THEORETICAL ARTICLES

Perspectives on research in project management: the nine schools

**J. Rodney Turner · Frank Anbari ·
Christophe Bredillet**

Abstract   This paper demonstrates that project management is a developing field of academic study in management, of considerable diversity and richness, which can make a valuable contribution to the development of management knowledge, as well as being of considerable economic importance. The paper reviews the substantial progress and trends of research in the subject, which has been grouped into nine major schools of thought: optimization, modelling, governance, behaviour, success, decision, process, contingency, and marketing. The paper addresses interactions between the different schools and with other related management fields, and provides insights into current and potential research in each and across these schools.

Keywords   Optimization · Modelling · Governance · Behaviour · Success · Decision · Process · Contingency · Marketing

J. R. Turner
Skema Business School, LSMRC, Univ Lille Nord de France, Avenue Willy Brandt, 59777 Euralille, France
e-mail: rodney.turner@skema.edu

J. R. Turner (✉)
Wildwood, Manor Close, East Horsley, Surrey KT24 6SA, UK
e-mail: rodneyturner@europrojex.co.uk

F. Anbari
Goodwin College of Professional Studies, Drexel University, One Drexel Plaza, 3001 Market St., Suite 100, Philadelphia, PA 19104, USA
e-mail: anbari@drexel.edu

C. Bredillet
Project Management Academy, Queensland University of Technology, 2 George St, GPO Box 2434, Brisbane, QLD 4001, Australia
e-mail: christophe.bredillet@qut.edu.au

Introduction

For the past 60 years, organizations have increasingly been using projects and programs to achieve their strategic objectives (Morris and Jamieson 2004), while dealing with increasing complexity, uncertainty, and ambiguity affecting organizations and the socio-economic environment within which they operate (Gareis 2005). Through projects, resources and competencies are mobilized to bring about strategic change, and thereby create competitive advantage and other sources of value.

Until the mid-1980s, interest in project management was limited to engineering, construction, defense, and information technology. More recently interest has diversified into many other areas of management activity. Currently, more than 20 % of global economic activity takes place as projects, and in some emerging economies it exceeds 30 %. World Bank (2008) data indicate that 22 % of the world's $55 trillion gross domestic product (GDP) is gross capital formation, which is almost entirely project-based. In India it is 39 % and in China it is 43 %. Gross capital formation is defined as "outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchase; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales and work in progress… Net acquisitions of valuables are also considered capital formation." (World Bank 2008). In many public and private organizations some operating expenditures are also project-based. Project management makes an important and significant contribution to value creation globally.

Developing relevant competence at all levels, individual, team, organization, and society is key to better performance (Gareis and Huemann 2007). Grabher (2004a) discusses the processes of creating and sedimenting knowledge at the interfaces between projects, organizations, communities, networks, and the socio-economic environment within which projects operate. He proposes the notion of *project ecologies* and their constitutive layers of the core team, the firm, the epistemic community, and personal networks. He contrasts two opposing logics of project-based learning by juxtaposing learning that is geared towards moving from 'one-off' to repeatable solutions with the discontinuous learning that is driven by originality and creativity. He proposes a differentiation of social and communicative logics, wherein "*communality* signifies lasting and intense ties, *sociality* signifies intense and yet ephemeral relations and *connectivity* indicates transient and weak networks." (Grabher 2004b).

Educational programs in project management have grown rapidly during the last three decades to support the need for competence (Atkinson 2006; Umpleby and Anbari 2004). The number of academic project management programs leading to degrees in project management increased greatly from 1990 onwards. This growth is evident in the US, Europe, Australia, Japan and other parts of the world. Institutions of Higher Education (IHEs) with programs in project management in the US include: Boston University–Metropolitan College, Colorado Technical University, DeVry University, Drexel University, Eastern Michigan University, Northeastern

University, Stevens Institute of Technology, The George Washington University, University of Alaska, University of Management and Technology, University of Maryland–A. J. Clark School of Engineering, University of Maryland University College, University of Texas at Dallas, University of Wisconsin–Platteville, Western Carolina University, and several others. Project management programs are offered internationally by several IHEs including the University of Quebec at Montreal, University of Technology at Sydney, Royal Melbourne Institute of Technology, University of Limerick–Kemmy Business School, School of Knowledge Economy and Management–SKEMA (which resulted from the merger of two French business schools, CERAM Business School and ESC Lille), and several others. In the last 3 years the Chinese Ministry of Education has supported the creation of 120 masters degree programs in project management to support their rapid economic development. To support this global development it is necessary for project management to develop as a rigorous academic field of study in management. This is essential so that the rapid economic development that is so dependent on project management can be underpinned by sound theory and not just case histories and opinions of doubtful rigour.

Modern project management started as an offshoot of Operations Research, with the adoption of optimization tools developed in that field, and some members of the community have continued to present it as such. However, authors of this paper wish to demonstrate that project management has now grown into a mature academic discipline of some diversity and complexity. At least nine schools of thought in project management can be identified, and project management is increasingly drawing on and making contributions to research in other fields of management, as the authors aim to demonstrate in this paper. In this way, project management is becoming substantially different from Operations Management, which continues to emphasize the application of optimization tools to the analysis of production processes (Slack et al. 2006).

The paper is based on an extensive review of academic research literature on project management that reflects the evidence advanced by leading thinkers and researches in the field. The literature is organized into nine major schools of thought on the basis of the key premise that drives each one. The intent of separating these schools of thought is to gain insight into current and potential research, within a manageable number of research themes without over-simplification of the richness of the underlying thought. However, the overlap and interactions between project management schools is also discussed.

Project management as a recognizable field of study

Audet (1986) defines a knowledge field as:

> … the space occupied by the whole of the people who claim to produce knowledge in this field, and this space is also a system of relationships between these people competing to gain control over the definition of the conditions and the rules of production of knowledge.

We use this definition to structure our discussion of project management as a knowledge field, while recognizing that other elements can be used to augment and enhance this definition based on other perspectives on how knowledge is gained in other fields (North 1987), and different approaches to the classification of a knowledge field (Mintzberg 1990), including empirical, rational, historic, and pragmatic methods (Hjørland 1998).

With project management making such a significant contribution to the global economy, developing relevant competence at all levels, individual, team, organization, and society is seen as a key for better performance (Gareis and Huemann 2007). Knowledge is needed to develop competence (Crawford 2007), and that knowledge should be based on sound, academically rigorous research.

In the early days of modern project management in the 1950s, the development of knowledge was led by the users. The US military made significant early contributions to the new discipline, developing such concepts as the Work Breakdown Structure (WBS), the Cost and Schedule Control Systems Criteria (C/SCSC) (which evolved into Earned Value Management, EVM), and the Program Evaluation and Review Technique (PERT), (see Morris 1997). Construction companies and their clients also made significant early contributions. For instance, DuPont developed the Critical Path Method (CPM) from a technique devised in the field of Operations Research. The baton was picked up by the growing computer industry in the 1960s (see Brooks 1995).

In the 1980s, leadership of the development of knowledge was taken over by the professional associations: The Project Management Institute (PMI®), based outside Philadelphia, the UK's Association for Project Management (APM), the Australian Institute of Project Management (AIPM), and the International Project Management Association (IPMA). They needed to develop bodies of knowledge to support their certification programs. The focus of this work continued to be very user oriented, and so did not always adhere to recognized standards of academic rigour.

It is only over the last 15 to 20 years that universities and other academic research institutions have begun to provide leadership. The first academic research conference in project management, the biennial IRNOP conference (International Research Network for Organizing by Projects), was initiated in 1994. PMI® started holding its biennial research conference in 2000, and the annual EURAM conference has had a project management track since its inception in 2001.

So we see that project management is a relatively young field of study as an academic discipline. Initially advanced study in project management in universities was located in schools of engineering or construction, and then in schools of computing, and so was viewed as a technical subject. More recently project management has also been incorporated into schools of business or management, and so is now gaining recognition as a branch of management. To our knowledge, the first doctorates in the field were done in engineering and construction in the late 1960s at the University of Manchester, Faculty of Technology (degrees conferred in 1971 and 1972), and the first doctorates in the field in schools of business in the UK were done during the 1980s at Henley Management College and the Cranfield School of Management. Europe has led the way in the growth of project management as an academic subject in management. The first doctorate in the field in a school of business in the US was done in the late 1980s at Drexel University, Department of Decision

Sciences (degree conferred in 1993). At a recent meeting of a government sponsored research network in the UK (Winter et al. 2006), there were more researchers from business schools than schools of engineering, construction, and computing combined.

