of objectively enforced stringent selection criteria. It was believed that the procurement processes would improve considerably if an independent consultant/contractor rating system could be introduced.

At present, contractors despite lacking in capacity continue to get work. Legislation of the country requires that construction contracts for public work projects be procured using a competitive sealed bidding process and awarded to the responsible bidder submitting the lowest bid. The majority of public sector construction contracts continue to be awarded solely based on the lowest price. A long-standing concern expressed by public owners, however, is that low bid, while promoting competition and a fair playing field, may not result in the best value for money expended or the best performance during and after construction. The practice of awarding

contracts on the basis of the lowest bids, which is prevalent in all agencies, was considered to be the major cause for poor quality of inputs and outputs. Similarly, the preferential use of public sector firms was a discouraging factor for the private sector.

The procurement processes were thought to take too long to complete, decisions regarding approvals were delayed and similarly, procedures prescribed by donors were considered to be a cause of delays. Quite often government rules were said to be in conflict with donor/lender rules.

Conditions of contract were considered to be imbalanced, suffered from a lack of effective escalation clauses and had complex and time consuming dispute resolution mechanisms. Stakeholders/owners desired that the standard FIDIC form of contract should be used by all agencies.

Procurement of works was also considered to be delayed due to slow and inadequate release of allocated funds for projects. The problems are compounded when project cost estimates are often incorrectly prepared to start with (implying poor design and evaluation capacities or the use of incorrect rates).

The majority of stakeholders/owners including clients, acknowledged the negative impact of low bids by local consultants and contractors on foreign firms seeking work in Pakistan. Acceptance of the lowest bid was stated to be the cause of:

- Insufficient rates
- Inadequate salaries
- Insufficient cash flows
- Delayed payment to subcontractors
- Delays in project completion dates (Unrealistic schedules)
- Specifications compliance problems
- Problems with physical interference
- Tolerance problems
- Weather related problems that could be avoided during design phase
- Low participation rate from international contractors and consultants

Major Project Delay Factors, Cost Overrun Factors, Quality Non-Conformance Factors and Safety Non-Performance Factors as attributed to Low Bid Environment are given in Table 3 (each in descending order of criticality).

Table 3. Major Project Delay, Cost Overrun, Quality Non-Conformance and Safety Non-Performance Factors as attributed to Low Bid Environment

Delay Factors	**Criticality Index**
Payment delays	1
Budget difficulties	2
Material procurement delays	3
Approval delays	4
Work suspensions	5
Cost Overrun Factors	**Criticality Index**
Incompetent site staff of designer	1
Economic problems (e.g. price escalation, exchange rate fluctuation)	2
Approval issues	3
Weather related issues	4
Permits approval process	5
Quality Non-Conformance Factors	**Criticality Index**
Material selection/ Procurement	1
Economic problems (e.g. price escalation, exchange rate fluctuation)	2
Lack of coordination on Site	3
Design decisions	4
Poor supervision	5
Safety Non-Performance Factors	**Criticality Index**
Incomplete construction drawings	1
Work suspensions	2
Ineffective safety observation program	3
Lack of effective work procedures/ rules for safety performance on site	4
Poor supervision	5

4.11 Bid Procurement Practices – A Way Forward to Implementing Best Value Procurement

The perceived benefits of adopting alternate procurement strategies (such as design-build), in descending order of value of benefit, are:

1. Improved contract management
2. Improved team coordination
3. Improved project quality
4. Reduced number of project changes
5. Improved schedule and cost control

The perceived benefits of adopting best value procurement as an alternate procurement strategy, in descending order of value of benefit, are given in Table 4.

