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The Application of Project Management Standards and Success Factors to the Development of a Project Management Assessment Tool

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Abstract

In spite of all that is known about project management best practices, they are often absent from typical construction projects. This has motivated our interest in developing a tool to assess construction project management practices, focusing on the assessment of individual project practices. We will also explore project outcomes and their correlation with project management practices-potentially identifying project management value. Previous efforts have addressed project management assessment. The paper describes examples that assess an individual's project management skills and approaches that examine the project management competencies of organizations. In contrast to these, our focus is on assessing the project management practices that have been implemented for specific construction projects. A central component of any assessment scheme is the identification of specific elements to be assessed (the assessment "targets"). We intend to draw heavily upon established project management standards and project success factors from previous research to provide the specific targets and benchmarks to be assessed. These include the Project Management Body of Knowledge (PMBOK) by the PM Institute, the IPMA Competence Baseline (ICB) by the International PM Association, ISO 9000, and Prince2 by The Office of Government Commerce UK. This paper describes how these standards are integrated into the project management assessment tool. It discusses the theoretical foundations for the project management assessment tool and the methodologies used for developing the tool and for applying the tool to specific project situations.

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1. Introduction

Project management (PM) is a vital and well-developed discipline within the construction industry. Yet, our experience is that weak PM practices continue to be commonplace, particularly among project owner organizations. Poorly managed projects cost U.S. companies and government agencies an estimated $150 billion per year (Larson & Gray, 2011). That cost may be $97 billion per year in Canada in public projects only, based on the study by Flyvbejerg (2002) and the investment in public projects from Statistics Canada (2011).

We suggest that two contributing factors to poor PM practices are: 1) project organizations are unaware of how their PM practices compare with best practices, and 2) project organizations are unaware and unconvinced about the value offered by various PM practices. In response, our goal is to develop an approach capable of performing the following:

1. Assess the PM on individual projects to benchmark the PM performance relative to PM standards of best practice.
2. Assess the success of construction projects and relate this to the assessed PM performance as a measure of PM value.

Our approach will take the form of a PM assessment tool that can diagnose the strengths and weaknesses of an organization's PM implementation at the project level and assess the value of PM. Some PM assessment tools currently exist, but these are generally designed to measure either organizational maturity levels or individuals' knowledge of PM. We propose to assess PM at the level of individual projects. A central component of any assessment scheme is the identification of the specific elements to be assessed (the assessment "targets"). Our methodology is to draw heavily upon established PM standards to suggest the specific PM practices that will comprise the targets and benchmark values to be assessed. A secondary source for identifying candidate assessment targets is the body of literature relating to project success factors. In addition to assessing the level of PM practices on individual projects, we will identify project outcomes, and then explore the correlation between levels of PM practices and project outcomes in order to find evidence of the value gained through PM practices.

Having used the PM standards and success factor literature to identify the PM practices to be assessed, we will develop an initial assessment tool (e.g., on-line questionnaire). This assessment tool will then be piloted at a small scale and refined prior to conducting a larger scale trial and data collection activity. These results will be evaluated both to analyze the correlation between PM practices and project outcomes, and to evaluate the assessment tool for further improvement.

This paper focuses primarily on one preliminary aspect of this research - a review of the main sources that used to identify the PM practices to be assessed. The paper first summarizes past efforts to assess PM and to measure the value of PM. The paper then surveys the major PM standards that we are drawing upon and presents an approach for their integration, followed by a review of project success factor research. The paper then provides a brief example of how these PM references are translated into assessment questions.

