PMWorldToday

Published in PM World Today - August 2008 (Vol. X, Issue VIII)

PM WORLD TODAY – FEATURED PAPER – AUGUST 2008

Project Managers in a Futuristic Environment

Dean Kashiwagi
(Professor, PBSRG, Arizona State University, Tempe, USA)

Marie Sullivan and Jacob Kashiwagi
(Graduate Researchers, Arizona State University, Tempe, USA)

Kenneth T. Sullivan
(Asst. Professor, PBSRG, Arizona State University, Tempe, USA)

Editor's note: This paper was a keynote presentation at the ***PM-04: 4th SCPM & 1st IPMA/MedNet Project Management Conference in the Mediterranean, 29-31 May 2008, Chios Island, Greece*** *(http://2008.pmgreece.gr). As a Media Partner for that event, PMForum offered to republish selected papers in PM World Today. This paper is included here with the consent of the authors and the permission of the Centre for Construction Innovation of the National Technical University of Athens (www.innovation.view.gr) who is the copyright holder of the conference proceedings. All conditions and disclaimers of the copyright holder pertain.*

Abstract

The demands for higher performance and increased efficiency have emphasized the importance of risk management for project managers (PM.) Using a traditional approach, PMs would increase management, direction and control to minimize risk. A new approach has been developed, which depends on alignment techniques. It is a supply chain process which minimizes risk through preplanning, the assignment of the risk to the most knowledgeable party, assigning of accountability through measurement and the reduction of information flow, and assigning the minimization of risk that the contractor/vendor does not control to the contractor. This "futuristic" PM role is a paradigm shift from traditional project management.

Keywords

New project management model, supply chain, best value, alignment, outsourcing, quality control

1. Introduction

Construction projects have reported a high degree of risk (not being on time, not being within budget, and not meeting the expectations of the client) (CMAA, 2004; Post, 1998). The construction industry's solution has been to implement increased project management (PM), direction, and control (Hwang and Liang, 2005; Gordon and Akinci, 2007; Cottrell, 2006). The authors propose that this solution is not theoretically defendable, and has not produced evidence that it is able to minimize construction risk (Buckshon, 2007; ENR, 2005, ENR, 2006). Micromanagement by definition (more direction, control, and information flow) increases process activity and inefficiency, drives transaction costs higher, and minimizes accountability. The authors make the following deductive observations about management, control, and direction:

1. Micromanagement is a manifestation of system and process inefficiency.
2. If the working participants are highly skilled, experienced, and perform, there is minimal need for micromanagement.
3. The more value management brings through direction/control, the lower value the contractor/workers brings.
4. A structure and process with a high degree of client management and control requires a high level of information flow, decision making, and risk.
5. An optimal PM structure/processes minimizes management.

The practices of leadership, quality control/quality assurance, outsourcing, lean and supply chain management all support the minimization of management, decision making, control and direction (Seppala, 2003; Deming, 1986; Shook, 1988; Chen and Kirkman, 2007; Price and Dainty, 2004). The authors propose that by applying these principles in a new project management (PM) system, the client's PM can minimize construction risk. The model can be exercised through the tools found imbedded in the Best Value Performance Information Procurement System (PIPS.)

2. Best Value Project Management Model

The new PM model or the best value PIPS delivery system has been developed and tested for the past 14 years at the Performance Based Studies Research Group (PBSRG) at Arizona State University. It is not only being tested on construction projects but on large service and commodities. PIPS has three main phases: 1) Selection, 2) Preplanning/Quality Control, and 3) Management through Risk Minimization. Best value PM practices have resulted in reducing up to 90% of the client's PM risk management activity, while increasing construction performance to 98% (on time, on budget, and customer satisfaction) (Kashiwagi, 2008). The Best Value/PIPS phases have the following steps (See Figure 1):

1. Selection (Identifies the "best value" contractor):
    a. Measures all key/critical project components.
    b. Contractors demonstrate relative expertise and value by identifying the project risk that they do not control and their "dominant" value added contribution.
    c. Key personnel are interviewed to identify if they have the capability to minimize risk that they do not control, rather than passing the risk to others.
    d. The best value contractor is selected, based on performance and price.