Table 4. Perceived Benefits of Best Value Procurement

Benefits	**Benefit**

	Rating
Qualification Benefits	
Opportunities for the contractor to create innovative management plans	1
Opportunities for higher safety	2
Opportunities to add significant value to the team	3
Quality Enhancement Benefits	
Opportunities for contractors to provide higher quality materials	4
A competitive advantage on variance in construction management techniques	5
A competitive advantage on variance in construction quality	6
Cost Savings Benefits	
Opportunities for contractors to provide products or designs with lower lifecycle costs	7
Opportunities for contractors to provide products or designs with lower construction costs	8
Improved ability of contractors to accept and positively respond to project growth	9
Schedule Savings Benefits	
Opportunities for contractors to reduce the project schedule	10
Improved ability of contractors to accept and positively respond to schedule growth after award	11
Opportunities for a shorter schedule	12

The major obstacles in adopting alternate procurement strategies (such as best value procurement), in descending order of severity, are:

1. Lowest price bidding is the traditional form of contracting strategy
2. Lowest price bidding is mandated by government regulations for public projects
3. Owners/ government only care about bidding price
4. Rigid attitude and behavior of executive management
5. Cost and time of implementation

4.12. Client Satisfaction Index

Mean Client Satisfaction Index (CSI) for Various Categories of Factors are given in the top part of Table 5, while the major Client Dissatisfaction Factors are given in the bottom part of Table 5, both in descending order of criticality.

Table 5. Major Client Satisfaction Indices (Top); Major Client Dissatisfaction Factors (Bottom)

Category	Mean CSI	Criticality Index
Regulatory/ Code related factors	3.13	1
Financial / economic factor	3.20	2
Administrative and management factors	3.21	3
Construction related factors	3.44	4
Design related factors	3.43	5
Contract related factors	3.50	6
Logistic factors	3.58	7
Factor	**Category**	**Criticality Index**
Political issues	Administrative and management factors	1
Law and order issues	Administrative and management factors	2
Contractor input in value engineering and constructability assessment	Construction related factors	3
Economic issues (e.g. price escalation, exchange rate fluctuation)	Financial/ Economic factors	4
Adequacy of subcontractor resources	Construction related factors	5

5. Pakistani Construction Industry – The Way Forward

5.1 Recommendations for Industry Performance Improvement

Using the research findings, the following recommendations are proposed for industry performance improvement.

There is a tremendous need for application of professional construction project management knowledge, tools, skills and techniques, which cannot be achieved until concerted speedy efforts are extended toward educating the industry, universities, supervisory bodies and owners as well as improving and strengthening the construction industry practices.

Successful implementation of construction project management in Pakistan construction industry can be achieved through persistence, positive hands-on leadership, upfront preparation and continuous maintenance of a sensible plan. The following basic steps are identified for improving the implementation of construction project management in the Pakistan construction industry:

1. *Obtain client commitment to risk assessment. This is crucial to success.*
2. *Generate awareness, educate project staff and change attitude.*
3. *Develop and document approaches to project management to projects.*
4. *Prepare project management plans for all levels of work and for various aspects of project management (risk, safety, quality, delay mitigation, etc.).*
5. *Install organization and managing bodies.*
6. *Institute proper tools and techniques which may enable the participants perform formal project management.*

7. *Promote staff participation and contribution by pre-task meetings and initiate brainstorming sessions.*
8. *Review response plans and measure performance.*

The authors strongly believe that a major need of the industry is to *develop the attitude of clients towards an active project management implementation,* since clients are usually the driving factor towards an active and mature project management system. Therefore, a change in the views and attitude of the clients through awareness programs can bring a prominent and distinctive change in the project management status in Pakistan not only among stakeholders/owners but also in the entire construction industry.

It would be appropriate to *arrange some form of formal and/or informal education and training on various aspects of construction project management* (quality, safety, risk, delays, cost, etc.). Formal education could be graduate studies in safety management systems. Informal education and training could take the form of career development programs organized by academic institutions or professional organizations.
Early contractor involvement in a project (in design phase) can help improving the constructability of a project and hence can contribute significantly in avoiding delays, project risks and in improving project quality and safety.