2. Project Management Assessment Tools

The Boston University Corporate Education Center (BUCEC, n.d.) has an online PM skills assessment. This tool is designed to measure PM technical competencies, personal competencies, and leadership and business competencies. After completing the assessment tool, the individual would identify his or her strengths and weaknesses and training needs. This PM skills assessment tool is oriented toward measuring a person's knowledge and skills. Along the same lines are the PM skills assessment tools by the Atlantic Management Center Inc. (AMCI, n.d.) and the Business Improvement Architects

(BIA, n.d.). They are designed to identify individual's existing PM skill profile and areas for improvement in basic PM knowledge. The BIA assessment tool consists of one hundred questions based on the PM body of knowledge (PMI, 2008). The Enterprise Information (EII, n.d.) has a PM maturity assessment, PM competency assessment, and PM skills assessment tool. These tools are designed to measure the maturity level of an organization, and the competency and skills of an individual. Harold Kerzner's PM maturity model online assessment (IIL, n.d.) and the PM/ROI Assessment (Ibbs & Kwak, 2002) are two assessment tools designed to diagnose the PM maturity level, the strengths and weaknesses, and training needs of an organization.

In contrast to these tools that assess the organizational practices or the knowledge of individual managers, our approach is to assess the PM practices in place for individual construction projects. We believe that this project scope assessment supplements the organizational scope and individual scope assessments (they are all useful), and that the project scope assessment offers the advantage of most closely matching the goals of benchmarking the PM practices of individual projects and of seeking correlations between PM performance and project outcomes.

3. Measuring The Value Of Project Management

Previous attempts have used three ways to measure the value of PM: a maturity-based Return on Investment (ROI) metric, a Balance Scorecard-ROI, and a resource-based view.

3.1. The Maturity-Based Metric

The maturity-based metric focuses on determining the organization PM maturity level and establishing the correlation between PM maturity and project variations in cost and time from the original baselines. The PM maturity analysis methodology consists of 148 multiple-choice questions that measure PM maturity and cover 8 knowledge areas and 6 project phases (Ibbs & Kwak, 2000). The PM maturity model attempts to determine the current PM level of an organization (Ibbs & Kwak, 2002). Ibbs and Reginato (2002) pointed out three important findings. First, companies with more mature PM practice have better project performance. Second, PM maturity is strongly correlated with more predictable PM schedule and cost performance. And third, companies with good PM practices have lower direct costs than companies with poor management.

3.2. The Balanced Scorecard-ROI Metric

There are two branches to this approach to measure the value of PM, the balanced scorecard and the balanced scorecard-ROI metric. The balanced scorecard (Kaplan & Norton, 1996) establishes goals and measures in four perspectives: financial, internal business, innovation and learning, and customer. Combining these perspectives, the balanced scorecard improves managers' decision making and problem solving abilities, "The balanced scorecard provides a framework for managing the implementation of strategy while also allowing the strategy itself to evolve in response to changes in the company's competitive, market, and technological environments" (*ibid*).

The balanced scorecard-ROI metric (Phillips *et al.*, 2002) uses the same approach as the balance scorecard, but tries to quantify any value realized in the form of monetary value. Forms of value can be measured by output data, calculating the standard cost of quality, converting employee time using compensation, using historical costs from records, using input from internal and external experts, or using estimates from team members and management team.

3.3. Resource-Based View Metric

This approach is based on the Ricardian statement that companies with superior resources will have lower average costs and earn rents (Peteraf, 1993). This view focused on "the impact that internal organizational competencies have in determining the long-term, sustainable competitive advantage of firms. The concern is that competencies are knowledge-related, tacit, difficult to trade, and typically shared among the agents of the firm. Thus the question emerges as to whether or not PM could be capable of generating advantage to a firm." (Thomas & Mullaly, 2008, p.20). Thomas & Mullaly (2008) found that based on the context, the PM implementation, and the fit of the PM implementation to a specific organization, companies obtained tangible and/or intangible values.

The concern of this approach is that the value of PM implementations was measured based on the subjective opinions of executives and project managers. There was no actual dollar value or cost saving percentage as a consequence of implementing PM knowledge and practices. Although it was important to reaffirm that PM implementation brings value to an organization, the idea of measuring the value of PM implementations is still to be explored.