2. Preplanning/Quality Control (QC) (Transfers project risk, accountability, and control to the "best value" contractor)
    a. The "best value" contractor preplans the project, and creates a Quality Control (QC) plan that identifies and minimizes the risk (time and costs) that the contractor does not control before the project begins.
    b. The "best value" contractor's QC plan and schedule are incorporated into the contract, and the contractor is awarded the project.

3. Management by Risk Minimization (Information Environment). Throughout the execution of the project, the contractor documents critical risk information/contract deviations through a weekly risk report.
    a. The risk report is documented by the contractor and not the client's project manager.
    b. When the project is completed, all critical elements (contractors and their personnel) of the project are measured. The measurement becomes 50% of their past performance rating used to compete for future projects (Figure 2). This allows the best value system to regulate itself, as performance becomes requisite to future competition.

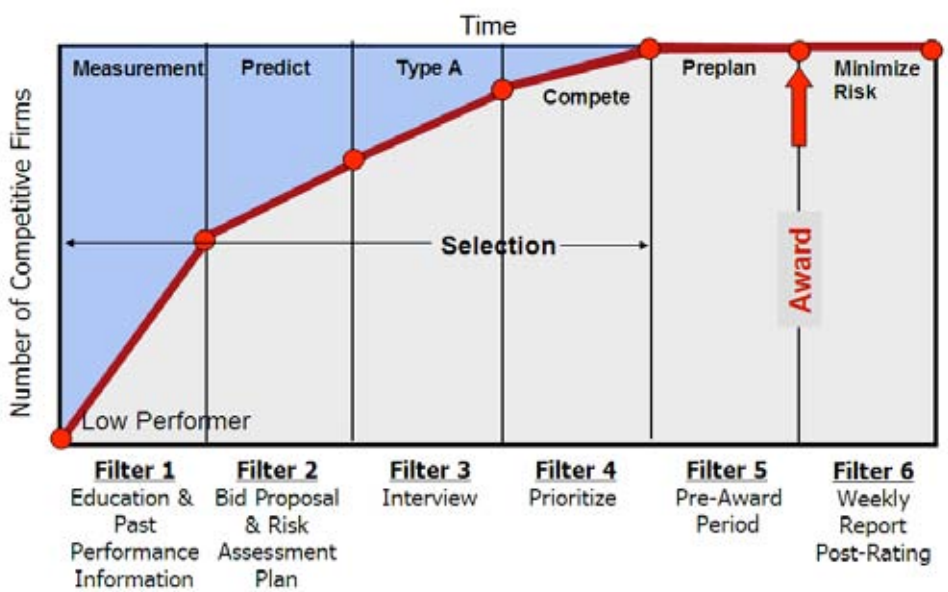

Figure 1: Best Value/PIPS Steps

3. Self Regulating Quality Control

After the PM selects the "best value," that contractor moves on to the preplanning/quality control phase. Quality control (QC) is defined as "a system for verifying and maintaining a desired level of quality in a product or process by careful planning, use of proper equipment, continued inspection, and corrective action as required (Random House, 2006)." It is a dynamic process that considers both the controlled variables within a system as well as uncontrolled variables in risk minimization, and compensates or adjusts plans according to the changes found in the uncontrolled or variable factors.