A constructability coordinator should be assigned by the project owner on every project to oversee the implementation of constructability.

Construction should be included as another specialty during the early project phases (just like architecture, design etc.).

Allocating the construction personnel (experts) to or locate them in close proximity of the design team and proposing construction methods that may improve construction efficiency of the project during preconstruction can improve project productivity as well as increase the probability of project success.

Careful analysis of layout, access and temporary facilities to improve productivity and use of tools that reduce labor activities, increase mobility, accessibility, safety or reliability can do the same in construction phase.

In Pakistan, currently there is no regulatory agency or organization for occupational safety management (for instance, OSHA – Occupational Safety and Health Administration in the USA). The primary construction regulatory body in Pakistan – the Pakistan Engineering Council (PEC) has yet to lay down safety laws and regulations that will be adopted by the stakeholders/owners in order to implement safety practices. Such regulations need to be defined and enforced. Hence the *need for such an administrative body is evident*; however, the integrity and effectiveness of such an organization is a major concern in relation to the existing adversarial business environment in the construction industry of Pakistan and need to be addressed. The jurisdiction and authority of this organization also need to be defined.

The current rating of contractors by PEC does not incorporate contractor safety performance. Incorporating safety performance as a factor in contractor rating would encourage the contractors to adopt safety management practices in their companies.

As a catalyst for maintaining safe, risk free and quality projects, contractor top management should formulate strategies and develop policies that nurture a project management culture. Construction management should be emphasized at all times no matter how fast the construction needs to be completed and under what budget constraints. Contractors should integrate management training programs with other practices according to their budget. Training can be provided in many ways: on-site training, meetings before the start of any work; large size contractors may develop separate training departments. Contractors should encourage their project managers to develop detailed project plans and schedules incorporating risk, safety and quality.

The project management has to play a key role in project management implementation. They should take it as their responsibility to consider managerial concerns during the planning stage and give safe and quality work plans to their clients (project owners and contractors). Project managers, as project coordinators, should also educate and motivate all stakeholders/owners to implement safety and quality on projects.

Coordination is needed from initial phase to end phase among all stakeholders/owners for successful project management implementation. However, most of the clients use the traditional design-bid-build delivery system, which, by nature, leads to lack of trust and confidence, adversarial relations, and increased arbitration and litigation, hence rendering the system devoid of effective communication and teamwork. Also, partnering, as a contracting strategy, is not practiced by any client. The industry has become increasingly reliant on back-dated poorly defined specifications, which neither exactly say what the owner intends them to say, nor compel the contractor to improve performance. This has led the owners to shift more of the risks to the contractors. The net outcome is that the construction industry has been bogged down with paperwork, defensive posturing, and generally tends to have a hostile attitude toward the other participants. Total Quality Management can help reverse this trend. Although, not a magic pill or panacea for all illnesses, it will, if properly implemented, help construction companies improve and will help all the parties come closer that would bring long-term benefits.

5.2 Future Research and Development Directions

The findings of the research conducted have helped in identifying the future course of action for long term sustainable improvement of construction industry in Pakistan. The root causes of underperformance of the industry have been identified, which have led to the conclusion that there is a tremendous need for application of professional construction project management knowledge, tools, skills and techniques, which cannot be achieved until concerted speedy efforts are extended toward educating the industry, universities, supervisory bodies and owners as well as improving and strengthening the construction industry practices. Future research and development in the sector should aim to achieve the following key objectives:

- Develop a strategic model for the improvement and strengthening of construction management education, research and practice in Pakistan with particular focus on enhancing the competitiveness of industry professionals so as to enable them to apply state-of the-art construction and construction management practices in infrastructure development as well as equip them with the necessary knowledge, skills, tools and techniques so that they are able to take effective assets management decisions.
- Devise a framework to standardize the construction industry practices for achieving improved performance on cost, time, quality, aesthetics, reliability and safety
- Build capacity of academia, industry and government in the area of construction management so as to improve the overall efficiency and productivity of the construction industry and hence improve its contribution toward the country's economy and improving international image.
- Replace the existing low bid procurement system with best value procurement system. As such, the research findings have formed the baseline for developing a proposal for implementing best value procurement system for the construction industry of Pakistan, which can be an essential contribution to attain the strategic objectives of improving the construction industry in Pakistan.

