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Swiss Management Center – Transknowlogy Campus

# Recognizing Project Management as an Abstract Science

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*Prepared by:*

Jeffrey S. Ray, PMP, P.E., Esq.
Doctoral Candidate, SMC University
jeffrey.ray@student.swissmc.ch
22836 Portico Place
Ashburn, Virginia 20148
(703) 229-2121 (phone)
(703) 995-0580 (fax)

*Prepared for:*

Swiss Management Center
Learning Center – Zurich
Seestrasse 463
8038 Zurich - Switzerland
Tel.: +41 (0)41 500 16 22
administration@swissmc.ch
http://www.swissmc.ch

## Abstract

Researchers indicate a shift in scholarly focus from a systems perspective, to one of leadership and organizational behavior. To address increasing project failure rates, leadership theories are being implemented to improve project performance by improving organizational cultures. The practice of Project Management, however, does not offer a framework for developing theories to improve project success rates, and then tracking them to prove their validity. This paper suggests that project management is really an abstract science and practitioners should act like scientists and develop project success theories. It concludes by assessing central research paradigms tailored for project management.

# Contents

# 1 Scholarly focus in project management is shifting from a systems perspective to a leadership and organizational behavior perspective

Systems management was taught by the Defense Systems Management College (DSMC) in the 1980's. The systems engineering methodologies for planning and executing defense projects advocated by the DMSC were captured in a Systems Engineering Management Guide (DSMC, 1990). It succeeded in defining management practices for handling complex technical projects. Modern project management techniques as espoused by the Project Management Institute (PMI) in the Project Management Body of Knowledge (PMBOK) Guide (PMI, 2008) are an outgrowth of these systems management techniques and are viewed as applied systems management (Kerzner, 2009). Today's projects however, require faster responses and increased adaptability. The typical projects encountered today: are dynamic, short in duration, complex in design, challenging with respect to technology, and cannot be managed by traditional, inflexible, management techniques. Most project managers today recognize the need to be flexible with respect to planning, and the benefits of embracing innovation. Research interests have evolved over time to reflect the new challenges a project manager faces. Kloppenborg & Opfer (2002) summarized a substantial PMI research effort that surveyed and analyzed over 3,500 articles related to project management. They observed trends in human resources, competency and commitment of team members, interpersonal and motivational behavioral aspects, and communications planning. A summary of the research focus areas by time period observed by Kloppneborg & Opfer (2002) include:

- 1960's research focus: planning and scheduling.
- 1970's research focus: automated cost and schedule controls.
- 1980's research focus: life cycle cost and risk management planning.
- 1990's research focus: team building, leadership, and human resources.

- 2000's research focus: project topologies, strategic project management, and globalization of projects.

Interestingly, Kloppenborg & Opfer (2002) confirm that there has been a shift from systems management to the team building and leadership perspectives over the years, and that no central paradigm has emerged so far in the project management field. Since 2002, research has evolved into more focused discussions like the use of knowledge in management. Reich (2007) contends the success of information technology (IT) projects depends on the effective creation, utilization, and transfer of knowledge. By integrating elements of knowledge management with mainstream project management practices, Reich (2007) contends an effective learning environment can be created.

It appears, therefore, that research efforts in the project management area have shifted away from a systems to leadership and organizational behavior perspectives. Why is this? What benefit does such research give the profession? Belassi, Kondra & Tukel (2007) studied the effect of organizational culture on the performance of new product development projects. New product development projects are challenging and have a unique set of problems. Globalization increases potential market share, but also increases competition and means there is constant pressure to make products better, faster, and cheaper. The continuous development of new technologies means shorter product life cycles and shorter time to markets. As a result of these challenges, Clancy & Stone (2005) report 95 percent of new consumer product projects in the United States fail. Belassi, et al. (2007) investigated the problem by conducting a survey to identify new product development project success factors. Success factors for these projects are said to include:

- Implementing a progressive organizational structure.

- Maintaining effective supplier relationships.
- Maintaining collaboration between marketing and engineering teams (Belassi, et al., 2007).