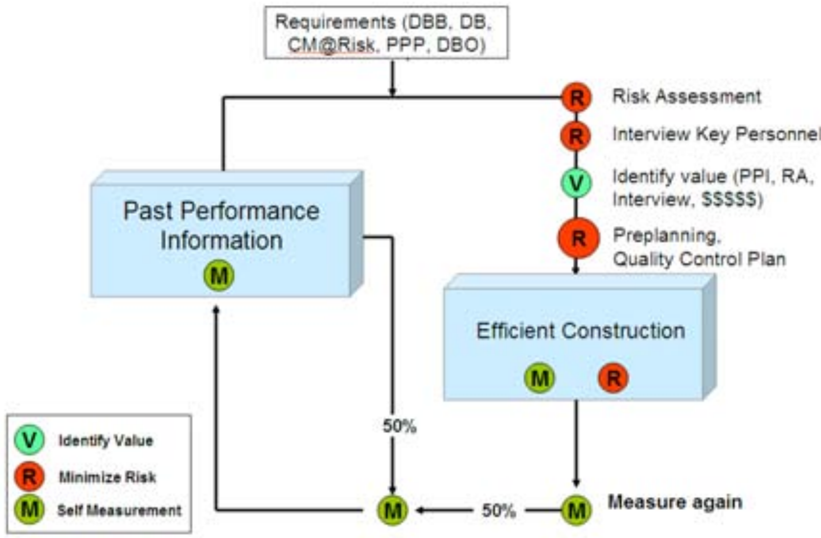

Figure 2: Best Value Closed Loop System

Quality control was initially applied during the Industrial Revolution when quality became a factor of group production rather than the responsibility of one individual (American Society of Quality, 2007). It was further developed by providers to eliminate the manufacturing production expenses due to costly rework and defects (risk in terms of cost and time.) Modern day quality concepts develop by Edward Deming and Joseph Juran focused on ensuring a product's ability to meet or exceed customer requirements (Deming, 1982). Quality control empowered the vendor with the knowledge that the quality of the service or product, as well as the profits, could be controlled through self-regulation. As a result of the success of quality control in the manufacturing industry, QC was adapted for the delivery of a variety of products, services, and processes, including construction delivery. In most instances, the system behaved as a vendor's component used to minimize risk and maximize profit. However, it has not worked as well in the construction industry. In the last ten years, the construction industry has attempted to use technology transfer from other industries to improve the performance of construction and minimize the risk of nonperformance. The industry has implemented a version of quality control (QC) executed by the owner representative in attempts to minimize the owner's risk of not receiving the technical results specified in a price based environment. It was not understood that QC is not a tool to manage or enforce behavior, but a tool to assist in the actual minimization of risk. It is best applied in an environment where the entity performing the QC is the entity minimizing the project risk.

3.1 QC/QA Differential in the Best Value Environment

Figure 3 shows the difference between the low bid and best value environments. In the price based environment, the client's PM is the manager, decision maker, and inspector. The minimum requirements of the price based structure creates the traditional PM structure. The risk to the client is that the contractor's personnel are not technically qualified and unable to meet the technical specifications. The contractor is therefore closely inspected and managed by the owner's PM's QC/QA process.

In the best value environment (Figure 3), the risk is not the technical requirement described in the specification, because a best value contractor knows how to do their job, and is planning on exceeding the minimum requirement. In the best value environment, the risk is what the best value contractor cannot control. It is the risk in the interfaces between the parties, the gray areas dependent on outside variables that are usually ignored. It includes factors that the contractor does not control, such as:

1. Coordination between parties.
2. Inaccurate or incomplete design.
3. Conditions that are not addressed in the specifications.
4. Environmental conditions (i.e. weather).
5. Concerns/risks identified by the client

The QC/QA program in the best value environment should contain plans to minimize the risk that the contractor does not control. However, if the contractor attempts to minimize the risk that they do not control, and the risk still occurs after doing everything they can possibly do, the client and not the contractor should be responsible for the costs to minimize the risk. After the risk minimization efforts of the contractor, the risks should be treated as unforeseen risks.

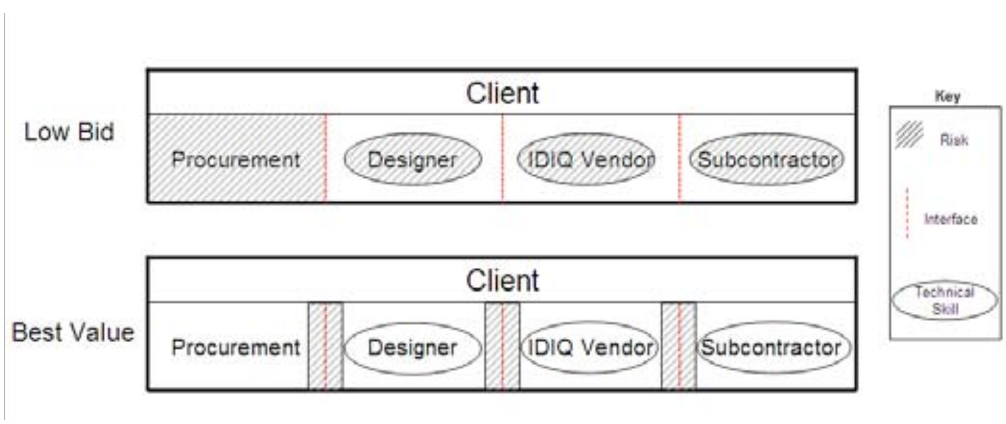

Figure 3: QC/QA Differential

3.2 Best Value QC/QA

The best value QC/QA process has the following components:

1. Contractors are required to preplan and identify risks to the project that they do not control, and identify how they will minimize the risks. This includes risks identified by the client and other contractors during the selection phase.
2. Risks need to include client concerns, unforeseen risks, and risks that are caused in part by the other participants in the construction delivery.
3. QC/QA process should be coupled with a weekly report that identifies which risks are not minimized, and contractor identified action on what will best minimize the risk.