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Case Study of Sustainability of the PIPS Best Value Program at the University of Minnesota

Kenneth T. Sullivan, John Savicky, and Dean Kashiwagi
Arizona State University
Tempe, Arizona

This is a case study testing the hypothesis that the best value PIPS process is a sustainable process/structure. The best value PIPS process has been tested 450 times over 13 years. However, the process/structure has not been sustainable, meaning that users have been successful at individual tests, but unable to imbed the system into their organization and standard operating procedures. It has been resisted because it minimizes the need for construction management, simplifies the delivery process and transfers both risk and control to the contractors. The University of Minnesota approached the Performance Based Studies Research Group (PBSRG) to test and implement the process. Unlike other research clients, they agreed to meet the requirements for sustainability: implementing a long term strategic plan, using and instructing a core team, running tests before full implementation, and implementing continuous education to both client professionals and contractors. This study shows the results of the hypothesis testing.

Key Words: Best value, Sustainability, PIPS, Risk management

Introduction

The Performance Information Procurement System (PIPS) is a best value selection program that was created in 1991 and developed at Arizona State University, Del E Webb School of Construction's (DEWSC) Performance Based Studies Research Group (PBSRG).

PIPS is a best value selection process that identifies a high performing vendor, forces the vendor to minimize risk that they do not control, and self regulates through risk management. The PIPS differs from other processes in the following ways (Kashiwagi 2008):

1. Minimizes the client's decision making and need for expertise and decision making.
2. Contractually forces the vendor to minimize risk that they do not control.
3. Selection concentrates on the ability of key personnel and critical subcontractors to minimize risk.
4. Requires the selected vendor to perform specified preplanning activities before the contract is awarded.
5. Transfers risk and control of the project to the vendor before contract is awarded.
6. The vendor manages, controls, and documents the project including change orders and reactions to unforeseen conditions.
7. Measures the performance before and after a project of all critical elements, which affects the competitive nature of the vendor in future projects.

The PIPS best value selection process is based on the following assumptions drawn from results of the traditional delivery of construction (CMAA 2004, Cottrell 2006, Hwang and Liang 2005; Gordon and Akinci 2007, Post 1998):

1. Construction nonperformance is caused by an inefficient delivery system.
2. Inefficiency and nonperformance are congruent principles.
3. The client dictates the level of performance of the contractor.
4. Client management, control, direction, and inspection of a contractor is inefficient and ineffective.
5. Management should be minimized by all participants in the delivery of construction.

Over forty different organizations have tested the PIPS best value selection process on 531 projects, including:

1. State of Hawaii (194 projects, $63M, 3 years)
2. State of Utah (12 projects, $81M, 2 years)
3. United Airlines (34 projects, $16M, 3 years)
4. Federal Aviation Administration (55 projects, $14M, 2 years)
5. Motorola, IBM, State of Georgia, State of Wyoming (21 projects, $56M, 1 year)

By 2002, the PBSRG had run the PIPS best value selection process on system installation, renovation projects, and new construction. The results were significantly different from the traditional delivery of construction (56 percent On time, 41 percent On budget) (Post 1998). The program had documented the following results:

1. 384 projects, $234 M of construction services delivered, and 98 percent performance (on time, on budget, and meeting client expectations).
2. Client project managers could handle up to ten times the number of projects they were able to handle in the past (State of Hawaii 2002).
3. Contractors were able to do twice as much work and make 5 percent more profit when compared to low-bid work (State of Hawaii 2002).