3.4. Proposed approach

In addition to the approaches described above, other efforts have conducted surveys of project management experts to ascertain their opinions about specific PM practices (tools and techniques), and their perceptions of their value (Patanakul *et al.*, 2010; Besner & Hobbs, 2006). These previous efforts to measure PM value all involve some form of assessment of PM performance and, in most cases, they compare these to some form of assessed project success to give a measure of PM value. The differences lay in approaches used for these assessments. As stated, our approach is to extend previous efforts -which focus of organizational competencies or individual manager's skills- by focusing more objectively on assessing the specific PM practices implemented on individual construction projects in relation to widely accepted PM standards.

4. Project Management Standards

In order to assess the PM performance on individual construction projects, we must first determine what "correct" or "best" PM practices are. The answer to this question is potentially open-ended and subjective, and it is beyond the scope of our study to develop an original solution. Rather, we look towards project management standards -which represent substantial investment of expertise, development effort, broad-based consensus, and wide-spread acceptance of PM best practices- as our primary benchmark for our PM assessment. There are many standards and methods for PM practices: the Project Management Body of Knowledge (PMBOK) by the Project Management Institute, the IPMA Competence Baseline (ICB) by the International Project Management Association, ISO 9000, Prince2 by The Office of Government Commerce UK, the Capability Maturity Model, the Project and Program Management (P2M) by the Engineering Advancement Association of Japan, and the C-PMBOK by the Chinese PM conference, among others. For the purpose of this study we intend to incorporate elements of the first 4 of these.

4.1. The PMBOK by PMI

This PM standard consists of nine knowledge areas and five process groups. The nine knowledge areas are: integration, scope, cost, time, quality, risk, human resources, communication, and procurement

management. The process groups are: initiating, planning, executing, monitoring and controlling, and closing (PMI, 2008). Each PM process defined within these knowledge areas and process groups is described in terms of its inputs, tools and techniques, and outputs.

Project integration management is a key knowledge area because it involves the coordination of all the management activities. Project integration management includes the authorization of the project (project charter), the PM plan (construction schedule, human resource plan, quality plan, risk plan, communication plan, and procurement plan), the execution/monitoring/controlling/closing of the project, and the change control process.

4.2. International Project Management Association Competence Baseline

The IPMA Competence Baseline, version 3, (ICB3) standard is represented in the 46 competence elements that are grouped into contextual competences (11 elements), technical competences (20 elements), and behavioural competences (15 elements) (IPMA, 2012).

The contextual competences include the project, programme, and portfolio orientation and implementation with the organisation's strategy. It also includes the permanent organization, business case, systems, products, technology, finance, and legal aspects. The contextual competence states clearly the importance of the project on a broader picture of the organization. This competence area also includes personnel management, which may be part of the behavioral or technical competence taking into account its definition.

The behavioural competences are personal skills and attributes a project manager should have to contribute to project success. These behavioural competences include leadership, engagement, motivation, self-control, assertiveness, relaxation, openness, creativity, result orientation, efficiency, consultation, negotiation, conflict and crisis, reliability, values appreciation, and ethics.

The technical competences include elements that are either knowledge-based or PM processes. PM success should not be considered a technical competence since it is more of the result of being competent. As defined by the ICB3 standard, "a competence is a collection of knowledge, personal attitudes, skills and relevant experience needed to be successful in a certain function" (*ibid*, p.9).

Within the technical competences, the following competences can be considered part of human resource management: project organisation, teamwork, problem resolution, project structures, and resources. In a similar manner, the following technical competences can be considered part of communication management: reports (control & reports), information and documentation, communication, and interested parties.

4.3. ISO 9000

The ISO 9000 family of standards (ISO 9000) are related to quality management and quality assurance. The ISO 9000 standard is intended to provide an understanding of the concepts and definitions in the family of 9000 standards. ISO 9001 is related to the requirements of a quality management system and certification process. ISO 9004 provides the framework for continuous improvement and the satisfaction of employees, owners, suppliers, partners, and society in general. The ISO 9000 standards are based on the principles of customer focus, leadership, involvement of people, process approach, system approach to management, continual improvement, factual approach to decision making, and mutually beneficial supplier relationship.

To successfully implement a quality management system, the ISO 9000 process approach includes management responsibility, resource management, product realization, and measurement analysis and improvement.

