Making Project Management Indispensable for Business Results™

5
Project Control: Literature Review
Shai Rozenes
Gad Vitner
Stuart Spraggett

15
Toward a Project Management Theory for Renewal Projects
Erling S. Andersen

31
Success of Projects in Different Organizational Conditions
Irja Hyvärä

42
The Effect of Intrinsic and Extrinsic Rewards for Developers on Information Systems Project Success
Robert C. Mahaney
Albert L. Lederer

55
Understanding Project Failure: Using Cognitive Mapping in an Insurance Project
Stephen Robertson
Terry Williams

Published by PMI
Get noticed for the right reasons

Feel confined by your current opportunities? Gain mobility and earning potential. Get your CAPM® credential, the definitive global certification for project team members who aspire to stand out from the crowd.

The CAPM credential tells the world you can use project management knowledge to give your team — and yourself — a competitive advantage. And it's developed by the organization that brings you the PMP® credential: Project Management Institute.

Making project management indispensable for business results.®
www.pmi.org/PMNetCAPM.htm

© 2006 Project Management Institute, Inc. All rights reserved. “PMI”, the PMI logo, “CAPM”, “PMP”, and “Making Project Management Indispensable for Business Results” are registered marks of the Project Management Institute, Inc.
From the Editor
Christophe N. Bredillet, PhD, MBA, Ingénieur EC Lille

PAPERS

5 Project Control: Literature Review
Shai Rozenes, Gad Vitner, and Stuart Spraggett

15 Toward a Project Management Theory for Renewal Projects
Erling S. Andersen

31 Success of Projects in Different Organizational Conditions
Irja Hyväri

42 The Effect of Intrinsic and Extrinsic Rewards for Developers on Information Systems Project Success
Robert C. Mahaney and Albert L. Lederer

55 Understanding Project Failure: Using Cognitive Mapping in an Insurance Project
Stephen Robertsonson and Terry Williams

72 Cover to Cover—Book Reviews
Kenneth H. Rose, PMP

79 Notes for Authors

80 Index of Advertisers
The Link Research—Practice: A Matter of “Ingenium” (Part 1)

The papers presented during the last PMI Research Conference in Montréal, Canada, exemplified the link Research – Practice.

In the meantime, a sound translation of research into practice is not obvious as it implies an “intelligent” action—a praxis—“ingenium”1, “this mental faculty which makes possible to connect in a fast, suitable and happy way of the separate things” as stated by Lemoigne (1995), quoting Giambattista Vico (1708).

What is the necessary condition supporting a sound translation of research results into practice, and being a preamble to any relevant research? One would say a clear understanding of the context, or the situation, within which the translation is made.

This involves clarifying our perception and understanding at four levels: paradigmatic, epistemological, ontological, and metaphysical.

• Paradigmatic Level (The word paradigm has referred to a thought pattern in any scientific discipline or other epistemological context.)
• Epistemological Level (Epistemology or the theory of knowledge is the branch of philosophy that studies the nature and scope of knowledge.)
• Ontological Level (In philosophy, ontology is the study of being or existence. Ontology can be said to study conceptions of reality.)
• Metaphysical Level (Metaphysics is the branch of philosophy concerned with explaining the nature of the world.)

In this “Letter From the Editor,” I will develop the paradigmatic level. The epistemological, ontological and metaphysical levels will be exposed in the next PMJ issue and these theoretical developments will lead me to introduce some burning issues that should be considered, in my view, with a greater attention.

1. Paradigmatic Level (The word paradigm has referred to a thought pattern in any scientific discipline or other epistemological context.)

Kuhn defined a paradigm as “an entire constellation of beliefs, values and techniques, and so on, shared by the members of a given community” (Kuhn, 1970, p. 175). Probably the most common use of the word paradigm is in the sense of Weltanschauung. For example, in social science, the term is used to describe the set of experiences, beliefs, and values that affect the way an individual perceives reality and responds to that perception.

Social scientists have adopted the Kuhnian phrase “paradigm shift” to denote a change in how a given society goes about organizing and understanding reality. A “dominant paradigm” refers to the values, or system of thought, in a society that are most standard and widely held at a given time. Dominant paradigms are shaped both by the community’s cultural background and by the context of the historical moment. The following are conditions that facilitate a system of thought to become an accepted dominant paradigm:

• Professional organizations that give legitimacy to the paradigm
• Dynamic leaders who introduce and purport the paradigm
• Journals and editors who write about the system of thought. They both disseminate the information essential to the paradigm and give the paradigm legitimacy
• Government agencies who give credence to the paradigm
• Educators who propagate the paradigm’s ideas by teaching it to students
• Conferences devoted to discussing ideas central to the paradigm
• Media coverage
• Lay groups, or groups based around the concerns of lay persons, that embrace the beliefs central to the paradigm
• Sources of funding to further research on the paradigm.

Paradigm as the “Gestalt of a Weltanschauung”

Another perspective to the concept of what a paradigm is that a paradigm is the Gestalt (the whole is more than the sum of its parts) of the three main branches of philosophy—metaphysics, epistemology, and ethics—that forms a “Weltanschauung” (German for “Worldview”):

So a paradigm is a view of reality that is a “Gestalt” resulting from:

(1) A metaphysical assumption of what could be known. It forms the basis for:
(2) A conception of epistemological knowledge acquisition. This is the essentialistic line of thinking essentialism from Plato, Aristotle, and Popper vs. the ontological line of thinking (ontology) opened up by the "uncertainty principle" of Heisenberg's quantum theories to Heidegger's "Fundamental Ontology." This in turn is the basis for the:
(3) Praxis in an ethic for living.

It is obvious that the three branches of philosophy describe the structure of a paradigm. None of the branches of metaphysics, epistemology and ethics can be left out for understanding paradigms. Together they describe a Gestalt, akin to a spiral (not a mere circular) movement, forming Hermeneutical understanding.

The result is that Hermeneutics cannot be reduced to an interpretation of something in context of the text itself in a mere "hermeneutic circle"; it is a developmental cycle that involves:

(a) "Wahrnehmung" as an "affective awareness," which is more than mere sense perception. The method toward an affective awareness is through "ontological understanding." It forms the principles behind a paradigm. This principle is perceived as the relation of the limited to the unlimited. Meta-ethical "principles," like the golden ethical rule of "Do unto others as you would like them to do unto you," are formed here.

(b) "Verstehen" as the analysis of "being" to reach understanding of the "self." Here the building of, or coming to, a theory of knowledge is achieved, determined by the assumptions in my metaphysical "belief" of the nature of reality in (a). These assumptions necessarily tend to a predominantly inductive or mainly deductive theory of knowledge acquisition, which is reflected in my epistemology. Meso-ethical "norms," like the sanctity of human life and freedom, are formulated at this level.

(c) "Ethos" is the attempt to form the world we live in, by growing an "attitude" or participation in a mutually structured reality. All those who choose to participate in this reality, do it by "taking responsibility for personal actions" in a social environment. More concrete micro-ethical "codes of conduct" and what we consider to be "true and correct behavior," is systematizing into our "dogma" at this level.

(d) "Praxis" is doing the "right" thing. It is the behavior resulting from systematizing (a), (b), and (c) into a Gestalt, where the whole is more than the sum of the parts. This behavioral level is again the basis for "Wahrnehmung," repeating the cycle on a new level. The next cycle of "Wahrnehmung" is elevated from the previous level of affective awareness to a deeper understanding.

Thus, a paradigm can only be understood in the context of a Hermeneutical cycle within the Structure of the Paradigms. It supersedes mere interpretation or just bringing understanding. It implies that paradigms are developmental by nature, moving in a hermeneutical cycle instead of a process of recurring mechanistic circles. Describing a paradigm as an era, epic, model, weltanschauung, or any other term is hardly more than merely renaming the concept of a paradigm to some other known concept, risking being a tautological swapping of terms.

In the next "Letter from the Editor" (Project Management Journal, December 2006 issue), I will develop the epistemological, ontological, and metaphysical levels. In the March 2007 issue, I will illustrate this theoretical part in proposing, in my view, some examples of burning points that should be considered more in-depth.

Ordo ab chaos.
Christophe N. Bredillet

References:


1 INGENIUM: "For the ingenium was given to human to understand, i.e., to make" G Vico Thus characterized it since 1708 the "Method of the studies of our time," method or rather advance—these ways which we build while going—what restores the vast contemporary project of a New Reform of Understanding. Deploying all faculties of the human reason, the ingenium—this "strange faculty of the human mind which allows him to co-join," i.e., to give direction to its experiments of the "world of the life"—makes us understandable of these multiple interactions between knowledge and action, between including/understanding and making, which we recognize in our behaviors within the human societies. With collective resignation to which still too often invite us scientific knowledge sacrilizing reductionism and deductivism, "sciences of ingenium" oppose the attractive capacity of the human mind to co-join, to understand and invent by forming projects, with this "stubborn person rigor" to which already testified Léonard de Vinci.
A project control system aims to minimize the gap between project planning and project execution in order to achieve project aims, i.e., cost, time, and content. This paper reviews the current literature on project control systems. The first part provides an overview of the nature and importance of project control. The second part deals with current project control tools and techniques, followed by a discussion on the advantages and disadvantages of these systems.

Keywords: project management; project control; control systems

©2006 by the Project Management Institute
Vol. 37, No. 4, 5-14, ISSN 8756-9728/03

Introduction

“project” is defined by A Guide to the Project Management Body of Knowledge (PMBOK® Guide) (PMI, 2004) as “a temporary endeavor undertaken, to create a unique product or service.” “Temporary” means that every project has a definite beginning and a definite end. “Unique” means that the product or service is different in some distinguishing way from all similar products or services. As time passes, there is a need to update the methods, tools, and techniques used in the management of projects.

The authors are not aware of any literature survey on the subject of “project control” undertaken over the past couple of decades. Hence, the purpose of this paper is to update the literature on project control.

The literature on project control is vast and it is not our intention to refer to each of the existing publications. However, the main references on each of the relevant areas are covered and interested readers may research the appropriate reference articles for further information/material.

This paper presents a literature survey that will be discussed in the following sections: (a) project management bodies of knowledge, which introduces the main and most important knowledge in the area of project management and project control; (b) the nature of project control, which defines the scope of project control; (c) the importance of project control, which exposes the project control system as a key element in striving for project success; (d) project control systems, which describes existing project control systems; and (e) a synthesis of requirements for project control and further research.

Project Management Bodies of Knowledge (BoK)

The increasing demand for project management solutions is reflected in the development of bodies of knowledge (BoK) that summarize the main and most important knowledge in the area of project management. BoKs have been compiled by two professional associations: the Association of Project Management (APM) and the Project Management Institute (PMI). These BoKs are unique phenomena within the areas of industrial engineering and management.

A review was conducted of the existing project management bodies of knowledge and indicated the need for a BoK and for continuous updating of the BoK (Morris, 2001). Another research surveyed Israeli defense projects and challenged...
the BoK assumption that all projects are similar and “one size fits all” (Shenhar, 2001). Shenhar classified the surveyed projects into four categories. In order to be managed successfully, projects in each category are handled slightly differently. A similar attitude was taken with regard to the classification of project management types based on the number of projects and sites involved (Evaristo & Van Fenema, 1999).

The main argument against the BoK approach is that a single methodology does not fit all kinds of projects. For example, managing a construction project requires a different approach than does managing a hi-tech project. Furthermore, complex projects should use a different methodology than less complex projects. A definition of project complexity is needed in order to cope with the evolution of projects (Williams, 1999). Other researchers, however, support the BoK assumption of project similarity (Tatikonda & Rosenthal, 2000). They investigated project management methods used during the execution phase of new product development project and found that companies do indeed balance firmness and flexibility in product development projects. Another result of their study was the finding that companies can manage a variety of projects using essentially similar project execution methods.

The APMBok suggested a strategic approach to the management of projects (APM, 2000). The core competencies of project execution within an engineering construction procurement environment were also studied (Lampel, 2001). Three types of strategies were developed: (a) focusing, i.e., company-driven; (b) switching, i.e., opportunity-driven; and (c) combination of focusing and switching.

Project management and control methodologies, such as network scheduling and Gantt charts, are being mentioned more and more frequently as control techniques. For example, a Small Medium Enterprise (SME) ISO 9000 implementation project is reported to have used a classical project control tool (Lo & Humphreys, 2000). Similar project control tools have also been introduced into a hospital environment (Côté & Daugherty, 2000).

Project management professional associations developed the BoK to standardize project processes and procedures. A debate is currently underway regarding the implementation efficiency, but the extent of BoK implementation is undoubtedly increasing.

The PMBOK® Guide does not refer to project control as a Knowledge Area. According to the PMBOK® Guide, project control includes segments within other Knowledge Areas, such as “cost control” within the “project cost management” Knowledge Area and “schedule control” within the “project time management” Knowledge Area.

The APMBok section on control, which includes many of the traditional tools associated with project control, emphasizes the importance of project control during the project life cycle. This is an important difference between the APMBok and the PMBOK® Guide.

However, both BoKs serve as standard authorized guidelines that support the project management domain.

Nature of Project Control
The APMBok takes a broad view of what is meant by the word “control” (APM, 2000). Planning, measuring, monitoring, and taking corrective action are all usually included in the control cycle. Typically, projects utilize a control system, which monitors the difference or gap between the planning variables and the actual results.

Project control systems indicate the direction of change in preliminary planning variables compared with actual performance.

Importance of Project Control
The successful performance of a project depends on appropriate planning. The PMBOK® Guide defines the use of 21 processes that relate to planning, out of the 39 processes required for proper project management (Globerson & Zwikael, 2002). Execution of the project according to the predefined project plan can be achieved through a control methodology. Consequently, project control is a significant issue during the project life cycle.

The design of a project control system is an important part of the project management effort (Shhtub, Bard, & Globerson, 2005). Furthermore, “it is widely recognized that planning and monitoring plays a major role as the cause of project failures. Despite the continuous evolution in the project management field, it appears evident that the traditional approaches still show a lack of appropriate methodologies for project control” (De Falco & Macchiaroli, 1998). Many articles have supported the importance of control in the achievement of the project aims and objectives. Project performance can be improved if more attention is given to the issue of control (Avison, Baskerville, & Myers, 2001). The successful implementation of a concurrent engineering methodology within a cross-country petroleum pipeline construction project in India strongly recommends controlling projects through risk management, quality monitoring, and an integrated information management system (Dey, 2000).

Analyzing Project Failures
Another way of tackling the issue of the importance of control is by examining project failures in order to identify the most effective project control rules. For example, a survey was carried out among 1,450 companies in the public and private sectors (Whittaker, 1999). The main conclusion was that lack of risk management was the most highly ranked factor contributing to project failure. Other contributing factors were lack of required team skills and lack of control.

Researchers surveyed construction projects in Jordan with the objective of identifying the major causes of delay in the construction industry (Odeh & Battaineh, 2002). Findings indicated that owner interference, inadequate constructor experience, financing and payments, labor productivity, slow decision-making, improper planning, and subcontractors were among the top 10 most important causes for delay.

During the past decade, leading projects in many industries were enterprise resource planning (ERP) implementation
projects. It was found that the recommended actions needed to bring troubled ERP projects under control are as follows (Motwani, Mirchandani, Madan, & Gunasekaran, 2002): (a) redefining or subdividing the project; (b) improving project management through the use of formal tools and techniques; and (c) using a team-based approach to solve specific project problems. The key element is to somehow link these factors to the project control system.

Another study showed that a useful control tool applied in the software industry to reduce project failure is the identification and analysis of threats to success (Schmit, Lyytinen, Keil, & Cule, 2001). This control process, developed in the USA, Finland, and Hong Kong using the Delphi methodology, and control techniques for the analysis and presentation of all possible resource requirements and outcomes were discussed in another study (Lorance & Wendling, 2001). The successful completion of a project within budgeted time, cost, and perceived parameters depends to a great extent on the early identification and control of immediate risks to the project (Datta & Mukherjee, 2001).

These cases show the necessity of a holistic approach to multidimensional project control, but this does not mean that all risks can be controlled solely by such an approach. For instance, the 9/11 incident, the rejection of the EU constitution treaty in the French national poll, growing U.S.-China trade conflicts, the currency crisis in East Asia, and the recent upsurge of international oil prices were least expected, even by experts. These incidents, whose frequency has seemingly increased in the post-Cold War period, have influenced and will continue to influence project implementation, since such risks cannot be internalized in project management. Project managers must deal with such risks in a most flexible and economic manner so as to minimize losses of project profitability.

**Success Factors in Project Management and Control**

Another project management approach refers to factors that lead to success in meeting the entire range of multidimensional objectives. Much research has been conducted in order to examine project success factors. A survey was carried out among a sample of “Fortune 1000” companies that examined project success (Pinto & Slevin, 1987). Another survey was conducted on research and development project management in the Spanish industry (Sánchez & Pérez, 2002), while yet another was done to capture the “real world” experiences of people active in project management (White & Fortune, 2002). This survey took the form of a questionnaire that was sent to 995 project managers. Another survey covered approximately 100 defense projects (Sadah, Dvir, & Shenhar, 2000), and another survey was conducted among organizations with inter/intrudepartmental projects (Fricke & Shenhar, 2000). The common denominator resulting from all of the above-mentioned surveys was a common checklist representing project success factors. This list included clear goals, management support, ownership, a control mechanism, and communication. A great deal of variation exists, however, among these success factors, which do not always have the same dimensions.

A different angle was taken by an Israeli researcher who surveyed 86 Israeli construction companies (Francis-Elran, 1998). Findings showed that the success level of a project implementing a specific control method is related to the level of risk measured by situational factors.

A case study of a $621 million power plant in East Asia demonstrated how a large and complex project in the area of energy production can be successfully implemented (Ling & Lau, 2002). An important factor in the project’s success was the use of control procedures that were applied meticulously by the project stakeholders.

In a study that surveyed about 100 Israeli defense projects, findings indicated a significant positive relationship between the project’s success and each of the following factors (Dvir, Raz, & Shenhar, 2003): (a) the amount of effort invested in defining the goals of the project; (b) the functional requirements; and (c) technical specifications of the project. Again, the question arises as to which project control factors best enhance these parameters.

Complex projects are performed also in the software industry. One study surveyed 86 project managers on project effectiveness in the software development industry (Jiang & Klein, 2000). The data indicated good control over risk factors. Project effectiveness measures reveal, however, that two common risks have a major significant impact: (a) the team’s lack of general expertise; and (b) lack of clear role definitions for team members. A year later, the same researcher surveyed Project Management Institute (PMI) members and reconfirmed the critical role of project managers in the project’s success, implying that organizations should involve their project managers as early as possible (Jiang, Klein, & Chen, 2001).

Another study strove to define project success by developing the logical framework method (LFM) for defining project success (Baccarini, 1999). LFM was developed to assist in the understanding of two components of project success: management success and product success. These two components must be defined and differentiated in the project so that the project team has clear knowledge of its objectives.

An article summarizing the issue indicated that success criteria should be agreed upon with the stakeholders before the onset of the project (Turner, 2004). A collaborative working relationship should be maintained between the project owner and the project manager. The project manager should possess the flexibility to deal with uncertainty, and the owner should take an interest in the project performance. A summarizing list of factors affecting the success of a project is presented in the appendix of the present review.

The integration of these success factors should lead to a better understanding of the major issues on which project managers should concentrate. Hence, a project manager should establish a control system that will monitor these significant issues. Furthermore, a control system can be examined by verifying its compliance with the project success factors.
Controlling for Multidimensional Objectives

Another important aspect of a project control system is the support of multidimensional objectives (Turner & Keegan, 2000). These researchers noted that managers should recognize that organizations are essentially multidimensional. Such multidimensional characteristics include: (a) hierarchy linked to the senior management; (b) different models for operational control and senior management; and (c) elements of operational control, i.e., managing clients, inputs, processes, and outputs.

Meanwhile, many studies have been conducted that develop tools, concepts, and methodologies for project management and control (e.g., Mantel, Meredith, Shafer, & Sutton, 2001; Mayor, 2003; Meredith & Mantel, 2003; Nicholas, 1994; Lock, 1987; Schimmoller, 2001; Walseman, 2001). The connection between project managers and organizational politics was also explored (Pinto, 2000). Organizational politics is often one of the prime moving forces within any organization. Project managers have long known the importance of maintaining strong political ties throughout their organizations as a method for achieving project success. A study related to the project initiation (start-up) phase was carried out within one of the world’s largest companies, which conducted an ongoing project management forum that included experts from different divisions (Halman & Burger, 2002). The forum members discussed their concerns regarding the effectiveness of the start-up phase. A process was defined to control misunderstandings between project managers and project owners (see also Gutierrez & Paul, 2000). Study findings revealed clear differences in perception between project owners and project managers. These differences refer not only to the project content and control, but also to expectations of their mutual roles during the start-up project.

It can be seen that project owners and project managers must face multiple objectives in order to successfully perform the project. Coping with multiple objects is, therefore, an essential element within the project manager’s scope of work. Moreover, there is a lack of project management multidimensional support tools and, clearly, further research is needed in this area.

Project Control Systems

Project control systems can be classified as: (1) one-dimensional control systems, and (2) multidimensional control systems.

Both one-dimensional and multidimensional control systems execute one or more predefined project control objectives. In one-dimensional control systems, such objectives are not integrated in any way, whereas multidimensional control systems integrate several project control objectives.

The earned value (EV) methodology is probably the most commonly used multidimensional project control method, integrating time and cost. Variations of multidimensional control systems exist that are associated with risk management, theory of constraint, statistical process control, and so on. These will be discussed later under their specific titles.

Another important factor in both project control systems is the ability to determine when to perform the control activity. This point was addressed by a study that proposed an analytical framework, based on dynamic programming, for determining the optimal timing of project control points throughout the life cycle of the project (Raz & Erel, 2000).

A survey, conducted on the integration of project control systems in clean-room construction projects, emphasizes the importance of the multidimensional project control system (El-Mashaleh & Chasey, 1999).

Project management researchers and practitioners state that existing project control systems have several deficiencies. One study reviewed an extensive array of research on various aspects of project scheduling (Kolisch & Padman, 2001). An important conclusion was that matching project objectives with the appropriate methodology is an important goal that remains to be explored. In the U.K., performance evaluation of new product developments was surveyed (Driva, Pawar, & Meno, 2001). Without exception, all companies wished to improve their use of performance measures. This implies that the methodologies used by these companies were not satisfactory.

Another researcher supports this view and describes the need to use performance measurements in project management, suggesting a list of preferred metrics (Bauly, 1994). The deficiency of current project control systems is also presented in additional work (Tukel & Rom, 1998). A thorough literature review regarding the contribution of mathematical modeling to the practice of project management was conducted (Williams, 2003). It was found that the synthesis of project management principles and operational research principles could lead to a new managerial theory.

One-Dimensional Project Control Systems

One-dimensional project control systems are used mainly to control specific issues in order to achieve a specific predefined project aim. According to the *PMBOK® Guide*, one such control tool is project scope management, which defines the procedures whereby the project content may be altered (PMI, 2004). This system includes various managerial tools designed to control changes. Researchers have noted that these changes result mainly from the stakeholders’ desires, technology developments, increased knowledge base, and changes in project processes (Meredith & Mantel, 2003).

Another control tool is based on project engineering design control systems, and includes a series of design reviews that typically contain predefined control points through a project’s life cycle.

Strategic project control is another control tool described in the literature, whereby a model is proposed to connect critical success factors with the balanced scorecard (BSC) in order to achieve strategic control (Van Veen-Dirk & Wijn, 2002). Thus, the combination of BSC with critical success factors can detect market changes and lead to appropriate changes in company strategy.
Other researchers introduced a new methodology for managing and controlling projects and jobbing production (Costa & Jardim, 1998). Their paper describes a conceptual model for a control system based on traditional techniques while emphasizing the importance of integration.

A procedure was described for controlling suppliers and contractors using the “Five Rights”: the right quantity; the right time and place; and the right supplier (Mayor, 2003). The need to define and establish a control system that would separately support time, cost, and performance was also presented, because project managers often prioritize project aims differently (Hormozi & Dube, 1999).

Another control system concentrated only on project finance control. For example, an implementation of a finance appraisal system called shareholder value analysis (SVA) was introduced (Akalu, 2001). The SVA tackles the relationship between the market value of debt used to finance the project and the net present value (NPV) of the project. The author recommended using SVA measures during the project life cycle at each control point. Another hybrid project finance control heuristic that maximizes project NPV was presented by Abbasi and Arabiat (2001). Their heuristic is based on a combination of minimum late start and shortest processing time priority rules.

The U.S. Department of Defense’s (DoD) scheduling guide for program managers illustrates a control system designed for projects producing more than one product unit (U.S. DoD, 2000). Performance is measured as throughputs at predefined control points. This control system uses the line of balance (LOB) technique, which presents the effect of learning on LOB control methodology in a repetitive-unit construction environment using learning curves (Arditi, Tokdemir, & Suh, 2001). Another derivative of the LOB technique was the development of a project work content that can be divided into several subprojects or segments, in which the same set of activities is performed on each segment (Shtub, 1997). The LOB measuring indices are then implemented within the control segments.

One-dimensional project control systems are simple to implement; however, control is focused on one specific dimension rather than on the entire set of project objectives. In some cases, one-dimensional project control systems are used simultaneously to measure different objectives, but this approach lacks an integrative measure and does not fully support project management objectives.

**Multidimensional Project Control Systems**

Multidimensional project control systems integrate several dimensions within the control system. Integrated cost and schedule control systems were introduced in the U.S. during the 1960s and were used mainly in defense projects. These systems created standards that were supported by official guidelines (e.g., U.S. DoD, 1997). A study describes the development process of an integrated project control system used by the DoD (Abba, 1997).

The project control system, also called EV, was implemented in large projects budgeted by the DoD. This classical project control method was used to monitor two dimensions: time and cost. The EV methodology is based on the work breakdown structure (WBS) planning tool. The second edition of the *PMBOOK® Guide* (2000) defines WBS as “a deliverable-oriented grouping of project elements that organizes and defines the total scope of the project.” Using a WBS to plan a project means the hierarchic structuring of a project using its components and subcomponents. A work package, usually at the lowest level of a WBS, includes a set of tasks to be carried out in a predefined organizational unit. In general, work packages are used as the basic elements in the planning and control phases of a project. A standardized WBS was offered by the DoD (MIL-HDBK-881, 1998). A “WBS Practice Standard” team was reported to have been working toward developing a document describing the use of a WBS (Berg & Colenso, 2000). The main conclusions were (a) the project manager should have flexibility to design the WBS; and (b) the lowest level in the WBS may be connected with dependency links in a dependency diagram.

The U.S. Air Force methodology that uses EV principles to examine work-performed cost versus budgeted cost is described in many textbooks and papers (e.g., Sipper & Bufin, 1997; Raby, 2000; Fleming & Koppelman, 1999; Fleming & Koppelman, 2000). EV is recognized as a very common methodology for project control.

Currently, project control systems employ similar principles. A survey, carried out in the Hong Kong construction industry, examined integrated cost/schedule control (Deng & Hung, 1998). Deng and Hung’s findings indicated that only a small percentage of construction projects implemented such a methodology. The article also recommended that the government and private sectors use an integrated cost/schedule control system, emphasizing that using a single performance measuring system would not advance the project’s performance.

De Toni and Tonchia (2001) surveyed 115 medium and large Italian companies. Among other things, it was found that although these companies adopted the synthesis of cost and non-cost dimensions, in practice, the cost and non-cost dimension results were kept separate and not integrated in any way.

Additional variations of multidimensional project control systems exist and will be discussed later in separate subsections. These variations logically led to a new approach called multidimensional project control systems (MPCs), which attempts to integrate all factors identified as being important.

**Adding Quality and Statistical Control**

An enrichment EV system is presented by the following studies and is offered in order to add additional dimensions to the control system (Paquin, Couillard, & Ferrand, 2001). The model constitutes a quality breakdown structure (QBS) that indicates the overall quality objectives. This dimension
enables the project manager to assess, at any time, the overall quality simply by comparing its earned quality with the planned quality. Assessing ongoing quality enables the project manager to identify activities that were not performed successfully. The assessment of such activities initiates corrective actions as quality deviations are detected.

Deficiencies in existing project control systems were also presented by Tukel and Rom (1998), who surveyed project characteristics in diverse industries. Their conclusions were that project quality was the most important project objective. Furthermore, the use of quality as a measure for project success was an important factor for the successful implementation of a project. Project quality can also be defined as being equivalent to proper performance of the project content, i.e., its multidimensional aims and objectives.

The total control methodology (TCM) is based on the scenario that several separate processes usually exist within each product line (Kwok & Rao, 1998). Each of these processes should have an individual control plan, which must include control instructions and specifications for each operator. These researchers enhanced the basic TCM model by using quality control tools, emphasizing the need to control the quality dimension. Another supportive opinion was that of Tukel and Rom (2001), who found that a project manager’s primary success measure is the quality of a project. This is supported by empirical generalization. The quality of a project was found to be associated with customer focus, rework reduction, and conformance to the technical specifications.

Another enriched EV model that developed a statistical approach that aimed at improving the project manager’s understanding of the EV results. Thus, the project manager can know when observed schedule variances are statistically significant in order to take corrective actions (Robinson, 1997).

A research paper introduced a new technique to provide dynamic real-time monitoring of time-, cost- and technical performance-related project parameters (Bauch & Chung, 2001). This methodology is called statistical project control tool (SPCT). The control limits and the central line of the project control chart are based on historical project parameter data. Project control is conducted by monitoring the project performance on the project control chart. The SPCT model requires the use of an appropriate chart for recording historical parameter data, which is an obvious limitation. It is therefore important to limit this application only to those projects to which the model may indeed be applied advantageously (Bauch & Chung).

Quality can be a significant dimension within the project objectives. It is therefore important to measure and monitor the project quality performance. Further research is needed to identify and to integrate quality measures with other project objectives.