Despite the outstanding results, the clients testing the PIPS process could not sustain the use of the program for reasons listed below.

1. *State of Hawaii:* When a new governor took office, the newly appointed comptroller ignored the successful results of the program and terminated the program. The program was also implemented much faster than was advised by the PBSRG.
2. *State of Utah:* One of the preconditions of using PIPS was that the State of Utah would not use the pre-award period. The results on five new construction projects was 100 percent on time, no contractor generated cost change orders, and high customer satisfaction. However, the State decided to modify the system due to political pressure.
3. *United Airlines:* United Airlines used PIPS for maintenance and repair of their facilities. They finished all of their projects before UAL declared bankruptcy and stopped doing maintenance and repair.

4. *Federal Aviation Administration*: Procurement/contracting office stopped the use of PIPS due to the increased amount of construction work (33 percent) with no assistance of manpower.
5. *State of Georgia*: Stopped using PIPS when two test projects were overdesigned, and the State found out that they were the biggest risk in the delivery of the two projects (and not the contractors).

Harvard University

In 2003, the PBSRG hypothesized that "an information-based risk management decision support system can be successfully implemented and sustained in an organization that optimizes individual functions and organizational structure by minimizing construction management and delivering higher performance (on-time, no contractor generated cost change orders, and high quality and customer satisfaction) by 30 percent for the same price (Kashiwagi 2008)." The objective of the PBSRG was to create and test sustainability requirements to allow users to implement and sustain the PIPS best-value program. Harvard University went ahead with the research tests based on the documented results of PIPS. The difference between the Harvard University tests and previous tests, was that the procurement office, not the construction/facility group, directed the tests. The tests were on time, with minimized change orders, and the users were highly satisfied. The biggest surprise to Harvard was the lack of construction management, direction, and control required by Harvard project managers.

The test results were so unexpectedly successful (Table 1), the Harvard University procurement office with PBSRG/ASU as a partner submitted for and won the 2005 CoreNet Global Innovation of the Year Award (CoreNet 2005). However, the procurement project manager and procurement director left Harvard University soon after, and did not leave enough expertise to sustain the program. The lack of funding precluded further education to train Harvard personnel and establish a second core group.

Table 1

Harvard results with initial eight projects using the PIPS system (Faigenbaum 2005)

Project Name	Number of Proposals	Awarded Contractor	Past Performance Rating*	Proposal Rating*	Awarded Cost	% Below Average Bid
26 Church Street	8	Columbia	9.4	5.2	$ 425,200	36%
William James Hall	14	Gloucester	9.6	7.5	$ 114,000	30%
Sackler Museum	10	Gloucester	9.6	7.3	$ 411,000	24%
Dunster & Mather	13	Shawmut	9.4	7.6	$3,900,000	18%
8 Mellen Street	7	Pyne	9.4	5.9	$ 146,000	32%
Loeb House	10	Shawmut	9.4	7.5	$4,700,000	17%
Paine Hall	3	JBM	9.6	7.8	$ 810,000	27%
Memorial Church	5	Consigli	9.5	7.8	$2,615,000	13%

*Ratings are on a scale of 1-10, 10 being the highest and 1 being the lowest

The PBSRG continued its efforts to search for a client to implement and sustain the PIPS program. Based on previous experiences, the PBSRG identified the following requirements for sustainability (Kashiwagi 2008):

1. The client must have a large, on-going construction program.
2. The client needs a visionary who understood PIPS, was very high on the client's organizational structure, and had sufficient support from lower level managers and project managers.
3. The client needs to have an organizational goal to be efficient, to minimize management activities, to transfer risk and control to contractors, and to hold all participants (inside and outside of the organization) accountable.
4. The client must not be susceptible to political changes.
5. The client must be willing to implement PIPS slowly and correctly, over 3 to 4 years, using the PBSRG team to ensure a successful and sustainable structure.
6. The client would need to establish a long-term strategic plan.