4.4. PRINCE2

PRINCE2 stands for projects in a controlled environment. PRINCE2 is a PM method based on a continued business justification and a planning process focused on products. It is the result of the accumulated experience from good and bad projects. It is a method that gives fundamental importance to roles and responsibilities within the project, and a management by stages and with defined deviation tolerances on cost, time, quality, scope, risk, and benefits (OGC, 2009).

PRINCE2 has themes that are similar to the PM knowledge areas of the PMI standard or to the technical competences of the ICB3 standard, for instance, quality, plans, and risk. The organization theme could be part of a broader knowledge area such as human resource management or part of the ICB3 contextual competence. The business case and change themes could be part of the integration management knowledge area or the contextual competences on the ICB3 standard. The progress theme is more like a process than a knowledge or skill.

4.5. Comparison of Project Management Standards and an Integrated Framework

Each of these PM standards share much common ground in their central PM concepts and practices, yet also they each include some PM issues not addressed by the others (Garcia, 2005). Rather that selecting one of these as our benchmark for assessing PM performance, we would like to take advantage of the strengths of all of them. To this end, our approach is to adopt the structure of the PMBOK (simply as a matter of preference), and then to create an integration framework that attempts to assemble a superset of the important elements of the four approaches - PMBOK, ISO 9000, ICB3, and PRINCE2. An example is the alignment of the project with the organization. The ICB3 emphasizes this important element with the contextual competences, and PRINCE2 based its method on a continued business justification principle and a business case in its themes. The ICB3 standard emphasizes behavioural competences, which are not mentioned in any of the other international standard.

We have combined the key elements of these four standards into an integrated PM framework. The framework adopts the PMBOK's knowledge areas, process groups, and PM processes as its core structure, and then adds in the corresponding elements from the other three standards, extending the PMBOK structure where necessary. This integrated framework provides the basis for defining the PM practices that will be assessed within this study.

5. Project Success Factors

The previous section showed that we are adopting an amalgamation of PM standards as our primary source against which to assess PM performance. However, we intend to consider additional, secondary sources as well. In particular, we are reviewing the literature on project success factors as a source for defining the content of the PM assessment tools.

Projects are considered successful when they meet stakeholders' needs and expectations. Most of the time, the stakeholder's needs and expectations are met when the project is on time, on budget and within the scope and quality planned. However, project success criteria are subjective, and most of the time, are determined by the stakeholders. There is a clear difference between project success and PM success (Wit, 1998).

In a recent study, a set of metrics were developed to determine the link between PM practices and project success. The outcome of this study was that the better the PM practices, the better the project results, "the results suggest that the PM practices that make a difference may not be the most frequently used" (Papke-Shields *et al.*, 2010).

Previous studies identified the following critical success factors: project mission, support from senior management, clear realistic objectives, strong/detailed plan kept up to date, good communication/feedback, user/client involvement, client acceptance, skilled/suitably qualified/sufficient staff/team, effective change management, competent project manager, strong business case/sound basis for project, sufficient/well allocated resources, characteristics of the project team leader, proven/familiar technology, realistic schedule, risk addressed/assessed/managed, project sponsor/champion, effective monitoring/control, adequate budget, organisational adaptation/culture/structure, good performance by suppliers/contractors/consultants, planned closed down/review/acceptance of possible failure, training provision, political stability, correct choice/past experience of PM methodology/tools, environmental influences, past experience/learning from, project size/level of complexity/number of people involved/duration, and different viewpoints (Fortune & White, 2006; Thomas & Fernandez, 2008; Cooke-Davies, 2002; Pinto & Slevin, 1987; Pinto & Prescott, 1988; Pinto & Mantel, 1990; Bryde & Robinson, 2005; Shenhar *et al.*, 1996; Shenhar *et al.*, 2003; Englund & Graham 1999).

Each of these success factors -as well as the PM standards- will be related to one or more of the questions of the initial PM assessment tool.