Using the Total Quality Management Approach
The move toward total quality management (TQM) is usually undertaken as a company endeavor with a timescale of many years. Two papers examined the use of project management and control tools as means for adapting TQM principles (Cicmil, 1997; Hides, Polychronakis, & Sharp, 2000). TQM principles support the entire operational process, including project management and project control. Another researcher introduced the Canada Award for Excellence, an internationally recognized quality award program (Laszio, 1999). The Canada Award for Excellence defines planning and execution processes and can therefore be used as a control tool. The author demonstrated the feasibility and practicality of applying a quality process control approach to project management and the control arena.

TQM principles should serve as the guidelines of any organization that manages projects. Further research should strive to prove the advantage of implementing TQM principles in a project environment.

Using the Theory of Constraint Approach
Another subject that researchers and practitioners have discussed in the project management literature is the application of the theory of constraints (TOC) in the project management arena (Goldratt, 1988; 1997). The critical chain is the TOC project management approach. The TOC offers controlling of project scheduling by monitoring the time buffers (Steyn, 2000).

Steyn (2002) presented a TOC application for managing resources shared by several projects executed in parallel. The author explored the use of TOC principles in project cost management and risk analysis. Other studies described the theory of constraints—critical chain principles and implementation methodology (Herroelen & Leus, 2002; Leach, 1997; Rand, 2000; Sragenhym, 2001; Umble & Umble, 2000). The TOC is implemented in many organizations, such as in pharmaceutical industry projects (Michalski, 2000).

Disagreement exists as to how effective and realistic it is to implement TOC in projects. Herroelen and Leus (2001) described the advantages and disadvantages of implementing critical chain scheduling. The critical chain scheduling method using time buffers (a basic TOC tool used to manage the project) provides a simple tool for monitoring projects and setting realistic due dates. The danger, however, lies in its oversimplification, i.e., implementing the TOC will lead to real-life problems that TOC tools are not capable of handling. Implementation of the critical chain in complex projects might, therefore, be problematic. However, the researchers suggested a branch and bound mechanism to improve the final project makespan. The critical chain method is starting to be implemented and it will be interesting to follow its further development and integration within traditional methodologies.

Risk Management as a Factor in Project Control
Significant research was performed in recent years on risk management and control. According to the *PMBOK® Guide* (2004), risk monitoring and control is an ongoing process that consists of keeping track of identified risks, monitoring
residual risks and identifying new risks, ensuring the execution of risk plans, and evaluating their effectiveness in reducing risk to facilitate project success. A study performed on 60 large-scale projects showed that building a strategic system for dealing with anticipated risks supports the control of unexpected events produced by business environmental turbulence, thus, reducing the risk (Floricel & Miller, 2001). Tummala and Leung (1996) presented a risk management model for reducing and controlling risk. Another study proposed that managing and controlling risk reduces the probability of project failure (Miller & Lessard, 2001).

A survey was carried out in order to examine project risk management practice in the British utility sector (Elkington & Smallman, 2002). Findings indicated a strong link between the extent of risk management undertaken in a project and the level of project success.

Dey (2001) described a success story of implementing a risk management methodology. The author developed and implemented a risk management model in a cross-country petroleum pipeline construction project in India. This control model was a decision-support system based on an analytic hierarchy process (AHP) and decision tree analysis.

The Multidimensional Project Control System Approach

The conclusions from the previously mentioned studies are that (a) the control dimensions of time and scheduling are generally insufficient; (b) a multidimensional project control system is needed that can measure the project’s aims and objectives; and (c) an integrative system is needed that can indicate the project’s status during the project’s life cycle.

A new control methodology was developed, which was called the multidimensional project control system (MPCS) (Rozenes, Vitner, & Spraggett, 2004). The MPCS is an approach whereby deviations between the planning phase and the execution phase are quantified with respect to the global project control specification (GPCS). The project’s current state is translated into yield terms, which can be expressed as a gap vector representing the multidimensional deviation from the global project control specification. The MPCS methodology allows the project manager to determine the integrated project status; where problems exist in the project; when and where to take corrective actions; and how to measure improvement. Implementing the MPCS methodology does not require extra data collation. MPCS deals with the control of a single project and defines the project performance in comparison with the plan.

The progression of several projects in parallel is a common situation in organizations; therefore, a comparison of the various project performances is required. It was proposed that a comparison process should be performed using the data envelope analysis (DEA) approach (Rozenes, Vitner, & Spraggett, 2003). The reference points for examining the performance of different projects and the directions of improvement for the projects are not necessarily found on the efficiency frontier. An algorithm was developed for applying multiproject system control with a relatively large number of inputs and outputs while maintaining the validity of the DEA methodology. The DEA output allows the diagnosis of the inputs and outputs that found on the efficiency frontier and those that need improvement.

The MPCS methodology introduced a different approach that controls the entire set of project objectives in a single project, or in a multiproject environment. Further research is needed to simplify the advantage of implementing the MPCS approach.

Discussion and Conclusions

Surveying the literature regarding existing control systems suggests the following:

The project management world uses one-dimensional control systems although these do not integrate project objectives in any way. The main reason for using the one-dimensional control systems is its simplicity of implementation.

The dominant multidimensional project control system is the EV system, which is used worldwide. This system integrates cost and scheduling and is simple to implement with many computerized programs available in the marketplace. The main disadvantage of EV is that other projects control dimensions, such as quality, design, and technology, are not integrated. Consequently, a broader control picture is lacking, because project managers must have more than two dimensions to achieve project objectives that go beyond time and cost. Much research is needed in order to integrate additional control dimensions into the EV approach and this would be fertile ground for future investigation.

The inclusion of an additional project control dimension defines a need for a multidimensional control system such as MPCS. It has already been demonstrated that the MPCS is fairly simple to use and understand. This tool still remains, however, at the research and development phase and although a computerized version has recently become available, there is little likelihood that the approach will be widely implemented. Nevertheless, this multidimensional approach offers great potential for further research.

TOC has been shown to have a positive impact on project control. It is still in its development stage and its applicability has yet to be demonstrated. Much research is needed to identify these applications.

TQM principles were shown to be applicable to virtually every organization and its use in project control can undoubtedly increase the added value of the system performance. Much more research must, however, be done in this specific project area in order to extract the principles for its effective application.

Finally, project risk management has been shown to be a controlling parameter for many types of projects. Although nations still suffer from an inability to forecast major world events, it is still expected that project managers will develop the means to forecast those events that could eventually affect their projects. Hence, this too constitutes a potentially fruitful area of research on project control.
References


Appendix: Factors Affecting the Success of a Project

- Project control systems
- Project mission and goals should be well defined
- Top management support within resources and budget is essential
- A detailed project planning that covers all aspects of the project
- Client consultation and acceptance during the project life cycle
- Competent project team members that supports project aims and objectives
- Technical abilities of the project team and project organization
- Project team should have troubleshooting capabilities
- Success criteria should be agreed upon with the stakeholders before onset of project
- A collaborative working relationship should be maintained between the project owner and project manager
- The project manager should have the flexibility to deal with uncertainty
- The project owner should take an interest in the project performance

SHAI ROZENES, PhD, obtained his PhD in industrial engineering from Coventry University, U.K. He is involved in international research within European and international research networks. Dr. Rozenes has published in refereed scientific journals and conferences. He is currently the chair of Industrial Engineering Department at the Ruppin School of Engineering. His research interests include project management and operations management. Dr. Rozenes is also a consultant in industry.

STUART SPRAGGETT, PhD, was formerly head of manufacturing engineering at Coventry University, U.K. but now runs his own consultancy business specializing in CAD. He has substantial research experience, with more than 40 publications to his credit. He has also supervised and examined many PhD’s for various U.K. universities.

GAD VITNER, PhD, is involved with engineering research and applications for more than 30 years. Dr. Vitner holds BSc and MSc degrees from the Technion Israel Institute of Technology, and a PhD degree in industrial and systems engineering from USC in LA. He started his career in Ben-Gurion University and after few years joined industry working for many years in various manufacturing and service companies. He is well experienced in the management of very large projects in the area of electronic systems. Few years ago he returned to academy where he acts as the Dean of School of Engineering in Ruppin Academic Center.
TOWARD A PROJECT MANAGEMENT THEORY FOR RENEWAL PROJECTS

ERLING S. ANDERSEN, BI Norwegian School of Management, Oslo, Norway

ABSTRACT
Project management literature treats projects as fundamentally similar. However, empirical studies show that projects are systematically managed differently. Thus, theories on how to manage different types of projects should be developed. This paper focuses on internal renewal projects that are seen as temporary organizations with assignments from a mother organization. This leads to an extended concept of project success. The propositions put forward to identify project success constitute a theory for renewal projects.

Keywords: project management theory; renewal projects; organizational perspective

©2006 by the Project Management Institute
Vol. 37, No. 4, 15-30, ISSN 8756-9728/03

Introduction
Projects are classified in a multitude of ways (Crawford, Hobbs, & Turner, 2002). They are categorized according to size, complexity, familiarity, industrial sectors, and contract types, etc. Doty and Glick (1994) pointed out that a typology might serve as the starting point for a theory and be developed into a complex theory. However, project classifications are seldom developed into distinctive theories. Most project management literature still assumes that all projects are fundamentally similar and that all types of project work can be governed by the same project management theory.

There are some exceptions: Turner and Cochrane (1993) argued theoretically that different types of projects should be treated differently, depending on how well the project goals and methods are defined. Their Type-4 projects (where neither the goals nor the methods are well-defined) require a different approach from the Type-1 projects (for which the goals and methods are well-defined). Such discussions, however, go somewhat unnoticed and mainly serve as footnotes to general project management theory.

Shenhar (2001) has paved the way for a new approach. He shows empirically how different types of projects (in this case depending on technological uncertainty and system complexity) are managed in different ways. He shows that projects with super-high technological uncertainty have more design cycles, later design freeze, more intensity, higher frequency, and more informal communication than projects with low technological uncertainty. Project managers of the super-high tech projects have a very flexible leadership style and high tolerance for change, while their colleagues in the less uncertain environment tend to stick to a formal and rigid style. He elucidates, “One size does not fit all projects.”

The natural consequence of his findings would be that organizations deliberately adopt a project-specific approach to project management and that theories for different types of projects can be developed. Alternatives to general project management theory have been sought after; middle-range theories on different types of projects have been suggested (Packendorff, 1995).

Several authors (Morris, 2003; Shenhar & Dvir, 1996) have argued in favor of a new distinct theory of projects (or project management). Lately, we have seen attempts to develop a general theory (Turner, 2006a; 2006b; 2006c; 2006d). However, the point of departure for this paper is that the possibilities of developing such a theory are probably neither feasible nor desirable. Instead, we argue...
that it is necessary to carry out a more thorough investigation into different types of projects. Specifically, this paper addresses the issue of renewal projects and the requirements that should be imposed in order to develop such a theory.

Developing a Theory of Renewal Projects

In this paper, we identify elements that could constitute a theory for a certain category of projects, specifically renewal projects. We could also call them change projects; projects that serve as arenas for internal renewal processes (Lundin & Midler, 1998). They cannot be considered a completely distinct group of projects, but they include all types of projects in which the intention is to bring the mother organization (which we will call the base organization) to a higher and better level of functioning. The projects may arise from an intentional development strategy or materialize from the need to adapt the base organization to new external circumstances. Examples include projects dealing with IT implementation, reorganization, organizational development, human development and training, TQM, and BPR. These are all projects focused on delivering results internally (to the base organization); this excludes all projects where the intention is to produce results for an external customer. An extensive discussion of the concept of renewal projects has been carried out by Ekstedt, Lundin, Söderholm, and Wirdenius (1999), who provide a classification of renewal projects into a few main categories.

A theory of renewal projects must be able to explain how to achieve project success. We claim that there is not one undisputable concept of project success. What some people would call success might not appear as success to others. The concept of project success depends on our worldview, or perspective, as we call it. Accordingly, we will start by presenting our perspective on renewal projects. Once we have defined our perspective, we will define project success. This will provide us with a starting point for discussing how to achieve such success. We will present a model of a renewal project that will help us address the issue of a theory of renewal projects.

An Organizational Perspective

The development of a theory requires a distinct perspective, i.e., a way of looking at the world. The traditional perspective within project management is what might be called the task perspective. The Project Management Institute (PMI) is the world’s largest professional association within the field of project management. Its main publication, A Guide to the Project Management Body of Knowledge (PMBOK, Guide) (PMI, 2004), promotes this perspective. Most project management professionals regard it as a de facto standard for project work. It defines a project in the following way: “A project is a temporary endeavor undertaken to create a unique product, service, or result.”

We draw attention to the use of the term endeavor. According to Webster (1988), an endeavor is “a determined effort.” This reveals the nature of the task perspective; the focus is on the work or the task itself. It is a perspective seen from the point of view of those making the effort. Originally, people that trained in the engineering discipline ran all projects (the projects were huge building and construction undertakings or large defense installations). The project definition reflects their way of looking at the challenge confronting them.

The task perspective implies more than the definition tells us. The endeavor is preferably a wholly rational approach. The goals are decided at the start of the project (delivering a product or service according to given specifications within a specified time and subject to cost restrictions), various plans of action are evaluated and the best one selected, detailed plans are prepared and the need for resources calculated, resources are allocated as agreed, the plans are followed, and the results are delivered on time and within budget. It might not always turn out this way, but this is the ambition that the project is striving to achieve. The ideal is Homo economicus, or the Economic Man from economic theory. It is a model that assumes the ideal project has perfect rationality and perfect information, as well as perfect self-interest. Self-interest means that the effort is viewed from the perspective of the project itself, whereby creating the specified product or service within the limits of time and budget is the overriding concern.

The task perspective and the PMI definition of a project have been subject to discussion. Their weaknesses have been revealed. Some of them are trivial, such as the problem of identifying when the task starts (Is it when the idea of the endeavor first occurs? Is it when the organization decides to carry it out? Or is it when the plans are finalized?) and when it ends (Is it when results are delivered or when they are utilized?). Furthermore, the definition says nothing about the size or nature of the endeavor beyond its uniqueness (Is a first-time pregnancy a project? Is walking the dog in new terrain a project?). The more serious weakness may be the belief in total rationality and the assumption that the project task is clearly defined and unambiguous. At the same time, however, it is emphasized that there is no one correct perspective (Engwall, 1998). The task perspective might be a suitable approach when the project is supposed to deliver a well-known specified product to an external client on a certain date and at an agreed price.

We claim that it is not an appropriate perspective when an organization strives for internal renewal. In such cases the preferable approach would be to look at the project as a vehicle for change. The permanent organization (the base organization) chooses to establish a temporary organization (a project) as a means to deal with the challenges of renewal.

We name this an organizational perspective. In this perspective we define project in the following way: “A project is a temporary organization, established by its base organization to carry out an assignment on its behalf.” This way of looking at a project has been particularly advocated by
The temporary organization receives its inputs from the permanent one and delivers its outputs or results to the same organization. In practice there could be more than one temporary organization as the permanent organization may have set up several renewal projects to run more or less simultaneously.

The establishment of a temporary organization is explained by what serves the base organization best. The base organization must pursue change and stability at the same time (Leana & Barry, 2000). This can seem like an impossible undertaking, but the construction of a temporary organization (the launch of a renewal project) allows for change activities and simultaneously protects the daily operations of the base. The temporary organization is also a proper way of releasing the creative forces in the base organization (Kreiner, 1992). The founding of a new organization gives momentum and inspiration to renewal processes.

The project is not given a well-defined task. The rationale of the renewal project is to create a foundation for the positive development of the permanent organization. We might call the given directions an assignment, whereby the nature of the assignment could vary considerably. It should focus primarily on the purpose of the project, perhaps outlining a vision or presenting a picture of a desired future. It would certainly not give the project a list of activities to be carried out. In some instances it may have more the nature of an idea than a well-defined outline of what should be achieved.

The project’s execution of its assignment is not based on the self-interest of the project. Instead, its actions will be determined by the best interest of the base organization. This might even result in the project deliverables being later than originally indicated and more costly, thus exposing the project to criticism. However, if this means that the results are of higher quality and more relevance to the base organization, the delay and cost overrun may be justified.

There is no reason to believe that the members of the temporary organization will behave in a strictly rational manner. We should expect limited rationality, as is the case in most organizations. We should also base our perspective on the fact that the people involved do not possess perfect information.

The permanent organization is giving the temporary organization an assignment and resources for its work. Furthermore, the permanent organization will, directly or indirectly, describe the project’s areas of authority and responsibility and define its boundaries, thus giving it an embryo of an identity (Brunsson & Sahlin-Andersson, 2000; Engwall, 2003). The identity of the project will then develop over time as it faces the challenges ahead. The temporary organization might take on a form very different from that initially expected by the permanent organization.

The task and organizational perspectives can be seen as two different theoretical traditions in project management research (Söderlund, 2004). The task perspective has its intellectual roots in engineering science and applied mathematics, primarily in planning techniques and methods. The organizational perspective challenges the engineering approach. It has its roots in business administration, economics, organizational psychology and sociology, and is especially interested in organizational and behavioral aspects. We have selected the organizational perspective as the basis for a project management theory for renewal projects.

It is interesting to note that Gaddis (1959), which was the first epoch-making article on project management in a leading journal (Harvard Business Review), defined project as “an organizational unit.” Project management research has neglected this perspective for several years, and it has taken a long time to bring it back into the forefront of renewal project management thinking.

The Extended Concept of Project Success

We reject the self-interest of the project as the dominating perspective and focus on the interplay between the project and the base organization. In doing this, we have a basis for clarifying what we mean by project success. The traditional view of project management as a discipline dedicated to deliver “on time, in budget, to specifications” is no longer adequate or sufficient in an organizational perspective.

Project success is defined as the combination of project management success (Munns & Bjeirmi, 1996) and project product success (Baccarini, 1999). Project management success is linked to the goals of the project, which express what the project should deliver at what time and at what cost. This kind of success is in the hands of the project. Project product success deals with the effects of the deliverables. It is dependent on the efforts of the base organization.

Project management success can be determined at the end of the project. Project product success depends on how the base organization makes use of the deliverables. It may take years to reach a final decision regarding the degree of project product success. The degree of product success depends on how the base organization takes advantage of and utilizes the potential of the deliverables. The effects must be measured according to the mission or purpose of the project. The mission of the project is the answer to the questions: Why does the base organization launch the project? What kind of changes or renewals is the base organization looking for by establishing the project?

The work breakdown structure (WBS) is a well-known and well-used technique within project management. In renewal projects it is more important to break down the mission of the project to get a clear and distinct picture of what kind of improvements the base organization hopes to achieve. Techniques such as the mission breakdown structure (Andersen, Grude, & Haug, 2004), needs hierarchy (Frame, 1995), and functional analysis system...
technique (Morris, 1994) are available and underutilized. If such techniques are used to clarify the mission of the project, it is also much easier to determine whether product success has been achieved.

Some authors have been specific in presenting the dimensions that should be included in the project’s mission, which can be helpful in breaking down the mission into different parts. Shenhar, Dvir, Levy, and Maltz (2001) identified the following areas of relevance for project product success: impact on customer, direct business and organizational success, and preparing for the future.

Identifying Possible Elements of a Theory
We regard the renewal project as a temporary organization that has been established to carry out a given assignment, the character of which may vary considerably in detail and formalism. It could be based on a rather loose idea or it could be a well-documented proposal resulting from an extensive pre-study. From a theoretical viewpoint, however, we can consider the temporary organization as a production entity that executes a variety of production processes to convert inputs into desired outputs. This is illustrated in Figure 1.

The main inputs are the assignment itself and the resources necessary to carry out the assignment. At the outset, the permanent organization defines the boundaries of the project, determining its areas of authority and responsibility. As pointed out earlier, these will probably not remain stable during the lifespan of the project, but may change. Results for an early deliverable affect future deliverables and directions.

In defining the production processes of a renewal project, we have chosen to make use of a rather traditional approach, the old classification of Fayol: commanding, organizing, coordinating, planning, and controlling. The reason for this is that most project management textbooks use a similar kind of classification, which makes it easier for us to demonstrate how a theory for renewal projects differs from traditional approaches.

The renewal project will also carry out the actual renewal or change processes (here called subject matter work). These processes are the core of project work and are context-dependent. The work might follow a model of change such as the famous Lewin model of unfreezing, moving, and refreezing (Lewin, 1947), or proceed through different phases such as the ones described by Judson or Kotter (see Armenakis & Bedeian, 1999). We will not discuss the implications of the different models any further here, but accept as a preliminary assumption that there is a renewal theory of project management independent of how the subject matter work is carried out. This assumption might be relaxed at a later stage.

The figure also shows the project outputs in the form of deliverables to the base organization. The timing of the deliveries is as important as the deliverables themselves.

The Different Elements
We will discuss the different elements of a theory referring to Figure 1. Each discussion will be summarized with theoretical propositions. We will first look at the boundaries of the renewal project as defined by its areas of authority and responsibility. Thereafter, we will discuss outputs, processes, and inputs. All discussions focus on how to achieve project success. A summary of the different kinds of propositions is shown as Table 1.

The Areas of Authority and Responsibility in a Renewal Project
When the base organization is constructing a project, it creates a situation in which two organizations are working in parallel. They must cooperate in order to obtain the best possible results. The division of authority and responsibility between the two is crucial to project success. The base organization needs to define these boundaries.

In principle, this may look easy. The project manager is responsible for project management success. Similarly, the management of the base organization is responsible for project product success. However, this is only part of the picture. It underestimates the role of project manager whose responsibility should go further. The project manager should also be responsible for exploring, defining, and proposing the links between the desired changes in the base organization and the project deliverables. The links are called critical integrative links (CIL) (White & Patton, 2002). They ensure that deliverables represent the correct foundation for the renewal of the base organization. However, most people will say that the decision on which deliverables to produce and hand over to the base organization rests with the managers of the base organization.

Today the boundaries between the two organizations are usually indirectly defined by applying the company’s
The project management model (like PRINCE2 or PROPS) to project work. Most project-intensive companies have a project management model that all projects are required to use. Such a model has its clear advantages as it gives direction and guidance to project work and eases the base organization’s control with regard to project progress (Esserod & Östergren, 2000). However, the instructions of the model also determine the areas of authority and responsibility of the base organization and the project. With all its rules and regulations it could be seen as a working culture or ideology that dominates the project work (Räisänen & Linde, 2004).

The project management model may defer decisions to the project that would otherwise have been the prerogative of the base organization. Räisänen and Linde (2004) give an example where the applied model increased the decision-making authority of the project managers. The model therefore provoked resistance from the line managers, who felt their authority was being eroded and their role undermined.

Usually the worries are of the opposite nature, with the main focus on the restrictions that standardizing project work implies for project management. Clegg and Courpasson (2004) see project management as a hybrid between the central enactment of rules and procedures and the capacity to change. The models of project management primarily represent bureaucratization, which prevents personal initiatives. Hodgson (2004) says “... the key effect of the application of project management models and techniques is enhanced control of the conduct of the employees, based on close surveillance and the limited delegation of discretion to those subjects involved in project work.” He shows that standardized mandatory models could represent a deliberate and strategic re-bureaucratization rather than a de-bureaucratization of contemporary organizations.

Even if the project management model should not represent unwanted bureaucratization, there are other arguments for relaxing the use of such models for renewal projects. In more technical projects we would assume that the project management model is refined through usage. Organizational learning manifests itself as improvements to processes and procedures. However, this may not be equally relevant in the case of renewal projects. The organizational learning in renewal projects will appear as tacit knowledge and new attitudes, which are more difficult to reflect in the project management model. When applied to renewal projects, most project management models will restrict the capacity for innovative change: they hamper creativity and originality. Renewal projects should be given the freedom to choose the best course, unrestricted by traditional project management models. Project work should allow for creativity (Shalley, Zhou, & Oldham, 2004). The importance of improvisation and intuition has also been emphasized (Leybourne, 2002; Leybourne & Sadler-Smith, 2004; Weick, 1998). These factors are contrary to a rigorous model of work.

We know that there could be resistance to change and renewal (Piderit, 2000). Both the project manager and the managers of the base organization should encourage the base organization to make proper use of the deliverables and create an atmosphere where the deliverables are met with enthusiasm.

We suggest the following propositions:

1. Project success for a renewal project requires clear lines of authority and responsibility between the base organization and the project.

   1a. Project success for a renewal project requires that the project manager accepts responsibility for achieving project management success and that the base organization managers accept responsibility for achieving project product success.

   1b. Project success for a renewal project requires that the project manager and the base organization managers share responsibility for the critical integrative links between project deliverables and project mission.

   1c. Project success for a renewal project requires that the project and the base organization have room for creativity, improvisation, and intuition, and are not hampered by a predefined model of project activities.

<table>
<thead>
<tr>
<th>Element of project model</th>
<th>Topic</th>
<th>Propositions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boundaries</td>
<td>Project’s responsibility</td>
<td>1, 1a-b. Division of responsibility for project success between project and base organization</td>
</tr>
<tr>
<td></td>
<td>Use of project management model</td>
<td>1c. Creativity, improvisation and intuition</td>
</tr>
<tr>
<td></td>
<td>Implementing change</td>
<td>1d. Creating momentum for change</td>
</tr>
<tr>
<td>Outputs</td>
<td>Composition of deliverables</td>
<td>2. Several deliveries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2a. Culture of qualitative polychronicity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2b. Evolutionary development</td>
</tr>
<tr>
<td></td>
<td>Timing of deliveries</td>
<td>3, 3a-b. Entrainment</td>
</tr>
<tr>
<td>Processes</td>
<td>Commanding</td>
<td>4. Transformational leadership</td>
</tr>
<tr>
<td></td>
<td>Organizing</td>
<td>5. 5a-b. Action and political organization</td>
</tr>
<tr>
<td></td>
<td>Coordinating</td>
<td>6. Teamwork</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6a. Knowledge management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6b. Utilization of human resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6c. Strong matrix</td>
</tr>
<tr>
<td></td>
<td>Planning</td>
<td>7. Strategic, tactical, and operational planning</td>
</tr>
<tr>
<td></td>
<td>Controlling</td>
<td>8. Broad controlling approach</td>
</tr>
<tr>
<td>Inputs</td>
<td>Assignments and resources</td>
<td>9. The nature of the assignment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9a. Securing commitment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9b. Managing the identity of the project</td>
</tr>
</tbody>
</table>

Table 1: The different propositions of a project management theory of renewal projects
1d. Project success for a renewal project requires that both project management and base organization management accept responsibility for creating the momentum for change.

The Composition of Deliverables—Polychronicity and Evolution
We now turn to the different elements of the project as a production entity. We start with the outputs—the deliverables of the project—as they are the key to mission and goals achievement. We will focus first of all on the nature of the deliverables and introduce concepts that will help us characterize how the deliverables are created and delivered.

Successful renewal demands a broad approach. The legendary Leavitt’s Diamond reminds us of the fact that change activities have to involve task, structure, technology, and people (Leavitt, 1965). Andersen et al. (2004) have coined the phrase PSO projects, which means that all renewal projects have to consider simultaneously people development, systems development, and organizational development. In this context, systems are interpreted in a broad sense, including manual processes, rules and regulations, in addition to IT systems. Providing for more fundamental changes to the base organization means that dissimilar activities have to be planned and executed at the same time. The mission of the project, which we previously discussed, should reflect the broad nature of an approach for genuine change.

Polychronicity is a culture in which people value and practice engaging in several activities and events at the same time (Bluedorn, 2002). A monochronic culture is more linear in that people prefer to be engaged in one thing at a time. A project consists of many activities. In principle, these activities could be executed in sequence; one activity should be finished before starting the next, and so on. However, a fundamental part of traditional project theory is that a project’s activities should be executed in parallel, which drastically reduces the time it takes to finish the project. The focus on parallelism appears to make the project culture polychronic.

This might be a precipitated conclusion. We have to introduce the difference between quantitative and qualitative polychronicity (Bluedorn, 2002). A quantitative polychronic culture involves engaging several similar tasks simultaneously, whereas qualitative polychronicity means carrying out multiple dissimilar tasks simultaneously. In this sense, many projects are better characterized by a quantitative polychronic culture where all activities belong to the same type. Examples of this include construction work or IT software programming.

An organizational perspective also calls for an evolutionary approach (Gilb, 1988; MacCormack, 2001; Matta & Ashkenas, 2003). There is a need for several deliverables to appear at different times. This complicates the task of the project manager, especially in the planning process. There is not only one set time for the deliverables. Deliveries are taking place several times during the project period. Further, feedback from users of an early deliverable may result in necessary changes to later deliverables. The project does not have a stable goal, but constantly has to adjust its course and deliverables. It is aiming at a “moving target” (Lereim, 2003), thus making it impossible to prepare a definite plan at the start of the project.

This gives us the following proposition:
2. Project success for a renewal project requires several deliverables.
2a. Project success for a renewal project requires a culture of qualitative polychronicity.
2b. Project success for a renewal project requires evolutionary development.

The Timing of the Deliveries—Entrainment
A core question within project management is: When will the deliverables of the project be handed over to the users? This question is traditionally addressed by using network planning. Network planning is the pride of the project management discipline. Knowledge of it distinguishes project managers from other kinds of managers. What could possibly be wrong with it?

First of all, it is a method where the delivery time of the project’s output is based solely on the interests of the project. The optimal schedule is based on what suits the project and its activities. Secondly, it presumes that all activities are known at the start of the project.

Both presuppositions should be rejected in a renewal project. Not all activities will be known at the outset. The project has to be able to adjust its activities during execution to identify the best ones. Even more importantly, the project should adopt a pace to suit the base organization. It is of utmost importance to deliver output when the base organization is most eager to receive it. It might be later or earlier than the network plan would conclude, which means that the level of ambition should be adjusted to deliver outputs at the appropriate time.

Time scheduling in renewal projects should be based on the philosophy of entrainment (Ancona & Chong, 1996). Entrainment is originally defined as the adjustment of the pace of one activity to match or synchronize with that of another. Here we adapt it for cooperating organizations. Entrainment is thus the adjustment of the pace of the project to match the needs of the base organization.