As a young discipline, the epistemological foundation of the field is still in its early stages of development. Meredith (2002) indicated that development of a theory of project management is important to progress in the field. Söderlund (2004) highlighted the wider interest in project management from other academic disciplines, the increasing need for discussing research on the subject, and the usefulness of examining project management and project organization from several perspectives. He discussed emerging perspectives within the field and presented questions that project research needs to discuss to further knowledge about project management. He argued that these questions include: why project organizations exist, how they behave and why they differ, what is the value added by the project management unit, and what determines the success or failure of project organizations. Turner (2006a, b, c, d) outlined a theory of project management based on work he did in the early 1990s (see Turner 2009, first edition published in 1993). Sauer and Reich (2007) agreed that such a theory was necessary as a basis for sound research in the subject, but suggested that Turner's approach was very normative, and that alternatives were possible. Cicmil et al. (2006) suggested that to develop a sound theoretical basis for project management, the very nature of projects needs to be examined, and fundamental questions addressing the different underlying theoretical perspectives emerging from and supporting the project management field are yet to be explored. Walker et al. (2008) highlighted the value of reflective academic research to project management practitioners and suggested that a reflective learning approach to research can drive practical results through the commitment of academic and industry partners. Artto et al. (2009) conducted a comparative bibliometric study and showed that projects have product development as their dominant theory basis, whereas programs take an open system view, seek change in permanent organizations, and have organizational theories, strategy, product development, manufacturing and change as their theoretical bases.

With the academic community now providing leadership to the development of knowledge in the field, greater academic rigour is being applied, meaning project management is now more deserving of recognition as an academic subject, and the admission of the International Journal of Project Management to the Social Sciences Citation Index (SSCI) is an important step in that process. Project management is drawing on other management disciplines and making contributions to them (Kwak and Anbari 2008), and we believe that all fields of management will be richer for that growing interchange. Against this background, several schools of project management thought have developed reflecting different trends, and the influence of other management disciplines. We now outline these major schools of thought and review progress, trends, and potential research in each of them.

Project management schools of thought

Project management is a relatively young academic discipline, but with the help of other fields of management, it has quickly evolved into a field of some diversity and

richness. It has been common to assume that projects and project management are fairly homogeneous (Project Management Institute 2008; Association for Project Management 2006; International Project Management Association 2006). However, there is a growing belief that projects are different, their success can be judged in different ways, and they can require different competency profiles for their successful management (Crawford et al. 2005, 2006; Shenhar and Dvir 1996; Turner and Müller 2006). Building on prior work, we can recognize several perspectives of project management. Anbari (1985) identified five schools of thought. Söderlund (2002) through a literature search and Bredillet (2004a) through a co-word analysis each identified seven similar schools. We can now identify at least nine schools, and most research in project management can be said to fall into one of them. Table 1 shows the nine schools, and how they compare to the five schools of Anbari (1985), and the seven of Söderlund (2002) and Bredillet (2004a). In fact all nine schools were previously identified by the other three authors. Compared to Söderlund and Bredillet we have added the Process School and split the Optimization School into the Optimization and Modelling Schools to reflect the modelling of multiple parameters and the use of soft systems modelling. Anbari (1985) called the Process School the Systems School, and his Management Science School covered the Optimization, Modelling and Decision Schools. He did not identify the Success or Marketing Schools. Table 1 also compares the nine schools to conventional fields of management study and to the management disciplines identified by Kwak and Anbari (2008) in their study of project management research published in top management and business journals. Table 2 shows the key idea associated with each school and the metaphor we have adopted to reflect it. The nine schools are depicted in Fig. 1 in the order in which the school came to prominence.

The Oxford English Dictionary gives the following definition of the word "school" amongst several others:

> School: a group of people sharing common ideas or methods; a specified style, approach or method; the imitators, disciples or followers of a philosopher, artist, etc.

That is what we mean by the word school. A group of researchers investigating and developing common methods, tools and techniques (for practitioners to use), often with one or more lead researchers providing the vision in that area. We strongly believe that the word "school" reflects what we mean here.

The optimization school: the project as a machine

Modern project management has its roots in the field of Operations Research of the 1940s and 1950s (Morris 1997). During and immediately after World War II, there was an explosion in the development of optimization theory, particularly in the US and the UK (Gass and Assad 2005). Optimization tools such as network scheduling techniques including the Critical Path Methods (CPM) and Program Evaluation and Review Technique (PERT) reflect the genesis of modern project management in the management science/decision sciences field. Bar (Gantt) charts, developed in the early 1900s by Henry Gantt for production scheduling, and network scheduling

Table 1 The Nine Schools of Project Management Research

School of Project Management	Field of Management Study	Anbari (1985)	Söderlund (2002)	Bredillet (2004a) (translated from French)	Kwak and Anbari (2008)
Optimization School	Operations Research	Management Science School	Optimization School	Optimization School	Operations Research
Modelling School	Management Science	(Management Science School)			Performance Mgt/Quality Mgt
Governance School	Governance	Functional School	Transaction Cost School	Transaction Cost School	Engineering/Contracts/Legal
Behaviour School	OB and HRM	Behaviour School	Behavioural School	Organizational School	OB and HRM
Process School	Operations Management	Systems School			Technology/Innovation
Contingency School	Contingency Theory	Contingency School	Contingency School	Contingency School	–
Success School	Strategy Management		Critical Success Factor School	Critical Success Factor School	Strategy
Decision School	Information Management	(Management Science School)	Decision School	Decision School	IT/IS
Marketing School	Marketing		Marketing School	Marketing School	–

Table 2 The key idea and key variable or unit of analysis of the Nine Schools of Project Management Research

| School of Project Management	Key idea	Sub-schools	Came to prominence	Key variable or unit of analysis
Optimization School	Optimize project duration by mathematical processes		Late 1940s	Time
Modelling School	Use of hard and soft-systems theory to model the project	Hard systems Soft Systems	1950s Mid 1990s	Time, cost, performance, quality, risk, etc.
Governance School	Govern the project and the relationship between project participants	Contracts Temporary organization Project-based organization	1970s Mid 1990s Late 1990s	The project, its participants and governance mechanisms
Behaviour School	Manage the relationships between people on the project	OB HRM	Mid 1970s Early 2000s	People and teams working on projects
Success School	Define success and failure Identify causes		Mid 1980s	Success criteria and success factors
Decision School	Information processing through the project life cycle	Project selection Information processing	Late 1980s Late 1980s	Information on which decisions are made
Process School	Find an appropriate path to the desired outcome		Late 1980s	The project, its processes and sub-processes
Contingency School	Categorize the project type to select appropriate systems		Early 1990s	Factors that differentiate projects
Marketing School	Communicate with all stakeholders to obtain their support	Stakeholders Internal marketing Value of project management	Mid 1990s Mid 1990s Mid 2000s	Stakeholders and their commitment to the project and project management
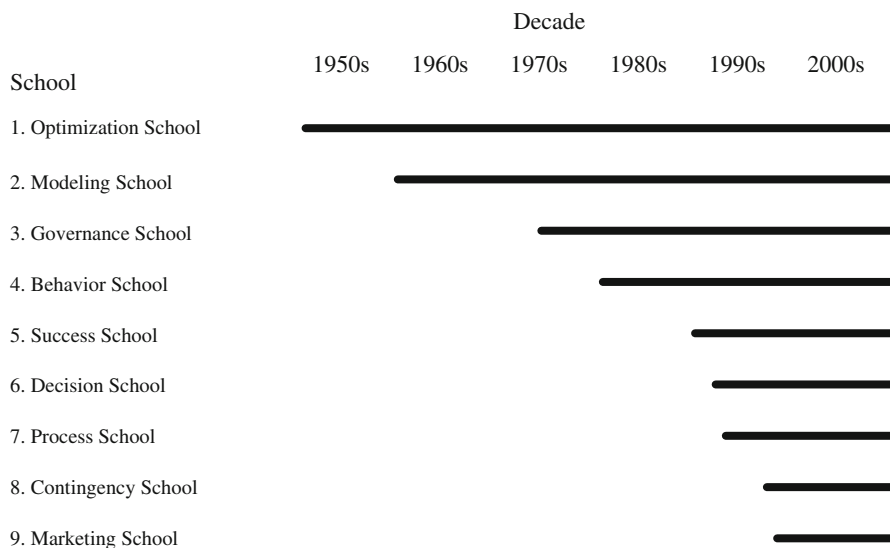
Fig. 1 The Nine Schools of Project Management Research

techniques were adopted during the 1950s (Archibald and Villoria 1967). Subsequent developments included the resource allocation and leveling heuristics, project crashing, resource constrained scheduling, Graphical Evaluation and Review Technique (GERT), Critical Chain, Theory of Constraints, Monte Carlo Simulation of project networks and cost estimates, and variations of these methods.

