Journal of International Technology and Information Management

Volume 17 | Issue 1 Article 4

2008

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Recommended Citation

Tesch, Debbie; Ireland, Lewis R.; and Liu, Julie Yu-Chih (2008) "Project Management: IS/IT Research Challenges," *Journal of International Technology and Information Management*: Vol. 17 : Iss. 1 , Article 4.
Available at: https://scholarworks.lib.csusb.edu/jitim/vol17/iss1/4

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Project Management: IS/IT Research Challenges

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ABSTRACT

A major challenge in Information Systems and Information Technology is to improve the ability to conceptualize, design, develop and deliver information systems that meet customer requirements. Project management is often adopted to create solutions that work and meet customer needs. The principles of project management as defined by the Project Management Institute, can improve project success rates. Researchers in the project management need to help practitioners understanding the impact of different principles on the success of IS development. This study undertakes a survey of project management experts on the state of practice and research to examine the need for improving project management, and suggest areas that can be improved. Research may be the most effective means of defining opportunities for enhancing project success rates by tapping the wealth of literature and complementing it with the expertise of project management practitioners.

INTRODUCTION

Software development applications require frequent changes and updates in order to support enterprise systems. These frequent changes to IS/IT comprise a large volume of software development efforts. These efforts, undertaken as projects, are generally complex and take place in a dynamic environment where business conditions and technologies change frequently during the life of the project (Chen, et.al., 2004). The factors of project success include user involvement and project size, management and planning (Schmidt, et al., 2001). A fully operational project management system in an enterprise offers the best opportunity for project success through the implementation of methods and tools for planning, organizing, and managing team-based activities to accomplish specific directives (Jurison, 1999).

Project management is widely adopted in Corporate America embraces project management to implement system changes (Muriithi & Crawford, 2003; Park & Pena-Mora, 2003; Yilmaz & Phillips, 2007), which are even considered as too significant to outsource (Fish & Seydel, 2006) or having high risk of leading to undesirable consequences (Wei & Peach, 2006). However, many projects fail, even when performed using project management techniques. Such project failure reduces the capability of technology components. The 2004 Chaos report by the Standish Group found that only 28% of IT projects were successful, down from 34% in an earlier report; The proportion of IT projects canceled before completion increased to 18% (from 15%), and a further 51% of IT projects were considered "challenged" as they are seriously late, over budget and missing expected features (The Standish Group, 2004; The Standish Group, 2007). Possible causes for these findings are the size and expense of large projects, a return to traditional development practices on large projects (Boddy, 1993), the absence of user involvement (Turner & Cochrane, 1993; Akbulut & Motwani, 2005), and lack of executive support (Munns & Bjeirmi, 1996). Thus, scope management is regarded as a key area of successful project management in practice (Hayes, 2004).

Although some project failures are because of technical reasons, most are directly related to the failure of stakeholders to embrace the principles of good project management (Jurison, 1999). As part of the project management process, project teams must understand the standards to which their projects are being held in order to

ensure that project performance is emphasized appropriately (Crawford, 2005). The *Field Guide to Project Management* (Cleland, 2004) suggests that project management should be "an easy sell" to organizations because it enhances business performance and increases revenue. An organization can manage project effectively by identifying its goals in applying project management principles (Aladwani, 2002). For most organizations, these goals are to apply a proven practice, optimize resources, serve customer needs and save time and money (Turner & Cochrane, 1993).

Project management in Corporate America is experiencing a renewed interest that reflects a shift in focus from merely tracking a few key project parameters to a full-blown application of management process functions, as expressed in the Project Management Institute's PMBOK® Guide, to meet customer needs. Project management has recently become very popular in the design and implementation of project-driven management strategies (Cleland & Ireland, 2002), particularly in the information systems industries. Recent research has identified project management as one of the most important success factors in IS development (Levina & Ross, 2003; Nah & Delgado, 2006). Although the importance of project management is widely recognized in IS faculty through standards and implementation (Reif & Mitri, 2005), the research performance of project management may not be comprehensive (Palvia, et al., 2004).