To support their contention that organizational culture influences the project success factors, Belassi, et al. (2007) reviewed the "strategic variables" that have been found to impact the success of new product development projects. They analyzed each factor in terms of whether it would be positively influenced by organizational culture. Having strong relationships with suppliers, for example, facilitates early involvement in the product development process and can result in "innovative products, faster product development, and lower developmental costs" (Belassi, et al, 2007, p. 20). The relationship between research and development (R&D) and marketing teams is another example of a strategic variable influencing project success that is a function of organizational culture. By collaborating with marketing teams researchers can ensure the new products they are developing will have the feature set necessary to generate sales. As it turned out the project success factors analyzed by Belassi, et al. (2007), were all positively influenced by organizational culture. Therefore, it is not coincidental that research in the project management field has been shifting away from traditional systems management to organizational culture related perspectives. If organizations can improve their culture, then they can improve the chances their projects will be successful. Innovation is another key aspect of success. If an organization's culture does not encourage innovation, then it is not likely to have any. This explains why corporate leaders are "increasingly interested in actively managing corporate culture" (Belassi, et al., 2007, p. 14). Essentially, they are learning how transform their organizations to adopt a culture that will make them more successful. The current state of the Project Management profession, however, does not offer these leaders much in terms of a

framework to test hypotheses and track the impacts of culturally based organizational changes. If project management was thought to be similar to a behavioral science, then these corporate leaders could act like scientists and develop theories on how to improve organizational performance, implement the changes required to test their theories, collect performance metrics to validate the theory, and in so doing, improve the knowledge base of the practice. In the absence of such scientific methodologies, the field of project management has been limited to merely applying historical best practices derived from projects acquiring systems several innovation cycles in the past, to forward looking (e.g., futuristic) projects involving new and innovative technologies, and the upgraded business models such technologies necessarily bring to bear. It is time, therefore, for Project Managers to start thinking and acting like scientists and treating the project management field as a behavioral science.

## 2 Challenges scholars face getting project management recognized as a social science

Getting project management recognized as a social science is a challenge, but that is to be expected. It was a challenge for the fields of economics and psychology, so project management practitioners can also expect a challenge. Even the physical sciences were challenged as they initially began to form. It is well known that the medieval church stifled scientific advancement via dogmatic resistance to any change to outdated concepts, such as the perception that the world was physically flat. Von Mises (1962) contributes this bit of history to support the proposition that the doctrine of *positivism*, which asserts the only authentic knowledge is knowledge which is based on sense, experience, and positive verification, created an unfounded illusion that scientific fact could ultimately prevail over dogmatic persistence of the theologians to maintain the status quo. As theologians eventually had to admit they were wrong in every "controversy,"

such as the theory of evolution, an "illusion originated that all the issues theology used to deal with could be one day fully and irrefutably solved by the natural sciences" (von Mises, 1962, p. 119). Science, it was thought, could explain everything. But these confidences are unfounded. The scientific methodologies employed in the physical sciences do not apply to the problems being investigated in behavioral sciences like psychology, project management, and economics, which von Mises characterized as the study of human choice under conditions of scarcity of sustaining resources. Mankind is at the mercy of many forces and powers beyond our control, which the physical sciences cannot explain or model. The physical sciences take aim at developing a level of understanding that provides full control, but within a narrow margin of possible events which, of course, "comprehend only a fraction of the events that determine man's fate" (von Mises, 1962, p. 65). There simply has to be something offered up in terms of explanation for the description and analysis of things the physical sciences cannot explain, which is where the behavioral sciences come into play.

The birth of a science has been discussed before. Mill (1874) found that the definition of a science follows, and does not precede, the creation of the science itself. As discoveries were made, they were collected one by one, and became "agglomerated according to their individual affinities" (Mill, 1874, p. 86). Without any intentional classification effort, the facts were said to classify themselves. As these facts became associated in the minds of researchers, they were spoken of as aggregates and "came to be denoted by a common name" (p. 86). "Any body of truths which had thus acquired a collective denomination, was called a science" (p. 86). Emphasizing the need to consider the defining characteristics of a field of science from an organizational perspective, Mill's noted, "there is scarcely any investigation in the whole body of a science requiring so high a degree of analysis and abstraction, as the inquiry, what the science

itself is" (p. 87). This dialog set the stage for Mill's to determine that economics exhibited characteristics like that of a science. It seems, therefore, that the project management profession needs to initiate research that is based on hypotheses so the resulting theories can be aggregated to form the abstract science of project management.