The main premise of this school is to define the objective(s) of the project, break the project into smaller components, ensure careful planning, scheduling, estimating, and execution of project tasks, and strive for cost and time efficiency throughout the project to achieve the optimum outcome. This school is very Taylorian in its approach. It treats the project as a system or a machine, once mathematically defined and analyzed will perform in predictable ways.

An important contribution is the textbook by Cleland and King (1983, first published in 1968), in which the authors set out a theory of project management based on the view that the project is a system to be optimized. This textbook had a substantial influence on the early development of the field, and became a dominant view. The textbook by Kerzner (2009, first published in 1979) can be considered the main textbook for this school. Its title reflects what the school is about: the use of a systems approach to planning and controlling the project, to model and optimize its outcome. *A Guide to the Project Management Body of Knowledge (PMBOK$^®$ Guide)* (Project Management Institute 2008, originally published in 1996) is currently considered the de facto global standard for project management, and has done much to shape the subject globally (its predecessor publication (1987) was entitled *Project Management Body of Knowledge (PMBOK) of the Project Management Institute*). Several elements of the *PMBOK$^®$ Guide* derive from this school, particularly the management of scope, time, and cost.

A current, prominent area of research in the optimization school is the EVM method and its extensions (Anbari 2003). We expect research to continue into the extensions of EVM such as forecasting project completion time, the earned schedule method, integration of planning and control of various project parameters, in particular scope, time, cost, quality, and risk, as well as the relationship of project management to the operational life cycle of the completed project.

Both fields of Operations Management and Project Management continued to develop their mathematical arsenals to improve decision making in operations, projects, and supply chain management, as well as incorporate contributions from other management disciplines. The field of Operations Management did not move substantially beyond the Optimization School (Slack et al. 2006), but in the field of project management this was found to be insufficient. The need to model multiple parameters, growing calls to include organizational and behavioural factors, and limitations of most optimization algorithms, led to the adoption of soft systems modelling to reflect the significant social element in projects. Project management has now advanced along a number of different avenues, which we review.

The modelling school: the project as a mirror

Project management thought progressed from optimization of one or two objectives (such as time and cost) to modelling the total project management system and the interactions among its components (Williams 2002). Thus the optimization school, based on a hard systems approach evolved into the modelling school, in which project management is broken into its main elements for study and understanding, and these elements integrated to obtain a full view of the total system. This is akin to Descartes' reductionism approach of dividing a complex problem into its parts, solving each part, and then integrating back to solve the entire problem.

Anbari (1985) discussed elements of the project management system and their interactions, and postulated the quadruple objectives/constraints of project management: scope, time, cost, and quality. Turner (2009, first published 1993) independently added project organization to give five project objectives. Anbari et al. (2008) suggested two sets of constraints: the primary triple constraints (scope, time, and cost) and the secondary triple constraints (meeting customer expectations, final quality, and mitigation of risks). Eisner (2008) stressed the importance of using a systems approach in projects and highlighted the relationship between Systems Engineering and project management. Williams (2002) postulated that "it is generally held that the complexity of projects is also increasing" (p. 4), and suggested that the compounding causes of complexity in projects are the increasing complexity of products being developed and tightening of timescales. He provided a comprehensive approach to developing models to understand the behaviour of complex projects. Techniques used in modelling are based on the System Dynamics approach developed by Forrester (1961) and applied to a wide variety of situations (Sterman 2000). While fundamentally similar to discrete event simulation, System Dynamics modelling focuses on the understanding of feedback and feed-forward relationships. Williams and others showed that projects can contain complex causal chains of "hard" and "soft" effects that can form into reinforcing feedback loops, and at times applying

accepted project management theory can make these loops worse. For example, adding resource, which CPM predicts would expedite the project, could exacerbate the problems that are causing the delay and result in further delays. This calls for the application of more sophisticated modelling tools (Williams 2005).

The Modelling School later encompassed soft-systems methodology and sense-making with the aim of addressing organizational, behavioural, political, and other issues affecting projects and the complex environments within which they operate. Whereas the focus of hard systems is optimization, the focus of soft systems is clarification and making sense of the project and its environment. The soft systems methodology (SSM) was originally proposed by Checkland (1972) to resolve unstructured management, planning, and public policy problems that often have unclear or contradictory multi-objectives. Thus, SSM extends the ideas of optimization to modelling of real-world messy problems. SSM does not assume a systemic view of such problems but uses ideas of systems analysis to help form the process of inquiry (Gass and Assad 2005). Yeo (1993) linked project management to SSM, and Neal (1995) suggested using the soft systems approach for managing project change. Winter and Checkland (2003) examined the main differences between hard systems and soft systems thinking through a comparison of their different perspectives on the practice of project management. Crawford and Pollack (2004) identified dimensions of hardness and softness of projects based on differences in the philosophical basis of that dichotomy.

Alderman et al. (2005) drew upon sense-making literature to address the management of complex long-term service-led engineering projects and suggested such an approach may help untangle project management challenges in a new way. Atkinson et al. (2006) maintained that "common project management practice does not address many fundamental sources of uncertainty, particularly in 'soft' projects where flexibility and tolerance of vagueness are necessary" (p. 687), and suggested that to manage sources of uncertainty more sophisticated efforts are needed encompassing aspects of organizational culture and learning. Winter (2006) highlighted the importance of problem structuring during the front-end of projects and the potential role that SSM can play. Pollack (2007) indicated that there is a growing acceptance of the soft paradigm, and suggested that a paradigmatic expansion to include soft systems thinking could provide increased opportunities for researchers and practitioners. Integrating into models the interactions among people and their relationships, communications, and power relationships, could add even more power to the tools of the Modelling School (Williams 2007).

It can be argued that hard systems include simulation, which provides a way of reflecting how a system evolves according to the influence and level of the initial conditions of its parameters. As such, hard systems are about sense-making as well. However, models are managed and analyzed by people who have to observe and judge to gain data to populate their models. The models that we have discussed in this section try to incorporate some consideration of the causes of attitudes and biases, and thus start to capture the socially constructed nature of "reality" in a project (Bredillet 2004b). Thus, the Modelling School is about acting *and* understanding, a mirror to reflect the project and shape our understanding of it. Research in this area will continue into integrating hard systems and soft systems

methodologies for modelling the total project management system, including optimization of multiple objectives under multiple constraints, and consideration of various forces in the internal and external project environments, as well as formulation and adoption of lessons learned from previous and ongoing projects to enhance the total system and the approaches used for modelling it.

The governance school: the project as a legal entity

The governance school has had several bursts of activity. The first investigated the relationship between contract management and project management, and the second looked at the mechanisms of governance on a project and in a project-oriented organization. The contract sub-school takes one of two views of the project:

- either it views the project as a legal entity in its own right, and describes how the relationship between the parties to that legal entity should be managed (Turner 2004), or
- it views the project as an interface between two legal entities, the client and the contractor, and describes how that interface should be managed (Barnes 1983).

