# The Evolution of Project Management Thinking

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## Abstract

Increasingly, organizations and individuals are organizing themselves around projects essential to their business activity. Project management research and practice has been evolving as a response to this approach to the organization of work. This paper reports on a study of the evolution of project management thinking. A historical perspective on the approaches to the art and science of project management is presented using a systematic review methodology. The objective of the review presented in the paper is to verify how project management and related research have evolved over the years and to identify related trends. The systematic review reported herein is intended to define an improved framework for the management of software projects in particular.

*Keywords:* Project, Project Management Thinking, Ideas, History, Project Management Evolution.

## Introduction

Organizing the work as projects has been an increased phenomenon in our society. Organizations and individuals are organizing themselves around projects. We have become a project-oriented society. Project management research and practice has been evolving as a response to this fact.

This paper aim is to report on a systematic review on project management (PM) thinking evolution. A historical perspective on PM thinking is presented using a systematic review methodology as a starting point. This systematic review is part of a research program which objective is to study and theorizing about software projects, looking for new paradigmatic ways to manage such particular projects. Instrumental PM approaches are not sufficient for a high flexible, uncertain, innovative and loosely defined artefact as software. By analyzing now the evolution of PM thinking one expects to make better research decisions in the future towards a more effective understanding and management of software projects.

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As proposed by Hazebroucq and Badot (1997) historical lens facilitates the understanding of the improvements made in project management research and practice. As cited by (Lehmann, 2010) a historical perspective was followed as most diachronic studies convey new ideas and develop innovation in research (Langley & Royer, 2006).

In this paper, the focus of interest is on thinking and research, not on specific trend topics (as in Crawford et al. 2006). PM education, although important, is not in the scope of the present paper and will be the subject of a future study.

After this contextualization, project management thinking is defined. The methodology used for literature review is then presented. The evolution of project management thinking, the larger part of the paper, is presented in the sequel. Trends in PM thinking and research implications are addressed. Finally, conclusions and comparisons with similar works are presented.

## Thinking and People

In the narrowest sense, an idea is just whatever is before the mind when one thinks. Very often, ideas are construed as representational images; i.e. images of some object. In other contexts, ideas are taken to be concepts, although abstract concepts do not necessarily appear as images (Audi, 2008). Many philosophers consider ideas to be a fundamental ontological category of being. The capacity to create and understand the meaning of ideas is considered to be an essential and defining feature of human beings. In a popular sense, an idea arises in a reflex, spontaneous manner, even without thinking or serious reflection, for example, when we talk about the *idea* of a person or a place (Wikipedia, 2010a).

In this paper the term *project management thinking* is used to refer to PM ideas and concepts, theories, methods (techniques, tools), standards and contributing areas. Similarly to Wren (1994), project management thought is the existing body of knowledge about the process of project management, its functions, purpose, and scope. *Evolution of project management thinking* is a temporal perspective of project management thinking; how ideas, concepts, theories, methods and standards have been evolving over time.

As thinking is a feature of human beings, talking about thinking is also talk about the life of people (and organizations) who originated the thinking (ideas). Ideas and thinking show a great influence of their times. In particular, a context formed by economic, social and political aspects was and is important in the flow of thinking (Wren, 1994). However, it is not in the scope of the present investigation an analysis of this context and the life (biography) of people associated with the ideas presented here.

### 3. Research Methodology

The choice of the methodological approach was guided by the objective to show a historical perspective (evolution) of PM thinking based on the existing literature. In this context, a systematic review was performed to identify meaningful source of information (data).

A systematic review (SR) is a summary of research that uses explicit methods to perform a thorough literature search and critical appraisal of individual studies to identify valid and applicable evidence. It is often applied in the biomedical or healthcare context, but systematic reviews can be applied in any field of research. Selection or *screening of articles* for inclusion is usually performed by reviewing the titles and abstracts of the articles identified, and excluding those that do not meet eligibility criteria. It often, but not always, uses statistical techniques (meta-analysis) to combine these valid studies, or at least uses grading of the levels of evidence depending on the methodology used (Wikipedia, 2010b). Systematic reviews may be applied to: (i) summarize existing evidence about a phenomenon; (ii) identify gaps in existing research; (iii) provide a framework to position new research; (iv) assist with the generation of new hypotheses; (v) conduct a literature review (thorough and unbiased) (Travassos *et al.*, 2006). Systematic reviews aim to synthesize existing research fairly (without bias), rigorously (according to a defined procedure) and openly (ensuring that the review procedure is visible to other researchers).

The objective of the conducted SR was to verify, based on the literature, how PM thinking and PM research has been evolving. Also, it was expected to identify trends in PM thinking and PM research. As mentioned before, the SR is in the context of a research program that aims to define a new framework for PM (in particular for software projects). Thus, it is expected to collect information to help define this framework and to identify its dimensions.

Defining a new framework for PM is a challenging endeavour. PM thinking and PM research evolution have been deemed as a suitable starting point. Identifying agendas, research issues, practical problems and thinking is an expensive process. Furthermore, if this is not clearly identified and understood, the future framework may not be relevant. Thus, the current work aims to answer the following research questions: (i) how PM thinking and PM research have been evolving? and (ii) what are future perspectives for PM thinking and research? The rest of this section presents the SR research protocol and the studies (papers) selection result.