While project management practices are increasingly being accepted and implemented (Lee and Pena-Mora, 2007; Nidumolu, 1995; Park and Pena-Mora, 2003; Yilmaz and Phillips, 2007), further research into the capability of enterprise project management is needed to identify the satisfactory practice for a given project. Nevertheless, a study by Palvia, et al., (2004) of trends in published research from 1993 to 2003 indicates that project management is not viewed as a subject in its own right, but instead is spread across issues associated with IS management, IS development, IS evaluation/control, IS planning, and IS implementation. Most MIS papers during the periods 1993-1997 and 1998-2003, were about IS management. However, all other subjects related to project management had fewer articles written during 1998-2003 than in 1993-1997. Project management as a practice must be examined to emphasize the "right" practices and improve the "wrong" practices for project productivity. Research in the form of surveys, interviews, field and case studies leads to better solutions than randomly changing practices and procedures until the optimum solution is found.

The purpose of this study is to explore the efforts in project management by IS researchers in order to consider the coverage of crucial knowledge areas of project management. This study analyzes the portion of recent research for the nine knowledge areas recognized by Project Management Body of Knowledge (PMBOK®) Guide obtained from the Project Management Institutes' (PMI®). Each of these nine areas is evaluated by established project management practitioners to the recent literature in terms of quantity of abstracts. The relevance to practice of PM IS/IT articles to each of the nine knowledge areas is accessed in terms of the following issues: the significance of key competencies as described to practitioners in project management knowledge areas; whether sufficient practices are available to accommodate these key competencies, and whether the available practices are applied; which knowledge areas are most often considered in a recent body of identified IS/IT PM abstracts, and whether these works represent applied research, method papers or theory.

The contribution of this study has two folds. First, analytical results of this study indicates the knowledge areas requiring more attention to help improving the success rate of IS/IT projects. Second, the results can be used to conduct assessments within an organization to identify opportunities for project management and the resultant project success.

BACKGROUND LITERATURE

Project Management Functions

The Project Management Institute (PMI®) has developed and evolved a Project Management Body of Knowledge (PMBOK®) over several iterations to establish the foundation for an organization's project management capability. The PMBOK® describes project management as the application of knowledge, skills, tools and techniques to project activities in order to meet project requirements (PMI Standards Committee, 2004). The project management discipline, as it has evolved, moves beyond considering just cost, time, and quality project goals, and toward

facilitating the entire project process (Mitchell, 2006). This facilitated project process involves project stakeholders, project management knowledge areas, and project management tools and techniques (Muriithi & Crawford, 2003; Morris, et al., 2000).

As described in the PMBOK®, the framework for a project consists of nine functional/knowledge areas that need to be considered when selecting, planning, executing, controlling, and closing any project. These functions (or knowledge areas) are:

- Project Integration Management – processes needed to coordinate project elements.
- Project Scope Management – actions taken to ensure that all project work is defined and addressed.
- Project Time Management – actions needed to define the time frame and activities of the project.
- Project Cost Management – actions taken to ensure that the project is completed within the budget.
- Project Quality Management - actions needed to ensure that the project's results meet the client's requirements.
- Project Human Resource Management – actions necessary to apply people to the project effectively.
- Project Communications Management – actions taken to effectively generate and disseminate timely information.
- Project Risk Management – actions that identify, assess, mitigate and respond to risk elements in a project.
- Project Procurement Management –action taken to acquire goods and services to support the project. (paraphrased from PMI's PMBOK®)

The project management knowledge areas describe the key competencies that project managers must develop. Project scope, time, cost, and quality management are considered core knowledge areas (Schwalbe, 2002). Four facilitating knowledge areas provide the means through which project objectives are achieved: human resource (HR), communications, risk, and procurement management. The ninth knowledge area, project integration management, ensures that all of the elements of a project can be delivered under knowledge transfer through coordination mechanisms for on-time project completion (Nidumolu, 1995; Brown, 1999). The knowledge transfer is to import new external knowledge and synthesize existing internal knowledge (Henderson, 1994). Procurement in organizations is traditionally an area that has been looked at many times for ways to cut costs and to streamline the business processes to increase efficiency (Hsieh, et al., 2002).