Researchers had been studying contract management on construction contracts for several decades before project management began to develop as a field. The UK's Institution of Civil Engineers first published its conditions of contract in the 1930s (Institution of Civil Engineers 1999). However, with the development of modern project management, researchers began specifically researching contract management from a project perspective (Barnes 1983), and the Institution of Civil Engineers (1995) developed its New Engineering Contract from a more specifically project management perspective.

The second burst of activity began by viewing the project as a temporary organization (Lundin and Söderholm 1995; Midler 1995; Turner and Müller 2003), and moved on to investigate the mechanisms of governance both of the project as a temporary organization (Turner 2006b; Turner and Keegan 2001) and of the project-oriented parent organization (Association for Project Management 2004).

The concept of the project as a temporary organization was first propounded in Sweden in the mid 1990s. The Scandinavian literature (Lundin and Söderholm 1995; Midler 1995) focused on the temporary nature of the project organization and its various implications. Lundin and Söderholm (1995) point out that mainstream organizational theory is based on the assumption that organizations are (or should be) permanent entities and "theories on temporary organizational settings (projects) are much less prevalent" (p. 437). They stress the importance of developing a theory of the temporary organization, highlight the difference between the role of time in a temporary organization and its role in the permanent firm, and specify that 'action' as opposed to 'decision' is central to a theory of the temporary organization (p. 437). Turner and Müller (2003) added to the discussion by showing that the view of the project as a temporary organization leads to the concepts of principal-agency theory and governance. In a series of editorials in the *International Journal of Project Management,* Turner (2006a, b, c, d) aimed to develop a theory of project

management, and defined a project as "a temporary organization to which resources are assigned to do work to bring about beneficial change" (Turner 2006a, p. 1).

The focus of the project governance literature covers three areas:

The principal-agency relationship between client and contractor

Two parties are in a principal-agency relationship when one party, the principal, is dependent on the other, the agent, to do work on their behalf (Jensen 2000). The principal suffers two problems, which are at the heart of project management:

- they do not always know why the agent takes the decisions they do (the adverse selection problem),
- the agent can act opportunistically and will act to optimize their economic outcomes from the project and not the client's (the moral hazard problem). The contractor will only optimize the client's economic outcomes if they are aligned with the contractor's, placing contract management at the heart of this school.

Harrison and Harrell (1993) showed that the principal-agency theory can explain the decision to continue a failing project when the agent has private information to make such a decision rational from the agent's perspective despite its being irrational from the principal's perspective.

Transaction costs associated with projects

Winch (1989) aimed to identify transaction costs associated with construction projects. Turner and Keegan (2001) analyzed transaction costs on projects, and what that suggested about mechanisms of governance, roles, and responsibilities. Turner and Simister (2001) and Turner (2004) showed how a transaction or agency cost analysis could be used to determine contract strategy, and showed that residual loss (Jensen 2000) is the main determining factor. Gerwin and Ferris (2004) analyzed transaction costs, potential for learning, and development of relations for future projects, in organizing strategic alliances for new product development projects. They determined the points at which it is more beneficial for partners to work with little or considerable interaction, and to have decision-making authority reside in a project manager or be consensual.

Mechanisms of governance of projects

Mechanisms of governance of the individual project are discussed by Turner and Keegan (2001). Mechanisms in the project-oriented parent organization are being investigated by a special interest group of the UK's APM (2004). Rentz (2007) highlighted the governance gap between project operations and control bodies, suggested that it "applies to any development project, *independent of its size, type, or geographic location*" (p. 222), and proposed a project governance model to support the institutionalization of ethical responsibility in nonprofit organizations. Garland (2009) described the logical steps necessary to establish and implement a project governance framework for a project or across an organization to support effective project decision-making, including the accountabilities and responsibilities of the main roles.

Current research in this area includes effective governance of projects, programs, and organizational portfolio (Jamieson and Morris 2007; Morris and Jamieson 2004), effective organization and functions of the project management office (PMO), project support office (PSO), and project management centre for excellence (PMCE) (Hobbs and Aubry 2007). Winch (2006) also proposes the need to investigate the governance of project coalitions. Research in this area may continue into project and program selection, portfolio refinement and management, the PMO, and the role of regulatory compliance in project management.

The behaviour school: the project as a social system

The behaviour school is closely associated with the governance school, and takes as its premise that the project as a temporary organization is a social system, and includes several areas focused on organizational behaviour (OB), team building and leadership, communication, and more recently human resource management (HRM).

Pioneering work in this school was done by Galbraith (1973) on designing complex organizations, and Youker (1977) on organizational alternatives for project management, in which we believe that Youker coined the term 'projectized organization' (p. 47). Other pioneering works include studies extending OB research to the project environment. These works include studies on conflict management in temporary organizational systems (Wilemon 1973) and managing conflict in project life cycles (Thamhain and Wilemon 1975). Subsequently Thamhain (2004) has extensively researched working in project teams, and more recently research has begun to investigate working in virtual project teams (Massey et al. 2003; DeLisle 2004).

In the 1980s, work was done on project start-up (Fangel 1987) both from a perspective of project planning and team formation and maintenance (Turner 2009). Project Managers have a reputation for being task focused rather than people focused (Turner and Müller 2006). A seminal work on bringing a people focus to project management was Graham (1989). In the early 1990s researchers became interested in the leadership skills of project managers (Briner et al. 1996, first published in 1990; Pinto and Trailer 1998), and recently Müller and Turner (2007) demonstrated that different profiles of leadership are needed for different types of projects. Pinto (1996) researched power and politics in projects, and Müller and Turner (2005) investigated communication between the project manager and sponsor from an agency theory perspective. Pitsis et al. (2003) studied a significant portion of the Sydney 2000 Olympic infrastructure and concluded that the project was a success, and that problems that arose were largely focused on social rather than on technical issues. Other significant research includes examination of the influence of goals, accessibility, proximity and procedures on cross-functional cooperation and perceived project outcomes (Pinto et al. 1993), deployment of dynamic capabilities within the resource-based view of the firm to enhance new product development and other organizational processes (Eisenhardt and Martin 2000), team dynamics in Six Sigma projects (Eckes 2002), and cross-cultural issues in project management (Anbari et al. 2004).

Research has now shifted from strictly OB view on projects to HRM view. Huemann et al. (2007) and Turner et al. (2007) researched HRM on projects and in project-oriented organizations. They found that project-oriented firms need to adopt new HRM practices specific to the project and different HRM practices in the line when compared to traditional HRM theory.

Research continues into the workings of virtual project teams, and HRM in project-oriented organizations. Cross-cultural issues and potential synergistic and antagonistic effects on project teams are important areas for research, particularly in view of the growing diversity of project teams, globalization, and global sourcing of project work. Research can also address knowledge management and knowledge sharing issues in view of the temporary nature of project workers who, upon completion of the project, are released and dispersed throughout the organization or may leave the organization entirely and take their knowledge with them.

The success school: the project as a business objective

This school focuses on the success and failure of the project. Project success literature describes two major components of project success:

- *Project success factors*. The elements of a project that can be influenced to increase the likelihood of success; the independent variables that make success more likely.
- *Project success criteria*. The measures by which we judge the successful outcome of a project; the dependent variables which measure project success. These are the business objectives we wish to achieve from the project.

Wateridge (1995) suggests that the project manager should identify the success criteria for the project, from them determine appropriate success factors to deliver those criteria, and then choose an appropriate project management methodology. Jugdev and Müller (2005) published a comprehensive review of this school. There has been a shift in emphasis in the project success literature from the 1970s to the present day. Early on the focus for success criteria was achieving time, cost and performance objectives, and it was felt that the greatest contribution to success was in the planning and control of the project—this is in line with the optimization school. Now it is accepted that a much wider range of stakeholders have a view on project success, and a much wider range of factors from project initiation to project commissioning and ensuing operations have an impact on its perceived success— this is in line with the governance and process schools.

Considerable research has been conducted on the factors that affect the success and failure of projects and project management. The first statement in modern project management of what causes project success and failure was made in Andersen et al. (2004, first Norwegian edition 1984), followed by Morris and Hough (1987), who studied several major projects from the 1960s, 1970s, and 1980s in the UK to identify how people judged success and what elements contributed to success. Another seminal study was the work of Pinto and Slevin (1987), who examined critical factors for project success.