6. Project Management Assessment Tool Development

Although, the primary focus of this paper is to describe the use of PM standards and project success factors as the foundations for the development of a PM assessment tool, as shown in the previous sections, a brief review of the tool development is provided here. The initial scope of the assessment tool will be restricted to PM in construction organizations at the owner, client, or developer level, in order to initially obtain data sets from a series of projects that are quite similar in nature so that the data allows testing and validation of the assessment tool. The case study projects will be selected based on similar levels of complexity and uncertainty (Shenhar *et al.*, 2002). The study will include only projects with initial project scope, cost, time, and quality baselines; and only projects with change management systems that can record the number and nature of changes.

Our methodology is to develop a preliminary version of a PM assessment tool by using the integrated PM standards framework, combined with the project success factors research, to suggest a set of PM practices to be assessed. For instance, in addition to the activity "develop the project charter" in the project integration management and initiating process group of the PMBOK-PMI framework, there will be contextual competences from ICB3, business case and configuration management strategy from PRINCE2, and determining criteria for product acceptance from ISO 9000, 7.1c.

After this step, there will be an initial test and refinement based on a pilot case organization, as well as an experts' review. The final version of the assessment tool will be tested on a full scale survey and a multi-case study. The results will be analyzed to explore the strengths, weaknesses, and value of PM in an organization, as well as recommendations and future improvement of the assessment tool.

As an example of the contents of the assessment tool, the following is one of the questions that addresses the topic of PM context:

At the beginning of the project, did the organization have each of the following:

a.	*Vision*	*Yes — No — Don't Know*
b.	*Mission*	*Yes — No — Don't Know*
c.	*Strategic plan*	*Yes — No — Don't Know*
d.	*Goals and targets*	*Yes — No — Don't Know*

This question addresses the PMBOK section 2.4.1, the ICB3 contextual competence 1 to 3, the ISO 9001:2008 section 5, the PRINCE2 section 4.3.4, and Larson & Gray 2011 on project success factors. The

following is another example of a question related to the PM implementation:

The project had support from senior management during the project life cycle:

a. Always
b. Often
c. Sometimes
d. Rarely
e. Never

This question addresses the ICB3 contextual competence 3 and 4, the PRINCE2 section 5.3.2, and the project success factors identified by numerous sources (Avots, 1969; Cleland & King, 1983; Morris, 1986; Pinto & Slevin, 1987; Morris & Hough, 1987; Stoddart-Stones, 1988; Magal *et al.*, 1988; Pinto & Mantel, 1990; McComb & Smith, 1991; Cash & Fox, 1992; Yap & Soh, 1992; Pollalis & Frieze, 1993; Tennant, 1993; Selin & Selin, 1994; Martinez, 1994; Coullard, 1995; Westell & Newman, 1996; Akkerman & Van, 2002; Somers & Nelson, 2001; Larson & Gray, 2011).

After answering the assessment tool, project managers and organizations will receive a feedback on areas to improve for future projects or training needs to improve PM practices.

7. Conclusions

A PM assessment tool can be used to diagnose the strengths, weaknesses, and value of PM implementation in construction organizations. The difference between the existing assessment tools and the proposed one is that previous attempts assess the organisation (PM maturity models) or the knowledge of the individual project manager. The proposed assessment tool will focus on what was actually implemented in a specific project. The value of PM can be shown by correlating assessed PM practices and project outcomes.

The PM assessment tool integrates four international standards-A Guide to the Project Management Body of Knowledge by the Project Management Institute, the Competence Baseline by the International Association of Project Management, ISO 9000 family of standards, and PRINCE2 by the Office Government Commerce UK-and project success factors derived from previous studies. Each question of the assessment tool is supported by a reference to a section of one or more of the international standards and one or more of the previous studies on project success factors.

At the time of writing, an initial draft of the PM assessment tool has been completed and has been applied to three pilot case studies. This will be followed by refinements to the tool prior to additional testing, data collection, and analysis of the results to seek insight into the strengths and weaknesses of PM practices in organizations, the value of PM for improving project outcomes, as well as areas to improve in the assessment tool.

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