Hartman and Ashrafi (2002) surveyed software owners/sponsors, contractors/suppliers, and consultants on 12 recent IS/IT projects to determine factors contributing to success with constructive action. They identified and tested the following recommendations for success identified and tested include: 1) linking the project to corporate business strategy; 2) aligning major stakeholders on key issues; 3) simplifying project controls and metrics, and 4) ensuring that effective communication and expectation management is maintained throughout the life of the project. However, the power or availability of identified project management functions that embody each of these success factors was not addressed.

Relevance of Research to Practice

The issue of relevance of information systems research to practitioners is frequently explored. A special issue of *MIS Quarterly* addressed this issue in March 1999. Benbasat and Zmud (1999), in the lead article, present reasons why much IS research lacks relevance, and recommend that authors intending to present relevant articles for practitioners must focus on the concerns of practice, provide real value to IS professionals, and apply a pragmatic tone. The ideal relevant publication would have content that discussed or presented actions that would be implemented in practice. Content represents a currency and level of interest in term of the applicability of the knowledge presented. How project management research can assist practitioners is an important issue.

The information technology (IT) discipline focuses on improving project management implementation in order to increase the success rate of IT projects (Schwalbe, 2002). However, the literature might not reflect this issue. Saunders (1998) reported problems with recently published academic research including the relevance of the content, delivery, and functionality. Relevant research enables managers to adopt the results to solve critical problems, as well as providing the opportunity to employ information technology to reshape the organization's environment (Saunders, 1998).

In considering the debate between rigor versus relevance, Robey and Markus (1998) developed an alternative solution for producing consumable academic research that can combine rigor and relevance. Distinguishing academic work from the work of untrained consultants and journalists, they (Robey & Markus, 1998) concluded that academicians have the advantage of rigorous training in research methods, a disinterested posture to vendors/products/technologies, a commitment to broad dissemination in the public domain and a commitment to scholarly values and ethical principles. These distinctive characteristics are very helpful in the production of consumable research. Additionally, the interaction between academic researchers and practitioners will also benefit from the transformation of academic research to become more user friendly, accessible, and relevant (Kavan, 1998).

Lee, Gosain, and Im (1999) explored the relevance of published IS articles from patterns in the literature, by discerning specific content differences between academic journals and practitioner magazines. Academic journals did not address applied issues of interest to practitioners and tended to lag in topical content. Palvia and Basu (2004) compared publications in several major journals based on key issues supplied by managers. This study attempted to match the published articles to the list of key issues based based on the content of the articles and the relevance of the topics. Unsurprisingly, the publication analysis and key issue rankings did not match.

This study employs methods similar to that of Palvia and Basu (1999) by considering the relevance to practice of identified project management research in IS/IT in terms of the body of knowledge applied by project management practitioners.

RESEARCH METHODOLOGY

The nine PMBOK® functions form the structure for the authors' research and reporting efforts. Each function represents a critical project management component. The degree application of each function in a improved project determines the success of the project. To measure practitioner considerations for key functions required of project managers, a survey was designed that required respondents to consider each of the nine project management knowledge areas on three fronts. First, respondents were asked to consider the critical nature of each of the nine knowledge areas and indicate the degree of importance competencies for each knowledge area that were critical. The responses to the Likert-type scale ranged from 1 (not a critical issue) to 5 (an absolutely critical issue).

Second, respondents were asked to consider the extent of application of practices, including the use of tools and techniques that are sufficient to accommodate the key competencies in each of the knowledge areas. The ratings to be assigned by respondents ranged from 1 (no practice exists) to 5 (sufficient practice exists).