This area continues to provide fertile grounds for research. Recent studies have investigated the relationship between the success of new product development projects and balancing firmness and flexibility in the innovation process (Tatikonda and Rosenthal 2000), and further refined our understanding of success factors and success criteria (Cooke-Davies 2002; Turner and Müller 2005). Other research has examined the relationship between project success and the implementation of the PMO (Dai and Wells 2004), use of project management software (Bani-Ali et al. 2008), and project risk management practices (Voetsch et al. 2005). Other studies showed that teamwork quality is significantly associated with team performance, and assessed the effects of collaborative processes within and between teams on overall project performance, quality, budget, and schedule (Hoegl et al. 2004). Other works have addressed project management maturity (Kerzner 2001, 2006), the relationship of capabilities to best practices and to project, program and portfolio outcomes (Project Management Institute 2003), and the relationships between project management and the Six Sigma method (Kwak et al. 2006). Recently, a major research study was completed to understand how project management is applied within organizations and the value it provides to the organizations that use it. This global, multi-year study, was sponsored partially by PMI® and was conducted by an international team of 48 researchers. The study demonstrated unequivocally that project management delivers value to the organizations that implement it. "More than half of our case study organizations demonstrate tangible value being realized as a result of their project management implementation (p. 350)… Most organizations demonstrate intangible value as a result of their project management implementation (p. 351)… Almost every organization that participated in a case study within this research project received some degree of value whether tangible, intangible, or both as a result of their project management implementation. For many of those organizations, the level of value was quite high (p. 356)." (Thomas and Mullaly 2008, p. 356). However, the study cautioned that for many organizations that received value from their project management implementation, there was no assurance that such value would be sustained. For such organizations, there is a question as to whether value would continue to grow or begin to decline. The causes of this "included attitudes that perceived project management as being 'done' and something that required no further investment, changes in the market or competitive conditions of the organization, changes in oversight and involvement by executives or parent organizations and loss of key resources that were originally responsible for the implementation." (Thomas and Mullaly 2008, p. 357). Research can continue to further refine our understanding of success factors, success criteria, stakeholder satisfaction with project outcomes, causes of failure of projects and programs, and approaches to ensure sustainability of the value of project management.

The decision school: the project as a computer

This school focuses on factors relevant to the initiation, approval, and funding of projects as well as factors relevant to project completion, termination, and conclusions about their success or failure. This approach addresses economic, cultural, and political rules that cause investments in projects. It encompasses issues

considered in the application of SSM in project management, and considers the ambiguity surrounding decision-making in the pre-project fuzzy environment.

There are two focuses of this school. The first is on the decision-making processes in the early stages of projects. In particular, why certain decisions are made, and the impact this has on the overall project. Much of the research has focused on major project disasters, what led to them, and whether these disasters were avoidable (Morris and Hough 1987; Morris 1997). Flyvbjerg (2006) investigated optimism and political bias in the early decision making processes to explain the continued underestimating of project out-turns. The other focus of this school is on information processing in projects. Winch (1989, 2002a, b) takes the view that a project is a vehicle for processing information and reducing uncertainty in the process. This links to the process school, the project is a process for processing information, and to the success school, processing information enables us to make better decisions, which is a success factor. Winch (2002a,b) links this view to the importance of decision-making and sense-making at end of stage reviews, and reducing uncertainty there. As such, this school of thought brings project management research a full circle to its optimization and decision making roots while considering various issues that affect organizational decisions.

Current research is addressing factors affecting initial estimates of cost and time required to accomplish project objectives to the level of expected quality, and methods for handling deliberately optimistic estimates and improving such estimates (Flyvbjerg 2006; Morris and Hough 1987, Williams 2002), the relationship of the organization's portfolio of projects and programs to its strategy (Artto et al. 2001), as well as factors affecting inclusion of projects and programs in the organization's portfolio and the ongoing refinement of such portfolio (Morris and Jamieson 2004).

The process school: the project as an algorithm

This school became popular in the late 1980s, particularly in Europe. The premise is to define structured processes from the conceptual start of the project to achieving the end objectives. Turner (2009) suggests that project management is about converting vision into reality; you have a vision of some future state you wish to achieve, and project management is a structured process, a road map, which takes you from the start to the desired end state. Winch (2002a) suggests that through this process we convert desire into memory. The project is like an algorithm that helps you solve the problem of how to get to that desired future state. Proponents include Turner (2009), Gareis (2005), and Meredith and Mantel (2006, first published in 1985). The emphasis of Turner's books is on defining the process to follow to achieve the project's objectives. He also defines processes for managing scope, organization, quality, cost, time, risk, project life-cycle, and management life-cycle. Gareis argues for process management and bases the maturity and benchmarking models he developed (Gareis and Huemann 2007), including the project-oriented company and project-oriented society models, on defining processes for the elements of project management. Meredith and Mantel (2006) organize various project management processes around the project life cycle as the primary organizational guideline. As such, project life-cycle and management life-cycle

belong to this school. Winch (1989, 2002a, b) advanced this school by taking an information processing approach to managing construction projects. Bendoly and Swink (2007) extended this approach to the effect of information on post-task sense-making and suggested that greater visibility of situational information impacts project outcomes by affecting the project manager's actions and perceptions. Several elements of the *PMBOK® Guide* derive from this school, particularly the concepts of project life-cycle, management processes, integration management, and the management of quality and risk. Turner (2006b) also showed that the governance of projects implies the project and management life-cycles, and processes for managing the project functions (Turner 2006b, c, d).

A current area of research is project categorization (Crawford et al. 2005; Shenhar and Dvir 1996, 2004) which suggests different processes to be applied to different categories of projects. Research in this area can continue into the extensions of categorization systems of projects, and the effectiveness and refinements of processes used to manage various categories of projects in different environments, as well as project audits and post project reviews aimed at improvement of project management processes in the organization.

The contingency school: the project as a chameleon

This school recognizes the difference between different types of projects and project organizations, considers the approaches most suitable for various project settings, and adapts project management processes to the needs of the project. It stresses that every project is different, and so the management approach and leadership style adopted need to be adapted to the needs of the project. Significant early research included work on project typology (Shenhar and Dvir 1996; Turner and Cochrane 1993) and more recently on project categorization systems to ensure alignment of capability with strategy (Crawford et al. 2005, 2006), and on the different competencies and leadership styles required to manage different types of projects (Müller and Turner 2007). Crawford et al. (2005, 2006) showed that project categorization systems have two main elements:

1. the purposes for which the projects are categorized,
2. the attributes used to categorize projects.

Most organizations undertaking projects have two main reasons for categorizing projects:

1. to align projects with strategic intent, and so prioritize projects for assigning resources, that is to choose to do the correct projects,
2. to assign and develop appropriate capabilities to manage those projects selected, that is to do the chosen projects correctly.

This approach asserts that an organization's ability to manage complex new projects is related to its ability to remember factors associated with past successes. It considers limitations on this ability due to classifications systems that have evolved over time, rather than being actively designed through a logical, organized categorization process. Further research in this school should clarify the project

management approaches most suitable for different project settings and methods for adapting the organization's existing approaches to various types of projects, and highlight interactions between success factors and criteria, project management approaches, and project categories.

The marketing school: the project as a billboard

This school focuses on the identification of stakeholders and client needs, stakeholder management (McElroy and Mills 2007), formation of project organizations, interactions between clients and contractors, and internal marketing of the project to the organization (Cova and Sale 2005; Foreman 1996). Research also addresses marketing the project to its customers (Pinto and Rouhainen 2001), and selling project management to senior executives (Thomas et al. 2002). This research addresses the disconnect between the tremendous growth in project management and its impact on increasing productivity and bottom line earnings, and the view of project management by some senior-level executives (and some academics in business schools) that it is not something of value to them.

Future research in this school may investigate the integration of strategic and tactical components of business success, address the linkages between strategic goals and project objectives, and investigate effective approaches for alignment of project management with the perspective of senior executives that focuses on strategic issues (Mintzberg 1990) and their common view of project management as an operational/tactical matter. Research can highlight the value of recognizing that everything an organization does is based on previously completed projects, and what it will do in the future is based on the projects it currently does. Research can also investigate customer relationship management in project management, as well as public and media relations in the context of the temporary project organization.