Project management practitioners can learn from the economics profession. Friedman (1966) contended the field of economics is a positive science, but noted it is denied dramatic and direct evidence from conclusive experiments, and the fact that theories can never be verified makes it hard to achieve a consensus for central economic paradigms which tend to require economic metrics collected over time to support them. This renders the weeding-out of unsuccessful hypotheses slow and difficult. Project management practitioners face a similar difficulty. Only after a project has conclusively been deemed a failure, can a performance theory be discredited. While economics may be a science it has inherent barriers to a scientific methodology that anticipates development of hypotheses that can predict future states and be verified by controlled observations. Unlike the physical sciences, where laboratories can be set up to test the laws of nature, the laboratory for conducting economic experiments is the world economy, which is large, complex and difficult to model. The "economy is a complex mechanism, and not suited to abstracting out aspects of a problem to support a focused investigation of potential remedies" (Ray, 2011, p. 7). The project management field will be similarly constrained. Just as predicting the performance of the economy is a complex undertaking, so is the prediction of a project's performance. Unlike a laboratory experiment that supports a theory in the physical sciences, which can be accomplished quickly, tests to confirm the performance of the economy or a project are: long-term, on-going, endeavors. Like economics, the project management field will therefore be slow to eliminate unsuccessful

hypotheses. The ultimate goal of a science is to develop a theory that yields meaningful predictions about things not yet observed (Friedman, 1966, p. 7). Project managers need to be able to identify the characteristics and metrics relevant to project success, so informed investment decisions can be made. Like the economics field, project management needs to be thought of as an abstract science to encourage the research necessary to develop the theories and hypotheses that will lead to a better capacity of predicting performance.

## 2.1 Should there be a general theory of project management?

There is some evidence that project management practices are closing in on improvement theories. Progress is indicated by:

- Upgraded project management approaches to address new challenges.
- Our ability to analyze and discuss the processes indicated in the PMBOK Guide (PMI, 2008), as a profession.
- New organizational structures that support integration management (Kerzner, 2009).
- Innovative training programs (Damare, 2008).

The PMBOK helped raise awareness that project management was a profession and captured best industry practices. Practitioners can now consult and be guided by the resulting body of knowledge while conducting project management activities. By creating a common project management framework and terminology for the profession, the PMBOK provided a concise way for practitioners to learn and apply institutionalized knowledge. While progress has been made with respect to institutionalizing project management concepts, project failures are still occurring at a high rate. In a study of 35,000 projects across several industries, cost overruns between 40 to 200 percent were typical (Morris and Hough, 1987). The success rates of Information Technology (IT) projects have been estimated to be around thirty four (34)

percent (Standish Group, 2003). Shenhar and Dvir (2007) attribute the problem to a lack of concepts and theories and the need to develop a wider project management research agenda. Scholarly theories espoused in the project management area would allow practitioners to view the project in conceptual terms and test their hypotheses to better understand project situations and consequences. The implication being that project managers need to start thinking more like scientists and view the world from a research methodology perspective. Reich and Wee (2006) analyzed the PMBOK Guide from a knowledge management perspective and concluded that it has a strong bias for explicit declarative and procedural knowledge that addresses *what to do* and *how to conduct* project management activities. It pays less attention to "tacit and causal knowledge" (Reich and Wee, 2006, p. 12), relative to why certain processes or actions should be performed. While project managers assessing the PMBOK have access to better information within a structure that facilitates its discovery, they are apparently only getting part of the information they need. Shenhar and Dvir (1993) found that 85 percent of projects have 70 percent schedule overruns, and 60 percent budget overruns. It seems there is more to project management that describing *what needs to be done* and *how to do it*. The conclusion to be drawn is "the problem is much deeper, it is at a conceptual level, rather than in process or practice" (Shenhar and Dvir, 2007, p. 95). There needs to be a general theory of project management to encourage better research that will result in predictive project performance. Having a theory based framework could supplement the content of the PMBOK Guide to include tacit and causal knowledge and help fill an existing gap. It would also allow practitioners to develop theories that would predict project performance and track the validity of each theory against project successes.