Finally, practitioners were asked to consider the application of available practices in their most recent project experience for each of the knowledge areas. Again, responses using the Likert-type scale ranged from 1 (no practice applied) to 5 (practices sufficiently applied).

The survey was sent to 534 PMI® members for their consideration and responses. Ninety-two completed surveys were received, indicating a response rate of 17 percent. The researchers expected to receive a higher percentage of responses than this, but the sample size of 92 completed surveys was a sufficiently large to draw conclusions.

Of the 534 surveys, 34 were initial surveys of project management practitioners in an executive seminar hosted by PMI-Southwest Ohio Chapter at Cincinnati, Ohio. This seminar was conducted in conjunction with an earlier investigation of IS/IT research literature, and provided the opportunity to directly collect information on a real-time basis from project management experts.

Five hundred more surveys were mailed to a random sample of PMI-Information Systems Specific Interest Group (ISSIG) members who are project management practitioners employed in the IS/IT field. The PMI-ISSIG has approximately 15,000 constituents employed in the development and deployment of integrated information systems. The aim of PMI-ISSIG is to be the preferred organization for all aspects of project management that apply to information systems, regardless of industry.

To examine consideration for key PMBOK® functions in the literature, this study employed a research database produced in a previous partnership between Xavier University and PMI® to generate research abstracts for the proceeding three years. These abstracts were based on a previously established research definition of project management and focused on research specifically in the IS/IT area. The resulting 784 records from this work formed the initial research base for the work reported herein.

Benbasat and Zmud (1999) maintain that evaluation of a representative set of abstracts should provide significant insights into the papers. The database is reviewed by having a practitioner and academic read and select pertinent abstracts. Although the text mining techniques (Feldman et al., 1996; Forman, 2003) are often adopted in the literature of expert systems for efficiently classifying and comparing documents, the review by research investigators must outperform on recognizing synonyms of the key words. The qualifications of the research investigators are critical to the evaluation process. The project management practitioner who participates in this investigation has more than 28 years of project management specific experience and has followed the evolution of project management definitions by PMI. He has been designated a project management professional (PMP®) and was one of the founders of PMI's Project Management Professional certification process. The academic has 18 years experience in academia primarily in the area of applications development and has participated in a recent stream of research considering parameters associated with project success in the IS/IT field.

To process the database, each abstract was first examined for inclusion as project management research in the IS/IT technology field. The research investigators selected those agreed upon as representative of project management successes or challenges. Accordingly, 268 abstract were chosen out of the 784 records in the original database. Each of the retained records was assigned to one of three knowledge areas and categorized by paper focus as applied, methodological, or theoretical. The results of the selection of abstracts are summarized below.

- Total abstracts used for processing – 268 (100%)
  - Abstracts from journals – 169 (63.1%)
  - Abstracts from conference proceedings – 92 (34.3%)
  - Abstracts from theses – 7 (2.6%)
- Abstracts addressing more than one PMBOK knowledge area – 24 (8.9%)

A two-fold descriptive approach was adopted to the reasons for applying the project management processes found in the literature and currently applied:

- This research was indentified by knowledge area category and describe relevant issues according to an existing annotated bibliography of information systems/information technology (IS/IT) project management research literature over three years.
- Project managers were surveyed to ascertain the relevance of this body of literature to practice.

ANALYTICAL RESULTS AND DISCUSSION

The results of this study contribute to the understanding of project management practices and to the opportunities for improving project success rates. These results show trends and give direction to any organization's efforts to adapt project management systems to meet their challenges while focusing on improved productivity.

Table 1 presents the number of abstracts in each knowledge area in descending order. The number of abstracts by medium (journal, proceeding) is given within each knowledge area. Results are not additive due to the possibility that some articles consider more than one knowledge area.

Table 1: Abstracts by Knowledge Area.