Interactions between project management schools of thought

The discussion above indicates that there is a fair amount of distinction yet overlap in research in various project management schools of thought. Our aim in separating them is to gain insight into current and potential research in each area, but we should not lose sight of their inevitable interactions. After all, all these schools are aiming to understand various perspectives of the same thing—project management:

- Governance defines the objectives of the project, success criteria. Governance defines project review points along the process.
- The success school defines what has to be marketed. The project has to be marketed to the organization, client(s), and governance council.
- Success provides the vision for the process. The process provides a path for making decisions directly and through appropriate model(s). The process is a model of the project.
- Success provides the objectives for optimization and the objectives for decision-making.

- Governance influences the nature of OB and HRM in the project. Behaviour of the project team needs to be included in the models, and makes every project different. The nature of the project also influences how success will be judged. The nature of the project influences what has to be optimized and how it will be optimized.
- Modelling helps us to optimize the project. Modelling helps us to make better decisions.
- The decision school provides guidance for improved decision-making. Over time, better decisions at various levels support the success of projects, strengthen the competitive position of organizations, and ultimately enhance the well-being of society.

Conclusions

We have shown that modern project management is a relatively young academic discipline with its roots in Operations Research. After borrowing tools from that discipline and bar (Gantt) charts from Operations Management, project management research was mainly inward-looking for as much as 30 or 40 years. However, as Table 1 illustrates, the development of research in the nine schools led the project management research community to interact strongly with other areas of management. Project management has benefited from progress in research in many areas of management, and has adopted ideas developed in other management disciplines, to apply them to the management of complex projects conducted in a dynamic environment. Project management has thus grown beyond its origins in Operations Research and management science. Project management has also contributed to other fields of management. It is used in strategy, marketing, innovation, change, information, and technology management, amongst others. There is significant interest in project management in the field of information technology management, exploring the various factors affecting the success or failure of systems development projects.

We have summarized in Table 2 the key idea and the key variable or unit of analysis in each of the nine schools of project management research. We have discussed promising areas of productive research in each school, throughout the paper. These areas include:

1. EVM and its extensions to forecasting project completion time, the earned schedule method, integration of planning and control of various project parameters, in particular scope, time, cost, quality, and risk, and the relationship of project management to the operational life cycle of the completed project.
2. Integration of hard systems and soft systems methodologies for modelling the total project management system, including optimization of multiple objectives under multiple constraints, consideration of various forces in the internal and external project environments, as well as formulation and adoption of

lessons learned from previous and ongoing projects to enhance the total system and the approaches used for modelling it.

3. Effective governance of projects, programs, and portfolios, project and program selection, portfolio refinement and management, effective organization and functions of the project management office (PMO), project support office (PSO), and project management centre for excellence (PMCE), governance of project coalitions, the role of regulatory compliance in project management, and ethical responsibility.

4. The workings of virtual project teams, HRM in project-oriented organizations, cross-cultural issues and their potential synergistic and antagonistic effects on project teams, knowledge management and knowledge sharing issues in view of the temporary nature of project workers.

5. Further refinements of our understanding of success factors, success criteria, stakeholder satisfaction with project outcomes, causes of failure of projects and programs, and approaches to ensure sustainability of the value of project management.

6. Factors affecting initial estimates of cost and time required to accomplish project objectives to the level of expected quality, and methods for handling and improving deliberately optimistic estimates, the relationship of the organization's portfolio of projects and programs to its strategy, as well as factors affecting decisions related to the inclusion of projects and programs in the organization's portfolio.

7. Extensions of categorization systems of projects, and the effectiveness and refinements of processes used to manage various categories of projects in different environments, as well as project audits and post project reviews aimed at improvement of project management processes in the organization.

8. Clarification of the project management approaches most suitable for different project settings and methods for adapting the organization's existing approaches to various types of projects, as well as interactions between success factors and criteria, project management approaches, and project categories.

9. The integration of strategic and tactical components of business success, the linkages between strategic goals and project objectives, and effective approaches for alignment of project management with the perspective of senior executives that focuses on strategic issues, as well as customer relationship management in project management, and public and media relations in the context of the temporary project organization.

10. Clarification of the interactions between the nine schools of project management research and with other management disciplines.

Project management is an identifiable field of study. We illustrated its diversity and richness as evidenced by nine schools of thought. Project management continues to draw on and make contributions to other fields of management. We have outlined the research trends in the nine schools of project management thought, highlighted promising areas of productive research in each of them, and shown that they will continue to draw strongly on other areas. We also expect that they will continue to make contributions back in return.

References

Alderman, N., Ivory, C., McLoughlin, I., & Vaughan, R. (2005). Sense-making as a process within complex service-led projects. *International Journal of Project Management, 23*, 380–385.

Anbari, F. T. (1985). A systems approach to project evaluation. *Project Management Journal, 16*(3), 21–26.

Anbari, F. T. (2003). Earned value project management method and extensions. *Project Management Journal, 34*(41), 12–23.

Anbari, F. T., Carayannis, E. G., & Voetsch, R. J. (2008). Post project reviews as a key project management competence. *Technovation: The International Journal of Technological Innovation, Entrepreneurship and Technology Management, 28*(10), 633–643.

Anbari, F. T., Khilkhanova, E., Romanova, M., & Umpleby, S. (2004). Managing cultural differences in international projects. *Journal of International Business and Economics, 2*, 267–274.

Andersen, E. S., Grude, K. V., & Haug, T. (2004). *Goal directed project management*. London: Kogan Page.

Archibald, R. D., & Villoria, R. L. (1967). *Network-based management systems (PERT/CPM)*. New York: Wiley.

Artto, K. A., Martinsuo, M., & Aalto, T. (Eds.). (2001). *Project portfolio management: Strategic management through projects*. Helsinki: Project Management Association of Finland.

Artto, K. A., Martinsuo, M., Gemünden, H. G., & Murtoaro, J. (2009). Foundations of program management: A bibliometric view. *International Journal of Project Management, 27*, 1–18.

Association for Project Management. (2004). *Directing change: A guide to governance of project management*. High Wycombe, UK: Association for Project Management (APM). Retrieved on April 9, 2007 from http://www.apm.org.uk/Governance2.asp.

Association for Project Management. (2006). *APM body of knowledge* (5th ed.). High Wycombe: Association for Project Management.

Atkinson, R. (2006). Guest editorial: Excellence in teaching and learning for project management. *International Journal of Project Management, 24*, 185–186.

Atkinson, R. W., Crawford, L. H., & Ward, S. (2006). Fundamental uncertainties in projects and the scope of project management. *International Journal of Project Management, 24*, 687–698.

Audet, M. (1986). Le procès des connaissances de l'administration. In M. Audet & J. L. Malouin (Eds.), *La production des connaissances de l'administration* (pp. 23–56). Québec: Les Presses de l'Université Laval.

Bani-Ali, A. S., Anbari, F. T., & Money, W. H. (2008). Impact of organizational and project factors on acceptance and usage of project management software and perceived project success. *Project Management Journal, 39*(2), 5–33.

Barnes, M. (1983). How to allocate risks in construction contracts. *International Journal of Project Management, 1*, 24–28.

Bendoly, E., & Swink, M. (2007). Moderating effects of information access on project management behavior, performance and perceptions. *Journal of Operations Management, 25*, 604–622.

Bredillet, C. N. (2004a). *Theories and research in project management: Critical review and return to the future*. Thèse de Doctorat, Lille School of Management (ESC Lille), France.

Bredillet, C. N. (2004b). Understanding the very nature of project management: A praxiological approach. *Proceedings of PMI Research Conference* [CD], London. Newtown Square: Project Management Institute.

Briner, W., Hastings, C., & Geddes, M. (1996). *Project leadership* (2nd ed.). Aldershott: Gower.

Brooks, F. P. (1995). *The mythical man-month* (20th anniversary ed.). Boston, MA: Addison Wesley.

Checkland, P. (1972). Towards a systems-based methodology for real-world problem solving. *Journal of Systems Engineering, 3*(2), 87–116.