By forcing the contractor to identify the risks that they do not control, by default, the contractors also identify what they do control. Instead of tasking the client's professional representatives to completely identify and clarify what a contractor is responsible for, the client now transfers the risk of construction risk to the expert, requesting them to identify what they don't control, and how they will attempt to minimize the uncontrolled risk. The contractor is the best suited for identifying risk, as they are the construction expert. It also assists the contractor in taking control. As risk and accountability are transferred to the contractor, they are now responsible to integrate all participants into the construction plan.

4. Risk Management through an Information Environment

In order to take full advantage of the best value QC/QA, the program must be coupled with an information environment. The information system should distribute the correct risk/performance information to the entities involved that encourages action that increases performance. The method to make everyone accountable is to set up an information system that uses dominant information where:

1. The system is simplistic and minimizes the amount of information.
2. The risk information is delivered quickly to the right location.
3. Any directives or decisions made by any of the participants that results in risk are documented by the contractor.
4. Any participant who causes a task to not complete on time or within costs is identified.
5. The contractor, who is at risk, is made to document all risk information.

The information environment passes simplified project information to the appropriate entities in a manner that accurately reflects the status of the project and encourages swift resolution and minimization of risk. This too is facilitated through aforementioned weekly report (See Figure 4). The weekly risk management report records risks that have actualized despite contractor risk minimization efforts, thus impacting the project's schedule, budget, or quality. It also records unforeseen risks that have negatively impacted the project. The weekly report is updated and distributed weekly, and contains the following information:

1. Identifies any unforeseen risks or risks that cannot be minimized.
2. Identifies the date of the risk, why the risk happened, who can most easily minimize the risk, an anticipated resolution date, and any time or cost associated with resolving the risk.
3. Lists any contractual change orders that result from the unforeseen risks.

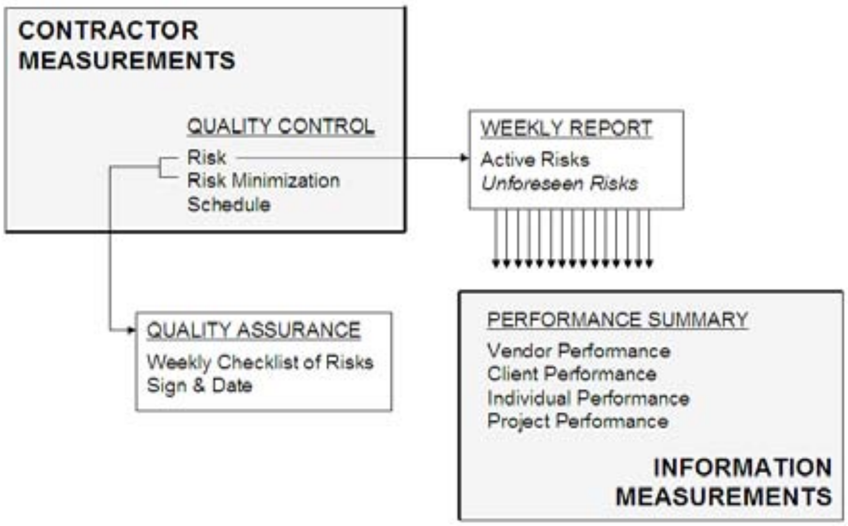

Figure 4: QC/QA/Risk Minimization Structure

By having the contractor report and minimize risks occurring that the contractor does not control, risks that were previously prolonged due to inactivity or finger pointing are addressed (See Figure 5). When the contractor reports a risk on the weekly report, they also identify the entity controlling or causing the risk to the project. As a result, the risk is minimized as soon as possible, as the responsible party is identified through the weekly distribution of the report, as agreed to prior to the award of the contract. This concept has been tested in recent tests at a Florida hospital site (Sullivan, et al., 2007), and quickly dispels confusion of who is responsible for contractor uncontrolled risk. Instead of a client's representative attempting to minimize unresolved risk, the contractor identifies the risk, how to minimize the risk, and who may be involved in creating or increasing the risk.