## 2.2 Comparing the effectiveness of the problem driven and central paradigm perspectives

Shenhar and Dvir (2007) identified two suggested perspectives for future research in the project management area: the problem-driven and central paradigm perspectives. Under the problem-driven research perspective, theories may evolve from real-life problems that prompt researchers to search for theories to deal with the problems. While some benefit is obtained, the problem driven approach is limited to reacting to problems once they arise. A more proactive approach like the central paradigm research perspective is called for. A paradigm is defined as a generally accepted model of how ideas relate to one another, forming a conceptual framework within which scientific research is carried out. Shenhar and Dvir (2007) refer to a paradigm as a lens through which one may view the project management field, and recommended three major views: the operational/process view, the team/leadership view, and the strategic/business view. The operational/process view "sees a project as a sequence of activities that have to be performed and completed according to plan" (Shenhar and Dvir, 2007, p. 96). The team/leadership view "looks at projects as an organizational team that needs to be led and motivated" (p. 96). The strategic/business view "sees a project as business-related activities that need to achieve the project's business results" (p. 96). Each view is said to be completely different, is based on different assumptions, uses different success criteria, and defines the project manager's role in a different way (Shenhar and Dvir, 2007). Table 1 indicates the characteristics of the three proposed central paradigms for the project management profession. While Shenhar and Dvir (2007) have laid out an outstanding framework for developing central theories that can be the basis for predictive performance models, it occurs to the author that a less intuitive view may be missing. The success and failure of many projects depend on how well the project meets the needs of users and how much it benefits society. As a result, the author

developed the additional central paradigms indicated in Table 2 for viewing the project management profession against. Tables 3 and 4 define the research implications for both the original views espoused by Shenhar and Dvir (2007), and the supplemental views put forth in this paper. Tables 3 and 4 indicate the theories, possible research methods, and the other disciplines that can contribute to the central views.

Traditionally, a project manager was put in charge during a project startup with total decision making authority. They were responsible for getting the project done within cost and schedule constraints. In today's project management environment this approach is not appropriate considering all of the stakeholders and participants that will have little to no decision making responsibilities. The project management profession has tried to address this shortcoming. Governing bodies were assigned, at some expense, in the form of workgroups, integrated product teams (IPTs), or customer milestone signatories, to force the project team to get a stakeholder input during the developmental phases. It failed miserably. It is simply too much to expect stakeholders to dig in deep enough to provide input detailed and focused enough to be relevant before they have any stake in the outcome of the project. A project typically gets ready to conduct operational training before they get adequate user involvement and, in many cases, find out the hard way the design is not very well suited to support user operations at a late point in the acquisition process. Since stakeholders and the user communities do not get totally involved in a project at an early stage, they are not willing to support it at an emotional level until much later, when a prototype can demonstrate new capabilities to them, and they can actually touch and feel the new features. The additional collaborative environment, user benefit, and balanced paradigm views added by the author in Table 2 are an attempt to address this shortcoming by facilitating user involvement through a collaborative environment and tying

*Table 1. Major views of project management*

| Central View | Operational/Process | Team Leadership | Strategic/Business |
|---|---|---|---|
| **Key paradigm** | A project as a process of activities and tasks to be completed | A project as an organization of people that need to be led, motivated, and coordinated toward a common goal | A project as a strategic activity, contributing to a larger business objective |
| **Unit of focus** | An individual project or subproject - a set of activities to be performed or a portfolio of projects | A team of individuals - often cross-functional, working on a common mission | An individual project, a portfolio of projects |
| **Success criteria** | Operational success - project completion on time, budget, and performance | Success as a team - speed, productivity, morale, learning, personal development | Business success - impact on customer, impact on business, long-term results, value |
| **Project manager's role** | Delivering the project on time, on schedule | Building and motivating the team for coordinated work | Creating the business results, creating value |