The following keywords were defined for source of information identification: *project*, *project management*, *project management directions*, *project management history*, *project management philosophy*, *project management research*, *project management researchers*, *project management thinking*, *project management rethinking*. A set of 38 studies were available before the systematic review. The following application areas will benefit from the systematic review results: project management, management. Professional types that will benefit: project management researchers, project managers,

managers, project management professional associations. A qualitative analysis was performed as meta-analysis. The following sources selection criteria were defined: ISI indexed journals; project management journals; management journals; online availability; search mechanisms availability.

The source selection phase ended with a list of 50 journals, 5 conferences and 4 sources for books. After evaluation the following journals were selected: International Journal of Project Management (IJPM); Project Management Journal (PMJ), previous Project Management Quarterly; Research Policy (RP); Scandinavian Journal of Management (SJM). Although books databases and conferences were not included in the source list, they were used in an indirect way via citations in the papers of the journals selected and the initial list of studies. Searching the selected sources a total of 1,000 papers were found[2] (IJPM: 227; PMJ: 430; RP: 267; SJM: 76). From those 157 were selected (IJPM: 48; PMJ: 63; RP: 20; SJM: 26). The following criteria were used for paper selection: shows how PM thinking and PM research has been evolving; contributes to identify some trends in PM thinking and PM research; shows/signals future perspectives for PM research; contributes with a theory, method or application in the PM field. Taking into account the initial set of documents, a total of 258 documents were selected.

An additional analysis was performed towards reducing the total number of selected studies. The following steps were then performed. First, a temporal structure (timeline) was defined. A five decades decomposition (1960-2009) was defined and the best 10 contributing papers in each decade were investigated (Kloppenborg & Opfer, 2002). Two time periods, the years before 1960 and the year 2010, were also considered. Second, a citation impact analysis was performed in order to help the selection of papers for each decade. Harzing 'Publish or Perish' software was used (Harzing, 2010). Finally, as a third step, a subjective analysis was conducted using: (i) inclusion criteria previously defined; and (ii) paper analysis (title and abstract reading, paper browsing). The quantitative result from this additional analysis is showed in Table 1.

Finally, each one of the 55 papers resulting from the SR selection phase was read entirely. Other studies (as books and other papers) – cited in the selected papers or present in the initial existing set of studies (before the SR) – were also read (indirect studies). Relevant parts of each paper read were then selected. A subset of the collected data will be presented in the next section.

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[2] For large search results only the first 200 records were included.

**Table 1.** Final paper selection quantities.

| Period | Papers found | Papers selected |
| --- | --- | --- |
| Before 1960 | 0 | 0 |
| 1960-1969 | 1 | 1 |
| 1970-1979 | 2 | 2 |
| 1980-1989 | 16 | 14 |
| 1990-1999 | 44 | 10 |
| 2000-2009 | 171 | 19 |
| 2010 | 16 | 9 |

## Evolution of Project Management Thinking

This section presents a subset of the data collected from the studies selected in the SR (including the indirect studies). A chronological sequence is followed. This result presented here is a selection of parts (text) of the original works. However some parts were edited for presentation purposes only.

### Before 1960

Project management and project management thinking have been in continuous evolution for a long time. Projects are not new elements. See, for example, major projects as the great pyramids of Giza (2560 BC), the Parthenon (447-438 BC), the US Transcontinental Railway (1863-1869) and the Transatlantic Cable (1854-1866).

**Taylor** ideas and achievements – scientific management principles (1911) – was a milestone for management and, later on, for the whole development of project management as it is still perceived today. Also **Fayol**´s administrative activity, involving plan, organize, command, coordinate and control, had a great influence on how projects are managed today. For example, Project Management Institute (PMI) PMBOK´s project phases and process groups – initiating, planning, executing, monitoring and controlling, and closing (Project Management Institute, 2008) – are very similar to Fayol´s administrative activity functions. **Adamiecki**'s work (1896) on harmonograms and **Gantt** in creating the Gantt-chart (1919) are also important in understanding the ideas at the time: relate production tasks and its progress on time. The inclusion of the time dimension is perhaps the most relevant aspects of Adamiecki and Gantt contributions (Wren, 1994).

World War II (1939-1945) posed new challenges regarding production management. The war effort in the US gave the opportunity for application of the management tools developed in the first half of the twenty century. During the first two periods of the Cold War (1947-1962) the networking diagramming methods were developed: **CPM (1957) and PERT (1957)**. Projects are networked sets of tasks. Project and project management were then better understood and detached from management of production line systems.

Systems thinking (1950) opened a new stream to be explored to solve management problems. However, at that time, there was no application to project management. **Drucker**´s management by objectives (1955), launched in the management context, later influences PM settings. In particular, the project manager is seen as the project executive and direct to the delivery of project´s results. Several big projects certainly started to build a practical knowledge which in later decades would contribute to the project management body of knowledge: Empire State Building (1930-1931), Hoover Dam (1931-1936), Pentagon Building (1940-1941), Polaris Missile (1956-1961), etc.

**1960-1969**

The development of the Cost/Scheduling Control System Criteria (C/SCSC) approach by the US federal government has produced some good results (**Archibald** & Villoria, 1967). CPM and PERT were applied in real projects during the 1960s as the quotation below about the Montreal´s Expo 67 illustrates:

*Apr 28, 1967 - To get Expo built in time, Churchill used the then new project management tool known as the critical path method (CPM). On April 28, 1967, opening day, everything was ready, with one exception: Habitat 67, which was then displayed as a work in progress[3].*

Developments in the field of project management in the 1960s also included the formation of two major professional associations (Stretton, 2007): IPMA (INTERNET at that time), in 1965, and PMI, in 1969. This was a clear indication of a strong practicing activity associated with the project management discipline. The disciplines of systems analysis (SA) and system engineering (SE) gave the main thought stream for the decade, which built into a called systems approach to project management. **Cleland** and King´s book (1983) is a good reference for that thinking stream. Among big projects of this decade one can cite: Expo 67 (1962-1967) and the Mercury, Gemini and Apollo programs (1961-1969).