The implications of entrainment are several: rather than thinking of change solely as a result of what has been changed and how it has been brought about, we must also be concerned about when change takes place. The work of the project cannot be seen isolated from the pace of the base organization. Everyday life in the base organization may be rhythmic—frantic and fast at one moment, quiet and slow the next. The deliverables of the project must be adapted to fit this rhythm. The needs of the base organization may also depend on what is happening in its environment and the timing of change may be linked to external events. Ancona and Chong (1996) summed it up: “Entrainment suggests that the timing of change has a big impact on the nature and outcome of the change process.”
We emphasized above the poly-
chronic nature of change, arguing that
successful change has to be based on
several dissimilar types of activities. The
concept of entrainment may also be
applied to these different types of
change activities. We have to acknowl-
edge that people development has a dif-
f erent pace from systems development,
and that the implementation of systems
or technical matters sometimes has to
wait until people have been trained and
motivated for its introduction.

We propose:
3. Project success for a renewal project
requires the adaptation of the philoso-
phy of entrainment.
3a. Project success for a renewal project
requires external entrainment, i.e.,
the adjustment of the pace of the
project to match the needs of the
base organization.
3b. Project success for a renewal project
requires internal entrainment, i.e., the
adjustment of the pace of different
types of change activities.

Commanding—Transformational
Leadership
Renewal project leadership should be
transformational (Bass, 1985; 1999).
The ability of the leader to articulate an
attractive vision for the possible future
is a core element of transformational
leadership. Such talents are needed in a
renewal project to create support for
the project. A transformational leader
defines the need for change, presents
his vision, and mobilizes commitment.
This kind of leadership typically pro-
duces followers that show a strong per-
sonal identification with their leader.

Transformational leadership is
often contrasted with transactional
leadership, which is primarily based on
exchanges of rewards for compliance.
Transactional leadership plays on the
self-interest of the employees. This
leadership style may be well-suited to
projects where all activities are well-
de fined and the focus is on costs and
deadlines. It has been suggested that an
organization is more receptive to trans-
formational leadership during adapta-
tion orientation than during efficiency
orientation (Pawar & Eastman, 1997).

We suggest the following proposition:
Project success for a renewal project
requires transformational leadership.

Organizing—Action and Political
Organization
What kind of organization should a
renewal project ideally be? Brunsson
(2002) distinguished between action
and political organizations.

Within the action organization, all
people fully support its goals and mis-
sion. Agreement is the principle of
recruitment; there is no room for dis-
agreement and conflict. A powerful ide-
ology dominates the organization. It
cuts down the need for making deci-
sions. The ideology chooses the actions,
and no other decision-making process
is needed. The action organization is
specialized and solution-focused.

The political organization, on the
other hand, reflects a variety of ideas
and demands, and strives to satisfy the
expectations of many different groups.
Conflicts are part of daily life. The
opportunity for its members to voice
adverse opinions is a vital part of the
organization and the main reason why
people with different views still want to
belong to it. Decision processes are
time-consuming, meticulous, but
accepted as objective. The decisions are
ideological by nature. They are con-
voyed with rhetoric and even hypocrisy
(explaining the decision in different
ways to different groups). The decisions
are not always followed by actions.

Within the task perspective, the
action organization is the ideal type.
All participants should fully subscribe
to the goals and mission of the project.
The project manager is to be seen as a
leader of a group of loyal followers.
The ideology manifests itself as a
strong wish to present the specified
project output within time and budget
constraints. The action organization
turns a project into a very efficient way
to deal with a specified task.

A renewal process is a different
kind of challenge, which cannot be
successfully handled by an action
organization. The renewal is usually
surrounded by contrasting views.
Some people are even openly negative
to the initiative. A renewal project
must adopt many of the qualities of a
political organization; allowing diversi-
fied participation, accepting different
opinions, making room for dialogue,
having an open and objective decision-
making process, and ensuring that all
participants still find something benefi-
cial to themselves in the project results.

The political process is not only
concerned with the output of the proj-
ct. It might also involve its pure exis-
tence or survival. Eskerod (1998)
showed that the way resources are allo-
cated to projects can be seen as a con-
tinuous negotiation process. Within
the task perspective, allocation of
human resources is regarded as a
(more or less mathematical) schedul-
ing calculation at the planning stage.
This is not the way it should be
approached in renewal projects.
Project managers must use their politi-
cal skills all the time to convince all
affected (the project owner, the man-
agement of the base organization, the
future users of the deliverables, and the
potential project team members) of
the benefits of the project.

However, politics is not enough.
Even a renewal project must strive for
efficiency. Most people regard projects as
an efficient way to address problems,
and the base organization will accord-
ingly expect results within a reasonable
time frame. The project must therefore
have elements from both ideal organiza-
tional types. This is not a surprising con-
clusion. Brunsson (2002) says it this
way: “… the kind of units which are gen-
erally regarded as whole organizations
generally have a dual basis for their legiti-
macy, both politics and action. It is
expected that they should reflect a vari-
ety of values and that they should be
reasonably efficient operations.”

This creates an organizational
they try to satisfy one legitimation
base, they will mismanage the other.
The demand for action requires an
integrative structure; the demand for
politics requires dissolution. This is a
genuine dilemma, an insoluble prob-
lem. It is not possible to be good at
both politics and action. It is not pos-
sible to solve the problem, only to
handle it.”
The way to handle the problem might be to separate and isolate politics and action. In the terminology of Weick (1969), we should “decouple” them. One suggestion would be that the base organization handles all political matters while the project focuses its full attention on action. (This is what the task perspective would advocate.) This is not workable. The moment a renewal project is established it will be subject to pressure from many groups, and it is impossible for it to shield itself from influences. Some external pressure might be avoided by a restrictive policy, but the project team itself will consist of participants from the base organization who will also be political actors, and their influences cannot be avoided.

In a renewal process it is possible to leave the implementation of change activities to the base organization itself. The deliverables of the project might be the fundamental decisions regarding which course the base organization should follow in the coming years. These decisions would be the results of extensive political discussions conducted by the project, but then the implementation is left to different parts of the base organization, which can act without any political interference. In this way the project is the political organization while the action is left with the base organization. It is probably not very wise to separate decisions on change completely from the actual implementation, especially when we adopt an evolutionary approach where feedback from early actions will affect subsequent decisions.

It is probably most realistic to accept that projects will be concerned with all aspects of renewal work and that the action part and the political part of a project are “loosely coupled systems” (Weick, 1976). The project will consist of parts that interact, but which also preserve their identity and separateness. The project manager must treat politics and action as two separate topics. This will require a high level of awareness. As has been demonstrated by Orton and Weick (1990), the concept of loose coupling can be interpreted in several ways and it opens up for an interesting debate about how different parts of an organization may interact.

We suggest the following propositions:

5. Project success for a renewal project requires a clear notion of what kinds of organizational types the project should be.

5a. Project success for a renewal project requires that the project has a double legitimacy as a political and action organization.

5c. Project success for a renewal project requires that politics and action are loosely coupled systems.

**Coordinating—The Teamwork**

A main reason for constructing a renewal project is to be given the opportunity to create a tailor-made knowledge-based team. It is a chance to integrate the specialist knowledge of many individuals into a unique knowledge combination. The role of the project manager is to facilitate this blending of knowledge, e.g., by establishing and opening up arenas and creating channels for information and knowledge sharing. The project manager has to lead the project team to obtain knowledge integration (integrating the different knowledge bases), knowledge globalization (stimulating system-wide knowledge processes), and knowledge pacing (coordinating the activities for efficient knowledge sharing) (Söderlund, 2005).

The project tends to bring together team members who may never have worked together before and who do not expect to work together in the future. They represent a diversity of knowledge and functions. It is not easy to mold them into a well-functioning entity. One idea might be to create role clarity so that all parties know exactly which activities fall under their area of responsibility. A responsibility chart is a well-known technique within project management. It is used to divide activities between team members and create role clarity. Role clarity is often stressed as an important part of project work, although this is not entirely true for creative projects, including renewal projects. Goodman and Goodman (1976) showed that role clarity does not result in the best use of human resources. Role clarity inhibits innovation resulting from combining the talents and knowledge of different people. It is of importance, however, when the project moves from idea generation and planning to execution.

Organizational renewal should be based on close cooperation with the employees who will be affected by the changes. This can be viewed as a natural democratic right in the working place. It can also be argued that the final results will be better given careful user participation (Kujala, 2003; Wagner III, 1994).

Creating a project team with people from the base organization implies a matrix organization (Larson & Gobeli, 1987). Because this will become a political organization with different opinions represented among the team participants, there is a need for leadership with authority. We will argue that in such cases there is a need for a strong matrix (PMI, 2004). This is an organization where the responsibility for project management success rests with the project manager, and the functional managers’ involvement is limited to assigning personnel as needed and providing advisory expertise. The strengthened authority of the project manager (less dependent on decisions from the functional managers) should enhance an integrated solution for all functional areas and diminish power struggles. The participation of employees from different parts of the base organization should ensure that local needs are duly considered.

We propose the following propositions:

6. Project success for a renewal project requires teamwork.

6a. Project success for a renewal project requires team members with a diversity of knowledge and active facilitation of knowledge generation and sharing by the project manager.

6b. Project success for a renewal project requires full utilization of all human resources in innovative tasks with as few restrictions as possible on participation.

6c. Project success for a renewal project requires a strong matrix organization.
Planning—On Different Levels

We pointed out that network planning and WBS are cornerstones of the task perspective. Planning based on these methods presumes perfect information about future activities, especially their resource and calendar time requirements. Such assumptions are not relevant in a renewal project.

This is not to say that planning is irrelevant. Planning is clearly an advantage to projects (Dvir, Raz, & Shenhar, 2003), but what we need in renewal projects is a planning approach where information about preferred activities is gradually acquired during the execution of the project. We need a level-based strategic, tactical, and operational planning.

Projects should have two kinds of strategies: positioning strategy and implementation strategy (Grundy & Brown, 2002).

Positioning strategy outlines the desired future situation (position) of the base organization, which the project, together with the base organization, should strive to achieve. Position is one of Mintzberg’s five definitions of strategy, whereby one role of a strategy is to define the match between the base organization and its environment—between the internal and external context (Mintzberg, 1987). Positioning strategy should ideally be part of the project mission, presented to the project as part of its assignment. If this is not the case, the project must develop the desired positioning as part of its work to achieve the project mission.

Implementation strategy outlines the way in which the project should generally approach its work. In Mintzberg’s schema it is the plan—a set of guidelines describing how to deal with the challenges confronting the project. Any renewal work may be approached in multiple ways. It could be evolutionary (gradually delivering its results) or revolutionary (all deliverables ready simultaneously), iterative (conscientiously repeating some of the activities to refine the results) or strictly sequential. It could be based on user participation or be expert-driven, experimental or based on analytical analyses. An implementation strategy would usually be a deliberate strategy. It delimits the degree of freedom in project work, but makes it possible to formulate a tactical plan.

As it is not possible to know which activities have to be undertaken at the outset of the project, the tactical plan cannot be expressed as a sequence of activities. Instead, the tactical plan should be a milestone plan (Andersen, 1996; Andersen et al., 2004); i.e., a plan consisting of the important milestones of the project. A milestone is a checkpoint in the project that ensures that the project is on the right track. It is a description of the state the project should be in at a certain stage. It describes what the project should achieve, but not how to achieve it (there should be no references to activities). As far as possible, the milestones of a tactical plan should be neutrally stated with regard to how they might be achieved. But how should the project identify its milestones?

Andersen et al. (2004) advocated that milestone planning should be based on logical precedence analysis. This is a backward analysis, moving from the end to the start of the project. The analysis starts by describing the preferred end result of the project work. The next step is to describe which previous state or situation—which milestone—is to be achieved in order to get into position for the end result. The analysis continues by asking repeatedly which milestone should be the previous one. The final plan will show all the milestones and their logical relationships. A rather similar approach is taken by Pitsis, Clegg, Marosszeky, and Rura-Polley (2003). They introduce the concept of future perfect to project management, which means a process where the future is imagined and then the project seeks to realize it, subject to constant revision. This method of reasoning is contrary to network planning, where the plan is created through forward activity-based thinking.

A traditional way of identifying milestones is to focus on the project life cycle. It is claimed that a project progresses by passing through phases such as start-up, planning and organizing, execution, and termination. Using this approach, the completion of a certain phase might be regarded as a milestone. This kind of thinking is based on certain presumptions; for instance, all activities of one type are collected in one phase and they are all carried out before the project moves on to the next phase. For example, all planning activities are to be completed before the execution phase starts. This will also exclude iterations. The project life cycle is not an appropriate concept for determining the milestones of a renewal project.

Van de Ven and Poole (1995) have identified four different basic theories for explaining change processes in organizations, including a specific life-cycle theory of change. However, all these theories look at change or renewal from the perspective of the base organization. In our organizational perspective we look at the interplay between the base organization and the project, and accordingly, we prefer to see the project as a provider of a flow of different kinds of deliverables, all of which contribute to the desired changes in the base organization.

The renewal project will be working on several deliverables at the same time. Start-up activities for work on one deliverable run in parallel with planning activities for the second deliverable and execution work on a third. The notion of a sequence of stages is meaningless in such an environment. The milestones are the stepping-stones on the way to the final deliverable of the project. The milestones may be earlier deliverables or preconditions for achieving them. The milestone plan is supposed to be a stable plan throughout the project, meaning that it is not affected by changing operational circumstances.

This way of looking at a project is rather similar to the idea used for program management (APM, 2000; Pellegrinelli, 1997). A program is a collection of projects related to a common objective such as a new business initiative, a new product development, and so on (APM). In our presentation of a renewal project the elements are represented by work on different deliverables, not by...
projects or subprojects as in a program. The difference, however, might be more of size than substance.

The operational planning (the detailed planning, the activity planning) should not be done before it is strictly necessary. The plans required to achieve each milestone should be made on a rolling-wave basis; that is, the detailed planning should not be carried out before the work is about to start, when all possible information is available. In that way the planning can take into consideration what has happened earlier in the project and what has been learned so far. Contrary to the milestone plan, activity plans may also be subject to frequent changes.

We suggest the following planning propositions:

7. Project success for a renewal project requires strategic, tactical, and operational planning.
7a. Project success for a renewal project requires a deliberate positioning strategy and a deliberate implementation strategy.
7b. Project success for a renewal project requires a tactical plan, focusing on the milestones the project should achieve during its lifetime.
7c. Project success for a renewal project requires detailed, easily changeable, activity-oriented plans, which supplement the tactical plan.

Controlling—Getting the Complete Picture

Traditional project control focuses on cost, time, and quality control. This is natural when the center of attention is project management success. Control is conducted by the project itself and it reports its progress on these matters to the project owner or the management of the base organization.

When we change focus to include project product success, control measures should also be extended. It is necessary to take a broader look at the work of the project. The most complete picture would be an IPO (Input-Process-Output) model (Day, Gronn, & Salas, 2004; Gladstein, 1984; Hackman, 1987). This is a model that can be used to present in a condensed manner the input, processes, and output of an organization. The description may also form the basis for a causal analysis. It provides material that makes it possible to discuss how project results depend on its processes and input factors. As part of the controlling processes, this could lead to the inputs and processes being changed in order to create better results.

The IPO model has been applied to projects. Examples are the X Model (Andersen, 2002) and Project Excellence Model, (Westerveld, 2003). The special feature of the X Model is a distinction between personal and structural factors. The Project Excellence Model is based on the EFQM model, which was developed by the European Foundation of Quality Management to improve the overall quality of an organization. The Project Excellence Model uses a definition of project success that includes project management success (time, cost, and quality). In addition, it takes a broad view on project product success, which covers the appreciation by client, project personnel, users, contracting partners, and stakeholders.

Conventional approaches to project management assume that success depends on imposing control. However, it has been shown that control-based approaches can be counterproductive (Drummond & Hodgson, 2003). Especially when we are dealing with creative and challenging renewal work, control must be used wisely. There is a very real danger of bureaucratization, shortsightedness, and overemphasizing technical matters in the controlling of renewal projects.

The controlling proposition is as follows:

8. Project success for a renewal project requires a broad controlling approach, which covers most aspects of project work such as the one we find in an IPO model.

The Assignment and the Resources—Commitment, Identity, and Image

The project’s assignment may come in different forms. When a project is to make deliveries to a third party, its work has to be governed by formally agreed and signed contracts. This is not the case for renewal projects, where formalities are of little importance. What matters is the base organization’s commitment to the idea of a renewal process and its willingness to commit knowledgeable resources to project work. As pointed out earlier, the project manager must continually “sell” the project idea to the base organization. Securing resources might be considered a continuous negotiation process.

There are cases when top management of the base organization establishes renewal projects just to defer or postpone difficult and demanding decisions. The assignment is only meant to signal that top management is taking action, although in reality it is not committed to the actual cause of the project (Sahlin-Andersson, 2002).

As pointed out earlier, the assignment and allocation of resources provide a starting point for creating the identity of the project. Organizational identity is traditionally defined as that which is central, distinctive, and enduring about an organization (Albert & Whetten, 1985). The organizational identity emerges from complex, dynamic and reciprocal interactions among among project managers, project team members and external stakeholders. Mission, goals, practice, values, and action (as well as lack of action) contribute to shaping organizational identity, in that they differentiate one project from other projects (Scott & Lane, 2000).

A project has multiple organizational identities when different conceptualizations exist among the project team members regarding what is central, distinctive, and enduring about the project (Pratt & Foreman, 2000). We have earlier discussed that a project may appear as both a political organization and an action organization. The two parts may be loosely coupled. It is reasonable to believe that the organizational members of these two different parts have different understandings of the project’s identity. This allows the project to maintain efficiency at the same time as satisfying the various stakeholders.

Managing multiple identities is an important function for the project
manager. There is an optimal level of identity multiplicity (Pratt & Foreman, 2000). Projects with too few or too highly related identities may have difficulty meeting all the demands. In contrast, projects with too many or too highly unrelated identities may become ineffective due to the conflicting demands imposed upon them.

Originally, identity was seen as a relatively stable factor, but recently it has been argued that it should be viewed as a more fluid and unstable concept (Gioia, Schultz, & Corley, 2000). This may be of particular relevance for projects, as they are temporary organizations with a rather short life (it may take time before a clear identity is developed) and a large number of stakeholders influencing their identity. This instability in identity is seen as adaptive in accomplishing change (Gioia et al.).

The identity of an organization can be affected as a consequence of differences between identity (“the way we see ourselves”) and image (“the way others see us”) (Gioia et al., 2000). The discrepancy could be regarded as so important that the project manager decides to take action to resolve it, either by changing the identity or the image. The base organization might see the project as a creative force. If the project tries to live up to its image, this may lead it into being more creative. If the base organization expects the project to follow a rationalistic model of project work, it may turn out that way.

The final propositions are as follows:

9. Project success for a renewal project requires an assignment, but the degree of formality and details is not of importance.
9a. Project success for a renewal project requires commitment and resources from the base organization, but securing resources is a continuous negotiating and “selling” process.
9b. Project success for a renewal project requires that the project manager deliberately manages the identity of the project.

Lessons for Management
Adopting the organizational perspective requires a new way of looking at projects. They are no longer merely a way in which to carry out specified tasks; they become part of the organizational strategy of the company. When top management is confronted with the need for renewal, it has at its disposal two organizational options: it can engage sections of the permanent organization to address the challenge or establish one or several temporary organizations.

Setting up a new organization within the traditional organization is a demanding job. It requires clear borderlines to be drawn between the existing organization and the new temporary one (Sahlin-Andersson, 2002). Many companies find it beneficial to set up a project management office (PMO), which acts as an advisory organizational entity assisting both the management of the base organization and project managers on strategic and practical matters (Dai & Wells, 2004). The PMO would help the base organization in implementing project management principles and practices. We stress the advisory role of a PMO. There is an implicit drive in such bodies to regulate and bureaucratize project work. We have previously warned against this as it can make it difficult to secure the desired autonomy of the project.

Furthermore, the proposed theory has several implications for the management of a base organization. A specific theory for renewal projects suggests that such projects should be approached differently from other projects. The base organization may have a project portfolio consisting of several projects, perhaps a building project, some projects supplying products or services to external customers and some renewal projects. The lesson for management is that it is not wise to use the same standardized methods for all projects. It has been claimed that projects are similar in the sense that they are all temporary and experience the same project life cycle. They all go through the same phases. However, as shown in the previous edition of PMBOK, Guide (PMI, 2000), life cycles differ substantially from one type of project to another. This cannot be used as an argument for approaching all project work in the same way. We even argued previously that the traditional life-cycle model is not useful for understanding the progress of some projects. Using an organizational perspective, it should not surprise us that organizational matters depend on the conditions under which the organization works. The classical contingency approach (Burns & Stalker, 1961) points out that different external conditions require different organizational characteristics. In fact, it would be stranger to assume that all types of projects, whether setting up a new office building, organizing a marketing convention, selling an insurance scheme to a company, installing a new computer network at a client’s site, or working to increase employee motivation in two merging companies, could be led, planned, organized, and controlled in an identical manner. Our advice to the base organization management is to treat renewal projects as indicated by the previously stated propositions. The result is that different projects belonging to the same base organization are approached differently.

Some implications of the proposed renewal approach may feel painful. Accepting that the project should partly be a political organization may be difficult. When the base organization creates what turns out to be a political organization, it must also accept that it is not possible for it to keep full control. Some decision-making power must be transferred to the project. Even if the final decision is still, in principle, left with the base organization, it is, in practice, impossible to ignore project proposals that have developed through a political process.

The use of a strong matrix organization and a transformational leadership with a clear and convincing vision will also contribute to the transfer of power to the project. The principle of entrainment should still put the base organization in the driving seat. The project must adapt to the needs and
pace of the base organization. The project cannot proceed at its own tempo. There is no point in handing over the project's deliverables to the base organization and users before the latter feel ready to accept them and are prepared to tackle the challenges they represent.

The management of the base organization may also be frustrated with a project that is not able to make a definite plan from the start. Some managers may demand a detailed plan and force the project to produce one. This illustrates the well-known planning dilemma: the project prepares detailed plans and makes its most-important decisions when the information available is at a minimum. The managers should be educated to be satisfied with an overview plan—a milestone plan—and not to press for detailed plans at an early stage of the project.

Advocating transformational leadership has consequences for the kind of project managers that are recruited for renewal projects. A transformational leader should have the ability to create a vision and communicate it convincingly to his or her followers. An extended view of what represents project success is needed.

The project manager of a renewal project must build an effective team; this is required of all project managers. The specific challenge of the renewal project is to handle simultaneously political and action organizations as well as to manage multiple organizational identities.

**Further Work**

The proposed theory has not been subjected to empirical tests. This is a clear limitation to its acceptance. On the other hand, it opens up areas for interesting research. The theory does not cover all aspects of renewal project work, but it would be possible to make extensions to the theory to cover, for example, financial issues and organizational learning aspects. More effort should be placed on presenting the renewal project as a learning organization.

The organizational perspective allows for utilizing general organizational theory on renewal projects. This kind of organization distinguishes itself by being temporary and having an assignment from the base organization. This should make renewal project management a specific organizational topic within organizational theory. However, for several problem areas the specific nature of renewal projects would not constitute a severe hindrance to applying general organizational knowledge.

The different elements of renewal project theory could define a research agenda for which we have outlined some topics next. The need for more empirical research within project management has been pointed out (Packendorff, 1995; Söderlund, 2002). Case studies can in themselves form the basis for refining the theory (Eisenhardt, 1989).

The theory presents a broad concept of project success with divided responsibilities between project and base organization for achieving such success. This division of responsibilities creates a challenge. There is a need for both cooperation and clear lines of responsibility. The (linear) responsibility chart is a well-known tool within project management (Meredith & Mantel, 2000). The effect of using it to clarify the individual roles within an organization has also been studied (Schaubroeck, Ganster, Sime, & Ditman, 1993). The responsibility chart could also be used to define the roles of the base organization and the project in achieving project success. The merits of this tool or alternative approaches to role and responsibility clarification could be studied.

The theory presumes that organizational renewal requires a complex set of different initiatives, ranging from technological to highly personal matters. The organizational culture of renewal projects must accept and even encourage a wide range of simultaneous tasks. We hypothesize that the most successful organizational culture of a renewal project is characterized by qualitative polychronicity. Polychronicity can be measured by the Inventory of Polychronic Values (Bluedorn, Kalliath, Strube, & Martin, 1999). The effect of polychronicity on company performance has been studied (Onken, 1999), which may inspire similar studies for renewal projects.

Dahlgren and Söderlund (2001) have studied the mutual coordination of activities between client and contractor in inter-company projects. The concept of entrainment has, to our knowledge, not been applied to renewal projects. This could lead to interesting case studies. In practice, we find that some projects are already timing their deliveries to suit the base organization and users. New projects may be convinced to use the thinking behind the concept of entrainment. It would be interesting to compare the performance of organizations where entrainment is the main principle to that of organizations where network planning is the norm. The benefits of entrainment could be compared to situations where timing and pace are solely determined by what best suits the project.

Case studies are also necessary to reveal the extent to which a renewal project becomes a player in the political arena of the base organization, and the consequences for the project of being both an action and political organization. Most case studies of projects are of large public projects (Flyvbjerg, Bruzelius, & Rothengatter, 2003; Murray, 2004). What is clearly needed is to learn more about internal renewal projects and how they handle the dilemma of operational efficiency and time spent on finding solutions to problems where the people involved have conflicting views.

Textbooks frequently recommend the use of stakeholder analysis as a tool to understand the interests of the various stakeholders and to propose ways of interacting with them. Within the task perspective, we have the notion of a harmonious project organization with all members sharing the same ideology. In a more political setting the renewal project might experience participants with extreme negative and highly conflicting attitudes. The stakeholder theory must be based on a realistic understanding of the incompatible views involved in organizational change (Friedman &
The influence of stakeholders on project identity should be investigated and its consequences discussed. The role of the project manager in building a project identity and managing multiple identities should be studied.

The theory presents the idea of the renewal project organization as a loosely coupled system with elements focusing on either politics or actions. Spender and Grinyer (1996) say, “Unfortunately, the loosely-coupled-system model is as much an intellectual attitude as it is a theoretical model in the conventional sense. It is descriptive and evocative but has no predictive value in its current form. It is not clear how it could be tested. Yet, the evidence above tells us something about how we might move forward toward a more powerful and usable organizational model that can deal with uncertainty, change, and renewal.” Attempts have been made to make loose coupling a more rigorous and comprehensive framework (Beekun & Glick, 2001).

The matrix organization of a renewal project will consist of participants from different disciplines, with permanent positions in different parts of the base organization. The project team members should be recruited on the basis of their knowledge and experience. They should not be seen as formal representatives of their discipline or functions; that would give them an official political role. However, in practice they will probably look upon themselves as spokespersons for colleagues from the same discipline or function. They will discuss the challenges of the project with their colleagues and draw on their expertise and understanding. They will also provide them with lessons learned from the performance of the project. In this way the project organization may develop into communities of practice (Wenger, 1998). Others have also described projects as an embryonic form of community of practice (Sense, 2003). The close connection between a loosely coupled system and communities of practice has been pointed out (Spender & Grinyer, 1996).

The theory also invites us to study the merits of transformational leadership in renewal projects. A recent study compared the relationship between transformational leadership style and employee motivation, commitment, and stress for employees reporting to either project or line managers (Keegan & Den Hartog, 2004). However, future studies should also address the hypothesis that transformational rather than transactional leadership increases the probability of project success for renewal projects. This might not be the case for more simple technological projects with external customers.

Planning plays a vital role in all project management theory. We have proposed a multilevel approach. We have argued in favor of a tactical plan (milestone plan), which stays unchanged during the project lifetime. This is the plan that the base organization sees and relates to. Research supports the importance of concrete plans. Changes in goals and plans have a strong negative effect on project success as it is experienced by the base organization (Dvir & Lechler, 2004). Internally, the project must have operational plans that can be changed more or less continuously. The concept of multi-level planning for renewal projects should be tested.

Control is usually closely related to planning. Control may be seen as checking whether the plan is followed. It is natural to check whether activities have been carried out as planned (operational control) and whether the milestones were achieved at the right time (tactical control), but control should involve much more. We have suggested the use of I-P-O models as a control tool to evaluate whether the project as a whole is functioning well. Such models have been used to describe projects, but their roles as controlling devices have not been established.

There is evidence that the project management approach should be conditioned by the context in which change is progressed. Buchanan (1991) introduced the concept of vulnerability, which refers to the scale and complexity of the problems faced by the project manager and the anticipated degree of contention and resistance that the change is likely to generate. He claimed that the challenge of change should be approached differently in high vulnerability contexts compared to a low vulnerability situation. This suggests that the theory of renewal projects should take into account the contexts of change, which should be explored further.

Conclusions
Most, if not all, organizations are confronted from time to time with the challenge of change and renewal. Many will choose to address the challenge by initiating a project. This paper has shown that many elements of renewal projects will differ from other types of projects. This strongly suggests that there is a need for a specific project management theory for renewal projects. This need may exist for many types of projects, but it is most urgent for renewal projects because the traditional task-oriented approach developed originally for building and construction projects does not work for renewal projects.

The project management discipline is characterized by an abundance of normative advice, despite a lack of empirical evidence (Packendorff, 1995). The need for more empirical research into internal renewal projects, based on a specific theory for this kind of project, is urgent. The propositions of this paper should encourage further research.

References


ERLING S. ANDERSEN is professor of project management and information systems at BI Norwegian School of Management, Oslo, Norway. He holds a MS in economics from University of Oslo. Before joining BI NSM he was associate professor in economics at University of Oslo, dean of NIKI College of computer science and professor of information science at University of Bergen. He has been a visiting professor to University of Tokyo, Japan and Nanyang Technological University, Singapore. He has published several books and articles on information technology, systems development, project management and management in general. His book Goal Directed Project Management has been translated into several languages.
The main purpose of this study is to evaluate the critical success/failure factors in project management and to examine the relationships between critical success factors and organizational background variables. This study also aims to gain an understanding of how project clients, owners, and sponsors present their needs and expectations to ensure project success. On the basis of the survey responses received, it is possible to identify critical success factors in project management that are significantly related to company/organization size, project size, organization type, and project managers’ work experience. The project implementation profile is also analyzed on average and by phases. The results indicate the importance of project communication that is related to company size, however. In contrast to some prior studies, communication was ranked highest in most project phases.