Knowledge Area	%	Journal	Proceeding
Human Resources	21.6%	28	17
Scope	20.1%	32	10
Risk	14.9%	27	4
Integration	12.5%	18	8
Quality	8.7%	10	8
Communications	7.7%	9	7
Procurement	7.7%	9	7
Time	3.4%	4	3
Cost	3.4%	3	4

Project human resource management was ranked first as the area most frequently mentioned in the representative documents. This finding is not surprising given the impact of people on the success and failure, not only of projects, but organizations. In particularly, in the IT field, qualified people are hard to find and keep. If people are an organizations greatest asset, then appropriate human resource management is required use people on a project effectively. Project human resource management involves organizational planning, staff acquisition and team development (Schwalbe, 2002; Mahaney & Greer, 2004). Therefore, project human resource management offers the greatest opportunity to improve project management practices.

Project scope management is a close second with nearly one-fifth of the issues identified. The very nature of IS/IT projects clearly reveals that scope planning is often weak, and the scope of the project is frequently dynamic with numerous changes during development. The effects of scope planning are felt throughout each of the other core knowledge areas, namely time, cost and quality.

Project risk management represents a high percentage of the challenged areas. Unsurprisingly, a rapidly moving IT environment creates more risks than a mature technology that has significant stability from the beginning to the completion of a project. Risk is also inherent in a project with inadequate skilled resources and a poorly developed project scope.

Table 2 lists abstracts by paper type for each of the nine knowledge areas. This sorting of papers indicates the source of information and whether it may apply to an industry or organization. "Applied" papers report results of actual use of project management for IT/IS projects. "Methods" papers report a process or methodology for project management. "Theory" reports the theoretical assessment and projection of how project management practices should be conducted in future projects, while 85 papers did not fall in any of these categories.

Table 2: Abstracts by Paper Type.

Knowledge Area	Paper Type		
	Applied	Methods	Theory
Scope	16	21	5
Time	3	4	1
Cost	5	1	1
Quality	11	5	1
Human Resources	29	6	9
Communications	10	6	1
Risk	18	10	3
Procurement	11	4	1
Integration	11	8	5
Total Number of Abstracts	114 (43%)	65 (24%)	27 (10%)

As expected, the largest number of papers reported is related to the application of project management practices (43 percent). Methods papers related to the process of project management practices ranked second with 24%.

This distribution of issues throughout the literature search suggests that addressing the application of project management can produce greater improvements of project success rate. Was the issue identified through application of project management, was it a lack or flaw in methodology, or was it a proposed theory for how project management should be accomplished? Interestingly, the largest number of studies focused on project human resource management, i.e., 29 incidents, in the applied column. And, more than half studies in the knowledge areas other than "Time", "Communication" and "Integration" focused on the "Applied" category.

The largest number of studies in the methods category focused on project scope management. The focus on project risk management and project scope management prevails with occupying 47.7% of all abstract. Around half of studies in project scope management fall into the methods category, and this indicates that the methodology is emphasized in the scope management of project.

Theoretical reports formed the smallest proportion of papers, with 10% of the population. This result is not surprising considering that "theory" contributes to long-term adjustments to an organization's project management practices whereas the "applied" and "method" reflect immediate concerns for an organization – and the project participants.

Project management competence is regarded as critical impact on project performance and organizational performance (Smith, et al., 1984; Pinto & Kharbanda, 1995; Toney, 1997). Competency implies the knowledge, skills, ability and motivation to perform work. Project management professionals were asked to consider the key competencies associated with each of the PMBOK® knowledge areas in terms of the critical nature of these competencies, the effectiveness of existing practices in accommodating these competencies, and the application of available practices are applied. A Likert-type scale, 1 through 5, was adopted in each category to ascertain the importance, availability and application of each competency.

Table 3 lists the mean score results of the practitioner survey. Standard deviations are reported to indicate how tightly the data are clustered around the mean. A smaller standard deviation indicates that the responses are closer to the mean. The standard deviations for each knowledge area increased as practitioners considered the critical nature of key competencies, followed by availability of existing practices, and ultimately the application of available practices.