One of the major problems for clients in implementing PIPS is underestimating the difficulty in changing the organizational paradigm to:

1. Turn over risk and control to the contractor.
2. Minimize decision making, direction, and inspection by the client's representative.
3. Turn over documentation to the contractor.
4. Use performance information to regulate contractors.
5. Minimize the use of relationships.

In the past, the ease of the process and great results in test projects lulled clients into thinking that the process could be modified or the process could be run by client representatives who were not properly educated. In 530 tests, very few projects have been unsuccessful. In this handful of projects, all of the nonperformance issues were caused by client decision making or deviation from the process as outlined by the PBSRG.

The University of Minnesota – Capital Planning and Project Management

The University of Minnesota (UMN) is one of the largest universities in the United States, servicing over 50,000 students. The Capital Planning and Project Management (CPPM) group is responsible for the procurement and delivery of all new and existing facilities on the Minneapolis Campus. On average, the CPPM group procures 300 projects a year on $40M in services.

The University of Minnesota (UMN) was first introduced to the best value program in 2003. A new Associate Vice President for CPPM, Michael Perkins, contacted the PBSRG after attending best-value conferences in 2004 and 2005, to implement and test the best value program at UMN. The objective of the pilot program was to transform the entire CPPM organization. The goal was to provide value and maximize the efficiency of the group (both internally and externally to maximize the performance for the University), and ultimately, the taxpayers.

Based on the lessons learned from previous clients, establishing a long-term strategic plan was a vital function to the long-term success of the program. The UMN established a four year implementation plan as outlined below:

Year 1: Testing
- Establish long term strategic plan and deliverables
- Identify and educate core group
- Run best-value procurement on 5-10 pilot projects (roofing, mechanical, electrical)
- Analyze pilot projects to identify impact
- Clarify roles and responsibilities within UMN

Year 2: Continued Testing / Refinement / Measurement
- Evaluate skills of core group – refine as needed to better support the growth of the program
- Continue testing the PIPS best-value process
- Expand test to different trades (General Construction)
- Educate additional internal CPPM staff
- Implement weekly project tracking system
- Refine list of qualified vendors on IDIQ list (add and/or delete)
- Identify support and educational needs for qualified vendors
- Identify performance of UMN organization (annual review)

Year 3: Transformation From Pilot to Standard Program
- Educate and allow other CPPM personnel to test the system
- CPPM acquire and perform all PIPS functions
- Core group provide all education / training
- PBSRG provide assistance on analysis and areas of weakness
- Track and monitor all UMN projects (including low-bid projects)
- Identify internal UMN areas to improve
- Identify performance of UMN PM's, Procurement, Permitting, etc.

Year 4: Continuous Improvement and Sustainability
- Identify performance of Best Value Program
- Identify performance of UMN departments / individuals
- Educate other UMN groups (Energy, Zones, Permitting, Codes, etc.)
- Implement best-value on a larger scale and other areas (A/E Services)
- Develop automated project management tool (track all projects, online, from identification of scope to final payment)

Preliminary Results of PIPS Testing/Implementation

Over a two-year period, the University has documented significant performance results as outlined below. The details of the PIPS tests are divided into participating vendor information, award information, and post project results analysis.

1. Vendor Information:
   - Number of contractors rated in the performance database: 68
   - Average performance rating of vendors (on a scale of 1-10, 10 being highest): 9.5
   - Average number of customer responses: 13
   - Types of contractors: Roofing, Mechanical, Electrical, General

2. Award Information:
   - Total number of procurements: 44 (2005-0, 2006-23, 2007-21)
   - Average size of projects: $300,000 ($50M high, $31K low)
   - Cost Analysis (awarded projects only):
     a. Allocated Funds: $10.9M
     b. Awarded Cost: $10.1M (-7.1 percent)
   - Percent of projects where the best value is also the lowest price: 50 percent
   - Average number of proposals per project: 3