Keywords: managing projects; critical success/failure factors; project success; organizational variables

©2006 by the Project Management Institute
Vol. 37, No. 4, 31-41, ISSN 0756-9728/03

IRJA HYVÄRI, Helsinki School of Economics, Finland

ABSTRACT

The main purpose of this study is to evaluate the critical success/failure factors in project management and to examine the relationships between critical success factors and organizational background variables. This study also aims to gain an understanding of how project clients, owners, and sponsors present their needs and expectations to ensure project success. On the basis of the survey responses received, it is possible to identify critical success factors in project management that are significantly related to company/organization size, project size, organization type, and project managers’ work experience. The project implementation profile is also analyzed on average and by phases. The results indicate the importance of project communication that is related to company size, however. In contrast to some prior studies, communication was ranked highest in most project phases.

Keywords: managing projects; critical success/failure factors; project success; organizational variables

©2006 by the Project Management Institute
Vol. 37, No. 4, 31-41, ISSN 0756-9728/03

IRJA HYVÄRI, Helsinki School of Economics, Finland

Introduction

There is a growing need for the management of projects in various business organizations. Increasingly, companies are now using projects in their daily work to achieve their goals. Surprisingly in the project management literature it is still somewhat unclear what makes a successful project in general, and, in particular, in the terms of organizational context of the company or companies involved. The concept of project success has not been well-defined anywhere in project management literature. Failure is also an imprecise and ill-defined term used by practitioners and in the literature, without deep meaning (Rae & Eden, 2002). Shenhar and Wideman (2000) concluded that there does not appear to be any agreed-upon understanding of the concept of success in either business or project management literature. Cooke-Davies (2002) also noted that decades of individual and collective efforts by project management researchers since the 1960s have not led to the discovery of a definitive set of factors leading to project success.

In recent years, researchers in project management have become increasingly interested in critical success/failure factors. Previous research results indicate that the relative importance of several of the critical factors changes significantly, based on life-cycle stages (Pinto & Prescott, 1988). Nevertheless, the success factors are usually listed in either very general terms, or very specific terms affecting only particular projects. Our knowledge and understanding of the critical success/failure factors, as well as of how to measure them and the interactions between these factors, have great importance for project management effectiveness (Belassi & Tukel, 1996).

There are still too many examples of projects exceeding their budgets, running late, or failing to meet other objectives. Numerous methods and techniques have been developed, and many examples exist of project management tools used for tracking the harder technical aspects of projects. However, there have been few attempts to find a tool to aid project tracking and control in relation to the softer human elements of project management (Pinto, 1990). However, additional future research concentrating on the relationship between critical success factors and measurement techniques and human elements in project management can be expected. It would seem to be of interest to give increased research attention to the behavior and organizational factors of project management (Hyvär, 2000; 2002; Zimmerer & Yasin, 1998).
This paper presents the results of a survey made in organizations among modern progressive companies. This study aims for new knowledge and understanding of project management and the critical success/failure factors in project management in an organizational context. On the basis of the findings it is possible to identify critical success/failure factors in project management in different organizational conditions and in different project phases. The paper is divided into the following parts. First, previous research is reviewed. Second, the results of the survey are presented and analyzed. These results are compared with previous results. Third, relationships are examined on the basis of this research. Finally, directions for future research are suggested.

**Previous Studies**

This research addressing the success of projects in different organizational conditions includes the following aspects of interest: (1) the organizational context in project management, (2) critical success factors in project management, and (3) dependencies between these factors. The following review of previous research concerning these aspects provides a view of current knowledge and missing knowledge concerning project success in an organizational context.

Organizational structures ranging from the classic purely functional organization to the opposite end of the spectrum, the projectized organization, have been presented in *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)* (PMI, 1996). In projectized organizations (or project teams) most of the organizational resources are involved in project work. Matrix organizations are a blend of functional and projectized organizations. Matrix organizations are defined by Gobeli and Larson (1987) as a functional, balanced, and project matrix. The *PMBOK® Guide* has named these matrix types as weak, balanced, and strong matrices. Most modern organizations involve all these structures at various levels. Even a fundamentally functional organization may create a special project team to handle a critical project.

Project managers interact continuously with upper-level management, perhaps more than with functional managers. The effectiveness of dealing with upper-level management has been presented by Kerzner (1990). The use of different types of organizations in project management has been examined by several authors (Chud, Tummula, & Nkasu, 1995; Gray, Dworatschek, Gobeli, & Knoepfel, 1990; Turner, Utley, & Westbrook, 1998). Within organizations, companies have organized project offices that specialize in managing projects more effectively (Bridges & Crawford, 2000). The project office is an organization developed to support the project manager in carrying out his or her duties. Project office personnel must have the same dedication with respect to the project as the project manager and must have good working relationships with both the project and functional managers. The major responsibility of the project manager and the project office personnel is the integration of work across the functional lines of the organization. The project team is a combination of the project office and functional employees. On larger projects and even on some smaller investments it is often impossible to achieve project success without the help of permanently assigned personnel from the company and outside the company. Project management effectiveness refers to the success of the project. Both the success of the project and the career path of the project manager can depend upon the working relationships and expectations established with upper-level management (Kerzner).

There are only a few studies of human resource management in project management (Fabi & Pettersen, 1992). Only since the 1990s have researchers noticed the significance of the project group and team (Katzenbach & Smith, 1993; Williams, 1997), empowerment and organizational learning (Argyris, 1977; 1990; Ayas, 1996; Hammuda & Dulaimi, 1997; Pinto & Kharbanda, 1996; Senge, 1990), and communication in project management. The focus of project risk management has turned from quantitative methods to the development of the risk management process and understanding in different project phases, and to the organizing of risk management (Artoo, 1997; Chapman & Ward, 1997; Kähkönen, 1997). For the requirements of project managers, the *PMBOK® Guide* has been created and published. In addition, a certification process for project managers is in progress. Although cooperation and networks between companies have increased lately, research in this area is still rare (Guss, 1997; Hedberg, Dahlgren, Hansson, & Olve, 1997; Larson, 1995; Weston & Gibson, 1993). In prior studies, in the area of project management research, the project manager’s leadership principles and duties have been examined (Zimmerer & Yasin, 1998). It has been concluded that organizational effectiveness requires project management to combine technical competency, i.e., tools, with the ability to develop and display leadership (Hyvärä, 2000; 2002; Zimmerer & Yasin, 1998). The leadership factors in the success of projects, the factors contributing to making project management effective, and the characteristics of effective project managers were all examined by Zimmerer and Yasin (1998).

Project management literature has not defined unambiguous criteria for successful projects. On the basis of previous research in project management, critical success/failure factors in project phases and conflict situations have been reviewed (Adams & Barnt, 1978; Belassi & Tukel, 1996; Cleland & King, 1983; Honko, Piiri, & Virtanen, 1982; Pinto & Prescott, 1988; Pinto & Slevin, 1987; Schultz, Slevin, & Pinto, 1987). A survey of critical success/failure factors has also been carried out by dividing the factors into strategy and tactics. A few success/failure factors in the project process have been observed. The success factors are usually expressed as either very general factors or are very specific factors affecting only a particular project (Baker, Murphy, & Fischer, 1983; Cleland &
King, 1983; Finch 2003; Pinto & Slevin, 1987). The project implementation profile (PIP) was developed by Slevin and Pinto (1986; 1987) in an attempt to identify which aspects of a project determine success or failure. Its aim is to assist in identifying and measuring 10 critical success factors (CSFs) for a successful project outcome. This PIP was applied by Pinto (1990), Pinto and Prescott (1988), Dilisle and Thomas (2002), and Finch (2003), who applied PIP to an information systems project. Pinto and Prescott (1988) examined CSFs over the project life cycle. They found that the relative importance of several of the critical factors change significantly based on the life-cycle stages.

There is little research on dependencies between organizational context and CSFs in project management. Belassi and Tukel (1996) emphasized, in their summary of previous research, the importance of understanding the critical success/failure factors and how to measure them and the interactions between these factors. They grouped CSFs into five categories (project, project manager, project team, organization, and external environment).

In conclusion, the research review reveals that there is a gap in research of the success of projects in an organizational context. There is not enough knowledge about the dependencies between organizational context and CSFs in project management. There is also an evident need to understand priorities of different success factors in different project phases.

**Purpose of this Study**

This study examines the success factors of project management in organizations actively involved in projects and how the project clients, owners, and sponsors in organizations present their needs and expectations to ensure a successful project. The main purpose of this study is to evaluate the critical success/failure factors in project management and to examine their relationships with organizational background variables.

This study aims to make a contribution to a better understanding and improvement of the project management context in organizations. In this research, success and failure factors in projects are explored on the basis of previous studies. On the basis of the information received from respondents, these factors are prioritized and it is supposed that the most critical factors are those success/failure factors that are highly prioritized. CSFs are prioritized between different success factors and in different project phases. In addition, an examination has been made as to whether the results of previous studies support the results in this study. Critical factors in projects and in project management have also been examined by factor groups and, on that basis, the relationships between organizational variables have been studied.

**Research Data and Methods**

**Empirical Data and Data Collection**

The empirical data of this study is based on a survey sent to the members of the Project Management Association Finland in 2002. In this research the survey started with the question: “Aren’t you interested in learning how projects and their management appear in your organization?” The survey included a great amount of data, gathered in response to 54 questions, including altogether about 400 sub-items. There were 14 open questions. The survey included questions on success/failure factors and the ways of handling conflicts. In addition, the survey included questions on the general background of the respondents, the projects, and the respondents’ organizations, tools and leadership styles. People were asked to take part in the survey only if they had been actively involved in managing a project, and were asked to base their responses on their most recently concluded project, even if that project had been curtailed or abandoned. The survey focused on the perspective of the project client/owner/sponsor, and included projects carried out for their own purposes.

First, in order to test the validity of the questionnaire, it was sent to 78 company members and 368 individual members, inviting them to participate in the project management survey. Thirty responses were received from respondents representing different business organizations. These respondents were then asked to participate in the actual survey, which was carried out between December 2002 and February 2003. Twenty-five responses were received and all the 54 questions were answered. The results were statistically analyzed for correlation and reliability, with the aim of deriving insights into various relevant factors. Although the final sample size is fairly small in an absolute sense, it is nevertheless comparable to some relevant prior studies (for example, Delisle and Thomas, 2002, use approximately 40-50 responses in their individual surveys), and in any case it can be considered representative of the profile of the company members of the Project Management Association Finland.

**Research Method**

The present survey study utilizes the results of previous qualitative, descriptive case studies (Hyväri, 2000; 2002) to avoid bias and errors attributable to the limitations of the survey. In addition, three interviews were conducted. The study made use of the chi-squared test statistic introduced by Karl Pearson (Agresti & Finlay, 1997, p. 255). The non-parametric chi-squared test is particularly appropriate here, because it is based on variables measured on nominal scales, which is the case in this study. Data from the survey was imported from Microsoft Excel to SPSS statistical software for analysis.

**Survey Findings**

**Background Variables**

The industry sector breakdown of respondents’ organizations is in Figure 1. Telecommunications services, software and IT accounted for 32% of
the responses, the manufacturing sector and engineering and construction for 20% each, public administration and education for 12%, and others for 16%.

The company/organization size in terms of turnover is shown in Table 1 of descriptive statistics of the survey organizations. Most of the companies had an annual turnover of €31-50 million, while four companies had a turnover in excess of €150 million. The respondents' background information is shown in Tables 2-3. With regard to respondent backgrounds, 32% of the respondents identified themselves as top-level, 52% as middle-level and 16% as some other level. Most of the respondents were project managers with 19 years (on average) of employment and 12 years (on average) as a leader or member of a project team. During the previous 12 months, an average of 60% of their work effort in their organizations had been in project management (standard deviation 35.5). And they had participated in six projects on average (standard deviation 8.3).

The projects were classified into nine types on the basis of the responses (see Figure 2). IT/software and investment projects each accounted for 24% of respondents, while staff development/training and business change/reorganization projects each accounted for 12% of respondents. R&D, business reallocation and engineering projects each accounted for 8% of respondents, and construction projects for 4% of respondents.

Half of the projects were over €1 million (the projects, which ranged in size from €0.02 million to €1,500 million, are categorized in Table 4). The average project duration was 18 months (the range was three months to 42 months). Twenty-one projects had up to 100 activities, while four had more than 100 activities. The project office and project team structures differ between organizations in this study. The number of persons involved in projects was on average 24 persons from their own organization, 14 from the client organization, 98 from the suppliers’ organization, and four from other organizations. The highest participation in one project was 2,000 persons. When respondents were asked to select the organization type that best described their own organization, the responses were divided as follows: functional 8%, functional matrix 28%, balanced matrix 12%, project matrix 28%, and project team 24%. Matrix type organizations were the most common.

Respondents were also asked questions concerning project communication in their projects on a scale of 1-5 (5 is the highest rating). Projects usually had written procedures/practices (project guidelines, project implementation plans or similar). Respondents usually understood their roles and responsibilities in the projects. They also got the information needed and had adequate access to people with the information necessary for them to perform their respective jobs. Respondents felt that they got accurate information. They also understood well enough what their supervisors and other project groups expected of them. All the responses were in the range 4.3 - 4.8.

Success/Failure Factors in Project Management
This section presents findings concerning critical success/failure factors in project management. The critical success/failure factors were grouped in factor groups, and could be used together with organizational background variables on projects, organizations, and respondents to form relationships. The importance rankings of CSFs are also presented according to the PIP (Pinto, 1990) on average and by project phases.

Respondents were asked to select the three factors in each factor group (related to the project, the project manager, the project team, the organization, and the environment) that they considered to be the most critical to the successful implementation of their project. The results are shown in Table 5. The success/failure factors originated from the studies of Belassi and Tukel (1996) and Hyväri (2000; 2002). The ranking is done according to the frequency of responses.

The three critical project-related factors in this study were clear goals/objectives, end-user commitment, and adequate funds/resources. In the study of White and Fortune (2002), the three CSFs mentioned most frequently by respondents (responses were received from 236 project managers) were clear goals/objectives, support from senior management, and adequate funds/resources. These results support the findings concerning critical success/failure factors in this study. The three factors chosen in this study were not listed on the questions given to

Figure 1: The industry sector breakdown of respondents’ organizations (%)
respondents in the previous Belassi and Tukel (1996) study. They were listed in this study and were rated as the most important by respondents. In the study of Belassi and Tukel, 57 project managers ranked size and value, density, and urgency as the critical project-related factors.

The critical project-manager-related factors in this study were commitment, the ability to coordinate, and effective leadership. In the study of Belassi and Tukel (1996), the critical project-manager-related factors were commitment, the ability to coordinate, and competence (the last was ranked fourth in this present study). In a separate questionnaire concerning leadership ability, the first three leadership characteristics of an effective project manager were being a good communicator, being a good motivator, and being decisive, while the next three were leadership by example, being visionary, and being technically competent. The characteristics of ineffective project management were mostly the opposite. The most important factors according to Zimmerer and Yasin (1998) were leadership by example, being visionary, and being technically competent. These factors were the next three characteristics of an effective project manager identified in this study. The most critical finding was that five of these six characteristics were managerial in nature. The technical competence factor was ranked only sixth in this study, whereas it had been third in the previous study.

The critical factors related to project team members were the same in this study as in the study of Belassi and Tukel (1996), namely communication, commitment, and technical background.

The critical factors related to the organization were ranked in the previous study (Belassi & Tukel, 1996) as organization structure, top management support, and functional managers’ support. In the present study, top management support was the most important. The next two were clear organization/job descriptions (new in this study) and project

Figure 2: Project types on the basis of responses (%)

<table>
<thead>
<tr>
<th>UR mill.</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-17.5</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>&gt;17.5-40</td>
<td>7</td>
<td>28</td>
</tr>
<tr>
<td>&gt;40-111</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>&gt;111-2200</td>
<td>6</td>
<td>24</td>
</tr>
</tbody>
</table>

Table 1: Company/organization size in turnover

<table>
<thead>
<tr>
<th>Years</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-11</td>
<td>8</td>
<td>32</td>
</tr>
<tr>
<td>&gt;11-20</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>&gt;20-29</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>&gt;29-35</td>
<td>5</td>
<td>20</td>
</tr>
</tbody>
</table>

Table 2: Respondent’s total work experience

<table>
<thead>
<tr>
<th>Years</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>7</td>
<td>28</td>
</tr>
<tr>
<td>&gt;5-20</td>
<td>13</td>
<td>52</td>
</tr>
<tr>
<td>&gt;20-32</td>
<td>5</td>
<td>20</td>
</tr>
</tbody>
</table>

Table 3: Respondent’s work experience in projects

<table>
<thead>
<tr>
<th>EUR mill.</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-.25</td>
<td>7</td>
<td>28</td>
</tr>
<tr>
<td>&gt;.25-1</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>&gt;1-13.5</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>&gt;13.5-1500</td>
<td>6</td>
<td>24</td>
</tr>
</tbody>
</table>

Table 4: Project size
1. Factors related to the project
- Size and value
- Having a clear boundary
- Urgency
- Uniqueness of the project activities
- Density of the project network (in dependencies between activities)
- Project life cycle
- End-user commitment*
- Adequate funds/resources*
- Realistic schedule
- Clear goals/objectives*

2. Factors related to the project manager/leadership
- Ability to delegate authority
- Ability to trade-off
- Ability to coordinate*
- Perception of his or her role and responsibilities
- Effective leadership*
- Effective conflict resolution
- Having relevant past experience
- Management of changes
- Contract management
- Situational management
- Competence
- Commitment*
- Trust
- Other communication

3. Factors related to the project team members
- Technical background*
- Communication*
- Trouble shooting
- Effective monitoring and feedback
- Commitment*
- Other scope known by members also

4. Factors related to the organization
- Steering committee
- Clear organization/job descriptions*
- Top management support*
- Project organization structure*
- Functional manager’s support
- Project champion

5. Factors related to the environment
- Competitors
- Political environment
- Economic environment
- Social environment
- Technological environment*
- Nature
- Client*
- Subcontractors*

Note: Factors marked with an asterisk are further examined in Table 6.

Table 5: Number of Success/Failure Factors

The responses concerning critical success/failure factors (in Table 5) were used to identify relationships between these factors and the organizational background variables on projects, organizations, and respondents. The three most commonly selected factors in each group were identified for further analysis. There are a total of five groups and 15 factors. The hypotheses were used as a way of determining whether the background organizational variables on projects (see Tables 1-4), and on project type and organization type, was significantly related to success across the most CSFs (Table 5). The Pearson chi-square showed the factors that were significantly (p < 0.1) related to success.

The relationships were as follows: Company/organization size in terms of turnover (Table 1) had a significant relationship with communication. Communication in project teams was found to be a more significant critical factor in bigger companies/organizations than in smaller ones.

A significant relationship was found between project size in terms of millions of euros (Table 4) and adequate funds/resources. The significance was stronger in smaller projects. Another project size factor, the number of activities in each project (84% of projects in this study had fewer than 100 activities, while 16% had more than 100 activities), was also related to adequate funds/resources. A positive relationship was found with projects of fewer than 100 activities.
Table 6: Relationships with project critical success factors and organizational background variables

<table>
<thead>
<tr>
<th>Company/organization size (EUR mill.)</th>
<th>End–User Commitment</th>
<th>Adequate Funds/Resources</th>
<th>Communication</th>
<th>Clear Organization Job Description</th>
<th>Client</th>
<th>Subcontractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project size (EUR mill.)</td>
<td>0.461 (0.081)</td>
<td>0.576 (0.006)</td>
<td>0.510 (0.033)</td>
<td>0.453 (0.091)</td>
<td>0.424 (0.019)</td>
<td>0.637 (0.002)</td>
</tr>
<tr>
<td>Project size (number of activities)</td>
<td></td>
<td>0.471 (0.008)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project management total work experience</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Table 6 reports contingency coefficients and related significance levels (in parentheses) between project success factors and background variables.

In terms of environmental factors, organization type had a relationship with the subcontractor and a weaker relationship with the client. The functional organization was negatively related to both of these environmental factors. Matrix organizations (functional, balanced, and project matrix) and project team organizations were positively related to the subcontractor factor and negatively related to the client factor. A negative relationship was also found between the client (as an environmental factor) and project size (in number of activities), mostly in smaller projects. The reason may be that most of the sample projects were company projects rather than client projects.

The total work experience of project managers (Table 2) was strongly related to the project factor, "end-user commitment." Project managers with longer work experience had a stronger connection with end-user commitment. A clear organization/job description was more significant for project respondents whose work experience was fewer than 11 years. A weaker relationship was found between respondents working in projects (Table 3 in the Appendix) and the project management/leadership factor, "commitment." A more significant relationship was found for those who were more experienced in projects. The conclusion could be that project managers with long experience get end-users committed, while younger project managers need clear organizations and job descriptions in order to manage project work.

No significant relationship was found between project type and critical success/failure factors. The relationships with critical success/failure factors are presented in Table 6.

Success Factors According to the Project Implementation Profile

The results of this study were also compared with the widely used PIP method to find out how the results of this study support the results of PIP. Table 7 presents the rankings of the importance of CSFs according to this study and previous studies in the PIP. In the ranking used in this study (1 being the most important and 10 being the least important), respondents ranked communication, client consultation, and client acceptance as the most important factors, as project managers in the IS project had done in the previous study of Finch (2003). These results support the findings in this study (in Table 6), because the relationships with project success factors and organizational background variables (in Table 6) were found to be communication, client, and end-user commitment. The results of this study and the previous study of Finch (2003) do not differ from each other as much as they differ from the studies of Delisle and Thomas (2002), Pinto and Slevin (1987) and Pinto and Prescott (1988).

The correlation in ranking between this study and Finch's study was significant at a Spearman's rho correlation coefficient (Agresti & Finlay, 1997, p. 277) of 0.609 at the 0.05 level. There was no significant correlation between this study and the studies of Delisle and Thomas, Pinto and Slevin, and Pinto and Prescott. The difference may be because, in the study of Delisle and Thomas, the respondents represent virtual projects, while in this study, the respondents represent different kinds of more traditional projects.

When we compare this study with the previous study of Pinto and Prescott (1988), and the study of Pinto and Slevin (1987), the most dramatic changes are that, in this study, communication was in the first position, while in the previous study it was in the sixth or ninth position. The importance of project mission dropped significantly, from first position in the studies of Pinto and Slevin, Delisle and Thomas, and Pinto and Prescott to sixth position in this study. Technical tasks, and monitoring and feedback were also much more lowly rated in this study than in the previous studies. Client consultation was highly rated in all these studies. In addition to different respondents and research periods (Pinto & Prescott and Pinto & Slevin results are based on survey data from the 1980s), one plausible explanation is attributable to different project types. For example, conventional construction projects count for only 4% in this study (see Figure 2), whereas they cover 44% of the projects examined by Pinto and Prescott (1988).

The CSFs were also ranked in the different project phases of the project life cycle (Table 7). The rank correlation analyses carried out in this study showed a strong relationship in factors...
between the definition, planning, and organizing phases. On the other hand, the association was lightly negative in factors between the definition and implementation phases. Weaker positive correlation was found between the other phases.

There were differences in findings between this study and the previous study of Pinto and Prescott (1988). The CSFs varied from the averaged results over all project phases. The two most remarkable differences were in project mission and communication. Project mission was a more important factor in the previous study, whereas it was the first factor only in the definition phase in this study. In Pinto and Prescott (1988) communication was hypothesized to be significant in the execution phase, but was eliminated during the ridge regression analysis. Pinto and Prescott (1988) confirmed that there is a relationship between communication and project success. In this study, communication was remarkable in all project phases being ranked number one on average. As previously noted, these differences may be attributable to different respondents and research periods.

**Discussion**

This paper presents the results of a survey made in organizations among modern progressive companies. The present study utilizes the results of previous qualitative, descriptive case studies (Hyvärä, 2000; 2002) to avoid bias and errors attributable to the limitations of the survey. In addition, three interviews were conducted. The
study made use of the chi-squared test statistic introduced by Karl Pearson (Agresti & Finlay, 1997, p. 255). However, the findings from the chi-square tests in this study should be interpreted with some caution, because the expected frequency did not exceed five in each cell (Agresti & Finlay, 1997, p. 258).

In this study respondents were asked to select and mark the three factors in each factor group (related to the project, the project manager, the project team, the organization, and the environment) that they considered to be the most critical to the successful implementation of their project. There was no remarkable difference between this study and the previous studies (Belassi & Tukel, 1996; White & Fortune, 2002) in terms of the listed factors. The three most commonly selected factors in each group were identified for further analysis. There were a total of five groups and 15 factors. The hypotheses were used as a way of determining whether the background variables on projects, organizations, and respondents were significantly related to the success of the project across the most CSFs.

The findings were as follows. Company/organization size was significantly related to communication in project teams. The latter was an even more significant factor in bigger companies/organizations. Project size (in terms of both millions of euros and number of activities) was related to adequate funds/resources, a relationship that was even stronger in smaller projects. In conclusion, project team communication is a more CSF for bigger companies, while adequacy of funds/resources is more critical for smaller companies.

The leadership section presented the characteristics of effective project management, with the survey results of this study being compared with previous studies (Zimmerer & Yasin, 1998). It was found that the most critical factors were managerial. All the evidence of recent research supports the idea that successful projects are led by individuals who possess not only a blend of technical and management knowledge, but also leadership skills that are internally compatible with the motivation of the project team and externally compatible with client focus strategies. As was apparent in the interviews of this study it is the talent and experience of project management that makes a project succeed or fail.

In terms of environmental factors, organization type had a relationship with the subcontractor and the client and was found to be critical. The functional organization had a negative relationship with both of these factors, while other organizations had a positive relationship with the subcontractor factor and a negative relationship with the client factor. Could the reason be that the functional organization is not able to respond quickly enough to the needs arising from environmental changes?

The total work experience of project managers was strongly related to the project factor, “end-user commitment,” with the relationship becoming even stronger with longer experience. Younger project managers seem to need clearer project management organizations and job descriptions than older project managers do.

In terms of the PIP, it was remarkable to notice in this study that communication was ranked the highest in all project phases except the definition phase, where it was ranked third. Client consultation was ranked second or third in all phases except the implementation and control phase, where it was eighth. Client acceptance, on the other hand, was important in the definition and closeout phases, while troubleshooting was ranked highly in the implementation and control phase. Project mission was number one in the definition phase. The other findings are shown in Table 7. The relationships with project success factors and organizational background variables were also found to be communication, client, and end-user commitment. These findings support the findings in this PIP study. The concept of project life cycle helps to clarify the reasons why different factors may be more important to project success at different times and in different phases.

Conclusion

This research points to the absence of empirical research about project success in different organizational conditions. This study has provided empirical evidence on the characteristics of the critical success/failure factors in project management in different organizational conditions. On the basis of the responses received, it is possible to identify CSFs in project management that are significantly related to company/organization size, project size, organization type, and project managers’ work experience. The CSFs have also been ranked for the PIP, in terms of average rankings and by different phases. As a result of analyzing the results given in this study, project managers would be able to identify and eliminate the factors that have a negative effect on their performance. The results indicate the importance of project communication that is related to company size, however. In contrast to some prior studies, communication was ranked highest in most project phases.

Overall, the findings of this study suggest the need for further research in studying the role of effective communication in project management. In particular, further studies into the situation of specific knowledge and information management may open one potential avenue to increase effective communication that was found critical in most project management phases. As the results indicate, the organizational context, especially the size of the company, is an important factor to be considered.

A major part of the work of organizations is nowadays carried out in projects. The results of this study can be used in making project management systems and in assessing project management effectiveness. This study may well contribute to a better understanding and improvement of the project management context in organizations. This study offers new knowledge of how projects and project management appear to relate to different organizational conditions.
Acknowledgments
The author wishes to express her sincere gratitude to Professor Kalervo Virtanen, Professor Juha Kinnunen, and Dr. Kalle Kähkönen for their helpful comments. Special thanks also go to all the survey participants. The survey was made among members of the Project Management Association Finland.

References


IRJA HYVÄRI is completing a D.Sc. (Econ.) at the Helsinki School of Economics (HSE), Finland. She holds a Lic. Sc. (Econ.) and an MSc (Econ.) in finance and accounting from HSE. Her Licentiate thesis focused on project management. She is working as a financial director in an international company.
THE EFFECT OF INTRINSIC AND EXTRINSIC REWARDS FOR DEVELOPERS ON INFORMATION SYSTEMS PROJECT SUCCESS

ROBERT C. MAHANEY, Eastern Kentucky University
ALBERT L. LEDERER, University of Kentucky

Introduction

The failure rate of information systems (IS) development projects remains alarmingly high (Ewusi-Mensah, 1997; Hartman & Ashrafi, 2002; Suardi, 2004). The Standish Group found that only 16% of all IS projects came in on time and within budget, while 40% were canceled before completion (Cafasso, 1994; Field, 1997; Johnson, 1995). This problem has endured for four decades and does not seem to be abating (Cringely, 1994; Cule, Schmidt, Lyytinen, & Keil, 2000; DeMarco, 1982; Faraj & Geter, 1998; Glass, 1998; Lucas, 1975; Merwin, 1978). As a result, many IS professionals have even accepted failure as inevitable (Cale & Curley, 1987; Forman, 2003; Hildebrand, 1998; McManus & Wood-Harper, 2003).

Researchers have identified various risk factors associated with IS project failure (i.e., low user involvement, poor estimating, scope creep, politics, etc.) (Baker & Menon, 1995; Faraj & Sambamurthy, 2006; Moynihan, 2002; Ross, 2004; Roy, Bernier, & Léveillé, 2006; Royer, 2003; Smith, Keil, & Depledge, 2001). Another potential explanation is that organizations do not offer proper rewards to developers (Austin, 2001; Rasch & Tosi, 1992). Herzberg (1966; 1987a) suggested that two types of rewards, intrinsic and extrinsic, may be used to motivate workers. Use of such rewards would be expected to lead to better outcomes. However, despite the crisis in IS project management, an extensive review of IS and general project management literature using published databases and indexes found no conclusions regarding intrinsic or extrinsic rewards in an IS project setting. The crisis in IS project management is so severe that every possible influence on project success must be investigated (Jiang, Klein, Hwang, Huang, & Hung, 2004; Mendoza, Pérez, & Grimán, 2006). Because rewards have been shown to improve performance in other areas of the organization substantially (Chen, Ford, & Farris, 1999), the central question for the current study is, “How are intrinsic and extrinsic rewards related to project success?”