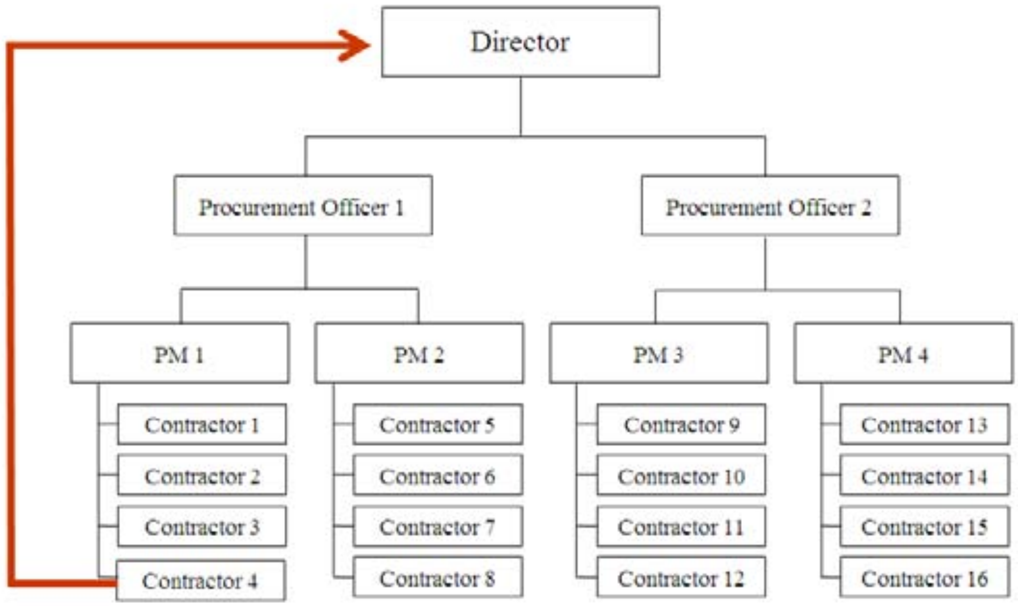

Figure 5: Right Information to Right Place Minimizes Bureaucracy

The authors developed a process for organizations involving multiple projects to compile the weekly reporting information results in order to quickly provide the Client with the ability to prioritize projects based on risk. The report contains the following information (Kashiwagi, 2008) (Figure 6):

1. Identification of the riskiest projects.
2. Who is responsible for causing the risk?
3. Every participant's performance information in relation to everyone else in the same job description.

5. Conclusion and Recommendations

The new project management model is more efficient and effective. It is an alignment model instead of a management, direction, and control model. It forces the contractor/vendor to manage and minimize the risk that the contractor does not control, transferring risk and control to the contractor. The new project management model also has measurements, minimized flow of information which leads to a minimization of decision making. The new project management model emphasizes alignment, preplanning, documentation of risk by the contractor, self regulation, and the construction of a performance information environment that quickly identifies risky contractors through dominant information.

DIVISION OVERVIEW	11/03/06
Total Awarded Budget	$172,751,944.23
Current Cost	$174,484,794.47
Over Budget	$1,732,850.24
PROJECT OVERVIEW	
Total Number of Projects	116
% Projects On Time	85%
# of Jobs Delayed	17
% Projects On Budget	86%
# of Jobs Over Awarded Budget	16
# of Projects Missing Owner Ratings	0
AVERAGE PROJECT	
Project Budget	$ 1,489,240.90
# of Risks per Job	3.14
Owner Generated Risks	1.66
Number of overdue risks	0.25
% Over Awarded Budget	3.39%
% over budget due to owner	3.23%
# of Days Delayed	8.76
# of days delayed due to owner	7.62
Owner Rating	9.17
Risk Number	**2.42**

6.1 Overall organization performance

UNFORESEEN (UF) & OWNER (O) RISK	
# UF Risks affecting budget/schedule	0
Days Delayed (Calendar)	0
Additional Cost	$ -
# O. Risks affecting budget/schedule	1
Days Delayed (Calendar)	0
Additional Cost	$ 2,000.00
Above risks include both potential and resolved.	
CONTRACTOR RISK	
# of Unaddressed/Overdue Risks	1
# Unrated Risks	0
# Risks affecting budget/schedule	2
Risk to Schedule (calendar days)	15
Risk to Cost	$ 1,000.00
Contractor Satisfaction Rating	**10.0**
Above risks include both potential and resolved.	
OVERALL CURRENT STATUS	
Days Delayed (Calendar days)	5
% Delayed	0.8%
Contractor % Delayed	0.8%
Additional Cost	$ 2,000.00
% Over Award	9.2%
Contractor % Over Award	0.0%
Project Satisfaction Rating	**10.0**
Risk Number	**1.16**
Above Schedule and Budget additions include only resolved risks.	