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[3] Source: http://en.wikipedia.org/wiki/Expo_67.

**1970-1979**

**Galbraith**´s model of project management (Galbraith, 1971) is one of many models (Wideman, 2003) which appeared to formalize the management of projects. The main idea is to view project management as a process.

Shenhar (1996) notes a focus on teamwork as a defining feature of project management in the 1970s, while Stretton (2007) notes an emphasis on breakdown structures and systems concepts. Project organizational context matters. In particular the organizational structure alternatives to accommodate project execution were a common subject of study. A combination of functional and project-based structures gave rise to matrix arrangements. Many of the distinctive project management techniques which were developed or refined during the 1970s appear to owe much to the rational problem-solving approaches which were characteristic of the systems concepts of the time. These include WBS (Work Breakdown Structure), OBS (Organisation Breakdown Structure), responsibility assignment matrices (for example, Linear Responsibility Charts), and "earned value" methods (Stretton, 2007).

Application of project management spreads to many industries including defense, construction, pharmaceuticals, chemicals, banking, accounting, advertising, law, state and government agencies, and the United Nations (**Kerzner**, 1979). Systems analysis and systems engineering continues to be the base for thoughts on PM.

**1980-1989**

Mintzberg´s adhocracy structure (1983) is an indication of the strong influence of the project management discipline on the project host organization. A broader understanding of projects starts to emerge, as illustrates by Hogberg and Adamsson (1983):

> *"PM is not an exact science following given laws or established rules. It is, rather, a task which is largely based on human relations and the specific knowledge, experiences, character and cultural background of each individual."*

Project management organizational structures are a recurrent theme. **Goldratt** (1984) introduces the theory of constraints (TOC). A milestone is Larson and Gobeli paper (Larson & Gobeli, 1985) where terms used by academicians to define PM structures (matrix, dispersed systems, bipolar management, and phase V) could not be identified by practitioners.

Technology has been playing an important role in many aspects of projects. This decade saw the popularization of the PC (personal computer) and the start of the internet. Löwstedt (1985) calls for the need for new frameworks for investigating the significance of the technology for the design of organizations.

*The* **Guide to the Project Management Body of Knowledge** (PMBOK Guide) was first published by **PMI** as a white paper in 1987.

Archibald positions projects as vehicles for strategic growth (Archibald, 1988). This is a new relevant line of thought: projects in a more strategic context. So far projects have been seen as operational arrangements. Projects having similar characteristics are often grouped into programs and a sound strategic management of the future growth of an organization requires selecting the right growth projects (Archibald, 1988). In Kumar (1989) the important issue of early planning is addressed. However Kumar presents no justification for the strategies and philosophies proposed, which were based on a particular project for the construction sector.

A systems approach to strategic project management is presented by **Milosevic** (1989). The paper addresses a systems model of strategic project management which can help the project manager improve the project results. As motivation Milosevic mentions that while numerous models have been developed providing operational project management support (**WBS**, CPM, the earned value concept, RAM – Responsibility Assignment Matrix, etc.), there is a strong need for a model that addresses a systems view on strategic project management. In Milosevic´s proposed model the environment is detached from the project management system (PMS). However, the question on how to comprise the elements of the environment is posed. Inputs and outputs are results of an exchange of materials, energy and information between the PMS and other systems. The PMS is only a subsystem of a larger system.

Desktop software tools for PM started to appear, as a consequence of a shift from mainframe/minicomputers platforms to the PC, which scaled the use of such tools.

**1990-1999**

Voropajev and Scheinberg (1992) state that the development of PM methods and tools for the 21st century is a current problem, the solving of which should become a large international R&D project (the PM-XXI programme). Methods and tools for the startup phase have lately been actively developed for medium and large technical and organization projects. It is necessary to modify these methods for national and international programmes, especially in the economic and social spheres.

In the most cited paper of the 1990s, James Barker provided an ethnographic account of how an organization's control system evolved in response to a managerial change from hierarchical, bureaucratic control to concertive control in the form of self-managing teams (Barker, 1993)[4]. Contrary to some proponents of such systems, concertive control did not free these workers from Weber's iron cage of

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[4] This paper was in the initial set of papers.

rational control (Weber, 1978). He said that while his old supervisor might tolerate someone coming in a few minutes late, for example, his team had adopted a "no tolerance" policy on tardiness and that members monitored their own behaviors carefully. The irony of the change in this post bureaucratic organization is that, instead of loosening, the iron cage of rule-based, rational control, as Max Weber called it, actually became tighter.

**Yeo** (1993) brings the relevance of **systems thinking to project management**. Systems thinking emerged as one of the most important intellectual disciplines, and it has provided a powerful mental frame of reference in understanding problem situations and in guiding day-to-day decision making. The practice of project management has its origin in systems analysis and systems engineering. Systems analysis requires the setting of clear and credible objectives and the formulation of viable alternatives. Systems engineering (SE) is goal-seeking, and emphasizes communication and feedback control. Yeo´s paper purpose is *to build bridges to link project management with the extended body of knowledge in systems thinking, incorporating the soft systemic methodology*. According to Yeo there has been, however, a gradual shift in emphasis in systems thinking from the structured, or hard, 'systematic' approach in the 1950-60s to a soft 'systemic' approach in the 1970-80s'. Finally, the author suggests that it is time to reunite project management with the extended body of knowledge in systems thinking.