Rewards

Organizations offer intrinsic and extrinsic rewards to project team members for the purpose of improving project outcomes (Arya, Glover, & Routledge, 2002; Dunn, 2001; Kowtha, 1997; Miller, Wiseman, & Gomez-Mejia, 2002). They sometimes provide financial or nonfinancial rewards specifically for successful project completion (Deci, 1972; Wang, Shih, Jiang, & Klein, 2006).
Intrinsic rewards are those that exist in the job itself (Herzberg, 1987a). Examples are achievement, variety, challenge, autonomy, responsibility, and personal and professional growth (O'Driscoll & Randall, 1999; Raghu, Sen, & Rao, 2003). They also include status, recognition, praise from superiors and co-workers, personal satisfaction, and feelings of self-esteem (Baker, Jensen, & Murphy, 1988). Employees are thought to be motivated to work hard to produce quality results when they have pride in their work, they enjoy their jobs, they believe their efforts are important to the success of the project, and their jobs are fun, challenging, and rewarding (Hwang, 2005). According to Herzberg, the job satisfaction resulting from these rewards is the source of employee motivation (Bassett-Jones & Lloyd, 2005).

Extrinsic rewards, on the other hand, are external to the job itself. They comprise such elements as pay, fringe benefits, job security, promotions, private office space, and the social climate (Herzberg, 1987b; Nelson, 1994; O’Driscoll & Randall, 1999). Other examples include competitive salaries, pay raises, merit bonuses, and such indirect forms of payment as vacation and compensatory time off. Employees are thought to be motivated to work hard to produce quality results when extrinsic rewards are offered and provided because the failure to receive those rewards disapproves them. Intrinsic and extrinsic rewards served as the independent variables in the current study.

Project Success
Researchers have diverse interpretations of project success (Mitchell & Zmud, 1999; Nidiffer & Dolan, 2005). Some have suggested that projects should be rated as successful when they are completed within or near the estimated schedule and budget, and produce an acceptable level of performance (Ford & McLaughlin, 1992; Martinez, 1994; Ward, 1994). Others have argued that user satisfaction is more important when assessing project success (Bailey & Pearson, 1983; Baker, Murphy, & Fisher, 1983; Gelderman, 1998; Li, 1997; Mitchell & Zmud, 1999; Pinto & Slevin, 1988).

One study identified three distinct dimensions of project success (Slevin & Pinto, 1986; Pinto & Slevin, 1988; Pinto & Mantel, 1990). They were client satisfaction, perceived quality of the project, and success with the implementation process itself. The first is reflected by user acceptance of the project with its intended benefits. The second covers the impact of the project in terms of improved performance. The third includes completing the project on schedule and within budget, and meeting its technical goals. The existence of these dimensions of project performance illustrates that a project can have both successful and unsuccessful outcomes at the same time (DeCotiis & Dyer, 1979; Glass, 1999). The three dimensions served as the dependent variables in the current study.

Hypotheses
Managers frequently attempt to motivate team members by offering them incentives and rewards contingent on project outcomes (Banker, Lee, Potter, & Srivivasan, 1996; Jergeas, Cooke, & Hartman, 1999; Kovtha, 1997; Lederer & Prasad, 1992; Tosi, Katz, & Gomez-Mejia, 1997). Such rewards are believed to encourage team members to focus on the goals of a project and work to achieve them (Raghu et al., 2003). If the project succeeds, then the team members receive the rewards as promised (Eisenhardt, 1988). Both intrinsic and extrinsic rewards, while distinct, have been shown to have positive effects on motivation (Wiersma, 1991).

H1: Intrinsic rewards will be positively related to project success in terms of:
(a) client satisfaction
(b) perceived quality
(c) implementation process.

Herzberg further believed that the absence of extrinsic rewards produces job dissatisfaction. Research has confirmed this belief (Davis, Bagozzi, & Warshaw, 1992). Employees have come to expect pay increases, fringe benefits, and job security. Receiving less than expected frustrates them. In fact, pay rates below market averages have been found to demotivate them (McLean, Smits, & Tanner, 1996; Staw, Calder, Hess, & Sandelands, 1980).

Extrinsic rewards are, thus, positively related to success (Tosi et al., 1997). Employees work harder, but merely to avoid the discomfort of lower levels of those rewards (Herzberg, 1987a). Their harder work would be expected to produce more successful project outcomes. Moreover, they believe that extrinsic rewards result in organizational benefits, even if not so powerfully as intrinsic ones (Chen et al., 1999). In fact, extrinsic rewards have been shown to be predictors of job involvement (although not as strongly as intrinsic ones) (O’Driscoll & Randall, 1999). Thus, again recognizing the three dimensional nature of IS project success, H2 is proposed as follows:

H2: Extrinsic rewards will be positively related to project success in terms of:
(a) client satisfaction
(b) perceived quality
(c) implementation process.
The extensive literature review preceding this study found no instrument for measuring the independent variable, i.e., rewards for IS project developers. Therefore, one was created following the steps suggested by Churchill (1979) and Bearden, Netemeyer, and Teel (1989).

Fifteen firms, representing a cross-section of industries and sizes, were asked to identify an IS project manager to be interviewed. Twelve of the firms agreed to participate. Structured interviews, consisting of a series of open-ended questions, were conducted face-to-face or by phone (Eisenhardt, 1989a; Fowler & Walsh, 1999; Shenhar, 1998).

The subjects were asked to describe the rewards provided to developers. All 12 project managers indicated that straight exempt salaries were the primary means of compensating developers. In addition, they identified 15 other rewards. These are listed in Table 1 along with their frequency of mention.

The project implementation profile (PIP), a 12-item scale, measures the three dimensions of project success. It was proposed and its application reported in the Project Management Journal (Slevin & Pinto, 1986; Pinto & Slevin, 1988). It has been empirically tested and shown to be reliable (Pinto & Mantel, 1990), and was thus suitable for measuring the dependent variable in the current study.

A web-based instrument was created containing the PIP items, the rewards items, and several demographic questions. It asked the extent of agreement with each PIP item on a 1 (strongly disagree) to 5 (strongly agree) scale for the most recently completed large (for example, costing over $100,000) in-house IS application development or vendor package project that the respondent had managed. It also asked the extent to which IS developers in the organization receive each reward for successfully completing large IS projects on a 1 (very little extent) to 5 (very great extent) scale. For these items, the respondent was asked to answer in terms of the organization’s overall practices in order to assess developers’ reward expectations for the most recently completed project. Appendix A shows the items and demographic questions.

**Pilot Test**

Nine pilot subjects completed the initial version of the survey. They did so to help the researchers clarify the survey instructions and items, and to test the performance of the web-based approach. The senior author was present for each pilot test and asked the subjects to identify any unclear text. Project managers from government, consulting firms, telecommunications, engineering, financial services, education, and a restaurant chain participated. Each of the first four tests produced minor rewording. The final five resulted in only one change.

**Data Collection**

Seven Project Management Institute (PMI) chapters provided e-mail addresses of 654 IS project managers to whom messages with a link to the survey were sent. Ten days later, reminders went to nonrespondents. Completed surveys came from 202 subjects (31%) who were then invited to provide their e-mail address to be in a drawing for one of five $100 PMI Bookstore gift certificates. The 152 providers of an address were asked to e-mail a project team analyst or programmer with a secondary link pointing to a survey with the project success items. Thirty-seven secondary surveys (24%) were completed.

The primary respondents had been with their current employers for about seven years and had been in IS for about 13 years. They had an average of four direct and 15 indirect reports. The median number of IS professionals in their organizations was 300, with a median number of 4,350 employees. The median annual gross revenue of the organizations was $1 billion. The projects ranged in initial budget from $30,000 to $60 million, and from one month to 8.5 years, with an average of 24 developers.

<table>
<thead>
<tr>
<th>Table 1: Rewards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>R14</td>
</tr>
<tr>
<td>R13</td>
</tr>
<tr>
<td>R04</td>
</tr>
<tr>
<td>R12</td>
</tr>
<tr>
<td>R02</td>
</tr>
<tr>
<td>R09</td>
</tr>
<tr>
<td>R10</td>
</tr>
<tr>
<td>R15</td>
</tr>
<tr>
<td>R11</td>
</tr>
<tr>
<td>R07</td>
</tr>
<tr>
<td>R03</td>
</tr>
<tr>
<td>R08</td>
</tr>
<tr>
<td>R05</td>
</tr>
<tr>
<td>R01</td>
</tr>
<tr>
<td>R06</td>
</tr>
</tbody>
</table>

Figure 1: Research model
Data Analysis
The data analysis followed the approach recommended by Bentler (1989), Hatcher (1994), and Byrne (1994). It began with tests for nonresponse bias and common method variance. The constructs were then validated. (The sample size of 202 was sufficient for the data analysis. Incidentally, none of the 11 Project Management Journal articles with surveys in the past three years had a larger sample [Anderson, 2003; Arain, 2005; Bennington & Baccarini, 2004; Cagno, Di Giulio, & Trucco, 2004; Carrillo, Robinson, Al-Ghassani, & Anumba, 2004; Love, Irani, & Edwards, 2003; Prabhakar, 2005; Sanchez & Perez, 2004; Smith, 2003; Smith & Flanagan, 2006; Zhang & Flynn, 2003]). Finally, structural equation modeling tested the hypotheses. The details of this analysis now follow.

Nonresponse Bias
Nonresponse bias refers to the difference between respondents’ and nonrespondents’ answers to survey questions, and it occurs because surveys do not test entire populations (Fowler, 1993). Late respondents were used as surrogates for non-respondents (Armstrong & Overton, 1977) to test for such bias. Surveys were completed by 113 respondents following the initial mailing. Eighty-nine surveys were completed after the reminder. These two groups were tested for systematic differences in the 27 items of the independent and dependent variables. Wilks’ Lambda (.820) was not significant (p = .406) (Johnson, 1998). This suggests the absence of the bias.

Common Method Variance
Common method variance refers to the variance attributable to a measurement method rather than a construct itself. A single individual’s assessment of a variable opens the possibility that the person’s response represents that individual’s opinion rather than the organization’s view. Two tests for this variance problem were conducted. Harmon’s one-factor test was the first. According to Harmon’s test, if a factor analysis of all items in an instrument does not yield a single dominant factor, then common method variance has not been found; the factors uncovered are not themselves deemed meaningful. In the current study, after entering all items into a factor analysis, four factors were extracted with Eigenvalues greater than one (Eigenvalue is a measure of the strength of a factor in factor analysis, and a common rule of thumb is to recognize factors with Eigenvalues greater than one as dominant and other factors as insignificant.). Finally, structural equation modeling tested the hypotheses. The details of this analysis now follow. Together, they accounted for 49% of the variance. The failure of a single factor to emerge and account for most of the variance is thus consistent with the absence of common method variance (Podsakoff & Organ, 1986).

Thirty-seven secondary respondents completed the shortened survey, allowing for the second test for common method variance. The primary and secondary responses were paired for each project and tested for systematic differences in the dependent variable, project success. Wilks’ Lambda (.674) was not significant (p = .472) (Johnson, 1998). This analysis thus also did not detect a common method variance problem.

Confirmatory Factor Analysis
The EQS software package, with its ROBUST option for non-normal data, was used to perform confirmatory factor analysis (CFA) on the project success model as well as on the rewards model (Bentler, 1989; Byrne, 1994; Hatcher, 1994). EQS provides statistical tests of validity (Chau, 1997; Chin & Todd, 1995; Dillon & Goldstein, 1984; Segars & Grover, 1993). Each detail item is proposed to load on only one factor. Goodness of fit indices show just how well the model and the data match one another.

EQS produces six goodness of fit measures: the comparative fit index (CFI), the robust comparative fit index (RCFI), the Bentler-Bonett non-normed fit index (BB NNFI), the standardized root mean square residual (RMR), the root mean square error of approximation (RMSEA), and the adjusted goodness of fit index (AGFI). Values of 0.9 or greater for the CFI, RCFI, and NNFI, and 0.8 or greater for the AGFI indicate the measurement model fits the data. The RMR should be less than 0.10 and the RMSEA should be 0.08 or less (Gefen, Straub, & Boudreau, 2000). A measure of overall goodness of fit, the ratio of Satorra-Bentler Scaled (SBS) chi-squared to degrees of freedom (df), should be less than 3.0 (Carmines & McIver, 1981).

Project Success CFA
Project success was measured by the 12 PIP items within their three dimensions (Pinto & Mantel, 1990). The means and standard deviations of the items appear in Table 2.

During an iterative CFA, four items cross-loaded and thus were removed. As a result, all criteria for the model were met. Each modification, moreover, appeared theoretically reasonable. In Appendix B, Table B1 shows the fit indices after each modification and Figure B1 shows the final project success measurement model.

The means of client satisfaction, perceived quality, and implementation process were 4.15, 4.16, and 3.26, respectively. Incidentally, although these means may have been numerically close, t-tests showed that both client satisfaction and perceived quality differed at a statistically significant level (p < .001) from implementation process.

Rewards CFA
For analysis purposes, three of the fifteen rewards were classified as intrinsic. They were the ones deemed to exist more in the job itself (such as those related to personal achievement). The other 12 were classified as extrinsic. They were deemed external to the job (such as those related to pay). Table 3 shows the groupings with the means and standard deviations of their items.

During the CFA, two items cross loaded and thus were removed. As a result, all criteria for the model were met.
Table 2: Project success detail items

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>sd</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Client Satisfaction</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PS04 - The project is used by its intended users</td>
<td>4.43</td>
<td>0.77</td>
</tr>
<tr>
<td>PS03 - The project that has been developed works</td>
<td>4.34</td>
<td>0.89</td>
</tr>
<tr>
<td>PS07 - Important clients, directly affected by this project, will make use of it</td>
<td>4.29</td>
<td>0.86</td>
</tr>
<tr>
<td>PS05 - This project has directly benefited the intended users either through increasing efficiency or employee effectiveness</td>
<td>4.13</td>
<td>0.95</td>
</tr>
<tr>
<td>PS09 - We are confident that non-technical start up problems will be minimal, because the project will be readily accepted by its intended users</td>
<td>3.54</td>
<td>0.99</td>
</tr>
<tr>
<td><strong>Perceived Quality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PS11 - This project will have a positive impact on those who make use of it</td>
<td>4.16</td>
<td>0.90</td>
</tr>
<tr>
<td>PS12 - The results of this project represent a definite improvement over the way clients used to perform these activities</td>
<td>4.15</td>
<td>0.97</td>
</tr>
<tr>
<td>PS06 - Given the problem, this project seems to be the best choice among alternatives, i.e., it was the best choice among a set of alternatives</td>
<td>4.15</td>
<td>0.92</td>
</tr>
<tr>
<td>PS10 - Use of this project has directly led to more efficient decision making or performance for the clients</td>
<td>3.84</td>
<td>0.95</td>
</tr>
<tr>
<td><strong>Implementation Process</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PS08 - I was satisfied with the process by which this project was completed</td>
<td>3.49</td>
<td>1.11</td>
</tr>
<tr>
<td>PS01 - The project came in within its original schedule</td>
<td>3.34</td>
<td>1.38</td>
</tr>
<tr>
<td>PS02 - The project came in within its original budget</td>
<td>3.19</td>
<td>1.39</td>
</tr>
</tbody>
</table>

Table 3: Intrinsic and extrinsic rewards

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>sd</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intrinsic Rewards</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R09 - Pride</td>
<td>4.04</td>
<td>0.91</td>
</tr>
<tr>
<td>R13 - Sense of contribution to organization</td>
<td>3.82</td>
<td>0.98</td>
</tr>
<tr>
<td>R12 - Public praise</td>
<td>3.46</td>
<td>1.23</td>
</tr>
<tr>
<td><strong>Extrinsic Rewards</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R02 - Favorable annual performance appraisals</td>
<td>3.87</td>
<td>1.01</td>
</tr>
<tr>
<td>R11 - Project completion celebration</td>
<td>3.52</td>
<td>1.32</td>
</tr>
<tr>
<td>R06 - Job security</td>
<td>3.41</td>
<td>1.19</td>
</tr>
<tr>
<td>R14 - Technical training</td>
<td>3.40</td>
<td>1.17</td>
</tr>
<tr>
<td>R04 - Flexible work schedule</td>
<td>3.24</td>
<td>1.26</td>
</tr>
<tr>
<td>R05 - Job promotion</td>
<td>3.23</td>
<td>1.11</td>
</tr>
<tr>
<td>R03 - Financial bonus</td>
<td>2.80</td>
<td>1.38</td>
</tr>
<tr>
<td>R07 - Newer technology (i.e., PC or laptop)</td>
<td>2.76</td>
<td>1.23</td>
</tr>
<tr>
<td>R15 - Time off</td>
<td>2.50</td>
<td>1.29</td>
</tr>
<tr>
<td>R01 - Choice of future assignment</td>
<td>2.44</td>
<td>1.18</td>
</tr>
<tr>
<td>R08 - Opportunity to work at home</td>
<td>2.38</td>
<td>1.30</td>
</tr>
<tr>
<td>R10 - Private office space</td>
<td>1.96</td>
<td>1.11</td>
</tr>
</tbody>
</table>

Each modification, moreover, appeared theoretically reasonable. In Appendix B, Table B2 shows the fit indices and Figure B2 shows the final rewards measurement model. The means of intrinsic rewards and extrinsic rewards were 3.77 and 2.81, respectively. T-tests showed that they differed at a statistically significant level (p<.001).

Convergent and Discriminant Validity

T-tests for the standardized factor loadings of the indicator variables measuring the project success and rewards constructs were used to assess convergent validity (Hatcher, 1994). All standardized factor loadings for the indicator variables measuring each construct had t-values significantly different from zero (p < .01), thus supporting convergent validity.

The composite reliability is an index analogous to Cronbach’s alpha (an inter-correlation among items in a group indicating the extent to which the group can be seen as measuring a single latent variable). All values (in Appendix B Table B3) met or exceeded the minimally accepted level of generally 0.6 to 0.7 (Hatcher, 1994).

Three tests examined discriminant validity. First, after setting pair-wise correlations among the constructs to 1, the chi square differences between the standard and the revised measurement models were significant (p < .001). Second, the confidence intervals calculated for the construct did not include the value 1.0. Finally, all variance extracted estimates exceeded the square of the correlation between the given factors of interest. In Appendix B, Table B3 shows the estimates and squared correlations. Thus, all three tests supported discriminant validity (Hatcher, 1994).

Structural Equation Modeling

EQS was used to test the hypotheses (Bentler, 1989). The CFI, RCFI, and NNFI, however, were slightly below 0.9. Thus, model refinement was appropriate (Anderson, 1987; Anderson & Gerbing, 1988; Bagozzi, 1981; Bentler, 1989; Gefen et al., 2000). High correlation between perceived quality and client satisfaction suggested the need for a path between them (Byrne, 1994; Joreskog, 1993). Adding such a path is a reasonable way to improve a model when the path is theoretically justifiable (Byrne, 1994), and in this case, it is theoretically justifiable because client satisfaction would be expected to be high when the perceived quality of a project is high (Pinto & Slevin, 1988). Thus, the model was modified and rerun, and yielded acceptable fit indices. Path coefficients appear in Figure 2. In Appendix B, Table B4 shows the fit indices.

The analysis provided support for H1a and H1b as well as for H2c, but not for H1c, H2a, or H2b. That is, intrinsic rewards predicted project success in terms of client satisfaction (p < .01) and perceived quality (p < .01). Extrinsic rewards, however, predicted project success in terms of implementation process (p < .05).

Discussion

This research found partial support for H1, namely that intrinsic rewards are positively related to project success in
terms of client satisfaction (H1a) and perceived quality (H1b). According to Herzberg (1987a), intrinsic rewards motivate workers by appealing to their sense of contribution and self-importance. The findings in this research are thus consistent with that theory.

The research found partial support for H2, namely that extrinsic rewards are positively related to project success in terms of the implementation process (H2c). According to Herzberg (1987a), extrinsic rewards motivate workers to avoid the discomfort of lower levels of those rewards. The finding for the dependent variable of project completion on time and within budget for this hypothesis is consistent with that theory.

However, this research failed to find support for the effect of intrinsic rewards on implementation process (H1c). It also failed to show an effect of extrinsic rewards on client satisfaction (H2a) or perceived quality (H2b).

Intrinsic rewards thus may improve the likelihood of client satisfaction and perceived quality, but do not appear to improve the likelihood of completing a project on time or within budget. Conversely, extrinsic rewards may improve the likelihood of implementation process success, but do not appear to improve client satisfaction or perceived quality.

We speculate that the reason for these complementary findings may stem from the more tangible nature of extrinsic rewards and project completion on time and within budget, and from the more intangible nature of intrinsic rewards, satisfaction, and quality. That is, perhaps team members motivated by tangible rewards produce tangible outcomes in IS projects, whereas those motivated by intangible rewards produce intangible outcomes in them. At the same time, organizational management might more easily link tangible rewards to tangible outcomes, and intangible rewards to intangible outcomes in its policies, procedures, and practices.

Interestingly, the generally stronger support for H1 than H2 (i.e., H1a and H1b were significant at p < .01, whereas H2c was significant at p<.05) is consistent with today’s growing belief that intrinsic rewards are more effective. Some observers believe, in fact, that extrinsic rewards are even counterproductive because they may undermine intrinsic motivation (Benabou & Tirole, 2003). They believe that extrinsic rewards are artificial and arbitrary, whereas intrinsic ones are the creation of the workers themselves and therefore more motivating. In fact, researchers have found that cash rewards provide fewer benefits than do intrinsic ones (Chen et al., 1999), while autonomy, self-direction, and empowerment produce more successful projects (Nidumolu & Subramani, 2004).

Finally, this study also found a positive relationship between perceived quality and client satisfaction. Although one might conjecture similar relationships between quality and implementation success as well as between satisfaction and implementation success, the analytic tool used in this study suggested only the one between quality and satisfaction. This finding is, perhaps, not surprising. It confirms the
power of projects that lead to more efficient decision-making or performance to result in greater system usage (Downing, 1999).

Implications for Future Research
This research found support for the effect of intrinsic rewards on satisfaction and quality as well as of extrinsic rewards on implementation process. It failed to find support for the effect of intrinsic rewards on implementation and of extrinsic rewards on satisfaction and quality. We speculate that the complementary nature of these findings was due to the more tangible nature of extrinsic rewards and project completion on time and within budget combined with the more intangible nature of intrinsic rewards, satisfaction, and quality. Future research should test that speculation or search for alternative explanations.

An established measure of project success based on a recognized definition of it provided the basis for assessing the dependent variable. The rigorous validation in this study demanded the elimination of some of its items. Future research might, therefore, develop a new set of items either based on that definition or on some other definition of project success such as project return on investment, increased revenue, or reduced costs.

Extrinsic rewards predicted success with the implementation process using project managers' assessment of that success. Future research might test hypotheses using objective measures of on time and within budget outcomes from completed projects.

Intrinsic rewards predicted perceived quality and client satisfaction using project managers' own assessments of those outcomes. Such project manager's assessments were used for the validation of the instrument and have been applied in previous research (Pinto & Slevin, 1988; Pinto & Mantel, 1990). Nevertheless, future research might test hypotheses with users' own assessments of quality and satisfaction.

The current study specifically addressed IS projects developed by a team of in-house IS professionals. Future research might investigate the impact of rewards on user-led development as well as outsourced projects.

The current study relied on Herzberg's (1987a) rewards theory. In doing so, it provided some interesting findings. However, future research might rely on other theories to help explain project success. Agency theory suggests that monitoring of workers with their compensation based on their accomplishments (rather than their hours worked) leads to greater project success while worker shirking, goal conflict, and privately-held information reduce success. The theory has been used to study sales representative, managerial, university faculty, and chief executive officer compensation. It might provide one reasonable foundation for future study in project management (Eisenhardt, 1989b).

The current study investigated rewards geared toward in-house development staff. Findings might differ if the rewards system were examined from the standpoint of contracted projects. Future research should thus investigate such projects.

Implications for Managers
This study provided two major implications for managers. First, it identified a set of rewards offered by organizations to systems developers. Managers can use the set as a checklist against the rewards offered by their own organizations, and add new ones if they believe they can be effective.

Second, the study found that intrinsic rewards predicted client satisfaction and perceived quality, whereas extrinsic rewards predicted implementation success. Correlation is not causation, but managers who wish to improve their success in quality and satisfaction might consider further emphasizing intrinsic rewards. On the other hand, managers concerned primarily with implementation success, might consider further emphasizing extrinsic ones.

Conclusion
The lack of IS development project success is a critical concern today for not only project managers, but also for business managers and even top executives. To help address that concern, this research attempted to answer the question, “How are intrinsic and extrinsic rewards related to project success?”

In answering the question, the study contributed both to practice and future research. It will prompt managers to further their thinking into motivating and rewarding their systems development staff. It will also spur their thoughts on rewarding effectiveness in the engineering and construction environment, with its long duration and usually costly projects and where budgets, schedules, quality, and safety are major concerns.

The research applied Herzberg's (1987a) rewards theory. Although the theory is long-standing and well-respected, it has not seen much application in IS project development, and this study thus contributes by continuing to demonstrate its usefulness in research. Project managers may have typically read a little about Herzberg’s work in textbooks, but this study sets forth a detailed examination of Herzberg’s motivation factors, and puts the theory into practice.

The research identified predictors of project success. In doing so, it provided potential specific guidance to managers concerned about their own need for greater IS development success.

The study further contributed by confirming that rewards are bi-dimensional. Intrinsic and extrinsic rewards had previously been found distinct in other areas of the organization, but this study shows them as such in IS development project management.

Finally, the research contributes by validating an existing instrument for measuring project success and then by creating a new one for assessing rewards. Future researchers can use these instruments in their own work with more confidence.

References

Anderson, J. C. (1987). An approach for confirmatory measurement and structural equation modeling of organi-


ROBERT C. MAHANEY, is a visiting associate professor of information systems in the College of Business and Technology at Eastern Kentucky University. He earned his MA in mathematics and his PhD in information systems from the University of Kentucky. He received his BS in mathematics and computer programming from Morehead State University. His research interests are in IT project management and outsourcing. His work has appeared in Journal of Systems and Software, International Journal of Electronic Commerce, Information Systems Management, Journal of Database Management, and Journal of International Technology and Information Management. He has been a member of PMI since 1998.

ALBERT L. LEDERER, is a professor of information systems at the Gatton College of Business and Economics of the University of Kentucky. He earned his MS in computer and information sciences and his PhD in industrial and systems engineering from the Ohio State University. He received his BA in psychology from the University of Cincinnati. He has more than 10 years of full-time industry experience in the information systems. His research focuses on information systems planning, and has appeared Communications of the ACM, MIS Quarterly, Journal of Management Information Systems, Information Systems Research, and many other outlets.
### Appendix A: Measurement Scales

#### Rewards

To what extent do IS developers in your organization receive the following for successfully completing large IS projects?

**Scale Range:** 1 = very little extent; 5 = very great extent

<table>
<thead>
<tr>
<th>R01.</th>
<th>Choice of future assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>R02.</td>
<td>Favorable annual performance appraisals</td>
</tr>
<tr>
<td>R03.</td>
<td>Financial bonus</td>
</tr>
<tr>
<td>R04.</td>
<td>Flexible work schedule</td>
</tr>
<tr>
<td>R05.</td>
<td>Job promotion</td>
</tr>
<tr>
<td>R06.</td>
<td>Job security</td>
</tr>
<tr>
<td>R07.</td>
<td>Newer technology (i.e., PC or laptop)</td>
</tr>
<tr>
<td>R08.</td>
<td>Opportunity to work at home</td>
</tr>
<tr>
<td>R09.</td>
<td>Pride</td>
</tr>
<tr>
<td>R10.</td>
<td>Private office space</td>
</tr>
<tr>
<td>R11.</td>
<td>Project completion celebration</td>
</tr>
<tr>
<td>R12.</td>
<td>Public praise</td>
</tr>
<tr>
<td>R13.</td>
<td>Sense of contribution to organization</td>
</tr>
<tr>
<td>R14.</td>
<td>Technical training</td>
</tr>
<tr>
<td>R15.</td>
<td>Time off</td>
</tr>
</tbody>
</table>

#### Project Success

To what extent do you agree with the following statements?