6.2 Individual project performance

TOP 10 RISK RANKING PROJECTS		
No.	**Project**	**Risk #**
1	Design for Two HVAC(s) & Windows	52.94
2	Tpe III WP	17.71
3	WP Replace C Tower HVAC Sys	13.61
4	Rpr/Rpl Elec Distr Sys	11.91
5	Renew Troop Medical Clinic	11.07
6	Fire Damage Repair	10.51
7	Construct Hyperbaric Chamber	10.50
8	Fault Current & Over Dev CS	10.35
9	Convert Warehouse to Admin. Area	10.10
10	WP Fire Protection Upgrade	10.07

6.3 Risk ranking of projects

CONTRACTOR OVERVIEW	Contractor A	Contractor B	Contractor C
Total Awarded Budget	$15,725,858	$52,274,179	$ 2,885,433
Current Cost	$16,480,244	$62,274,179	$ 2,886,433
OVERVIEW OF PROJECTS			
Total Number of Projects	25	18	6
# of Jobs Delayed	4	2	4
# of Jobs Over Awarded Budget	9	0	0
AVERAGE PROJECT			
% Over Awarded Budget	13.93%	0.00%	0.00%
# of Days Delayed	6.84	2.33	9.50
Owner Rating	8.03	8.89	10.00
Risk Number	**4.15**	**2.94**	**2.41**

6.4 Comparing vendor performance

Figure 6: Performance Information on Different Client's Project Managers

6. References

American Society for Quality (2007) The History of Quality. Retrieved January 1, 2007, from: http://www.asq.org.

Buckshon, Mark (2007, May) Complex Bids: An Industry Challenge. *Ottawa Construction News/GTA Construction Report* Accessed on July 31 at http://www.ottawaconstructionnews.com/user_linksdetail.php?nLocalFeedID=32129.

Chen, G. and Kirkman, B. L. and Kanfer, R. and Allen, D. and Rosen, B. (2007) A Multilevel Study of Leadership, Empowerment, and Performance in Teams. *Journal of Applied Psychology*, Vol. 92, Issue 2, pp. 331-346, March 2007.

Cottrell, D. S. (2006) Contractor process improvement for enhancing construction productivity. *Journal of Construction Engineering and Management*, Vol 132, n 2, pp. 189-196, February 2006.

Deming, E. W. (1986) *Out of the Crisis.* Massachusetts Institute of Technology, Center for Advanced Engineering Study, Cambridge, Mass.

ENR (2005) Design Firms' Split Personality Linked to Career Pandemic. *ENR*. Vol. 256, p. 96.

ENR (2006) Project Owners with Few Bidders May Be Stinky Clients. *ENR*. Vol. 257, No. 12A, p.100

FMI / CMAA Fifth Annual Survey of Owners (2004). Management Consulting - Investment Banking for the Construction Industry, Retrieved September 27, 2006 from http://cmaanet.org/user_images/fmi_owners_survey2004.pdf

Gordon, C. and Akinci, B. and Garrett, J. H. (2007) Formalism for Construction Inspection Planning: Requirements and Process Concept. *Journal of Computers in Civil Engineering*, Vol. 21, Issue 1, pp. 29-38, January/February 2007.

Hwang, S. and Liang, L. (2005) Proactive Project Control Using Productivity Data and Time Series Analysis. *ASCE International Conference on Computing in Civil Engineering*, July 12-15, 2005.

Kashiwagi, D.T. (2008) *Best Value Procurement*. Performance Based Studies Research Group, Tempe, AZ.

Post, N.M. (1998). "Building Teams Get High Marks", *Engineering News Record*, 240[19], 32-39.

Price, A. D.F. and Dainty, A. R.J. (2004) Empowerment as a Strategy for Improving Construction Performance. *Leadership Management Engineering*, Vol. 4, Issue 1, pp 27-37, January 2004.