Table 4 lists the rank of each knowledge area by category, as viewed by project practitioners. It is interesting to note that the required competencies in each knowledge area somewhat match the abstracts. For example, the practitioner lists "scope" as being critical to projects, but ranks implementation of sound scope management in existing projects nearly in the middle (number 4 of 9). Furthermore, the available practices are applied second to the most critical area.

Table 3: Practitioner Description of Key Competencies.

Knowledge Area		Critical Nature of Key Competencies	Existing Practices Accommodate Key Competencies	Available Practices are Applied
Scope	Mean	4.76	3.48	3.55
	Std	0.45	0.97	1.13
Time	Mean	4.24	3.85	3.59
	Std	0.70	0.86	0.95
Cost	Mean	4.14	3.80	3.47
	Std	0.81	0.97	1.00
Quality	Mean	4.05	3.20	3.03
	Std	0.73	0.94	1.02
Human Resources	Mean	3.70	3.32	3.22
	Std	0.89	0.90	0.99
Communications	Mean	4.48	3.41	3.34
	Std	0.72	0.97	1.18

Risk	Mean	4.05	3.17	3.02
	Std	0.69	0.92	1.05
Procurement	Mean	3.15	3.49	3.00
	Std	0.94	1.04	1.19
Integration	Mean	3.96	2.92	3.13
	Std	0.85	0.90	1.06

Table 4: Rank of Key Competencies.

Knowledge Area	Critical Nature of Key Competencies	Existing Practices Accommodate Key Competencies	Available Practices are Applied
Scope	1	4	2
Communications	2	5	4
Time	3	1	1
Cost	4	2	3
Quality	5.5	7	7
Risk	5.5	8	8
Integration	7	9	6
Human Resources	8	6	5
Procurement	9	3	9

Analysis of the rankings in the three columns provides some insight, though not statistically significant, into the perceived importance of competency within a knowledge area. Mapping a knowledge area to the need for competency suggests more than simply understanding the written word or the practices within the knowledge area.

CONCLUSIONS

The purpose of this work was to analyze the endeavors in project management by IS researchers on the nine functions of project management. The literature search and the survey of project management practitioners as presented herein set a baseline for understanding the issues within IS/IT project management, and suggest that organizations may want to refine their methods, practices and policies to improve efficiency and effectiveness of projects. This study draws the following major conclusions:

- Research into IT/IS project management reveals that improving Project Human Resource Management and Project Scope Management produces greatest success of project.
- The need for improving project management knowledge areas is not met by the application of available practices. Organizations need to enhance project success by aligning the knowledge area need with the availability of practices.
- Some knowledge areas are more important than others where one area may adversely affect another. For example, poor scope management in a project may lead to a higher risk. Similarly, inadequate allocation of human resources in a project negatively affects time, cost and quality.
- Application of project management practices and methodology rank higher than theory because of the immediate need of both practices and methods. Therefore, the long-term benefits from theory receive less attention than the short-term benefits of practical solutions.
- Organizations need to assess project management practices within the knowledge areas defined by PMI, and adjust those practices to improve productivity.

This research touches on project management practices within the IS/IT industry, but its results may be applicable to other industries. Results of this study can be used to conduct assessments within an organization to identify

opportunities for project management and the resultant project success. This framework around PMI's PMBOK Guide knowledge areas may be the most efficient means of identifying areas for improvement.

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ACKNOWLEDGEMENTS

The contribution of time, talent, and energy by those persons involved in the survey questionnaire is gratefully acknowledged. Their sharing of knowledge has a significant impact on the outcome of the research.

The leadership and project management contribution of the PMI-Southwest Ohio Chapter under the direction of Debbie Miersma, past president, is acknowledged and appreciated.

Leadership and organization efforts of the facilitated workshop by Tim Kloppenborg, Xavier University, are greatly appreciated.

Thanks to International Paper and David Braud for providing facilities for the facilitated workshop.