**Scale Range:** 1 = strongly disagree; 5 = strongly agree

<table>
<thead>
<tr>
<th>PS01.</th>
<th>The project came in within its original schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS02.</td>
<td>The project came in within its original budget</td>
</tr>
<tr>
<td>PS03.</td>
<td>The project that has been developed works</td>
</tr>
<tr>
<td>PS04.</td>
<td>The project is used by its intended users</td>
</tr>
<tr>
<td>PS05.</td>
<td>This project has directly benefited the intended users either through increasing efficiency or employee effectiveness</td>
</tr>
<tr>
<td>PS06.</td>
<td>Given the problem for which it was developed, this project seems to do the best job of solving that problem, i.e., it was the best choice among the set of alternatives</td>
</tr>
<tr>
<td>PS07.</td>
<td>Important clients, directly affected by this project, will make use of it</td>
</tr>
<tr>
<td>PS08.</td>
<td>I was satisfied with the process by which this project was completed</td>
</tr>
<tr>
<td>PS09.</td>
<td>We are confident that non-technical start-up problems will be minimal, because the project will be readily accepted by its intended users</td>
</tr>
<tr>
<td>PS10.</td>
<td>Use of this project has directly led to improved or more effective decision making or performance for the clients</td>
</tr>
<tr>
<td>PS11.</td>
<td>This project will have a positive impact on those who make use of it</td>
</tr>
<tr>
<td>PS12.</td>
<td>The results of this project represent a definite improvement over the way the clients used to perform these activities</td>
</tr>
</tbody>
</table>

#### Demographics

1. How many years have you worked for your current employer?
2. How many years have you worked in information systems?
3. How many total employees report to you directly?
4. How many total employees report to you indirectly?
5. Approximately how many IS professionals work for your entire organization?
6. Approximately how many total employees work for your entire organization?
7. Approximately what is the annual gross revenue of your organization?
8. Approximately how much was the initial budget of the project?
9. About how long was the initial, estimated project duration?
10. About how many different full-and part-time developers in total worked on the project?
### Appendix B: Model Validation and Path Analysis

<table>
<thead>
<tr>
<th>Model</th>
<th>CFI</th>
<th>RCFI</th>
<th>NNFI</th>
<th>SBS $\chi^2$</th>
<th>df</th>
<th>SBS $\chi^2$/df</th>
<th>RMR</th>
<th>RMSEA</th>
<th>AGFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Model: Measurement model for three-factor Project Success model (Client Satisfaction, Perceived Quality, and Implementation Process)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>.815</td>
<td>.815</td>
<td>.760</td>
<td>150.91</td>
<td>51</td>
<td>2.96</td>
<td>.105</td>
<td>.109</td>
<td>.748</td>
</tr>
<tr>
<td>Modification: The five largest and seven of the largest nine standardized residuals involved PS08 (“I was satisfied with the process by which this project was completed”). The Lagrange multiplier test also suggested that PS08 cross-loaded. Therefore PS08 was dropped.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>.885</td>
<td>.839</td>
<td>.784</td>
<td>117.52</td>
<td>41</td>
<td>2.87</td>
<td>.078</td>
<td>.106</td>
<td>.762</td>
</tr>
<tr>
<td>Modification: The Lagrange multiplier test suggested that PS05 (“This project has directly benefited the intended users either through increasing efficiency or employee effectiveness”) cross-loaded. This variable was also included in the second largest standardized residual. Therefore PS05 was dropped.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>.918</td>
<td>.880</td>
<td>.831</td>
<td>79.11</td>
<td>32</td>
<td>2.47</td>
<td>.075</td>
<td>.094</td>
<td>.816</td>
</tr>
<tr>
<td>Modification: The two largest standardized residuals involved PS06 (“Given the problem for which it was deployed, this project seems to do the best job of solving the problem, i.e., it was the best choice among the set of alternatives”), suggesting cross-loading. The Lagrange multiplier confirmed the cross-loading. Therefore, PS06 was dropped.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>.941</td>
<td>.909</td>
<td>.863</td>
<td>55.61</td>
<td>24</td>
<td>2.32</td>
<td>.069</td>
<td>.089</td>
<td>.842</td>
</tr>
<tr>
<td>Modification: Three of the largest four standardized residuals involved PS10 (“Use of this project has directly led to improved or more effective decision making or performance for the clients”). The Lagrange multiplier test also suggested that PS10 cross-loaded. Therefore PS10 was dropped.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>.964</td>
<td>.950</td>
<td>.917</td>
<td>31.00</td>
<td>17</td>
<td>1.82</td>
<td>.058</td>
<td>.070</td>
<td>.869</td>
</tr>
<tr>
<td>Modification: No additional changes.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table B1: Project success measurement model validation

<table>
<thead>
<tr>
<th>Model</th>
<th>CFI</th>
<th>RCFI</th>
<th>NNFI</th>
<th>SBS $\chi^2$</th>
<th>df</th>
<th>SBS $\chi^2$/df</th>
<th>RMR</th>
<th>RMSEA</th>
<th>AGFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Model: Measurement model for two-factor Rewards model. (Intrinsic Rewards and Extrinsic Rewards)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>.814</td>
<td>.829</td>
<td>.798</td>
<td>220.24</td>
<td>89</td>
<td>2.47</td>
<td>.085</td>
<td>.095</td>
<td>.768</td>
</tr>
<tr>
<td>Modification: Two of the three largest standardized residuals involved R11 (“Project completion celebration”), suggesting cross-loading. The Lagrange multiplier test also pointed to R11 as a problem. Therefore R11 was dropped.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>.892</td>
<td>.905</td>
<td>.886</td>
<td>137.96</td>
<td>76</td>
<td>1.82</td>
<td>.074</td>
<td>.070</td>
<td>.826</td>
</tr>
<tr>
<td>Modification: The three largest standardized residuals involved R02 (“Favorable annual performance appraisals”). The Lagrange multiplier test also suggested cross-loading. Therefore R02 was dropped.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>.926</td>
<td>.937</td>
<td>.923</td>
<td>101.85</td>
<td>64</td>
<td>1.59</td>
<td>.066</td>
<td>.060</td>
<td>.864</td>
</tr>
<tr>
<td>Modification: No additional changes.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table B2: Rewards measurement model validation
Appendix B: Model Validation and Path Analysis (cont.)

<table>
<thead>
<tr>
<th>Composite Reliability</th>
<th>Variance Extracted Estimates (on the diagonal) and Correlations (below the diagonal)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intrinsic Rewards</td>
</tr>
<tr>
<td>Intrinsic Rewards</td>
<td>.81</td>
</tr>
<tr>
<td>Extrinsic Rewards</td>
<td>.82</td>
</tr>
<tr>
<td>Client Satisfaction</td>
<td>.71</td>
</tr>
<tr>
<td>Perceived Quality</td>
<td>.83</td>
</tr>
<tr>
<td>Implementation Process</td>
<td>.60</td>
</tr>
</tbody>
</table>

Table B3: Composite reliability and discriminant validity using variance extracted estimates

<table>
<thead>
<tr>
<th>Model</th>
<th>CFI</th>
<th>RCFI</th>
<th>NNFI</th>
<th>SBS $\chi^2$</th>
<th>df</th>
<th>SBS $\chi^2$/df</th>
<th>RMR</th>
<th>RMSEA</th>
<th>AGFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Model: Causal path model with five constructs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sem01</td>
<td>.896</td>
<td>.891</td>
<td>.871</td>
<td>281.50</td>
<td>178</td>
<td>1.58</td>
<td>.093</td>
<td>.061</td>
<td>.797</td>
</tr>
<tr>
<td>Modification: Eight of the 10 largest standardized residuals represent the eight paired combinations between the four indicator variables of Client Satisfaction and two indicator variables of Perceived Quality. This indicates high correlation between these two factors. Additionally, the Lagrange multiplier test suggests a causal path should be added from Perceived Quality to Client Satisfaction. Furthermore, such a change is theoretically sound. Therefore, a path was added from Perceived Quality to Client Satisfaction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sem02</td>
<td>.922</td>
<td>.920</td>
<td>.905</td>
<td>252.71</td>
<td>177</td>
<td>1.43</td>
<td>.077</td>
<td>.052</td>
<td>.814</td>
</tr>
<tr>
<td>Modification: No additional changes.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table B4: Path analysis model
Understanding Project Failure: Using Cognitive Mapping in an Insurance Project

STEPHEN ROBERTSON, Glasgow
TERRY WILLIAMS, Southampton University

Abstract

Many projects fail, especially IT projects. The only way that companies can get better at performing projects is by learning from projects they have carried out. But traditional practice of holding a lessons-learned session during or following a project may not allow organizations to examine the deep and "messy" reasons why projects fail, particularly with complex projects. Complex projects can best be understood by using modeling, such as cognitive mapping. Cognitive mapping aids identification of causal chains and where these close in on themselves to form positive feedback loops, which helps to understand not only what went wrong, but also the reasons. Cognitive mapping is used to understand the impacts of management decisions on a project, both intended and unintentional. This approach is used here to examine a large software development project carried out by an insurance company which overran its original plan by several years. Some suggestions are made both for using such methods and lessons to be learned for future projects.

Keywords: lessons learned; complex projects; mapping

Introduction

The research described in this paper has three distinct but interrelated objectives:

- To explore methods by which learning in and from projects can take place: What are the benefits of reviewing projects, and how can learning be achieved?
- To learn about what went wrong or right in a major software development project, Project X2; this was to be used a vehicle to “learn how to learn” (Cooper, Lyneis, & Bryant, 2002).
- To make recommendations for the organization’s future projects to improve both project execution and results and also learning between projects.

History of Project X

In late 1997 an organization, called here AutoInsurance Ltd (AIL), recognized that the core software package that supported the business (called InsSoft in this paper) would shortly begin to place limits on the organization's development. InsSoft was also not year 2000 compliant. Tenders were invited for the provision of a replacement package; the contract was won by a supplier, and Project X initiated. By early 1999 it was decided that the project was not going to succeed and the contract was terminated. Subsequent lawsuits by AIL and counter lawsuits were eventually settled out of court.

AIL then reissued the invitation to tender. This second contract was won in June 2000 by the supplier of InsSoft, a software systems supply company we will call SSS. The new project was called Project X2 and was split into four phases:

- Integrating an industry-standard quotation engine into InsSoft
- Establishing a model office environment at AIL
- Developing, implementing, and integrating SSS’s customer relationship management (CRM) package
- Replacing InsSoft with new software, based upon SSS’s proprietary packages, and integration.

Every stage of the process finished later than planned. The delivery of the solution architecture was late. The expected delivery date for the Release C design that was later than the original planned delivery date; this date too was missed. After Release C was implemented further delays meant that the planned Release D was
split into Releases D1 and D2. Release D1 was delivered and implemented, but due to further delays Release D2 was further split into Releases D2.1 and D2.2. Release D2.1 was achieved on time, but with less functionality than had been planned, so the final release was again split, into releases D2.2A, B, and C. Release D2.2C was delivered to AIL for user acceptance testing (UAT) in June 2003, with a plan to start implementing the software at the end of the year. Delays to the testing process resulted in another delay, and the software implementation eventually began in June 2004. This was planned to take at least six months to fully implement across all functions in AIL. In order to achieve this goal, some compromise was made on the quality standards agreed for the completion of UAT, which resulted in over 800 known defects outstanding when implementation started.

Despite the delays and defects (and therefore workarounds), there was a sense at AIL that the project had been a success. AIL’s managing director indicated that he was very satisfied with the end result. Business benefits were immediately identified in some areas and, with familiarity and as defects are resolved, there was a good expectation that this would be improved.

Literature

Roots of Failure in Projects

Despite a belief that project management techniques have matured, the rate of failure of projects has never been higher (Cooke-Davies & Arzymanow, 2003). There are various surveys on project failure; all agreed that failure is not uncommon. Rechelt and Lyneis (1999) reported the findings of various other authors, that projects which overrun are more common than projects which complete within original time scales, overruns likely to be between 40% and 200%; that fewer than half of projects examined in one survey met cost and schedule targets; and that only one third of World Bank projects met their aims, with typical delays of 50%. Jørgensen and Sjøberg (2004) reported another survey showing only 17% of projects meeting all three aspects of the project triangle (cost, time, and scope, Gray, 2001), with typical cost overruns as high as 189%. Worse still are IT projects where it is reported just 3% are considered to be a success (Journal of Management Development, 2001). Keil and Robey (1999) reported a survey that found that half of all IS projects in the U.S. in 1995 failed, costing a total of $140 billion.

What constitutes project success or failure? Most frequently a project is considered a failure if it fails to meet its targeted cost, time, or scope. Commonly a fourth criterion is also included, the benefits accruing to the organization as a result of the project. White & Fortune (2002) found seven criteria used for judging the success of a project, all related to the above four. Shenhar, Dvir, Levy, & Maltz (2001) describe four dimensions of success, with 13 measures pertaining thereto, which are similar:

- Project efficiency (meeting schedule and budget goals, or, “meeting design goals” Dvir, Raz, & Shenhar, 2003)
- Impact on the customer (meeting functional performance and technical specifications, fulfilling customer needs, solving a customer’s problem, customer using the product, customer satisfaction)
- Business success (commercial success and creating a new market share)
- Preparing for the future (creating a new market, product line, or technology).

The literature suggests a great many causes of failure of projects. In his study of 136 European projects, Cooke-Davies (2002) found 12 “real success factors” grouped under three headings:

- Factors critical to project management success: particularly relating to project risk management (PRM) (PRM education, ownership of risks, a maintained risk register, and a PRM plan) but also documented organizational responsibilities, project stage durations below three years, a mature scope change management process, and maintenance of the performance measurement baseline
- Factors critical to success on an individual project—namely, cooperation between project managers and operational managers within the business
- Factors critical to consistently successful projects-program management able to resource projects matching business strategy, metrics linking project performance with anticipated future success, and (interestingly) an effective means of learning.

Cooke-Davies does not make explicit the role of people in delivering these, but does say “people perform every process, and it is the people who ultimately determine the adequacy. Thus the ‘people’ side of the success factors is woven into their very fabric.”

Moynihan (2002) identified a number of “people-problems” against which he advises the contractor (in software development projects) to protect itself: unrealistic customer expectations, lack of ownership of the project by anyone in the client organization, disagreement about the project’s goals within the client organization, lack of skill of the client’s project manager, reluctance of users, and politics within the client organization. The first of these is picked up by Jørgensen and Sjøberg (2004), who found that unrealistic customer expectations can lead to significant underestimation of the project’s duration, particularly where the estimate provided forms the basis of a bid for a software contract. Similarly, Liang, Klein, Chen, and Lin (2002) found an overlapping set of people factors affecting success, including user involvement and participation and executive management support.

The culture of the organization undertaking the project is a crucial element in these factors. Gray (2001) found that in many organizations there was, to some degree, a feeling of threat against the project’s participants should the project fail (typically to their career prospects, reputation, financial returns, and self-image). There appeared to be an acceptance that this was a necessary evil, if the project were to be a success. However, it was found that where such behavior was
common, there was a greater propensity for projects to fail. Furthermore, where the organization’s culture favored “voluntarism” (i.e., free expression, questioning of management decisions, participation in defining goals, intrinsic work satisfaction) the likelihood of success was increased.

Participants from the 15th IPMA World Congress proposed eight factors leading to project failure (Journal of Management Development, 2001). One was the “Wrong Leader.” Five types were identified: two of whom damage the project—the “overt saboteur” and the “passive resister”; two of whom do little to benefit it—the “non-committed” and the “well-wisher”; and only one beneficial—the “fully committed.” A second was “Ineffective Controls”: financial controls concentrate on cost rather than time, so delays caused in an effort to save money can end up costing much more than the planned saving; project management tends to look backward comparing progress to-date against plan, and spend too little time looking forward, anticipating issues and making timely corrections. Others included inappropriate team and poor communication.

Dvir et al. (2003) found that, although there was no doubt that some basic level of planning was required, there was no correlation between planning and success. However, they did find a significant correlation between success and the development of requirements for the project, and recommended that the project’s goals and deliverables should be defined (a view echoed by Jiang et al., 2002).

The Need for Learning from Projects

If organizations are to get better at complex projects, they need to learn from project experience. They must examine the events of the project, and also the behaviors that may have led to failure (or success): what went wrong? How did that impact the project at hand? What was the management response at the time? What impact did that response have? How could such events be avoided in the future? As Disterer (2002) noted, most firms fail to review projects and as a result tend to repeat bad decisions and errors. According to Ayas (1996), “The ability to sustain success and significant improvement in projects over a long period of time depends mainly on the capability to learn from experience.” Schindler and Eppler (2003) went further and suggested that an organization that is able to learn from project experiences is one that is able to make comparisons between the various projects it carries out and record the best problem-solving practices it finds; and it will be able to minimize risk in future projects by knowing potential problems and taking appropriate action much earlier. The effect of this is an organization able to “develop project competencies that lead to a sustainable competitive advantage” (also see similarly Barker & Neailey, 1999).

Project management methodologies have recognized the need for learning from the past. PRINCE 2 promotes the use of a “lessons learned log,” which is established early in the life of a project and maintained throughout (Office of Government Commerce, 2002). This provides the basis for writing a formal lessons learned report at the end of the project (to “ensure that all lessons learned during the project are annotated for the benefit of future projects” and “report on whether the project management activity itself has been a success or not”) (Central Computer and Telecommunications Agency, 2001). Similarly, the need to take note of lessons learned is recognized in A Guide to the Project Management Body of Knowledge, which emphasizes the need to record not only the events that occur within and to the project, but also the management actions taken as a result and the reasons for those actions (Project Management Institute, 2000).

However, there is a considerable body of evidence to suggest that, despite the self-evident benefits of learning from past successes or failures, in practice this is seldom done (e.g., Cooper et al., 2002; Disterer, 2002; Garvin, 1993; Schindler & Eppler, 2003; Williams, 2003a; 2004). There are a number of potential reasons.

First, there is a lack of understanding about the validity of learning from projects, so the activity may be seen as a waste of time. There is a tendency for managers to consider that one project’s experiences are unique so offer no benefit to future projects—or there is so little in common that “separating the differences from the similarities would be difficult if not impossible” (Cooper et al., 2002). Williams (2003a and references therein) noted a similar effect whereby managers “avoid the discipline of drawing in experiences from the project before” and that “the organization that thinks it has a unique situation is unlikely to gain from the experiences of past works or others. True systemic causes and transferable project management lessons are there to be learnt.”

Second, previous bad experiences, where no benefit has been seen to be gained from this activity, may prevent future attempts from being made (Williams, 2003a; 2004). This is especially true if the task is allowed to degenerate into a mere paper exercise, where a formulaic approach yields trivial and poorly thought through results, which are not seen to lead to any beneficial change in future projects.

Under these circumstances a third factor is likely to be strong, where time pressure is experienced, ruling out bringing the project group together for any kind of learning experience (Schindler & Eppler, 2003; Williams, 2003a; 2004). Usually after the end of a project the company has a need to ensure that the personnel involved are deployed onto a new project as soon as possible. Little or no time is given to post-project review (Cooper et al., 2002), especially when the project has been a failure. There tends to be an unwillingness to spend time dwelling on past failures (see also Sense, 2004).

Using time pressure as a reason for not conducting a post-project review may sometimes be a convenient excuse, when in fact the fourth reason may be the (unspoken) fear that an examination of the project’s failures will elicit evidence of personal failures. People at all levels in projects are often unwilling to admit to their own mistakes (Abdel-Hamid & Madnick, 1990) and the impact these may have had on the course of a project. This is especially true when
there is a sense that negative sanctions will be used should errors be uncovered (Schindler & Eppler, 2003; Smith, Keil, & Depledge, 2001). Even if reviews do take place, the lack of frank and honest self-appraisal by individuals involved means that it may not be able to achieve all that it could.

Finally, the difficulty in determining the true cause of failure (or success) means that it is often difficult to make any review more than a banal recital of the obvious. Cooper et al. (2002) asserted that even successful managers find it hard to identify the best practices. This is particularly true because projects are becoming more complex (Baccarini 1996; Helbrough, 1995b; Jaafari, 2003; Williams, 1999a). Complexity is caused from two elements. First, a complex project consists "of many varied and interrelated parts ... operationalized in terms of differentiation and interdependency" (Baccarini, 1996); for such, traditional project management decomposition-type methods are inadequate as the interaction between the parts of the project means that the project is more than the sum of its parts (Williams, 2002; 1999a). Baccarini discussed his definition of project complexity in terms of two dimensions: organizational and technological complexity, related to the structure of the organization and the project. The second element is uncertainty; although there is some debate about the role of uncertainty in project complexity, the inclusion of uncertainty allows complexity to be defined in a more over-arching sense (Williams, 2002). Uncertainty itself has two subdimensions (Turner & Cochrane, 1993): goal uncertainty, typical of software development projects where the requirements for the product are poorly understood or defined; and methods uncertainty, so standard project management plans cannot be created because the constituent tasks and dependencies are not clearly understood.

The Nature of Learning

Learning has been defined as “the process by which knowledge is created from experience and the path by which improvement takes place” (Kotnour, 2000). Learning is different from experience, as not everyone learns from experience; there is an activity involved in learning; a process that an individual has to initiate. A learning organization has been defined as “an organization continually expanding its capacity to create its future” (Kotnour, 2000), and as “an organization skilled at creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights” (Garvin, 1993). It is insufficient simply to generate new knowledge—in the form of documents, processes, and operational procedures—unless that knowledge is embedded in new ways of working for the organization (Williams, 2003a). According to Ayas (1996), most of the knowledge in an organization is tacit, existing only in the minds of its people, however it can be made explicit by sharing it with the surrounding workgroup, and the behavior of the organization can change as a result of the new knowledge.

Mechanisms of Learning from Projects

Many project management methodologies emphasize establishing lessons learned both during and at the end of projects. According to Kotnour (2000), during the project, lessons learned benefit the project itself; at the end of the project (although this may also happen during the project) the focus moves on to lessons that are transferable to other projects. He describes how allowing, and encouraging, the project team to spend time reflecting on the actions taken during the project, and the good or bad outcomes of those actions helps to break down barriers to learning within the organization. This is supported by documenting the lessons learned, including which actions to take and which to avoid. Learning is fed back either to the project in hand or to subsequent projects according to the “plan-do-study-act” cycle. Kotnour describes four dimensions of the lessons learned process:

- When: Lessons can be learned throughout the project as opportunity arises, throughout the project at regular meetings, or at the end of the project.
- What about: Lessons should be learned about tasks with minor and major or no problems.
- How: Issues can be identified by comparing actual to planned performance, and by remembering.
- What: Included in a lessons learned could be the original plan, the actual results, the problems encountered and the tasks that went well.

Barker and Neailey (1999) suggested that the failure of post-project reviews has a number of causes, a key one being the failure to provide a context for the review. They suggested that a useful context is innovation, which they took to be a combination of “conception” “invention,” and “exploitation.” They recommended a four-stage approach based upon their experience of a project within the automobile industry:

- Individual learning logs to encourage team members to reflect upon and record their own learning. The structure of the log helped individuals achieve “more detailed and specific recollection of learning,” and the logs supported the kind of thinking that could lead to innovation.
- Functional learning reviews, bringing together individuals from within a functional grouping to assist them to combine their learning and identify learning for that section.
- Whole-team learning review: The leaders of each function are brought together in a workshop to review the output from others’ learning reviews and jointly develop plans for change.
- Communication of learning: The importance of documentation is recognized, but greater emphasis is placed upon informal, verbal communication.

A major failing of such approaches is that while they give excellent suggestions on how the tacit and implicit knowledge generated through the life of a project is made
explicit and documented to enable effective sharing within an organization, they have little to say about how new knowledge can be created (Williams, 2003a). Projects are becoming increasingly complex, and outcomes are often difficult to relate to the actions and events that shaped them. In such circumstances collecting data on what was planned, and what actually happened and ever more-detailed recollections about the “facts” of the history of the project is relatively straightforward and time consuming; however, understanding how all of these things are interrelated and interacting is much less trivial (Williams, 2002). Schindler and Eppler (2003) noted that while traditional approaches are good at answering questions such as “what,” “where,” and “how many”; they are not good at getting at the more difficult questions of “why” and “how”: questions which are much better answered by reference to “stories” (Schindler & Eppler, 2003; Williams, 2002).

As we have discussed, traditional project management decomposition-type techniques are inadequate to explain the behavior of complex projects (Williams, 2002; 2004). One event or issue may have an adverse impact upon many activities, and may create new relationships between activities; this becomes even more complicated where there are multiple such issues; the impact upon an activity may not be direct or obvious (e.g., impacts on the project team’s morale); there is little or no recognition of the management inputs; often impacts to “noncritical” tasks can often have significant delaying effects; and finally the eventual delay to a project may not be simply the duration of the original delay. For example, AIL started a piece of work requiring a deliverable from the supplier by its mid-point, or else it would have to be abandoned and restarted from the beginning; the deliverable was late, and the early work wasted. The problem lies in the nature of complex projects and in their inherent “messiness”: “... explanations center around the systemic interrelated set of causal effects; the dynamics set up by these effects including feedback loops; importantly, the management response to project perturbations; and the resulting exacerbation of the feedback loops” (Williams, 2002).

One answer to this complexity is to employ modeling techniques, in particular, cognitive or causal mapping (Williams, 2000; 2002; 2003a; 2004), which is specifically designed to help tackle “messy” problems (Eden, 1988). In this approach, interviews are carried out with people who have been involved in the project, either one-to-one or as part of a group workshop. The circumstances and events of the project are discussed and explanations sought for them. Concepts that describe events, issues, management actions, etc. are noted, and any causal link between them is drawn in, i.e., where one concept led to another, or led to its increase, the two are linked by cause and effect. Where the effect is to decrease, a negative sign is assigned to the link. Each map is examined and feedback loops are identified. Where there are no negative signs in a loop, or the total number of negative signs is even, the loop is a positive feedback loop, or “vicious circle.” Where such feedback loops exist, it is interesting to note the effect management actions have in that loop, as often interventions designed to help can in fact make matters worse (Eden, Williams, Ackermann, & Howick, 2000; Howick & Eden, 2001). Once several maps are generated they can be combined into one map, including all of the information available from the interviews and workshops.

Complementary to cognitive mapping, which can provide a qualitative analysis of projects, is system dynamics (SD), which can provide a quantitative analysis (Cooper, 1994; Cooper et al., 2002; Rodrigues & Bowers, 1996; Williams, 2002). For example, it can help to quantify the impact that clients have on a project’s outcomes, even when the assessment might involve subjective aspects. Rodrigues and Williams (1998) reported a typical scenario where an early milestone is about to be missed. The client sees this as an indication of failure, and cannot accept this. The contractor’s only response may be to recover the short-term milestone, only to incur worse overruns later in the project. In cases such as this, SD may be of benefit in helping to quantify the impacts of the actions, and in providing a rationale that is otherwise missing. In addition to describing a project post-mortem, SD can help the project manager to make decisions for the future (Rodrigues & Williams, 1997). For example, where a change to a project’s scope is threatening to increase its time scales, the traditional approach to project management is likely to lead to the introduction of additional resources; however, adding resources to an already-late project may in some cases lead to no significant benefit, or worse, to further delays. This is the basis for both Brooks’ law and Cooper’s $2,000 hour (Cooper, 1994). In such circumstances, SD may help to determine the appropriate balance, which minimizes delay (Williams, 1999b). According to Lyneis, Cooper, and Els (2001) the use of SD tends to be around the strategic and/or tactical management of projects, rather than operational.

Implications for This Study

This literature had a number of implications for the study in AIL:

- Before an approach to learning from Project X2 could be decided, it was essential to establish whether it was a complex project or merely big. If the former, a mapping approach looking for positive feedback dynamics might be valuable; if the latter, then a more straightforward lessons learned process may be as effective, and more time-efficient.
- Assuming that the project was complex, interviews carried out with key project personnel using cognitive mapping might be the most effective way to elicit the information required for the analysis, making it more likely to avoid pressure to conform to any one point of view.
- Analysis should focus on management interventions designed to bring the errant project back on course, and consideration given to all of the consequences, intended or otherwise.


- Particular attention should be given to looking for signs of positive feedback dynamics.

Methodology

This research involved the study of a large software development project (Project X2) undertaken by AIL (the client) and SSS (the contractor). A careful study using cognitive mapping was carried out to determine the causes of project time overrun. Particular attention was given to the management actions taken to resolve the developing overrun, to establish whether secondary effects of these actions may have contributed to the end result. Following this analysis, some general recommendations were made to AIL’s management team in order that future projects may avoid, or at least minimize, such overruns.

Clearly, this study tries to extrapolate general learning from one specific example, so is phenomenological. Phenomenological research is effective at making explicit perceptions and interpretations of individuals and in challenging assumptions, and is generally seen as being descriptive rather than providing explanation (Lester, 1999). Care is therefore taken in describing any generalized findings to explain how these were arrived at and to put them into the context of other published findings. Easterby-Smith, Thorpe, and Lowe (2002) put most research in the social sciences on a two-dimensional plane—one dimension being characterized by the positivist/social constructionist poles and the second by the level of involvement of the researcher, from “involved” to “detached.” Social constructionism is characterized by the assumption that “reality is not objective and exterior, but is socially constructed and given meaning by people.” The focus of such research is on gaining an understanding of how people perceive and understand the phenomenon under study, and how this is affected by the paradigms they hold. Although this research lies quite firmly on the social constructionist side, it does recognize the objective reality of the situations under study. Regarding the second dimension, in this research the researcher was an integral part of the AIL management team who undertook Project X2; therefore, it was impossible for the researcher to abstract himself completely from the process, and it will be noted throughout that this does limit the researcher’s objectivity.

The approach taken followed Williams (2004). Cognitive mapping (Eden, 1998) was employed to interview a number of key AIL managers, who had responsibility for aspects of Project X2 in looking to gain an understanding of the important events within the project that led to its significantly late delivery. Interviews rather than a group workshop were chosen for a number of reasons (Eden & Ackermann, 1998):

- The participants came from various levels within the organization, and there was likely to be some disagreement among them as to the impact of some management decisions; this might cause material not to be surfaced in a group context for fear of negative impacts for more junior members.

- This gives interviewees more time to think, giving a richer, deeper understanding of the subject matter.

- It avoids the risk that the louder, more forceful personalities are the only ones whose opinions are heard.

- It avoids some of the potential hazards of working in groups, e.g., “social loafing” or “group think.”

- It is less time-consuming for each of the participants.

There are, however, a few drawbacks of interviews relative to workshops. In particular, the process is more time-consuming for the facilitator, with several interviews and subsequent analysis of the resultant cause-maps, and the combination of the maps into one. Also if there is no subsequent group workshop the interviewees can feel detached from the end result and therefore not accept the output fully.

An SD approach, although generally useful in analysis of this type, was not adopted. This was because the exercise was being carried out from the perspective of, and on behalf of, the client and much of the hard, numerical data required to support an SD approach (e.g., cost profile) is only available to the supplier, who would be unwilling to disclose this information. Under these circumstances an SD approach was not feasible, and so the approach adopted relied on cognitive mapping only.

Findings and Analysis

Was Project X2 Complex?

Complexity is not a factor of size alone, but rather arises from the interaction and interdependence of many subelements within the project, within the organization(s) engaged in the project (organizational complexity), within the project itself (technological complexity), within the product, or due to uncertainty within the project. So did Project X2 display any of these factors, and is it complex?

First, organizational complexity. The primary parties involved in the project were AIL and SSS, but there were a number of other parties involved:

- Part of the system to be delivered included computer telephony integration (CTI). The development of this software functionality was subcontracted by SSS to a U.S.-based company, and the development was carried out mostly in the U.S. As the client, AIL had little contact with this company.