In (**Lundin** & **Söderholm**, 1995), the second most cited paper of the 1990s, the authors state that the idea of the firm as an eternal entity possibly came in with the era of industrialism. In any case, the practical consequences of this idea contrast sharply with many ideas about projects and temporary organizations. Mainstream organization theory is based upon the assumption that organizations are or should be permanent; theories on temporary organizational settings (e.g., projects) are much less prevalent. The article addresses the need for a theory of temporary organizations, thus seeking to supplement traditional project management wisdom. Some components of such a theory are suggested by elaborating on certain ideas about projects. "Action", as opposed to "decision", is one such component which is central to a theory of the temporary organization. The role of "time" in the firm is different as compared to its role in the temporary organization.

**Packendorff** (1995) makes a critical investigation of the present body of knowledge in project management, and proposes an alternative research agenda concerning research methods, theories and foci for further empirical studies. "The WBS serves the same purpose as specialization and division of labor in mass production planning: to assign different tasks to different people by identifying controllable action sequences. The problem of the project as being de facto a multifaceted phenomenon, contingent on the nature of the task and environmental characteristics, has received only sporadic attention in the project management literature". The impact on empirical research is thus yet to come. Accordingly to

Packendorff projects are seen as tools, not as organizations. The concept of temporary organization is given. A temporary organization: (i) is an organized (collective) course of action aimed at evoking a non-routine process and/or completing a non-routine product; (ii) has a predetermined point in time or time-related conditional state when the organization and/or its mission is collectively expected to cease to exist; (iii) has some kind of performance evaluation criteria; (iv) is so complex in terms of roles and number of roles that it requires conscious organizing efforts (i.e. not spontaneous self-organizing). Common denominators of some theoretical areas for further exploration of the reality of project management are: (i) that different types of project will require different theories; (ii) that extensive empirical fieldwork is required in order to build these theories; and (iii) that a diversity of theories and perspectives will enhance our understanding of projects as compared to the single viewpoint of rational management. Time limits and projects may also be described as social constructions; by putting "brackets" around a certain sequence of action in the past, a slice of order can be cut out of a complex stream of events. To understand the processes of collective action in projects would take us a step further, relative to the rather superficial leadership theories.

**Partington** (1996) states that project management is increasingly used to manage organizational change initiatives and there is evidence of the use of inappropriate systems for the management of such projects. This may be contributing to the failure of many projects of organizational change, which is widely reported and for which poor management is frequently blamed. *He examines the forces for change to a project-based approach to management and considers potentially productive new directions for project management research in the context of organizational change.* An important idea found in Partington´s paper is that 'prescribed systems of management are seldom transferable'.

The purpose of **Shenhar** and **Dvir** (1996) is to address some of the theoretical issues of project management and to suggest a two dimensional taxonomy of projects and their management styles. In spite of the growing use of the project management practice, as the authors say, most research literature on the management of projects is relatively young and still suffers from a scanty theoretical basis and a lack of concepts. Shenrar and Dvir quote **Pinto** and Covin (1989): "the prevailing tendency among the majority of academics has been to characterize all projects as fundamentally similar," and, "the implicit view of many academics could be represented by the axiom: 'a project is a project is a project'". In spite of the existing universal line of thought, real projects often exhibit extensive differences. Their findings suggest that projects have indeed a wide range of variations and that, in contrast to Pinto and Covin's quote, "a project is not a project is not a project". Technological uncertainty emerged as the dominant factor affecting projects' characteristics, and its four different levels exhibit distinct patterns of managerial styles and practices of management. An explicit, clear identification of the project type prior to execution should

provide a basis for a proper adaptation of managerial attitudes and for a better selection of managerial tools. Such an adaptive approach may increase the probability of project success and contribute to better organizational effectiveness. Yet another source of uncertainty may be the extent of project equivocality and the difficulty to precisely articulate customer requirements. Some project missions are not well-defined, causing often a change in project scope at mid-course.

The publication of the first edition of the PMBOK by PMI (1996) is a milestone in this decade. Project management is structured in nine knowledge areas. Some processes, as *Project Human Resource Management*, are superficial reflecting a more systems-oriented approach in the standard.

In (Dawson, 1997) the focus is a methodological issue (processual research method). As "real-world" examples of company experience, processual case studies are able to tell their own story of the way change unfolds in practice, and how the substance, context and politics of change all interconnect and overlap in shaping the dynamic odyssey of workplace change. As such, processual research offers the possibility for widening our interpretations through enabling the presentation of complex change data. It was argued that there can be no substitute for researchers "getting their hands dirty" in doing research.

Dvir et al. (1998) try to answer two questions: is there a natural way to classify projects and what are the specific factors that influence the success of various kinds of projects? Perhaps one of the major barriers to understanding the reasons behind the success of a project has been the lack of specificity of constructs applied in project management studies. Many studies of project success factors have used a universalistic approach, assuming a basic similarity among projects. The purpose of this study is to combine the theory of project success factors with the search for a natural project classification. However, unlike previous research which presented a given construct and then identified specific factors for each type, this research first search for an appropriate classification scheme using linear discriminant analysis and then uses this classification in order to identify specific project success factors for different classes of projects.

Lechler (1998), in a detailed analysis, shows the primary importance of 'people' in project success. This analysis indicated a growing trend to recognize the "human" side of project management as crucial to project success.