3. Post Project Analysis
   - Number of completed projects: 23
   - Overall cost increases: 4.9 percent (Client) / 0.4 percent (Contractor)
   - Overall schedule increases: 48.6 percent (Client) / 4.1 percent (Contractor)
   - Number of projects with no contractors cost increases: 21 (91 percent)
   - Average PM satisfaction of best-value process: 100 percent
   - Average PM satisfaction of Contractors (on a scale of 1-10, 10 being highest): 9.4
   - Average increase in contractor profit: 4.5 percent

Two projects incurred cost increases. In the "Smith Hall" roofing project, there were delays caused by errors and omissions in the architect's design. In the "Parking Ramps" project, the contractor was directed to install new security equipment. However, after the equipment was installed, the manufacturer stated that the equipment room was too hot, and that an additional fan would need to be installed. This was categorized as a contractor change order. In both of these cases, the risk was not under the contractor's control. The changes were client driven and unforeseen, resulting in a contractor change order rate of 0 percent.

Three projects had schedule increases. The "Akerman Hall" renovation project was delayed due to a light supplier not delivering material on time. The "Social Sciences" renovation project was delayed due to a pump supplier not having the proper material on hand. The "Tate" project was delayed for additional testing of the equipment. These conditions could easily have been categorized as unforeseen events.

In summary, the UMN tested the best value program on 44 pilot projects, with allocated funds of $10.9 Million in construction. Documented results include over 7 percent savings in initial project award costs, 100 percent customer satisfaction, and less than 1 percent change order rate due to vendor delays or cost increases. A survey of 11 awarded contractors showed that the average profit increase by 4.5 percent on best-value projects. This confirms the theory that best-value increases efficiency, since the client received higher performance at no cost increase (50

percent of the best-value awards were also the lowest priced), and the vendors maximized profit margins. The positive conditions of the UMN environment for implementing PIPS include:

1. The Vice President (VP) of CPPM was a change agent, visionary, and held views that were inline with the leadership concepts based on logic and efficiency (Kashiwagi et al. 2008).
2. The VP of CPPM was hired by a senior vice president whose mantra was efficiency, value, and change.
3. The VP of CPPM was able to put together a small group of visionary implementers to run the pilot program.
4. The CPPM group had buy-in from upper management, project managers, and procurement agents.
5. The VP of CPPM understood their organization's limitations, spent the necessary time to understand why the previous users of PIPS were not able to sustain the structure, and used a strategic plan.
6. The CPPM has taken the necessary time to educate and train both internal staff and external vendors.

These conditions aligned well with the requirements identified by PBSRG for a client to create a sustainable PIPS structure.

Examining the Hypothesis

The UMN test case supports the hypothesis that a client must understand the importance of having a strategic plan, creating a core team, implementing the change slowly, and by continuously being educated on the PIPS process, the underlying theoretical foundation of Information Measurement Theory (IMT).

A strategic plan is essential to the long-term success of a best-value program. No other user group has established in writing what their objectives are and their measurements to achieve their goals. The research performed with the CPPM has shown that users have a greater chance of success if they have a measureable strategic plan.

There are two main categories of activities that may jeopardize the sustainability of a best-value organizational transformation. These areas are "performance risk" and "political risk." Performance risk is the risk of the vendor not completing the project on time, within budget, or to the satisfaction of the user. Political risk includes resistance from both internal and external parties, including; procurement personnel, upper management, project management, and the vendors. The CPPM took steps to minimize both areas of risk. Performance risk is easily avoided by simply implementing the PIPS best-value process as suggested by the PBSRG. Political risk is more difficult to contain because the greatest obstacle is the owner themselves. To minimize political risk, a long-term plan was established which outlines how quickly the user will implement change, how they will do it, and how they will measure their success. The strategic plan regulates the rate of change and minimizes decision making that could cause risk.