- The system was made up of three major software packages tightly integrated. One was owned by another U.S.-based company with whom SSS had a sole distribution rights deal, but SSS did not own or control the code. During the project, SSS bought the product’s intellectual property.

- A key feature of the product being developed in Project X2 was a subsystem that calculates a premium for private motor car insurance based upon various risk factors using a quotes engine. At the start of Project X2, SSS owned the quotes engine and developed it. During the project, a management buy-out occurred. The part of SSS covering the quotes engine was bought and established as a new company.
On the client side, a number of other organizations were involved in the project. At first, project management and test management were provided by external consultants. However, AIL did not feel that they were meeting expectations and terminated the contract. A consultant from another consultancy was hired as project manager. Another external consultant was hired as test manager, and more consultancy support was used toward the end of the testing effort.

Therefore, although the number of parties in the project changed over time, there were never less than five different commercial organizations involved. The coordination of effort between these was challenging at times. For example, when the test manager first became involved, the legal teams of SSS and his home company meant it was difficult to agree on the wording of a nondisclosure agreement, which meant that he was not allowed to see any documentation or attend meetings with SSS for more than two weeks.

Second, technological complexity. The nature of the project itself was complex, and increased in complexity over its life. Having several release dates timed relatively close to each other meant that releases were at different states of maturity at the same time, all requiring input from the same resources in both SSS and AIL. For example, while release C was being implemented, release D1 was in the user acceptance test phase, and release D2 was in the detailed specification phase.

Third, the product was also very complex, as it is made up of several parts. The major components of the final solution were a CRM tool, an insurance sales and administration quotation application, and an accounts package. The major components themselves consisted of several interdependent parts. The CRM tool was integrated to several other components: the call center's preexisting telephone automated call distribution switch, which directs inbound telephone calls, and the call center's automated dialer, which makes outbound customer calls; a bespoke workflow system that enables work to be recorded and stored for later or transferred around the organization; postcode lookup software; and AIL's unique specialist database. The quotation product too was complex and required several component parts to perform many interdependent functions-namely, to provide new business quotations and allow for their confirmation (requiring integration to an external vehicle database, held by the government licensing authority DVLA); to provide quotations for permanent or temporary changes to the risk, and allow for their confirmation; to produce customer documentation including legal documents (requiring integration to production and queuing systems); and to communicate new policies to the underwriting insurer, requiring integration to an electronic data interchange subsystem. Also, the products were integrated with a credit-card verification and payment system and a direct banking component for the establishment and maintenance of direct debits.

This complex functionality depended on a highly complex technical infrastructure. The application was "fat client," which means that most of the business logic resided on the user's desktop PC. However some business logic along with workflow and external components resided on a middle tier server. The telephony was specialized. One major database ran on Oracle. There are other SQL databases that ran under Windows. The database servers all ran with high availability clustering, while the middle tier server was split into a set of seven load balancing servers. Each of these elements required specialist knowledge to maintain and develop.

In conclusion, Project X2 was complex. It met Baccarini's (1996) definition. Organizationally and technically, it consisted of many subelements that were highly interdependent. The product also consisted of many interdependent software and hardware components that were interrelated and interdependent. As such, standard lessons-learned type approaches were likely to be inadequate for its study. Instead, as previously discussed, a cognitive mapping approach was more likely to help achieve meaningful learning.

Identification of Candidates for Interview and Construction of Cognitive Maps
The AIL sponsor for Project X2 was the information services director, and reporting to her was a project manager, an external contractor. Interviews were carried out with the project manager and cognitive maps drawn. Cognitive maps were also drawn for the business process manager (BPM), who reported to the sponsor and was responsible for ensuring the system met the business' needs and delivered benefits; it should be noted that the BPM is the main author of this paper, and although every attempt has been made to remain objective, this may not always be possible. Two cognitive maps were produced based upon the BPM's experience: the first showed events, decisions, and situations that occurred leading up to the launch of the application; the second showed the situation following launch.

Pre-Launch Map
Figure 1 shows the resulting map. The concepts were color-coded into four categories; in this paper, ovals with bold writing represent the main outcomes, other ovals represent events external to AIL, rectangles represent AIL management decisions, and rounded rectangles represent other concepts. Obviously, color-coding is extremely useful in drawing up and analyzing these maps, which does not come out fully in gray scale. As previously discussed, one of the most significant structures to find in such maps are positive and negative feedback loops, where a chain of cause and effect loops round and joins up again at some earlier point; all the arrows being positive (or an even number of negative arrows) increasingly leads to more and more of whatever is being described, good or bad. Analysis of the map using Decision Explorer (Eden et al., 1992) shows that there are a great many loops (1,633), although many of these are slight variations on the same theme. There are however a number of significant loops that can be considered.
Destructive Positive Feedback Loops

One significant loop is shown in Figure 2. Ongoing effort to complete the design resulted in the final design for the application not being agreed, meaning that the supplier’s developers had insufficient work to keep them fully occupied. The supplier, driven by the need to keep costs down on the fixed-price contract (concept 4), chose to put their developers to work writing code in the hope that there would be little change required when agreement was reached. The supplier subsequently had to concede that some work had begun on design that needed to be changed (concept 18). This resulted in changes being required in pieces of functionality already written and rework of development effort. To make matters worse, other interdependent subelements often had to be redesigned in order to accommodate these changes, which required more discussion and extra design effort, so the cycle begins again. One thing not clear from the maps is that this cycle persisted for over a year. This loop is related to a similar loop (loop 2 in Figure 2) in which management decisions taken by AIL aggravated loop 1. Through negotiation with the supplier, AIL not only agreed to, but also encouraged the parallel working that led to the positive feedback loop being established.

Clearly these decisions by SSS (concept 7) and AIL (concept 12) were intended to mitigate the delays to the project, and although they did manage to ensure that all resources were fully utilized, they also meant that resources were not necessarily being used on tasks that were contributing to the completion of the project. The resulting loops caused the delivery date to be revised many times. Without access to SSS internal documentation it is hard to be precise about the degree, but they added at least one year.

Another significant loop can be seen in Figure 3, which shows another impact of parallel activity in design and development. When testing was performed, a large number of apparent defects were discovered. Many of these were genuine defects, a significant proportion of which were attributed to design documentation, which was incomplete when the code was developed. The remainder were misunderstandings on the part of the tester who recorded the defect, again due to incomplete design documents. The time taken by test and design resources to analyze these defects when the code was developed. The remainder were misunderstandings on the part of the tester who recorded the defect, again due to incomplete design documents. The time taken by test and design resources to analyze these defects when the code was developed. The remainder were misunderstandings on the part of the tester who recorded the defect, again due to incomplete design documents. The time taken by test and design resources to analyze these defects when the code was developed. The remainder were misunderstandings on the part of the tester who recorded the defect, again due to incomplete design documents. The time taken by test and design resources to analyze these defects when the code was developed. The remainder were misunderstandings on the part of the tester who recorded the defect, again due to incomplete design documents. The time taken by test and design resources to analyze these defects when the code was developed. The remainder were misunderstandings on the part of the tester who recorded the defect, again due to incomplete design documents. The time taken by test and design resources to analyze these defects when the code was developed. The remainder were misunderstandings on the part of the tester who recorded the defect, again due to incomplete design documents.

Figure 1: BPM’s pre-launch map
ered. This resulted in rework of the affected components and often of one or more interrelated components. This was aggravated by the extended time taken to analyze the defect before it was assigned to a developer for a fix to be produced.

It should be noted that, although it is not apparent from the map, these two sets of loops (1 & 2 and 3 & 4) did not occur over the same time frame, although they did overlap somewhat. The loops 3 and 4 relating to testing, in general started as loops 1 and 2 relating to the original design work were coming to an end.

Given that time scales for this project were extending significantly, it is unsurprising that the business did not stand still during this time. This resulted in AIL management decisions to request changes to the design to accommodate the changing business, which resulted in a further positive feedback loop (loop 5; Figure 4) being established. The effect of changes being requested was to cause further rework of already completed tasks, further delaying the project allowing the business to experience more change.

As discussed there were a number of management interventions in this project, most of which aimed to limit the delay. However, some, counter-intuitively, had the opposite effect. One significant decision was to encourage the use of overtime in both AIL and SSS. Although overtime can be an effective means in resolving a short-term issue, over the long-term there tends to be a law of diminishing returns, after some time the units of work per hour decreases, meaning no more work is achieved. Worse, the quality of the work being achieved is adversely impacted (Cooper, 1994), leading to two further loops (6 and 15) shown in Figures 5 and 6. In Project X2, this combined with the decision to accept the application when it was delivered—despite the fact that it had a large number of known defects. These loops (Figure 6) resulted in AILs testing time being extended, and led to further rework (by SSS) and subsequent retest (by AIL) further delaying the project.

Beneficial Negative Feedback Loops
Not all AIL management decisions caused positive feedback. As time went on and the project became very late, some decisions were taken to resolve issues extending the testing time scales. One was to move some SSS resource from their base to AIL’s site, to enable more joint working (the “one-team approach,” concept 41). This resulted in a negative feedback loop in which the time taken to analyze apparent defects was decreased allowing resources to concentrate on the real testing effort (loop 7 in Figure 7) and also meaning the development team learned of defects earlier, reducing rework (loop 8 in Figure 7).
Two further significant decisions were taken: one was to change the established criteria for exiting testing to allow more defects (concept 40), the other to de-scope the project, temporarily removing the data migration task (concept 39). These two decisions arising out of a desire to minimize delay in launching the application to the call center created a further two negative feedback loops that helped reduce the overall time scales (loops 9 and 10 in Figure 7). However, not all of the impact of these decisions were beneficial, as the resulting de-scoping of the product had some negative impacts on the business as will be seen later.

**Trigger Events**

A useful analytical tool in Decision Explorer is to examine the “tails” of the map, those concepts that only have arrows coming out. These should be trigger events, which initiate the loops in the first place (otherwise, it would indicate that there was more material to be elicited). In this map there are two trigger events. One is that the original contract for the project was on a fixed-price basis (concept 4). This meant that from the start the supplier was very determined to keep costs at a minimum, and never to have resources underutilized. The other trigger was that the supplier initially underestimated the scale and complexity of the work to produce this software solution. It seems likely that the underestimation was at least in part caused by the supplier’s failure to separate the “price-to-win” bid from a realistic estimation of the effort required, and that they suffered from over-optimism in making their estimates (typical in such situations-Jørgensen & Sjøberg, 2004). Failure to fully grasp the complexity and underestimating the time required led to the initial project overruns, which forced the management corrections that in turn started the positive feedback loops. It also resulted in the errors and omissions that contributed to the failure to reach agreement on the design.
Central Concepts

Two closely related concepts, concept 7 (introduction of parallel working) and concept 20 (ongoing effort to complete design), were of central significance in the resulting late delivery of Project X2. They feature in multiple positive feedback loops, and in fact all but one of the loops goes through one or the other (or frequently both) of these concepts. This is indicative of the centrality of these issues for the very significant time extensions experienced during this project. In fact, chronologically, the failure to complete the design stage led to the introduction of parallel working, and, therefore, this one concept may reasonably be considered the most significant point at which an alternative decision may have affected the entire course of the project, allowing it to avoid becoming significantly late. It should be noted that action at this point would not have prevented the time delays completely, as it was already late by the time this was observed. However, action could have prevented the destructive positive feedback, observed in the map, from exacerbating the existing problems to the eventual proportions they took.

Outcomes

The outcomes of this map are represented here as ovals with a shadow and bold text. These are typically, but not necessarily, the heads of the map (concepts that have only arrows going in). This map contains four outcomes: the increased amount of senior management time expended by both parties to bring the project to completion (concepts 13 and 28), and, most significantly, the late delivery of the application to the business and its reduced scope when it was delivered (concepts 6 and 25, respectively). Obviously, the late delivery meant that AIL’s internal staff costs for project personnel increased significantly, although the external cost did not increase due to the fixed-price contract. Late delivery also meant that the business benefits that comprised the business case for the investment could not be realized until delivery was complete. However, even after completion the other outcome, reduced scope, meant that the benefits were not immediately realizable.

Post-Launch Map

The map drawn to represent the situation post-launch (Figure 8) is much simpler than that of pre-launch. It includes three concepts drawn in from the previous map (25, 39, and 40): the scope of the product, and two contributing factors to the scope of the product. In addition it contains only 23 new concepts.

Decision Explorer identifies four loops within this map. However, three of the loops are (temporally) spurious. One apparent causal loop involved the decision to focus attention on completion of the data migration task at the expense of resolving some of the other issues. This decision was taken with the full knowledge that it would have an impact on the resolution of outstanding issues, and that this would likely have an impact upon the user community. However, it was decided that this was a necessary compromise to allow completion of the rollout phase of the project, because the impact of operating two applications simultaneously was greater than the impacts of the other issues requiring attention. So that, while the slow progress in resolving outstanding issues (concept 113) led back into dissatisfaction (concept 108), and this increased the desire to reduce negative impacts (concept 109), it did not then lead to an increase in the decision to focus attention on migration (concept 112). Two of the other loops also contain this loop as a subset, and are thus also spurious.

The only genuine loop found within this map is loop 14: AIL staff are highly bonused, so loss of productivity had a big impact on their satisfaction. This led to staff developing a poor opinion of the application and to demoralization, which affected productivity even more. This loop impacted the whole business but particularly the new business acquisition area where user confidence helps sales ability and therefore sales performance, allowing a destructive positive feedback loop to be perpetuated. AIL management quickly intervened to minimize the impact of the positive feedback, primarily through communication. Project personnel ensured that operational management within the areas affected were kept up-to-date with the likely impacts of application issues. This allowed management to develop realistic expectations and therefore set realistic targets that helped to counter demoralization.
developing within the user community. It also allowed them to set expectations regarding what the user community would find, and when they could expect issues to be resolved. This went some way to reducing the negative opinions being formed. These management decisions could not reverse the effects of the feedback loop, but were able to minimize them.

There are four tails in this map (likely to be trigger events) in addition to two of the concepts replicated from the pre-launch map for context. Like those two, the first also feeds into the product scope. Following launch, defects that had not been discovered during the testing phase began to come to light (concept 101). There were not many of these, but they further diminished the product’s scope. The second trigger event was the dependence of the rollout of the product on data migration (concept 118). At launch, some new policies were written in the new system; however, even had 100% of new business been written in the new system, there would remain the preexisting customer base with its records in the legacy system, so any contact with those customers would require access to that system. For this reason, and due to the decision to de-scop-e data migration from the launch, rollout could only progress up to a point until data migration was completed. The third trigger was outside of the control of AIL: fixing defects and completing the data migration required the same SSS resources accessing the same code base (concept 111), so they were constrained by the available resources from working to resolve the outstanding defects as quickly as AIL. Finally, the fourth trigger is the primary decision that helped to minimize the effects of the positive feedback established. The introduction of improved communication channels between the project and the business (concept 120), achieved by bringing into AIL an experienced external consultant for the period leading up to, and immediately succeeding, the launch of the application.

There are three outcomes new to this map. Two relate to staff: concept 114 dealing with demoralization and concept 117 dealing with the negative attitude that began to develop toward the application among people who had not yet received their training. These were minimized through improved communication. The third outcome was that the business suffered at best a failure to realize benefits, and at worse real losses through the introduction of this application. As indicated in the analysis of trigger events, these outcomes in part derived from the failure to identify all of the potential problems that existed. However, they also arose from the decisions made pre-launch to de-scop-e the application through accepting more outstanding defects, compromises on functionality and de-scoping the data migration. These were the decisions that helped to break the vicious cycles that were preventing the achievement of a launch date.
Concepts such as 114 dealing with demoralization within the staff and concept 117 dealing with the negative attitude that began to develop toward the application are “soft” issues, which are not usually dealt with in project management bodies of knowledge. This type of issue is seldom considered in project reviews, and the feedback loops that might result may go unrecognized. It is a strength of this approach that they were captured and can be linked into more tangible project events like the extension of time for rollout.

Construction of Cognitive Maps for the Project Manager

Two cognitive maps were also constructed following interviews with the project manager, again showing events leading up to launch and those following. Many of the features found in the project manager’s maps have already been surfaced in the BPM’s maps, as previously discussed. There are no contradictions between the two managers’ maps, but there are some further features in the project manager’s maps that did not previously appear, some of which are discussed here.

Analysis of the project manager’s pre-launch map shows a number of interesting trigger events. One was the choice of SSS to include a package that they did not own as part of the solution; SSS’s subsequent decision during the project to buy the intellectual property rights for this product was cited by them as a partial cause of the delay. A second was AIL’s previous failed attempt at this project with a different supplier. This resulted in some key AIL management decisions. First, the legal case launched by AIL against the supplier, which was settled out of court, had an effect on both AIL management and SSS management when negotiating the contract for this project (concept 231), so that key people on both sides felt the need always to “cover their backs,” slowing progress that might have been achieved in a more cooperative environment. Second, AIL decided to make use of the design documents that resulted from that first failed project as the initial baseline for the new project (concept 229); however, few people from AIL and none from SSS were involved in that project and no one was completely comfortable with the documents, so there was disagreement as to their content and meaning.

The project manager surfaced an important outcome not apparent in the BPM’s map. Events in the project leading up to the launch led to a commercial dispute between the two companies (concept 251), which threatened to sour a relationship, which at times had been fractious, but which more recently had been improving with the successful adoption of joint working. The effects of this were particularly seen in the post-launch map.
The project manager’s post-launch map contained just 22 new concepts, plus two reproduced from the pre-launch map for context. It contained two sets of double loops, all negative feedback. These loops, shown in Figure 9, are unique to this map and show the beneficial impact of the involvement of senior management following launch. As can be seen from the map, there were several pressures within the project forcing the rollout period to be extended, while at the same time conflict for the use of limited SSS resources prevented resolution of all of these. The involvement of AIL and SSS senior management was seen as a key to keeping the focus, which had been somewhat lost, on completing the project and shortening the rollout period. Also, the prioritization of work by the senior management team helped to resolve some of the conflict for resources. One further outcome was staff in both SSS and AIL started to tire of the project, and looked to move on to something new. This can lead to a drop in morale among the project team if allowed to go on unchecked.

Recommendations for Projects
The recommendations for AIL can be divided into two: first, recommendations specific to how projects should be run in future following analysis of cognitive maps drawn based upon the experience and perceptions of three key managers in Project X2; and second recommendations for how AIL may approach learning from projects in future.

A number of specific recommendations can be made for the future conduct of Project X2:

1. The business has benefited greatly from effective communication; care should be taken to ensure that this momentum is not lost.
2. Steps need to be taken to ensure that the X2 project team is refreshed, and given new focus for the remainder of the project to avoid degradation of morale.

For future projects within AIL:

3. Care should be taken to ensure that all design work has been completed and agreed before work begins on code development. Failure to do this can result in much rework, both in areas where the design is subsequently agreed to be other than that developed and of inter-dependent areas. This does not mean that it is not possible to complete activities in parallel, just that care needs to be taken to ensure the independence of parallel activities.
4. Overtime should be used sparingly and for the resolution of short-term issues-for the supplier as well as AIL’s staff. Extensive use of overtime can lead to unproductive staff, and poor quality output. The resolution of issues caused by poor quality can take much longer than that saved, especially where the defect is not discovered quickly and subsequent work is built upon that defect.
5. Applications should not be accepted from the supplier until successful completion of all (or most) of the agreed testing. Acceptance of the application with a large number of known outstanding defects caused AIL’s own testing effort to extend.
6. Every effort should be made to avoid making changes to an application’s design during the project. Some change may be inevitable; however, the impact to the rework cycle is significant, the effort being not only to make the change requested, but also to change all dependent elements.
7. The joint working initiative should be repeated where feasible. This was responsible for shortening the turnaround of defect resolution, freeing up resources to continue other work, and preventing excessive rework of interdependent elements.
8. If a project is running late, opportunities to reduce the scope of the deliverable(s) should be examined; however, care must be taken to ensure that the impact upon business is understood and accepted before doing so.

Learning Recommendations
Any organization that desires to improve its competitiveness in today’s market place must learn from its experiences. Therefore, in addition to the specific recommendations arising from Project X2, there are more general recommendations for the ongoing learning of the organization resulting from the experience of this learning study:

1. The mechanism of learning adopted should suit the nature of the project. For simple projects, a straightforward lessons-learned process may be appropriate, but for more complex projects, especially where there is any suspicion that there may have been positive feedback effects at work, a mapping approach such as that adopted here is more effective.
2. Learning should not be left to the end of the project. It should be integrated into the heart of the project process, on a regular basis as well as following any significant event.
3. Cognitive maps can be created through one-on-one interviews or in a group setting. The decision of which approach to take should depend on the circumstances at the time:
   - Consider group approaches if time is limited, and/or if it is essential that all parties can identify with, and “buy-in” to, the output.
   - Consider individual interviews if participants come from various levels within the organization and there may be disagreement between senior and junior participants, and/or some participants are likely to be significantly more forceful so that quieter team members may get drowned out.
4. When constructing the cognitive maps, attempt to identify the management actions taken in reaction to the events of the project, and all of the consequences of those actions, intended or otherwise; these can provide crucial triggers or exacerbating elements of the explanation of the project outcomes.
5. As well as “hard” quantitative explanations of behavior, look also for the “softer” human-oriented elements, as these can also provide essential elements of
the causal chains that provide explanation of the project behavior.

6. When constructing cognitive maps:
   • Look for positive feedback loops, which are likely to be root causes of spiraling costs or time scales.
   • Investigate tails and consider if these are truly root-causes of the effects being or if there might be something more fundamental that has been missed.
   • Investigate any orphans and determine how these concepts link in to the rest of the material.
   • Consider all of the heads. Could these be considered outcomes? If not, ask if these lead to anything that should be recorded on the map.

Conclusions
Reviewing projects is essential if a business is to learn how to better conduct projects in future. The main recommendations arising from this study have been described in the previous two sections, but this section will summarize the results. Concerning learning from projects:

   • It is critical that managers learn the impacts their decisions might have on a project. Some of these are unexpected, so typically are difficult to identify. Cognitive mapping can help to do this, and can show positive feedback loops resulting from management decisions, which can have serious adverse effects on a project. Managers should learn to recognize these feedback loops when they are occurring (and similarly for beneficial impacts).
   • It is widely agreed that learning should not be left to the end of a project, but should be incorporated throughout, at regular intervals, and following significant events.
   • For projects that are not complex, a straightforward lessons-learned process is likely to be sufficient. However, this is insufficient when faced with complexity and will not bring out the difficult, and sometimes counterintuitive, lessons. Standard lessons learned processes are good mechanisms for recording the lessons already learned so that they may be disseminated further, but they are not themselves good for creating new insights into the workings of the project.

As far as Project X2 is concerned, a fundamental problem was the supplier’s original underestimation of the complexity of the task, which early on led to the project becoming late. In order to draw back some overrun, management in both AIL and SSS decided to execute parts of the project in parallel, so that a significant rework cycle developed in which completed work regularly had to be reexamined, and development work proceeded without agreement on the design baseline. This resulted in commercial disagreement, confusion, time wasted analyzing false problems, and a delivery that did not always meet the business’s needs. Later, management tried to increase the project team’s output by the use of overtime; this combined with the unclear design led to the eventual delivery being of a poor standard. AIL’s management decided to accept the release despite the known problems. This resulted in a positive feedback loop, which caused the testing end-date to move increasingly further away. The testing phase was clearly going to continue to extend unless significant decisions were taken to resolve the problems. First, part of the delivery was de-scoped allowing concentration to be focused on the essentials. Second, joint working was introduced, significantly speeding up the resolution of issues and breaking a feedback loop that had impacted the testing phase. The de-scoping decision had a downside, as after launch it became apparent that the business impact of some of the de-scoped functionality was significant, and affected productivity as well as the time required to complete the rollout of the application to all users. This was minimized by a decision to hire in temporary expertise to ensure sufficient communication between the business and the project team.

Cognitive mapping is a powerful tool for reviewing projects:

   • It allows identification of chains of causality and feedback loops not readily identified by intuition alone.
   • It helps direct an interview process to ladder up from concepts already surfaced to outcomes and to ladder down to trigger events.
   • Care needs to be taken when concepts describe effects that happened in different time scales; this can lead to the identification of spurious loops. Identified loops need to be thoroughly checked for this where the map describes events over an extended time frame. Separate maps to represent different phases of the project might help.
   • “Soft” issues such as morale can be incorporated into the maps, and these issues on the performance of the project can be examined.

Considering “how does one learn from projects?” requires a different understanding of the dynamics of projects, and how those dynamics shape the impacts we as managers have on the course of a project. Even where we do understand impacts intuitively, these techniques help to give a rational foundation for instincts and allow the manager to argue these points more successfully. It was an original learning objective of this work to learn how to better run a project; however, it became clear that the most valuable learning comes from understanding the sometimes counterintuitive effects of management decisions and how project events and decisions are interrelated and interacting. Well-intentioned management decisions to resolve potential issues can lead to counterintuitive positive feedback loops, driving projects further off course rather than controlling them.

References


White, D., & Fortune, J. (2002). Current practice in project


Chichester: John Wiley & Sons Ltd.


Government projects are not the same as commercial projects. Different factors apply, different rules control. Rote application of the principles of the PMBOK® Guide to public projects will likely yield an other-than-happy result. Addressing this issue, the Project Management Institute has published Government Extension to A Guide to the Project Management Body of Knowledge (PMBOK® Guide)—Third Edition. This updated version aligns the document with the most recent edition of the PMBOK® Guide.

Government projects are fundamentally different in that they are generally funded by citizens and implemented for the benefit of citizens. Accordingly, this publication focuses on two distinguishing and unique factors of public projects: laws that prescribe precise terms regarding fiduciary, managerial, and sociopolitical responsibilities; and the responsibility of project teams to serve as public stewards.

The Government Extension recognizes three levels of government—national, regional, and local—that may be involved in projects. At higher levels—national and regional—projects tend to be grouped into programs to facilitate funding and control. Stakeholders participate and express their interests across all levels, often being linked between levels in rather complex ways.

The document is organized into three sections that address the project management framework, the standard for project management, and the project management knowledge areas. The framework (Chapters 1 and 2) defines key terms and describes the environment of government projects. Readers should not skim over this brief section. Understanding the life cycle of public projects and how it differs from private sector projects is essential to gaining full benefit from what follows.

In a government framework, the constraints of law and authorized budgets are significant factors for consideration. Stakeholders exist as a broader set and include the general public, regulators, the press, sellers, future generations, private-sector partners, and opposition groups that may wish to counter project goals for various reasons. Organizational systems, governance systems, and organization culture also influence public projects in ways that must be understood by all involved.

The standard for project management in government uses the same process groups as the private sector, with the addition of laws and regulations that may require more rigid application of certain processes.

The bulk of the Government Extension is dedicated to discussion of the nine knowledge areas. Each is exhaustively addressed, process by process. In many cases, there is no additional guidance, simply a referral to the basic PMBOK® Guide. Readers should pay special attention to those processes that do offer additional guidance. This is the reason for the document. These are the things that can confound a government project or bring it to an unsatisfactory close.

Scope management highlights the importance of spending authority and public accountability as overarching controls. It emphasizes the role of stakeholders, who are more influential than in private projects, and points out that project are often subject to external scope controls such as higher level approval or funding authorities.

Cost management includes additional guidance, particularly in the areas of budgeting and controls. Other government budgeting techniques—performance-based and gateway budgeting—are addressed in Quality Management.

Human resource planning describes unique aspects of civil service systems, disclosure of project information, and use of contractor personnel. In government projects, key decision authority can not be delegated and government employees often have a choice as to what projects they will be apart of.

Communications management provides considerable additional guidance related principally to government requirements that balance privacy and public accountability. It emphasizes the importance of an early and complete communications requirements analysis.

Risk management and project procurement management are matters of particular concern in government projects, especially the latter. Readers will find comprehensive discussion of both issues that detail the differences from typical commercial practice. The text closes with a handy glossary that defines the key terms associated with government projects.

The Government Extension is aimed at a broad audience: political leaders, senior executives, program managers, project managers, project team members, stakeholders, and others. All will benefit to some degree from its contents. Government projects are not like commercial projects. Knowledge of the guidance provided by this document will lay the foundation for project success in government domains.

Reviewed by Kenneth H. Rose, PMP, Director, Peninsula Center for Project Management in Hampton, VA, USA
Global project management conjures up images of coordinating complex multinational projects in distributed environments with participants in many time zones using different languages and alternative value systems to deliver a product or service that will satisfy all parties. Given new challenges such as outsourcing, virtual project teams and collaborative partnerships there is a growing need for a clear handbook that offers practical and usable procedures, methods and insights for competing and working in a global environment.

The recent book by David I. Cleland and Roland Gareis, Global Project Management Handbook, Planning, Organizing and Controlling International Projects, sets out to fill that void. The editors point out that in the new environment project management has become “boundaryless” as it cuts across disciplines, functions, organizations and countries. One could easily add other domains, such as cultures, continents and values, to the list. This shows the enormity of the task undertaken by the authors.

The first part of the book describes the state of the art of project management by emphasizing some of the fundamentals. It starts by charting the history and evolution of project management. Additional chapters introduce the business process of project management, the need for ongoing research, the total life-cycle approach to projects, risk in international construction projects and the need to look beyond projects. A key chapter within this sequence focuses on managing multinational teams by highlighting drivers and barriers to team performance, developing a model for team building and providing a set of recommendations that provide a solid foundation for developing a set of success factors.

The second part is dedicated to performance and competence of project personnel. The initial chapter kicks off by reminding the readers that professional competence extends beyond knowledge to incorporate experience, attitude, and behavior. The following chapters are concerned with dealing with risk and uncertainty, human energy, and managing project personnel. This part concludes with a chapter revisiting the project implementation profile, an instrument for measuring the success factors associated with a project.

The third part of the book addresses some of the global issues associated with projects. While this part is short, it offers a solid grounding in many of the complex challenges associated with global projects. Managing quality in international projects can prove to be a challenge and a whole chapter is dedicated to dealing with cultural differences and expectations in ways that ensure a high quality outcome for all concerned. Virtual projects have become increasingly popular in software development and therefore receive their own chapter that introduces the factors that lead to success. This part concludes by looking at collaborative knowledge projects.