The Japan Project Management Forum (JPMF) is founded in December 1998 as a division of the Engineering Advancement Association of Japan (ENAA) to promote project management in Japan. Later (in 2005) it combines with the Project Management Professionals Certification Center (PMCC) to form the Project Management Association of Japan (PMAJ).

In (Evaristo & Fenema, 1999) the objective is, first, to introduce a typology of new forms of project management. Rooted in existing project management literature, the model comprises two core dimensions capturing the essence of new challenges to project management: single versus multi-site projects and single versus multiple projects. Second, the paper identifies patterns of evolution of projects across three

levels across project forms. The framework and evolution model serve as a guideline for practitioners to map the type of project they are engaged in, and to determine which critical issues arise in different types of projects. New methods and tools can be developed that fit in different types of projects. Second, the model supports researchers in project management to structure research and considers how their expertise fits in the typology.

Several very big projects take place in this decade including The Millennium Bug, The Three Gorges Dam (China) and The Channel Tunnel Rail Link (UK).

**2000-2009**

In (**Hobday**, 2000) – the most cited paper in the 2000s – the aim is to identify some of the features of the project-based organization (PBO) by looking in depth at how CoPS projects are managed in one large PBO, comparing this with CoPS produced in a functional division of the same company. The purpose of taking a 'bottom up' project perspective is to explore the dynamics of project structures, processes, and performance in the PBO vs. a functional organization. CoPS are the high-technology, business-to-business capital goods used to produce goods and services for consumers and producers. e.g., the avionics systems for aircraft. Using a case study approach, the paper compares the efficiency and effectiveness of the functionally-oriented, matrix organization with the PBO, pointing to both the strengths and weaknesses of the PBO in the management of CoPS.

Nightingale (2000) proposes that technologies are constructed by following a set of interrelated problem solving tasks that constrain the range of possible innovation processes. The author develops a framework that links products to their innovation processes, to show how the complexity of systemic capital goods produces specific innovation problems that are not typically found in other settings. By linking knowledge, technology and organization, the paper explains how both design uncertainty and the number of redesign feedback loops can be reduced, but not eliminated, producing a shorter more cost effective development process. Finally, the framework argued that complex capital goods have specific innovation management problems that are not found to the same extent in simple products.

In (Prencipe & Tell, 2001) the aim is to discuss the learning abilities of project-based firms. The authors study whether and how project-based firms are able to capitalize on knowledge that is acquired during the execution of one project and their ability to transfer it to other projects or parts of the organization. The focus is on CoPS.

In (White & Fortune, 2002) the findings on a survey designed to capture the 'real world' experience of people active in project management is reported. A survey was conducted with a questionnaire being sent to 995 project managers representing 620 organizations in both the public and private sectors in the UK. Of the 995 questionnaires that were sent out in the main survey, 236 were returned (23.72% response

rate). The three criteria used for judging project success most cited in the literature (on time, to budget, to specification) were also the highest ranked success criteria identified in the survey. However, they were not the sole criteria by which project outcome was judged; the fit between the project and the organization and the consequences of the project for the performance of the business were also reported as important criteria.

Steyn (2002) illustrates the use of the theory of constraints (TOC) (Goldratt, 1984) to areas as project risk management and project cost management. The possibility of apply TOC to project selection is suggested for further investigation. So far TOC was applied in scheduling of single project to reduce project duration and simplify project control (Goldratt, 1997).

In (**Cooke-davies** & Arzymanow, 2003) the results of an investigation into the nature and extent of variations between project management practices in six industries are presented. The investigation had the practical purpose of supporting a group of pharmaceutical R&D organizations in their search for an optimum project management model. A total of 10 'domains' was identified using qualitative methods in six industries. Each interview elicited a quantitative assessment of the practices relating to the domain, using pre-determined scales, and qualitative comments on the practices based on the experiences of the interviewee. Differences between companies and industries were found to exist in each domain. The most highly developed project management models (which might be said to equate to measure of project management maturity) were found in the Petrochemical and Defense industries, which on average scored highly on most dimensions. Other industries (Pharmaceutical R&D, Construction, Telecommunications, and Financial Services) displayed some interesting differences in different domains, but did not display the coherence or scores of the two leading industries.

In (**Engwall**, 2003), the second most cited paper of the 2000s, mentions that with few exceptions (e.g. (Brown & Eisenhardt, 1997), (Eskerod, 1998), (Hobday, 2000)), PM research has been dominated by a perspective based on "the lonely project". There are probably few organizational theorists today who would challenge the idea that external factors strongly influence the inner life of an organization. Studies with a more open systems approach to projects are rare. The paper addresses the importance of analyzing the interior processes of a project in relation to its historical and organizational context, i.e. the project's environment. Thus, this calls for an ontological change; instead of lonely and closed systems, projects have to be conceptualized as contextually-embedded open systems, open in time as well as in "space".