Cicmil, S., Williams, T., Thomas, J., & Hodgson, D. (2006). Rethinking project management: Researching the actuality of projects. *International Journal of Project Management, 24*, 675–686.

Cleland, D. I., & King, W. R. (1983). *Systems analysis and project management* (3rd ed.). New York: McGraw-Hill.

Cooke-Davies, T. J. (2002). The "real" success factors on projects. *International Journal of Project Management, 20*, 185–190.

Cova, B., & Sale, R. (2005). Six points to merge project marketing into project management. *International Journal of Project Management, 23*, 354–359.

Crawford, L. H. (2007). Developing individual competence. In J. R. Turner (Ed.), *The Gower Handbook of Project Management* (4th ed., pp. 677–694). Aldershot: Gower.

Crawford, L. H., Hobbs, J. B., & Turner, J. R. (2005). *Project categorization systems: Aligning capability with strategy for better results*. Newtown Square: Project Management Institute.

Crawford, L. H., Hobbs, J. B., & Turner, J. R. (2006). Aligning capability with strategy: Categorizing projects to do the right projects and do them right. *Project Management Journal, 37*(2), 38–50.

Crawford, L., & Pollack, J. (2004). Hard and soft projects: A framework for analysis. *International Journal of Project Management, 22*, 645–653.

Dai, X. C., & Wells, W. G. (2004). An exploration of project management office features and their relationship to project success. *International Journal of Project Management, 22*, 523–532.

Delisle, C. L. (2004). Contemporary views on shaping, developing and managing teams. In P. W. G. Morris & J. K. Pinto (Eds.), *The Wiley guide to managing projects* (pp. 983–1013). New York: Wiley.

Eckes, G. (2002). *Six Sigma team dynamics: The elusive key to project success*. New York: Wiley.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal, 21*, 1105–1121.

Eisner, H. (2008). *Essentials of project and systems engineering management* (3rd ed.). New York: Wiley.

Fangel, M. (Ed.). (1987). *Handbook of project start-up: How to launch projects effectively*. Zurich: International Project Management Association.

Flyvbjerg, B. (2006). From Nobel prize to project management: Getting risks right. *Project Management Journal, 37*(3), 5–15.

Foreman, S. (1996). Internal marketing. In J. R. Turner, K. V. Grude, & L. Thurloway (Eds.), *The project manager as change agent* (pp. 116–125). London: McGraw-Hill.

Forrester, J. W. (1961). *Industrial dynamics*. Cambridge: MIT Press.

Galbraith, J. R. (1973). *Designing complex organizations*. Boston: Addison-Wesley Longman.

Gareis, R. (2005). *Happy projects!*. Vienna: Manz.

Gareis, R., & Huemann, M. (2007). Maturity models for the project oriented company. In J. R. Turner (Ed.), *The Gower Handbook of Project Management* (4th ed., pp. 183–208). Aldershot: Gower.

Garland, R. (2009). *Project governance: A practical guide to effective project decision making*. London: Kogan Page.

Gass, S. I., & Assad, A. A. (2005). *An annotated timeline of operations research: An informal history*. New York: Springer/Kluwer Academic Publishers.

Gerwin, D., & Ferris, J. S. (2004). Organizing new product development projects in strategic alliances. *Organization Science, 15*, 22–37.

Grabher, G. (2004a). Temporary architectures of learning: Knowledge governance in project ecologies. *Organization Studies, 25*(9), 1491–1514.

Grabher, G. (2004b). Learning in projects, remembering in networks? *European Urban and Regional Studies, 11*(2), 103–123.

Graham, R. J. (1989). *Project management as if people mattered*. Bala Cynwyd: Primavera Press.

Harrison, P. D., & Harrell, A. (1993). Impact of 'adverse selection' on managers' project evaluation decisions. *Academy of Management Journal, 36*, 635–643.

Hjørland, B. (1998). The classification of psychology: A case study in the classification of a knowledge field. *Knowledge Organization, 25*(4), 162–201.

Hobbs, J. B., & Aubry, M. (2007). A multi-phase research program investigating project management offices (PMOs): Results of phase 1. *Project Management Journal, 38*(1), 74–86.

Hoegl, M., Weinkauf, K., & Gemuenden, H. G. (2004). Interteam coordination, project commitment, and teamwork in multiteam R & D projects: A longitudinal study. *Organization Science, 15*, 38–55.

Huemann, M., Keegan, A. E., & Turner, J. R. (2007). Human resource management in the project oriented company: A critical review. *International Journal of Project Management, 25*, 312–320.

Institution of Civil Engineers. (1995). *The engineering and construction contract* (2nd ed.). London: Thomas Telford.

Institution of Civil Engineers. (1999). *Conditions of contract: Measurement version* (7th ed.). London: Thomas Telford.

International Project Management Association. (2006). *International competency baseline* (3rd ed.). Zurich: International Project Management Association.

Jamieson, H. A., & Morris, P. W. G. (2007). Implementing strategy through programs of projects. In J. R. Turner (Ed.), *The Gower Handbook of Project Management* (4th ed., pp. 27–46). Aldershot: Gower.

Jensen, M. C. (2000). *The theory of the firm: Governance, residual claims, and organizational forms.* Cambridge: Harvard University Press.

Jugdev, K., & Müller, R. (2005). A retrospective look at our evolving understanding of project success. *Project Management Journal, 36*(4), 19–31.

Kerzner, H. (2001). *Strategic planning for project management using a project management maturity model.* New York: Wiley.

Kerzner, H. (2006). *Project management best practices: Achieving global excellence.* New York: Wiley.

Kerzner, H. (2009). *Project management: A systems approach to planning, scheduling, and controlling* (10th ed.). New York: Wiley.

Kwak, Y. H., & Anbari, F. T. (2008). *Impact on project management of allied disciplines: Trends and future of project management practices and research.* Newtown Square: Project Management Institute.

Kwak, Y. H., Wetter, J., & Anbari, F. T. (2006). Understanding the interrelationships between project management and Six Sigma method. *Proceedings of PMI Research Conference* [CD], Montreal, Canada. Newtown Square: Project Management Institute.

Lundin, R. A., & Söderholm, A. (1995). A theory of the temporary organization. *Scandinavian Journal of Management, 11,* 437–455.

Massey, A. P., Montoya-Weiss, M. M., & Hung, Y. T. (2003). Because time matters: Temporal coordination in global virtual project teams. *Journal of Management Information Systems, 19*(4), 129–155.

McElroy, W., & Mills, C. (2007). Managing stakeholders. In J. R. Turner (Ed.), *The Gower Handbook of Project Management* (4th ed., pp. 757–778). Aldershot: Gower.

Meredith, J. R. (2002). Developing project management theory for managerial application: The view of a research journal's editor. *Proceedings of PMI Research Conference 2002: Frontiers of Project Management Research and Application* [CD], Seattle, WA. Newtown Square: Project Management Institute.

Meredith, J. R., & Mantel, S. J, Jr. (2006). *Project management: A managerial approach* (9th ed.). New York: Wiley.

Midler, C. (1995). "Projectification" of the firm: The Renault case. *Scandinavian Journal of Management, 11,* 363–376.

Mintzberg, H. (1990). Strategy formation: Schools of thought. In J. W. Frederickson (Ed.), *Perspectives on strategic management* (pp. 105–209). Boston: Ballinger.

Morris, P. W. G. (1997). *The management of projects* (2nd ed.). London: Thomas Telford.

Morris, P. W. G., & Hough, G. H. (1987). *The anatomy of major projects: A study of the reality of project management.* Chichester: Wiley.

Morris, P. W. G., & Jamieson, H. A. (2004). *Translating corporate strategy into project strategy: Achieving corporate strategy through project management.* Newtown Square: Project Management Institute.

Müller, R., & Turner, J. R. (2005). The impact of principal agent relationship and contract type on communication between project owner and manager. *International Journal of Project Management, special issue: What is project business, papers from IRNOP, 6*(23), 398–403.

Müller, R., & Turner, J. R. (2007). Matching the project manager's leadership style to project type. *International Journal of Project Management, 25,* 21–32.

Neal, R. A. (1995). Project definition: The soft-systems approach. *International Journal of Project Management, 13,* 5–9.