As documented by the research performed at the State of Hawaii, having a core team is another critical component of an organization's long-term success. The CPPM has achieved great success due to the buy-in from all critical parties (upper management, procurement/contracting, and project management personnel). The core team members cannot be changed or controlled. All members must have the capability and perception to understand efficiency, value, and the transfer of risk and control.

Every construction group is pressured to complete construction as quickly as possible. The CPPM initially set aggressive procurement schedules to make their awards as soon and quickly as possible. However, they later realized that this mentality was faulty. By spending more time upfront, they found they were able to save time and effort once the project began. Instead of rushing the award and dealing with issues during construction, most issues were resolved during the pre award period. This increased the total time to make an award, but saved time during construction. The CPPM project management also documented that there was a 90 percent decrease in overall construction management requirements. The lesson learned at the CPPM is to set a slow schedule that can be met by all parties.

Continuous education has been provided for both the contractors and the client's personnel. The client's personnel are heavily educated prior to running any pilot project. Project managers that are willing and feel comfortable with the process are allowed to run tests. Once the pilot projects are completed, documented, and analyzed, the program can be shifted towards the client's other project managers. "Training the core team who are conducive to the leadership based PIPS process" and "training of the rest of the personnel" should be treated as two entirely different stages. The second implementation requires detailed documentation, rules, and the presence of highly trained core team members. The vendors should receive continuous education periodically throughout the implementations, with debriefings at the award of projects and completion of projects.

Current Status of UMN PIPS Implementation

The UMN is now in their third year of running/implementing the best value PIPS structure. They are currently renewing for a fourth year. They are also attempting to implement the best value structure to the following design/construction functions:

1. Implement the best value PIPS structure to the planning, design, and procurement of construction. Their goal is to make the client and designer more accountable.
2. Implement the PIPS structure to change the way designers approach their design function, adding risk management, accountability for schedule, and making them manage their design with a quality control plan and a weekly risk report.
3. Using the PIPS structure to compete facility managers and their facilities to determine prioritization of funding of projects.

Conclusions

For over 13 years of research, the PBSRG has documented that the PIPS best-value selection process is capable of producing high performance results. However, the greatest challenge to the PIPS program has not been with the performance risk, but rather the political risk which has threatened the sustainability of the best value PIPS structure. The political risk has prevented many organizations from sustaining the program over an extended period of time. The results/impact of the best-value program at the UMN has shown that:

1. Best-Value does not cost more (currently awarded 7.1 percent below allocated funds and also below the average proposal cost).
2. Best-Value is not always the most expensive option (best-value was the lowest bidder on 50 percent of projects).
3. It takes an additional 10 days (on average) to procure a project using the PIPS best-value process.
4. The Pre-Planning phase makes the entire project more efficient. 21 out of 23 projects had no contractors cost increases.
5. High performing vendors are capable of accepting accountability and minimizing risk.
6. The PIPS best-value process can reduce project management by up to 90 percent on a project, allowing the project managers to manage more work with less effort.
7. Vendors documented that they increase profit margins by up to 10 percent (average rate of 4.5 percent) by minimizing the amount of time and effort spent on non-value added functions (management, meetings, etc).

These results could not have been documented without a carefully laid out strategic plan that allowed the University to gradually educate and train their internal staff and external vendors. The program documented success on both the client side (higher performance) and the contractor side (maximized profit), and was used as an example of how well best-value could work within a public organization (which allowed the State to pass the State Best Value law for all public organizations).

The UMN program also validates that the best value PIPS structure can be a sustaining permanent system. This validates that:

1. PIPS concepts work. This includes transferring risk and control to the contractor, minimizing client construction management functions, forcing contractors to preplan and minimize the risk that they do not control, and hold the contractors accountable by continually measuring their performance.
2. PIPS concepts can be permanent.
3. The source of the construction problems are the client's delivery system.
4. The most efficient and effective delivery system is one where management is minimized, and the contractor controls the project in an environment that measures performance and risk.

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