**Söderlund** (2004a) elaborates on a framework for the analysis of project-related research. Concepts such as the management of projects and the management by projects clearly point to the current devotion of project research to the management of project-based firms. Researchers currently occupied with the development of knowledge about projects come from such diverse disciplines as sociology, economic

geography, organization theory, organization behavior and strategic management. For instance, work has revolved around politics, complexity, change, time, and learning. This research clearly acknowledges the perspective that Packendorff (1995) labels temporary organizations without giving reference to research published in other areas on similar topics. Söderlund suggests the term ''project ecologies'' for this research's interest in the links between projects and actors (e.g., firms), the sociology of projects, in the economics of projects and in the links between project participation and company development. Research on project ecologies thus takes interest in the study of the interrelationships between projects and their environments. Lundin and Söderholm (1998), for instance, stress the importance of macro descriptors of projects in order to analyze the ''projectified society''. For Söderlund (2004b) project management has long been considered as an academic field for planning-oriented techniques and, in many respects, an application of engineering science and optimization theory. Much research has also been devoted to the search for the generic factors of project success. Project management has, however, in the last decade received wider interest from other academic disciplines. As the field rapidly expands, the need for an internal discussion and debate about project management research increases. Project management and project organization is a complex subject and, the authors argue, is usefully examined from several perspectives. The paper discusses the emerging perspectives within the project field and also presents a number of questions that project research to a greater extent should acknowledge. The questions concern issues such as why project organizations exist, how they behave and why they differ, what is the function of, or value added by, the project management unit, what determines the success or failure of project organizations? The principal argument is that too much effort has been dedicated to clarifying the reasons of project success and failure, while downplaying a number of important research questions that need to be discussed in order to further the knowledge about project management.

In (Dvir and Lechler, 2004), based on a sample of 448 projects, the interactions between three project planning variables, the quality of planning, goal changes, plan-changes and project success are analyzed. The most important results of this study are the interactions between the planning variables and their influences on project success. By using structural equation modeling, insight into these complex indirect relationships was gained. The results clearly show that the positive total effect of the quality of planning is almost completely overridden by the negative effect of goal changes. This paper is a good example of PM quantitative research.

In (Ibert, 2004) the main distinguishing feature of projects is their nature as "temporary organizations". This paper analyses the interplay of projects and their social context with regard to knowledge creation and organizational learning. The main difference between a project and a firm is their conceptions of time. The paper provides an exploratory study of one dynamic industry (software) to reveal the specific modes of organizational learning connected with projects and firms and to delineate the interplay between

these modes. The theoretically deduced assumption of a complementarity between project – and firm – specific learning modes is confronted with empirical results from the Munich software ecology.

In (Hoegl & Proserpio, 2004) how the degree of team members' proximity affects performance-relevant team collaborative processes is investigated. In this investigation, however, the authors focus on the degree to which team members are in geographical proximity (or dispersion) and identify how this affects the quality of teamwork performed. The study investigates the influences of team members' proximity on the collaboration of software development teams, operating as IT professionals with advanced technology such as Computer Aided Software Engineering (CASE) tools.

Moving beyond a "one best way" to describe the field, Tanaka (2004), in the presentation of his historical view of project management models over four generations, offers views on project management opportunities and challenges in the future. Project management models can be drawn from such attributes as project management structure and methods, socioeconomic drivers that prompt the build-up of the model in question, typical project management techniques offered by the model, primary application areas, and the mechanism for popularizing the model. Project management models are classified into seven models over the four generations. A hypothesis is that a "versatile" model (fourth generation) is forthcoming in the future in which traditional general management will have been replaced by or merged into project management.

In (**Jugdev** & **Müller**, 2005) the evolving understanding of project success over a 40 years period is assessed. Conditions for success, critical success factors and success frameworks are discussed.

In (**Winter** *et al.*, 2006), the opening paper of the IJPM special issue on Rethinking Project Management, the results of a UK's research network called "Rethinking Project Management: Developing a New Research Agenda" are presented. The RPM Network, between 2004 and 2006, defined five new directions for future research which indicates, in essence, the need for new thinking in the areas of project complexity, social process, value creation, project conceptualization and practitioner development. In essence, the Network has found there needs to be a much greater focus in future research on concepts and theories closely resonating with these realities, to provide practitioners with practical concepts and approaches more in alignment with contemporary thinking. The final heading, theory in practice, is essentially a reference to how practitioners learn their craft, and how they actually practice their craft using relevant theory from the published literature on project management.

In (**Cicmil** *et al*, 2006) a controversial position regarding PM research is put forward. Accordingly to the authors we know very little about the ''actuality'' of project based working and management. *The aim of the paper is to formulate and map a strand of research within the project management field that adequately addresses the 'actuality' of project based working and management*. A framework for

conceptualization of 'project actuality' is proposed. Project management practice is seen as a social conduct, defined by history, context, individual values and wider structural frameworks. Researching the actuality of projects means focusing on social process and how practitioners think in action, in the local situation of a living present. This work represents a shift towards a praxis-based theory and research, which focuses on the empirical reality of projects by taking into account different contexts in which project management is enacted, thus addressing complexity, non-linearity, values, multiple perspectives and social processes in project environments. Researching the actuality of projects, therefore, consists of 'gathering, analyzing, and disseminating knowledge about people working in concert with things, technologies, and each other and the means through which these relations are coordinated and controlled, for what ends' (Clegg & Ross-Smith, 2003). The paper, by referring to a set studies in the literature, shows that competent practitioners have a much broader and more intellectually complex understanding of project management than the discourse embedded in the PMBOK Guide – but that they feel they must apologize for using some of the ''virtuoso'' skills as they are not recognized in the traditional discourse. This implies an alternative view on *managerial knowledge and competencies, challenging the traditional image of 'professional' project manager as thinking, purposive, decisive, and rational*. Cicmil and Hodgson (2006) address the need by identifying space outside of the tightly-defined and densely populated conceptual landscape of mainstream project management where other perspectives, other concerns, and other agenda may be articulated and explored. Fundamental questions are posed as a guide to the reflection on how projects are conceived and how they could be conceived: is there a universal explanation of what projects are and how projects evolve? What is the meaning behind the concepts in use, that is, terms such "project", "project management" and "project success"? What are the implications of the "mainstream" definitions of "project"' and "project management" for the nature of knowledge and the intellectual foundations of studies of project-based organising, work, and management? What are the consequences of project organising as currently prescribed, both for project managers and project workers? What alternative perspectives upon projects exist beyond the mainstream? Whose interests are being served by the reproduction of the status quo in the field? Not only are projects considered suitable ways to control endeavours in a turbulent environment, but also more importantly, they are regarded as the appropriate way to stimulate a learning environment and enhance creativity so as to deliver complex products (Hobday, 2000). Despite the inherent contradiction between these two arguments for project-based organizing (Tjaeder & Thomas, 2000), it is precisely upon this ambitious promise to deliver both "controllability and adventure" (Sahlin-Andersson & Söderholm, 2002) that the attraction of organizational "projectification" is found. The resulting drive towards the professionalization of the project management discipline has been accompanied by the struggle and tensions involving in