North, S. M. (1987). *The making of knowledge in composition: Portrait of an emerging field.* Upper Montclair, NJ: Boynton/Cook Publishers.

Pinto, J. K. (1996). *Power and politics on projects.* Newtown Square: Project Management Institute.

Pinto, M. B., Pinto, J. K., & Prescott, J. E. (1993). Antecedents and consequences of project team cross-functional cooperation. *Management Science, 39,* 1281–1297.

Pinto, J. K., & Rouhainen, P. J. (2001). *Customer-based project organizations.* New York: Wiley.

Pinto, J. K., & Slevin, D. P. (1987). Critical factors in successful project implementation. *IEEE Transactions on Engineering Management, 34,* 22–27.

Pinto, J. K., & Trailer, J. W. (1998). *Leadership skills for project managers.* Newtown Square: Project Management Institute.

Pitsis, T. S., Clegg, S. R., Marosszeky, M., & Rura-Polley, T. (2003). Constructing the Olympic dream: A future perfect strategy of project management. *Organization Science, 14*, 574–590.

Pollack, J. (2007). The changing paradigms of project management. *International Journal of Project Management, 25*, 266–274.

Project Management Institute. (2003). *Organizational project management maturity model (OPM3®)*. Newtown Square: Project Management Institute.

Project Management Institute. (2008). *A guide to the project management body of knowledge (PMBOK® Guide)* (4th ed.). Newtown Square: Project Management Institute.

Rentz, P. S. (2007). *Project governance: Implementing corporate governance and business ethics in nonprofit organizations*. Heidelberg: Physica-Verlag.

Sauer, C., & Reich, B. H. (2007). Guest editorial: What do we want from a theory of project management? A response to Rodney Turner. *International Journal of Project Management, 25*, 1–2.

Shenhar, A. J., & Dvir, D. (1996). Toward a typological theory of project management. *Research Policy, 25*, 607–632.

Shenhar, A. J., & Dvir, D. (2004). How projects differ, and what to do about it. In P. W. G. Morris & J. K. Pinto (Eds.), *The Wiley guide to managing projects* (pp. 1265–1286). New York: Wiley.

Slack, N., Chambers, S., & Johnston, R. (2006). *Operations management*. London: Financial Times/Prentice Hall.

Söderlund, J. (2002). On the development of project management research: Schools of thought and critique. *Project Perspectives, 8*, 20–31.

Söderlund, J. (2004). Building theories of project management: Past research, questions for the future. *International Journal of Project Management, 22*, 183–191.

Sterman, J. D. (2000). *Business dynamics: Systems thinking and modeling for a complex world*. New York: Irwin McGraw-Hill.

Tatikonda, M. V., & Rosenthal, S. R. (2000). Successful execution of product development projects: Balancing firmness and flexibility in the innovation process. *Journal of Operations Management, 18*, 401–425.

Thamhain, H. J. (2004). Linkages of project environment to performance: Lessons for team leadership. *International Journal of Project Management, 22*, 533–544.

Thamhain, H. J., & Wilemon, D. L. (1975). Conflict management in project life cycles. *Sloan Management Review, 16*(3), 31–50.

Thomas, J., Delisle, C., & Jugdev, K. (2002). *Selling project management to senior executives: Framing the moves that matter*. Newtown Square: Project Management Institute.

Thomas, J., & Mullaly, M. (2008). *Researching the value of project management*. Newtown Square: Project Management Institute.

Turner, J. R. (2004). Project contract management: Incomplete in its entirety. *Construction Management and Economics, 22*(1), 75–83.

Turner, J. R. (2006a). Editorial: Towards a theory of project management: The nature of the project. *International Journal of Project Management, 24*, 1–3.

Turner, J. R. (2006b). Editorial: Towards a theory of project management: The nature of project governance and project management. *International Journal of Project Management, 24*, 93–95.

Turner, J. R. (2006c). Editorial: Towards a theory of project management: The functions of project management. *International Journal of Project Management, 24*, 187–189.

Turner, J. R. (2006d). Editorial: Towards a theory of project management: The nature of the functions of project management. *International Journal of Project Management, 24*, 277–279.

Turner, J. R. (2009). *The handbook of project based management* (3rd ed.). New York: McGraw-Hill.

Turner, J. R., & Cochrane, R. A. (1993). The goals and methods matrix: Coping with projects with ill-defined goals and/or methods of achieving them. *International Journal of Project Management, 11*, 93–102.

Turner, J. R., Huemann, M., & Keegan, A. E. (2007). *Human resource management in the project-oriented organization*. Newtown Square: Project Management Institute.

Turner, J. R., & Keegan, A. E. (2001). Mechanisms of governance in the project-based organization: The role of the broker and steward. *European Management Journal, 19*(3), 254–267.

Turner, J. R., & Müller, R. (2003). On the nature of the project as a temporary organization. *International Journal of Project Management, 21*, 1–8.

Turner, J. R., & Müller, R. (2005). The project manager's leadership style as a success factor on projects: A review. *Project Management Journal, 36*(2), 49–61.

Turner, J. R., & Müller, R. (2006). *Choosing appropriate project managers: Matching their leadership style to the type of project*. Newtown Square: Project Management Institute.

Turner, J. R., & Simister, S. J. (2001). Project contract management and a theory of organization. *International Journal of Project Management, 19*, 457–464.

Umpleby, S., & Anbari, F. T. (2004). Strengthening the global university system and enhancing projects management education. *Review of Business Research, 4*, 237–243.

Voetsch, R. J., Cioffi, D. F., & Anbari, F. T. (2005). Association of reported project risk management practices and project success. *Project Perspectives, 27*, 4–7.

Walker, D. H. T., Cicmil, S., Thomas, J., Anbari, F. T., & Bredillet, C. (2008). Collaborative academic/practitioner research in project management: Theory and models. *International Journal of Managing Projects in Business, 1*(1), 17–32.

Wateridge, J. H. (1995). IT projects: A basis for success. *International Journal of Project Management, 13*, 169–172.

Wilemon, D. L. (1973). Managing conflict in temporary management systems. *Journal of Management Studies, 10*(3), 282–296.

Williams, T. (2002). *Modelling complex projects*. Chichester: Wiley.

Williams, T. (2005). Assessing and moving on from the dominant project management discourse in the light of project overruns. *IEEE Transactions on Engineering Management, 52*, 497–508.

Williams, T. M. (2007). Project modelling. In J. R. Turner (Ed.), *The Gower Handbook of Project Management* (4th ed., pp. 587–599). Aldershot: Gower.

Winch, G. M. (1989). The construction firm and the construction project: A transaction cost approach. *Construction Management and Economics, 7*(4), 331–345.

Winch, G. M. (2002a). *Managing construction projects: An information processing approach*. Oxford: Blackwell Science.

Winch, G. M. (2002b). Rethinking project management: Project organizations as information processing systems? *Proceedings of PMI Research Conference 2002: Frontiers of Project Management Research and Application* [CD], Seattle, WA. Newtown Square: Project Management Institute.

Winch, G. M. (2006). The governance of project coalitions: Towards a research agenda. In D. Lowe & R. Leiringer (Eds.), *Commercial management of projects: Defining the discipline* (pp. 323–324). Oxford: Blackwell.

Winter, M. (2006). Problem structuring in project management: An application of soft systems methodology. *The Journal of the Operational Research Society, 57*, 802–812.

Winter, M., & Checkland, P. (2003). Soft systems—A fresh perspective for project management. *Proceedings of the Institution of Civil Engineers: Civil Engineering, 156*(4), 187–192.

Winter, M., Smith, C., Morris, P. W. G., & Cicmil, S. (2006). Directions for future research in project management: The main findings of a UK government funded research network. *International Journal of Project Management, 24*, 638–649.

World Bank. (2008). *Little Data Book*. Washington, DC: International Bank for Reconstruction and Development/The World Bank, Development Data Group.

Yeo, K. T. (1993). Systems thinking and project management—Time to reunite. *International Journal of Project Management, 11*, 111–117.

Youker, R. (1977). Organization alternatives for project managers. *Management Review, 66*(11), 46–53.