The fourth part looks at project-oriented organizations. It also explores the project portfolio scorecard, the business process within project organizations, and the crucial role of partnering as a cooperative form of working on projects and sharing some of the risks. The fifth and final part of the book is concerned with project management at the national level. The chapter features the state of the practice in Austria, China, Australia, Romania, and Japan. The choice of countries provides an interesting mix of developing and developed countries trying to compete and within a global economy.

The main weakness of the title is related to the nature of the domain. Many of the early chapters address fundamental issues in project management, providing excellent insights. Indeed it would be a shame that many project managers who are not searching for insights related to global project management may miss out on the content offered by this work. In sense there is too much good stuff in this book and perhaps the title should incorporate the fact that it is not all to do with global projects.

Global projects will continue to challenge the project management community. This book is a major step toward expanding the available body of knowledge in this crucial area. The editors have done a sterling job in bringing together expertise covering many nations, sectors, and project types. The collection updates earlier work thus providing a key reference. Experienced project managers, as well as beginners, would do well to add the book to their library. Academics and students would also benefit from the updated information provided in the handbook. In the world of complex “boundaryless” project management, this handbook will continue to provide a guide to some of the pitfalls and an atlas charting lessons and new developments.


Reviewed by Dr. Darren Dalcher, Professor of Software Project Management at Middlesex University, London, England, and Director of the National Centre for Project Management
Paul Dinsmore and Terry Cooke-Davies have combined their vast experience and knowledge of project management in a most interesting book, “The Right Projects Done Right! From Business Strategy to Successful Project Implementation.”

The preface sets the stage for the book and points out that potential readers range from CEOs to project team members. Mr. Dinsmore and Dr. Cooke-Davies have organized the book in such a manner that specific sections of it are targeted to certain readers. Examples from their own experience in working with diverse industries are included. Further, they have included specific case studies contributed by practitioners from diverse industries to supplement their own ideas. Throughout the book, graphics and interesting analogies complement the easy-to-read text.

The introduction discusses the importance of project success, but notes that the rate of project success has not kept pace with the growth of the project management profession. The authors point out that business strategists and project managers are partners as they must work together to interact and achieve their goals. An interesting section discusses how processes and projects interrelate; describing that project management is really concerned about the management of change.

Mr. Dinsmore and Dr. Cooke-Davies have organized the book into three parts. After an opening description, each chapter includes a discussion point. A graphic is included at the beginning of each chapter to show the overall structure of the book so the reader can see what lies ahead in case he or she wishes to move on to a different chapter.

Part One is titled “How to Manage Multiple Projects Successfully Throughout the Enterprise.” Although this section is targeted to upper management, project professionals at any level can benefit from reading it. The authors recommend four key performance indicators: effectiveness in implementing corporate strategy, productivity of key corporate resources, overall level of project success in the organization, and the overall level of project management success. Differences between program or project work and that of “business as usual” or ongoing operations are described. They describe benchmarking and assessments of organizational project management maturity, with an emphasis on using results in order to make improvements. This section also emphasizes the importance of the people component to project management, focusing on selection, competence, synergy, and human resources.

Holding project reviews and conducting lessons learned sessions may be standard practice for many. The authors describe ways to introduce the learning agenda into project management by of incorporating in project initiation a review of past lessons learned focusing on “facts behind the facts.” They also suggest using communities of practice and development of anecdotes by project managers to focus lessons learned in a way that is easier for others to learn from them and relate to them.

Part Two, “How to Make Sure Each Project is the Right Project,” is addressed to those individuals who are sponsors of programs and projects, a critical role in project management that is often overlooked. It describes the importance of benefit measurement and complements the information included in the Project Management Institute’s recently published standard on program management. The authors stress the importance of ensuring that the proper ranking and selection criteria are used in determining which projects to undertake. They delineate the differences between programs and projects.

Part Three is titled “How to Make Sure Each Project is Done Right,” with content specifically designed for project managers. Chapters focus on critical practices, the people component, and projects in different industries. The authors note the type of practices that lead to different types of success. Results of survey research they conducted are included. Of particular interest was data that showed the extent of use of project metrics in terms of project selection, reliability of the metrics, scope of the metrics, and use of metrics. Further, they describe ways to reframe our current thinking on projects to bring the human dimension closer to the forefront with a discussion on leadership and on competence and personal learning.

The Right Projects Done Right! is an important contribution to the project management literature. Its easy-to-read style with analogies as well as statistical data from survey research makes this book an essential resource for project professionals at all levels.

Jossey-Bass, 2006, ISBN: 0787971138, hardcover, 336 pp., $42.75 Member, $45.00 Nonmember

Reviewed by Dr. Ginger Levin, PMP, Senior Consultant in Project Management, and Lecturer and Program Management Specialist in Project Management for the University of Wisconsin-Platteville
SUCCESSFUL PROJECT MANAGEMENT: A STEP-BY-STEP APPROACH WITH PRACTICAL EXAMPLES, FOURTH EDITION
BY MILTON D. ROSENAU, JR. AND GREGORY D. GITHENS

Successful Project Management is a winner! Rosenau and Githens have given us a significantly improved edition of an already quite useful guide to project management. The book is a solid balance of insights to techniques, tools, and practical applications advice.

The authors assert that the book is written for project managers both novice and experienced, project team members, executives, and functional managers—a diverse audience indeed. In fact, they have come closer to that goal than in earlier editions. Their use of many real-world examples to frame the description of key points may be useful for the targeted audiences. The effort to more strongly integrate the various topics is also helpful toward this goal.

This fourth edition attempts to accomplish three specific improvements over the previous edition. First, five chapters were rewritten to emphasize integration in project planning. Readers with considerable project management experience will recognize how well the authors understand this critical dimension of successful project management, and will appreciate how well they have captured it for the less experienced to understand a bit better. Second, the chapter on program risks and issues has been redone. Third, in the authors’ words, the book has been generally updated to “reflect contemporary thinking and practices in the project management field.”

According to Rosenau and Githens, “The best organizations avoid a rigid set of step-by-step procedures for project management. Instead, the best organizations educate all stakeholders on the principles and allow for discretion and common sense.” The book certainly offers up some specific tools and templates, but it also makes a serious effort to communicate the important underlying principles and purposes rather than merely being dogmatic about formulas for success. The material about project scope definition and management is an especially good example of their comprehensive approach.

The chapters on project planning and scheduling offer good but brief overviews of the techniques and methods. The material is adequate for a brief orientation or a quick reminder of such devices but readers would have to refer to other sources if they were not already familiar with the topics.

The practical tips and examples of how to deal with real-world situations make these chapters worthwhile.

Of course, no book can be all things to all people and this book is no exception. Three specific areas might have been addressed better. First, the authors address the broader organizational challenges of an organization within which a project may be conducted. They talk early in the book about the leadership roles and then later about organization structures. However, the material is somewhat out of tune with the rest of the book. These sections describe the traditional roles of leaders and the traditional structural alternatives but fail to provide the keen insight so often present in other parts of the book about unique demands placed on leadership by the project environment and the matrix or project organization structures.

Second, the material on proposals seems disconnected from the general outline of the book. The authors describe a project flow (defining, planning, leading, controlling, and closing) in the first chapters and generally adhered to that outline. But they inserted in Chapter 4 a section that deals briefly, and superficially, with proposals. They might better have simply referred the reader to other books on the subject.

Third, the chapter on risk management is both excellent and disappointing. The authors write eloquently about the notion of “risk response” and influencing outcome probabilities. Too often writers would have us believe that risk management is a matter of mathematics derived from lessons learned when in fact it is as much, if not more so, a matter of project team attitude. Rosenau and Githens remind us that a team that believes it can influence its future will be much more likely to manage its risks effectively, even if the risk management mathematics is sloppy. On the other hand, they missed an opportunity to describe opportunity as well as risk management. Teams that are “on their toes” will seek out and manage their opportunities just as aggressively as they will their risks.

All in all, Successful Project Management, Fourth Edition is a fine overview of the art and technique of project management, worthy of the attention of all involved in projects at any level.

John Wiley & Sons, Inc., 2005, ISBN: 047168032X, hardcover, 384 pp., $71.25 Member, $75.00 Nonmember

Reviewed by Jerry L. Wellman, PhD, Human and Organizational Systems, PMP, Vice President Honeywell Technology Solutions, Inc., Columbia, MD, USA
Earned value management is not the center of the universe. Though it may seem so from all the hype in project management literature, it is just a part—albeit an important one—of a larger whole. Robert R. Kemps makes this clear in Fundamentals of Project Performance Measurement, first published in 1996 and now in its fourth updated edition.

What Kemps makes clear is that measuring project performance is a complex task involving many interrelated and progressive steps. Earned value management is a powerful, essential element, but it is not an end in itself. Other books discuss earned value in glorious detail. Kemps weaves in into a broader discussion that focuses on concepts rather than formulae. It is earned value without the onerous acronyms.

Kemps begins in the usual way by describing performance measurement as comparing actual performance to a baseline plan. He shows the typical chart that compares actual costs to the approved budget and points out the inherent shortsightedness of this view. This is one of the rare occasions where he uses the terms and acronyms for budgeted cost of work scheduled, budgeted cost of work performed, and actual cost of work performed. Having established, in a traditional way, the need for a different method of measurement, Kemps proceeds in a nontraditional way, eschewing the how-to formulae in favor of a better understanding of what to do and why.

Understanding the full scope of the project is the first step toward effective performance measurement. Kemps describes the work breakdown structure as a means of defining project work and, once completed, a framework for integrating management subsystems and accumulating performance information. Linking this to an organizational breakdown structure is an essential step—and one that must be carefully done—that produces control accounts, the basic level of work measurement.

Moving forward with scheduling and budgeting, Kemps emphasizes the importance of vertical and horizontal “traceability,” that is, the linkage of scheduled tasks from top to bottom and from beginning to end. Establishing the project baseline is a difficult and time-consuming task, but a critical step in gaining a realistic view of what lies ahead. Kemps cautions readers that external budgeting decision made without regard to their effect on individual projects often lead to much grief in schedule slippage and cost overruns.

Detailed planning produces work packages—a defined task or set of tasks that have a completed product or end result. The author points out that it’s not always that simple. Work packages may encompass a variety of time spans. Some work, such as general project management, may not be amenable to packaging. Such work must be captured by either separate level-of-effort accounting or apportioning to affected work packages.

“The key to performance measurement is the objective assessment of work in progress.” So says the author in the beginning of his discussion of earned value. He describes the difficulties associated with measuring work of different kinds and different durations, reinforcing the role of control accounts, work packages, accounting systems, and data collection in achieving meaningful measures.

Chapter 11, Estimating Cost at Completion, stands out as being centrally important. Kemps emphasizes that cost estimates must not be structured to fit some predetermined, politically saleable number. Now, earned value arises as a comprehensive method for measuring progress. The author also points out that the numbers resulting from earned value analysis are not sacrosanct. Rather, they should be used as a sanity check within wider consideration of other types of estimates.

Projects are not carved in stone when initial planning is complete. Kemps reminds readers that change—both internally and externally generated—is inevitable. Changes must be managed and baselines must be adjusted to avoid downstream surprises. Maintaining the baseline is probably the most difficult aspect of performance measurement according to the author. He suggests that measuring performance against a goal rather than a total authorized budget may be a more practical approach, if the customer agrees.

Kemps addresses the matter of external reporting in some detail. He suggests reports in column format, different from the S-curves usually encountered in project management literature. He also suggests a baseline report that will disclose any “rubber baseline” problems—baseline adjustments that result from using future funds to solve current problems.

Fundamentals of Project Performance Measurement delivers exactly what its title describes. It is not a collection of acronyms and formulae. It is a logically progressive presentation of concepts and a general approach. Before applying specific earned value techniques, readers should understand what it’s all about. This book is the place to start.


Reviewed by Kenneth H. Rose, PMP, Director, Peninsula Center for Project Management in Hampton, VA, USA
Guidelines for *Project Management Journal* Book Reviews

Selecting Books for Review

*Project Management Journal* welcomes recommendations from project managers and others regarding books that may be of professional value to fellow PMI associates. Areas of potential interest include: new ideas about the theory, concepts, and techniques of project management; new approaches to technology and management; getting business results; competing in today’s complex workplace; and global changes. Recommendations should include the title, author, and publisher, and a brief statement as to why the book should be considered for review. The journal will select books for review and identify a reviewer. Individuals recommending books for review may also volunteer to write the review. However, individuals should not submit a review before the journal has selected the book. The journal receives many books from publishers and authors and cannot review them all.

Guidelines for Writers

Reviews should begin with a strong, brief opening paragraph that identifies the book and author, and tells the reader why the book is important. The review should not only describe the content of the book, but also what the content means; that is, why it is a contribution to the project management body of knowledge. Reviewers may include the following elements:

- A summary of key or unique concepts
- Favorite quote, graphic, chart, etc.
- Important tips or guidelines
- New terms or phrases, such as “knowbots” or “teamocracy”
- Message from the book that should be remembered for future use, or should have been disclosed years ago.

Reviews should include the book’s strong points and any weak points if this information will be useful to the reader. Reviews should be written in a conversational style that maintains academic rigor. Reviewers should avoid use of the first person (“I”) and focus on the book and its contents. Reviewers should also avoid use of extensive lists as a means of describing or duplicating content. Instead, focus on what the content means to readers. Reviews should be no longer than 750 words (please use your computer word count to verify length of the review).

Reviews should include complete publishing information, if possible: title, author(s), publisher (city and state), year published, ISBN number, total pages, and price in U.S. dollars. The journal will add any information that is not available to reviewers.

Reviews should be prepared using MS Word and may be submitted by e-mail (preferred) or on CD. Submissions should include the name, title, company, address, phone/fax/e-mail, and brief (one or two sentence) biosketch of the reviewer. Reviews should be submitted to Natasha Pollard at natasha.pollard@pmi.org

or via mail to:

*Project Management Journal*
Book Review Editor

c/o PMI Publishing Department
Four Campus Boulevard
Newtown Square, PA 19073

PMI reserves the right to edit all material submitted for publication.
SEPTEMBER 2006

7-8 September  
Project management congress for Central America and Caribbean Region. San José, Costa Rica. Sponsored by PMI Costa Rica Chapter. Keynote speaker: Dr. Franklin Chang, former NASA astronaut and CEO/Chairman of Ad Astra Rocket Company. For more information, please visit http://www.pmi-costarica.org/congreso2006/index.html

12-13 September  
PMI Kansas City Mid-America Professional Development Days. Overland Park, Kansas, USA. “The Art and Science of Project Management.” Speakers include Buzz Aldrin and Lee Lambert, PMP. For more information, please visit www.kcpmichapter.org

13-15 September  
International Project Management Forum. Hong Kong, China. Sponsored by PMI Government SIG. A three-day forum to bring awareness about value of project management to government executives, government staff and to non-profit organizations at Southeast Asia. For more information, please contact Patty Wong, PMP, for project & planning (wong.patty@hit.com.hk) or Barry Hsuing, PhD, PMP, for paper presentation (barry@pmi.org.tw).

21 September  
Super PDD-Who Moved My Baseline? Troy, Michigan, USA. A professional development day sponsored by PMI Great Lakes Chapter. Speakers: Lee R. Lambert, PMP; Carl Pritchard, PMP; EFP; Peter de Jager, Dr. Prasad Kodukula, PMP. For more information, please visit www.pnmgc.org

21-22 September  
First International PMI Warsaw, Poland Chapter Congress with special guest Gregory Balestrello, PMI CEO, and ministers of education from Poland, Russia and Ukraine. Warsaw, Poland. Themes: European Union Projects; The Future of Project Management Professions; PMO; Risk Management. For more information, please contact kongres@pmi.org.pl and visit www.pmi.org.pl/congress.

24-27 September  
6th International Program Office Summit (IPOS). Atlanta, Georgia, USA. Sponsored by Project Management Leadership Group. Focus on the tools, techniques and knowledge to rapidly and effectively implement and sustain program and portfolio management. For more information, please visit http://pmigc.com/international_pmo_summit.shtml

25-28 September  
PMI SeminarsWorld® Salt Lake City, UT, USA. For more information, please visit the SeminarsWorld Homepage.

27-29 September  
3rd International Conference on Project Management (ProMAC2006) Incorporating Australian Institute of Project Management Annual Conference and PMI Sydney Chapter Annual Conference. Sydney, Australia. Theme: “Transforming Organizations, Government Agencies and Communities through Project and Program Management.” For more information, please visit www.promac2006.com

27-29 September  
IV PMIRS Seminar of Project Management. Porto Alegre, RS, Brazil. Sponsored by PMI Rio Grande do Sul Chapter. For more information, please visit www.pmirs.org.br/seminarios.htm

OCTOBER 2006

3-7 October  
Innovation: Leading the Way to Successful Change. Minneapolis, Minnesota, USA. Professional Development Days presented by PMI Minnesota Chapter. 13 educational classes, symposium day with Peter de Jager as Keynote Speaker. For more information, please visit www.pmi-mn.org

4-6 October  

4-6 October  
VI PMI-SP International Project Management Seminar. São Paulo, Brazil. Sponsored by PMI São Paulo Chapter. For more information, please visit www.pmi-sp.org.br/viseminario

6 October  
Fourth Annual Professional Development Day and Vendor Fair. Presented by PMI Central Indiana Chapter. Indianapolis, Indiana. Please visit www.PMICIC.org to register or for more information.

6-7 October  
PMI Tampa Bay Chapter Annual Symposium. Tampa, Florida, USA. Learn more about the current state of the project management industry and profession, as well as earn Personal Development Units (PDUs). The general itinerary will feature a keynote speaker and cocktail hour on Friday evening and educational sessions all day Saturday for available PDU credits. Contact the Symposium Committee (pmitsbsym@pmi-tampabay.org) for details in regards to submitting papers and sponsorship opportunities, etc. Registration and additional details for the event can be found on the chapter Web site (www.pmi-tampabay.org).

7 October  
PMI Benelux Day. Antwerp, Belgium. Sponsored by PMI Belgium and PMI Netherlands Chapters. Theme: Globalization: Is the Project Manager (un)touchable? For more information, please visit www.pmi-beneluxday.org

7 October  
Submission deadline for 3rd International Project Management Conference. Tehran, Iran, 20-21 February 2007. All researchers and participants are invited to send their latest findings and articles on the themes related to this conference by 7 October 2006. For more information, please visit http://www.ipmc.com

13 October  

17-19 October  
6th Annual PMI OVIC Project Management Symposium. Ottawa, Ontario Canada. Papers will be presented in two concurrent streams over two days: Projectizing Corporate Reorganization and Rapid Project Management/Project Management During Crisis. Day three will include two half-day workshops: Procurement and Project Management and Network Computing in OPENSOURCE. The Symposium will also include a vendor display area and a forum for student paper presentations. For more information, please visit www.pmioivic.org

21-24 October  
PMI Global Congress 2006-North America. Seattle, Wash., USA. For more information, please visit http://congresses.pmi.org/

2 November  
International Project Management Day program with Joseph Phillips, presented by PMI Central Indiana Chapter and Clarion Health Partners, Indianapolis, Indiana. A day-long seminar examining the similarities between successful projects and successful lives. This presentation will focus on “What if you treated the next year of your life as a project?”. Mr. Phillips is inviting us to participate in an experiment for the next year he will be treating his life as a project. He’ll set requirements, plans, execute, monitor and control, and then prepare to close out this project on 2 November 2006. Visit his Web site for details about the experiment at www.lifelongproject.com. Please visit www.pmicic.org/to register or for more information.

6-8 November  
18th Annual International Integrated Program Management Conference. Sponsored by PMI College of Performance Management, Alexandria, Virginia, USA. For more information, please visit www.pmi-cpm.org or call +1-703-370-7885.

6-10 November  
4th Annual PMI Houston Chapter 2006 Conference & Vendors Expo. Houston, Texas, USA. “Modern Project Management and Beyond.” Includes keynote and guest speakers, workshops, training, and the vendors expo. Twelve workshop sessions will be conducted Thursday through Friday morning focusing on project management, real world experiences, and best practices. For more information, please visit www.pmihoustonconference.org

10 November  
PMI Central Ohio Chapter Professional Development Day. “NEW GAME. NEW RULES.” Columbus, Ohio, USA. Mark Adams, keynote speaker. For more information, please visit www.pmicentralohio.com

13-16 November  
PMI SeminarsWorld® Scottsdale, AZ, USA. For more information, please visit the SeminarsWorld Homepage
SCOPE

Project Management Journal is the professional journal of the Project Management Institute. The mission of the Journal is to advance the state of the art of the knowledge of project and program management. The Journal presents useful information on both theory and practice in the field of project management. Authors are encouraged to submit the following types of original manuscripts: descriptions of innovative practices; summaries of research results; reviews of current literature; surveys of current practices; critical analyses of concepts, theories, or practices; developments of concepts, theories, or practices; analyses of failure. Manuscript length should not exceed 12,000 words. The selection of manuscripts for publication is based on the extent to which they advance the knowledge and understanding of project management. PMI neither approves nor disapproves of any data, claims, opinions, or conclusions presented.

MANUSCRIPT REVIEW

Project Management Journal uses a double-blind review process. The first review of every manuscript is performed by two anonymous referees (usually members of the Editorial Review Board). The manuscript is then either accepted, rejected, or returned to the author for revision (with reviewer comments furnished to the author). Revised manuscripts are sent to the Editor, who makes a final disposition in consultation with the Publisher. The Journal strives to respond to all authors within three months of the date the manuscript is received at the PMI Publishing Department. Accepted manuscripts are subject to editorial changes. The author is solely responsible for all statements in the manuscript, including editorial changes.

ORIGINAL PUBLICATION

It is the policy of PMI to be the sole, original publisher of manuscripts. Manuscripts that have been submitted simultaneously to other magazines or journals will be rejected outright and will not be reconsidered. Republication of a manuscript, possibly revised, that has been disseminated via conference proceedings or newsletter is permitted if the editor judges there are significant benefits to be gained from publication.

COPYRIGHT

Upon acceptance of a manuscript, authors will be asked to transfer copyright of the article to the publisher. This transfer will ensure the widest possible dissemination of information. This transfer of copyright enables PMI to protect the copyrighted material for the authors, but does not relinquish the author’s proprietary rights. The copyright transfer gives PMI the exclusive rights to republish or reprint the manuscript in any form or medium as well as to grant or refuse permission to third parties to republish all or parts of the manuscript.

SHORT ITEMS

Short items do not need rigorous academic scrutiny and are not refereed. Upon receipt, however, these items become the copyright property of PMI.

- **Opinion** presents thoughtful discussion of project management issues.
- **Correspondence** pertains to the project and program management profession, including references to literature, practice, and scholarship as well as discussion and replies related to articles published in the Journal.
- **Book Reviews** express opinions about books related to the project management profession, or about general management or technical books that cover topics of particular value to the project manager.
- **Calendar of Events** offers notices of forthcoming meetings and calls for papers.

SUBMISSIONS

All manuscripts must be submitted electronically either by e-mail to natasha.pollard@pmi.org or on CD and sent to: Project Management Journal, Attn: Natasha Pollard, 4 Campus Blvd., Newtown Square, PA 19073 USA. If you submit your manuscript on CD, please include a printout of the manuscript, including all tables and figures, on 8 1/2 x 11 inch paper, double spaced throughout, and printed on one side only. Manuscripts should include the following in the order listed:

- A title page that includes the title of the manuscript and each author’s name, affiliation, mailing address, and phone, fax, and e-mail address. Correspondence will be directed only to the first author listed.
- An abstract of 100 words or less that outlines the purpose, scope and conclusions of the manuscript, and selected keywords.
- Text (use headings and no more than two levels of subheadings). To permit objective reviews by two referees, the abstract and first page of the text should not reveal the authors and/or affiliations, but only the manuscript title.
- References.
- Illustrations and Tables. These should be titled, numbered (in Arabic numerals and captions), and each on a separate sheet, and the preferred location indicated within the body of the text.
- Biographical details of each author. Upon manuscript acceptance, authors must also provide a black-and-white passport-style photograph and a signed copyright agreement.

COMPUTER-GENERATED TEXT AND ILLUSTRATIONS

Authors are requested to submit the final text and illustrations via e-mail or on CD. As with the requirements for manuscript submission, the main text, list of references, table and illustration captions, and author biographies should be stored in separate text files with clearly identifiable file names. Keep the layout of the text as simple as possible and save text in its original applications and/or Rich Text Format (RTF). It is essential that the name and version of the word processing program and format of the text files are clearly indicated (example: Word for Windows 2000 doc). The electronic version should only be sent with the final accepted version of the paper to the Editor. NOTE: The hard copy and electronic files must match exactly.

Upon acceptance of the manuscript for publishing, authors will also be asked to provide illustrations placed or embedded within their chosen word processing program. If this isn’t possible, please submit illustrations in their native programs. Be sure to include a hard copy as well. PMI now recreates all illustrations, figures and tables electronically for publication. By doing so, the publication is ensured a consistent look throughout. Although this makes electronic versions of illustrations less important, a hard copy becomes crucial for re-creation purposes. Contact PMI’s Publishing Department for further details.

STYLE OF TEXT

You should write in clear and concise English. Spelling should follow Webster’s New World Dictionary. Authors whose native language is not English are assured that in-house editorial attention to their manuscript will improve clarity and acceptability to readers. For questions regarding style and format of text, refer to the Publication Manual of the American Psychological Association, Fifth Edition.

REFERENCES

For questions regarding reference format, refer to the Publication Manual of the American Psychological Association, Fifth Edition. References used in the text should be identified by author name and publication date in parentheses, e.g., (Cleland & King, 1983), and listed alphabetically at the end of the manuscript. Page numbers should be cited for all quotations. Follow the format example shown below:


Please ensure that references are complete, that they include, where relevant, author’s name, article or book title, volume and issue number, publisher, date and page reference.

The use of page footnotes should be kept to a minimum. Footnotes should be numbered consecutively and listed at the end of the text as endnotes.
KEYWORDS
Keywords categorize your manuscript. They cover project management methodologies and processes, tools and techniques, PMBOK® Guide knowledge areas, industries, types of projects, geography. Please list three or four keywords that best categorize your manuscript. Choose from the following list of suggested keywords (this is not a comprehensive list) or you may use your own.

Accounting
Activity Duration Estimating
Agriculture
Arrow Diagramming Method
Baselines
Benchmarking
Benefit/Cost Analysis
Budgeting
Change Control
Communications Management
Concurrent Engineering
Configuration Management
Conflict Resolution
Constraints
Construction
Contingency Planning
Contract Closeout
Cost Estimating
Cost Management
Critical Path
Delegation
Deliverables
Design
Documentation
Earned Value
Engineering
Environment
Estimating
Fast-Tracking
Feedback
Finance
Float
Funding
Human Resource Management
Information Systems
Integration Management
Large Project
Leadership
Life-cycle Costing
Manufacturing
Management Skills
Matrix Organization
Milestones
Mitigation
Monte Carlo Analysis
Multiproject Planning
Negotiating
Networking
New Product Development
Organizational Planning
Organizational Structure
Parametric Modeling
Performance Reporting
Pharmaceuticals
Procurement Management
Productivity
Project Life Cycle
Project Management Software
Project Plan Development
Quality Assurance
Quality Management
Reengineering
Resource Planning
Responsibility
Risk Management
Risk Response Development
Schedule Development
Schedule Control
Scope Management
Scope Definition
Scope Change Control
Simulation
Staff Acquisition
Stakeholders
Standards
Statistical Sampling
Team Development
Time Management
Tools
Training
Transportation Variance
Utilities
Virtual Organization
Work Breakdown Structure
Work Packages

CHECKLIST
- Manuscript via e-mail or on CD
- 100-word abstract
- Illustrations
- Author biographies
- Black and white author photographs (upon acceptance)
- Signed copyright agreement (upon acceptance)

REVISIONS
Correspondence and files for revision will be sent to the first-named author unless otherwise indicated. Copyediting of manuscripts is performed by PMI staff. The authors are asked to check edited files for typographical errors and to answer queries from editors. To improve publication times it is important that revised files be returned within three days. Excessive turnaround time may jeopardize publication of papers.

COPIES AND REPRINTS
Authors will receive 10 copies of the Journal free of charge. Additional copies of the Journal and/or article reprints can be ordered at any time from PMI.

Project Management Institute
Publishing Department
4 Campus Blvd.
Newtown Square, PA 19073 USA
Tel: 610/356-4600 ext. 5016
Fax: 610/355-1633
E-mail: natasha.pollard@pmi.org

Index of Advertisers

Certified Associate in Project Management (CAPM®) .............................................C2
Program and Portfolio Management .................................................................C3
Latin American Congress 2006 ........................................................................C4
Organizations invest in their future by initiating projects, programs and portfolios as a means of achieving organizational success. The utilization of program and portfolio management processes and skilled program and portfolio managers continues to rise. Recognizing this development, PMI introduces *The Standard for Program Management* and *The Standard for Portfolio Management*.

Learn how to optimize program components and organizational schedules and resources for success. *The Standard for Program Management* describes the processes and provides guidance for managing multiple projects and non-project activities within a program environment.

**PMI Member Price**: $38.95 (US)
**Price**: $46.95 (US)

Portfolio management is gaining favor as a means of helping organizations focus not only on “doing work right” but also on “doing the right work.” *The Standard for Portfolio Management* provides methods to take a comprehensive view of portfolios, group them for the most effective management and ensure all components are aligned strategically.

**PMI Member Price**: $38.95 (US)
**Price**: $46.95 (US)

Visit the PMI Bookstore (www.pmitookstore.org) for more information and to order your copy today.
Santiago, Chile
6-8 November 2006

Join your fellow project management practitioners to...

- Learn from educational presentations tailored to your specific needs and interests
- Meet face-to-face with providers of the newest products and services in the Exhibition Hall
- Share best practices and innovative ideas while networking with colleagues
- Focus on critical issues of the profession such as leadership, strategic thinking, risk management and team development

Visit www.pmi.org/LA06.htm to register and learn more about the congress.