conceptualizing, promoting and agreeing on the universally acceptable document that should outline the formal body of project management knowledge.

Searching for diagnoses and prescriptions for fundamental project management questions, Cicmil and Hodgson pointed out that was mainly in the 1990s that critical analysis of social and political power associated with projects as organizational and social arrangements, and project management as a practice and as a social grouping emerged. The arguments turn toward critical management studies, outlining the implications of this intellectual tradition for studies of projects, project management, project performance, and individual skills and competencies to cope with social arrangements labeled "projects". Making projects critical is the new trajectory proposed. Cicmil et al. (2009), after a characterisation of the background and ambitions of critical project research, introduce six papers comprising a special issue of ephemera entitled *Project management behind the façade*. As 'windows in the façade of project management' they all contribute new insights into the realities of project work practice and new theoretical outlooks that can inspire future critical research on these practices.

Regarding PM thinking and research the 2000 decade was the most productive and diverse so far. Several very big projects take place in this decade as the Airbus 380, Boeing 787 Dreamliner.

**2010**

In (Sage *et al.*, 2010) the authors start presenting a short synopsis of the 'Critical Projects Movement' (CPM). It then examines the reflexive approach prominent within this critical movement. Secondly, it positions these approaches within the dialectical tradition of knowledge creation. Thirdly, it draws upon dialectical critiques within critical management and organizational studies to suggest some important unexamined assumptions that have consequences for the way reflexive management has been conceptualized as central to the production of novel project-based knowledge. a divergent group of authors, but which happens to be articulated most evidently by authors self-identified as 'critical' in orientation. The intention of this paper is to provide a theoretical critical intervention, in other words, to address extant thinking about practice rather than provide an instant contribution to project management practice.

In (**Blomquist** *et al.*, 2010) the authors state that there is a need to go beyond project management models, A Project Management Body of Knowledge (PMBOK® Guide), project plans, work-breakdown structure (WBS), program evaluation and review technique (PERT), and Gantt schedules (**Maylor**, 2001) when trying to understand projects. Projects are at the most basic level an open-system organization with many contextual dependencies, as well as individual variation. This is still research about projects. But this is research on what people do in projects (practice) rather than on the confirmation of best practice models for project management. The authors argue for a practice perspective that begins with

individual actions and asks what overall models and concepts result from those actions. The aim is to outline elements for project-as-practice research and to discuss major issues that need to be addressed within this approach. The authors are not discarding the present knowledge about projects. Rather, they are suggesting a complementary approach.

In (Eskerod, 2010) **reflective thinking**, i.e. persons involved in a given activity reflecting on what they did, is acknowledged as an efficient way to facilitate leadership development (Parkes, 1998). However, research has shown that "reflection does not come naturally or even easily to most managers" and "explicit attempts to encourage adoption of learning and reflective practices through either logical explanations or development sessions have been largely unsuccessful" (Smith, 2001). Action learning may be a promising way of facilitating leadership development as it involves reflective thinking (Smith, 2001). Based on the case study, the article discusses conditions necessary to enhance competence development among project managers by action learning.

Accordingly to Lehmann (2010) matching change management (CM) to project management (PM) has become recently a new challenge for organizations: they want their changes to be more successful and see in project management a way to gain performance. By "changes as projects", he brings up the idea that (all) changes depending of their objects could be processed as projects. In his study Lehmann summarizes the two approaches – traditional and renewal schools – in project management. As in change management, these two approaches represent two poles of a continuum and are not opposite approaches. A new frame to study management of changes as projects based on three elements: mineral approach, organic approach and mixed approach is presented.

Leybourne (2010) observes a sector where project-based techniques are used extensively: the construction of high-value "superyachts". The issue of changes is a particular difficulty, as larger contracts may take 6 to 7 years from conception to launch, in an industry where some areas of the technology are changing quickly. This article therefore proposes to use a variety of data, including individual interviews with project managers and senior executives within the U.K. superyacht industry, together with project data and secondary data from within and outside the sector, to consider some of the challenges inherent in the project management of these complex projects. Within this research, however, the focus is on deviation from what is originally agreed, but often the improvisational nature of any solution is due to a need to meet delivery targets that are sometime away, indicating that bricolage is not always the predominant requirement. This generates temporal pressure within the project. This activity usually occurs toward the end of the build, resulting in compression of timescales and additional complexity, which has to be resolved. This leads us to the consideration of time in organizations. There is evidence of a reliance on experience, and the ability to draw on a pre-experiential library of previously successful improvisational interventions, which can be adapted and adjusted to meet a specific requirement to resolve a project-based

problem. Arguably, this is a shift away from the traditional project-based paradigm of "plan, then execute," but in the increasingly complex domain investigated here, where acceptance of the complex adaptive system model.