Table defines central paradigms the project management profession can be viewed through and was taken from Shenhar & Dvir (2007) in its entirety

*Table 2. Supplement views of project management proposed in this paper*

| Central View | Collaborative Environment | User Benefit | Balanced Paradigm |
|---|---|---|---|
| **Key paradigm** | A project as a collaborative environment that encourages coordination among the project team, governing integrated project teams (IPTs), stakeholders, sponsors, users, senior management, and results in buy-in to the path taken | A project as a set of benefits to the targeted users, as perceived by the ultimate users of the product or service | A project as a balance of strategic objectives, consensus building collaboration, and user benefits (as perceived by the user) in an unstable equilibrium state |
| **Unit of focus** | External bodies that percieve the value of a project through the collective assessment of project participants (including stakeholders, project team, sponsors, governing bodies, senior management, etc.) | The impression society gets about a project by evaluating proposed benefits from a user perspective | The impression society gets about a project by comparing its strategic objectives and percieved user benefits from within a collaborative environment that encourages coordination |
| **Success criteria** | Success as a team of participants - programmatic buy-in to the develop-ment apporach, quantity and quality of stakeholder input | Operational success of the delivered product in terms of quality and value-improved functional capabilities at a reasonable costs | Success as a society from an infra-structure evolutionary perspective - impact on economy, impact of value, when compared to other project candidates |
| **Project manager's role** | Establish collaborative practices and setup configuration management (CM) tools for managing and remembering knowledge to obtain buy-in of project objectives and user benefits | Defining and communicating user benefits by building and motivating an engaged user community | Creating value for society and thereby maintaining buy-in for the project |

Table defines some additional central paradigms the project management profession can be viewed through to supplement the work of Shenhar & Dvir (2007)

*Table 3. Theoretical and research implications of central paradigms proposed for project management*

| Central View | Operational/Process | Team Leadership | Strategic/Business |
|---|---|---|---|
| **Theories** | Process theory<br>Optimization<br>Network theory | Psychology<br>Behavioral theory<br>Leadership<br>Organization theory | Strategic management<br>Resource-based view<br>Economics |
| **Methods** | Mathematical programming<br>Simulation<br>statistical analysis | Case studies<br>Field studies<br>Empirical analysis<br>A blend of quantitative and qualitative methods | Models<br>Case studies |
| **Related disiplines** | Operations research<br>Information science<br>Decision science<br>Risk management<br>Accounting<br>Quality<br>MIS | Organization theory<br>Social psychology<br>Media richness theories<br>Human resources | Marketing<br>Finance<br>Strategic management<br>Risk management<br>Economics<br>Business |

Table defines the research implications of central paradigms the project management profession can be viewed through and was taken from Shenhar & Dvir (2007) in its entirety

*Table 4. Theoretical and research implications of additional central paradigms proposed in this paper for project management*

| Central View | Collaborative Environment | User Benefit | Balanced Paradigm |
|---|---|---|---|
| **Theories** | Collectiveness<br>Knowledge management<br>Data structures and mapping<br>Overcoming cultural barriers | Value optimization<br>Operational concepts<br>Managing public perceptions | Buy-in strategies<br>Industry needs assessment<br>Enterprise leadership<br>Enterprise economic strategies |
| **Methods** | Case studies<br>Focused and targeted training<br>Survey research | Analysis of alternatives<br>Survey research<br>EVA accounting methodology<br>Case studies | Enterprise modeling<br>Case studies<br>Survey research<br>Function mapping<br>Capability gap analysis<br>Alignment of industry need to research efforts |
| **Related disiplines** | Data sharing<br>Configuration status accounting<br>Team dynamics<br>Motivational theory<br>MIS | Marketing benefits of project<br>Enterprise accounting<br>Quality | Enterprise marketing<br>Finance<br>Strategic investment analysis<br>Industry coordination<br>Targeted research |