Seppala, P. (2003) Flat organizations and the role of white-collar employees in production. *International Journal of Industrial Ergonomics*, 33, pp. 15-17.

Shook, R. L. (1988) *HONDA*. Prentice Hall Press, New York, New York.

Sullivan, K., Kashiwagi, D., and **Goodridge, S.** (2007) "Case Study: Minimization of Best Value Issues in the Procurement of Construction Services at the City of Miami Beach." *Cobra 2007 Conference,* Georgia Tech Global Learning Center, Atlanta, GA, USA, CD Track 68 (September 5-7, 2007).

This paper was originally presented at the PM-04: 4th SCPM & 1st IPMA/MedNet Project Management Conference in the Mediterranean, 29-31 May 2008, Chios Island, Greece. It has been republished here with permission of the authors and conference organizers. For information about the conference or to see the full proceedings, visit ***http://2008.pmgreece.gr***.

About the Authors:

Dean Kashiwagi, PhD

Author

Dean T. Kashiwagi, PhD, is a professor at Arizona State University's Del E Webb School of Construction and also the Director of the PBSRG. PBSRG is the worldwide leader in improving facility/project performance and efficiency. Kashiwagi has developed a "hands off" approach to managing contractors or vendors in any industry. His concept is contrary to traditional price-driven procurement. The technology has been tested over 500 times totaling $1.135 Billion ($683M in construction projects and $451 in non-construction projects) with a 98% success rate since 1994. He work is now being tested in the Netherlands. Kashiwagi has integrated these concepts into a Facility-Project Asset Graduate Program at ASU. His presentations are highly sought out by highly recognized international organizations such as the Project Management Institute (PMI) Global Congress. Dean can be contacted at dean.kashiwagi@asu.edu.

About the Authors (continued):

Jacob Kashiwagi

Co-Author

Jacob Kashiwagi is a Ph.D. research student at Arizona State University. He is the developer of the no-influence leadership theory, the theoretical basis for the PIPS model. He is also a senior researcher and lecturer in ASU's leadership development and best value efforts. Jacob has worked with numerous public and private organizations (United States Army Medical Command, Schering Plough, State of Hawaii, City of Miami Beach, Entergy, Arizona State University, etc.) to help increase efficiency in their outsourcing of services and management of projects. The technology has been tested over 500 times with a 98% success rate. He has also an author of several research papers and reports. Jacob can be contacted at **Jacob.kashiwagi@asu.edu**.

Marie Sullivan

Co-Author

Marie Sullivan is a research specialist at Arizona State University's Del E. Webb School of Construction. Marie's key principal areas of teaching and research are in Quality Assurance and Risk Minimization. Her studies also include theoretical modeling, prototype development and testing, and implementation of systems. She has authored over 20 International conference proceedings (papers) in efficient processes, best value, and construction performance. She oversees training and projects from the following research clients: US Army Medical Command, City of Miami Beach, State of Washington and the University of Minnesota. She is currently pursuing her doctoral degree in Public Administration. Her eight years of research expand in the following areas of performance documentation, implementation of performance concepts and information, and theoretical development of the systems delivering construction, services, and systems. Marie can be contacted at Marie.kashiwagi@asu.edu.

About the Authors (continued):

Kenneth T. Sullivan, PhD

Co-Author

Kenneth Sullivan is the deputy-director of the Performance Based Studies Research Group (PBSRG) and the director of the Facility Management Research Institute (FMRI) as an assistant professor in the Del E. Webb School of Construction at Arizona State University. His research focuses on risk management, cost engineering, productivity, best value, and leadership in facility management and the built environment. He is well versed in quantitative methodologies, statistics, and data analysis techniques and teaches courses in advanced estimating, research methods, and facility management. Sullivan's research fundamentally seeks to shift established organizational paradigms into a more efficient structures composed of measurement-based systems of accountability, resulting in the reduction of inefficient practices of over-management and the increase of risk control. As co-founder, and now Secretary of Research for the International Council for Research and Innovation in Building and Construction (CIB) Task Group 61, Kenn has been commissioned to generate a global performance metric for construction and facility management, and create a new journal focusing on performance information and risk. Kenn has also published 58 peer-reviewed papers and is a frequent speaker, both domestically and internationally. Kenn can be contacted at Kenneth.sullivan@asu.edu.