Table defines the research implications of supplement central paradigms the project management profession can be viewed through to supplement the work of Shenhar & Dvir (2007)

user benefits to project strategy objectives. Ultimately, success of a project, in addition to the aspects that can be planned and managed, is also a function of the degree of buy-in it gets from industry and user communities. Boehm (1988) developed the spiral development approach for fast prototyping in an attempt to solicit user input regarding features of the interface. Although merely one small step in the right direction with respect to getting user buy-in, consider the magnitude of the impact the spiral development methodology has had on industry over the years. Clearly, no matter how well a project is run internally, it is subject to evaluation and even termination by outside forces if user communities are not convinced that the right system is being built for the right need. Developing some paradigm views that consider the buy-in a project gets from user communities is a good supplement to the fine work already accomplished by Shenhar and Dvir (2007). Each of the new views proposed by the author in Table 2 is discussed briefly below.

The collaborative environment is a proposed central paradigm that sees a project as a collaborative environment that encourages coordination among the project team, governing integrated product teams (IPTs), stakeholders, sponsors, users, senior management, etc., and results in buy-in to the path taken through participation. It will focus on external bodies that perceive the value of a project through a collective assessment of participants and interested members of society. Success criteria for this view include programmatic buy-in to the development approach, and the quantity and quality of stakeholder input, which should be periodically evaluated and rated. Thus, the amount of buy in, and the quality of the collaboration are assessed.

The user benefit is a central paradigm that sees a project as a set of benefits to the targeted users, as perceived by the user community and interested members of society. It will

focus on the impression interested members of society get about the value of a project by evaluating the proposed user benefits. The project manager's role is to use the view to build and motivate an engaged user community. Thus, the value of the project to the user community is assessed.

The balanced paradigm is perhaps the most difficult view to describe. It attempts to shift the focus from internal to the project, and project team, to an outside one with an enterprise perspective. A project is thought of as a balancing of strategic objectives and perceived user benefits from within a collaborative environment that encourages coordination. Success criteria include the project's impact on value to society and the economy when viewed from an evolving infrastructure perspective. The project manager's role is to use the view to create value for society and thereby maintain buy-in for the project. The way the term "balance" is meant to be used must be explained in more detail, by way of an analogy. As one sits in a reclining chair, leaning all the way back, they can find a mid-way position between two stops. Any leaning forward would cause the forward stop to be hit, any leaning backwards would cause the rear stop to be hit. Although in perfect balance, and in a state of equilibrium, one would never-the-less have an uncomfortable feeling due to the fact any movement what-so-ever would result in a loss of the delicate balance achieved. The success of a project as it is being planned and developed is in a similar state of balance, a state I'll refer to as "*unstable equilibrium*." For the project to continue on it must have numerous champions from all areas of influence. To achieve this kind of support, the project must be perceived as worthwhile to an army of participants as well as the general public. Any person or organization that does not see the value of the project, can bring it to a halt by questioning whether society will consider it worthwhile. The strategic justifications for executing a project, therefore, achieve a similar unstable equilibrium that can be disrupted at

any time. The state of balance must be nurtured and a significant effort should be expended to ensure it is maintained. As an experienced project manager, the author contends that this is the profession's greatest weakness, the inability to keep communicating the short and long-term benefits of a project after its initial funding has been identified and approved. There are numerous examples of projects which, despite being on schedule and on budget, were terminated prematurely due to changing programmatic concerns and priorities. The ability to develop a doggedness type mentality, with respect to completing projects once a substantial investment has been made, is essential for the profession to turn the dooming statistics of failure around and start developing some success stories.

# 3 Summary

To summarize, this paper looks at the evolution of the project management profession and concludes that indeed, it should be thought of as a branch of science. There should be a general theory of project management, and this paper shows a preference for defining central paradigms for viewing the project management profession and encouraging research. Three additional views were proposed to supplement the fine work already accomplished by Shenhar and Dvir (2007) to accommodate programmatic concerns about community buy-in to a project's strategic value. When the profession is thought of from within the construct of the central paradigms, it will facilitate the creation and management of hypotheses and theories that may result in a capability to predict project performance so investments in projects can be made more wisely and improve the industry's success rates. Since project management research has been migrating to leadership concepts, that might be a good place to start developing theories for the new, abstract, science of project management.

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