==Saynisch== (2010) arguments that fundamental changes in sciences offer new perspectives for the management of complexity. Increased complexity in society, economics, and technology requires a new and suitable organization and management. One phenomenon is the rapid growing variance of complex, new technologies (innovations) in industrial and social products (results of projects) – for example, microsystems, bio systems, nanotechnology, and their connections to "human" scale dimensions (Kroy, 2004) as well as biological or living systems with mega complex features, especially human social systems, and virtual spaces. Another phenomenon mentioned by Saynisch is the "dynamics of instability" as stated by Ervin Laszlo: the development of our world and society with its markets, technologies, people and organizations is not foreseeable (i.e., stable and linear). In real life it is unstable and non-linear. The phenomena require a new management approach. Traditional methods and mechanistic thinking lose their efficiency. The results of the long range research program (started in 1990) *Beyond Frontiers of Traditional Project Management* are presented. The concept of "project management second order", as a main result of the research program, is discussed.

In (Skulmoski & Hartman, 2010) the soft competencies by project phase that information systems (IS) project managers require for project success are investigated. The authors conducted 33 qualitative interviews to collect data from a sample of 22 IS project managers and business leaders located in Calgary, Alberta, Canada. The authors identified the key competencies for each of the IS project phases (initiation, planning, implementation, and close-out). The competencies were sorted into competency categories: personal attributes (e.g., eye for details), communication (e.g., effective questioning), leadership (e.g., create an effective project environment), negotiations (e.g., consensus building), professionalism (e.g., lifelong learning), social skills (e.g., charisma), and project management competencies (e.g., manage expectations). Each of the most important competencies is discussed and interconnections among competencies identified.

## Project Management Thinking: Trends and Research Implications

Figure 1 summarizes ideas and concepts, project management "theories", contributing areas, methods and techniques, standards and professionalization identified in this study.

Based on the results of the SR data collection a project management timeline is proposed. This timeline illustrates clearly the main developments over the investigated period and is presented in Figure 2. A synthesis of the main characteristics of each one of the five periods investigated was also prepared.

The study of the evolution of PM thinking was an intellectual and reflective endeavour which gave rise to many questions. What are the current streams or schools of project management? What lies ahead in terms of research and practical issues? What the role of technology in the project process? What makes a project discipline? How project education and training should proceed? Should project management research methodologies be distinct from management research methodologies? Each one of those questions – maybe already addressed by some researchers – deserves full study themselves. In the sequel some preliminary considerations about them are made.

Many researchers follow the basic idea that the two approaches (hard and soft) to project management are complementary. For Lehmann (2010) "these two approaches represent two poles of a continuum and are not opposite approaches".

**Figure 1.** Project management thinking.

**Ideas and Concepts**

project; project management; multiproject management; project portfolio; research the actuality of projects; projects as networks; critical projects movement; hard and soft paradigms; projects as temporary organizations; dialectics considerations on reflexive versus instrumental PM; project typology and categorization; project actor focus; project success factors; sensemaking; organizing; …

**Project Management "Theories"**

transaction cost theory; contingency theory; organization theory; problem structuring methodologies; analysis tools for project contexts; theory of constraints; knowledge management; complexity theory; project networks dynamics; theory of the temporary organization; …

**Contributing Areas**

systems thinking; new product development; praxeology; systems engineering; systems analysis; …

**Methods and Techniques**

CPM; PERT; WBS; EVA; Gantt chart; …

**Standards**

PMI PMBOK; Prince2; ISO; PMI OPM3; …

**Professionalization**

PMI; IPMA; PMAJ; …

**Figure 2.** Project management thinking timeline.

1898   Adamiecki´s harmonograms

1911   Principles of Scientific Management (Taylor)

1919   Gantt´s charts

1954   Drucker´s management by objectives

1957   CPM

1957   PERT

1950   Systems thinking

1959   PDM initiated

1960s  EVM

1965   IPMA (INTERNET) created

1969   PMI created

1979   Kerzner´s book first edition

1983   First issue of International Journal of Project Management

1984   First PMP certifications were awarded

1987   PMI "The Project Management Body of Knowledge" published

1993   IRNOP created

1994   IRNOP Conference on PM and Temporary Organization

1995   New directions for project management research (Scandinavian Journal of Management)

1996   PMBOK (first edition) published

2002   Frontiers of Project Management Research (PMI)

2003    Making Projects Critical Workshops (Critical Projects Movement)

2006    RPM Network Final Report (UK EPSRC)

2009    Project Management Behind the Façade (ephemera special issue)

It is precisely upon the ambitious promise to deliver both "controllability and adventure" (Sahlin-Andersson & Söderholm, 2002) that the attraction of organizational "projectification" is found. A quantum approach to project management[5] would go towards this direction: you can have time predictability or risk control, but not both in, for example, innovative projects.

Production processes were strongly influenced by technology changes. The project process should be transformed by technology change in the next decades. New IT technologies, nano technologies, social experiences, sensor networks, neural science, new learning processes, among others may strong influences the project process. In particular information systems, seen as the main integrator and synthesizer of these technologies may play a major role. Studies of the impact of technology change on the project process (as well as on the organization) are then necessary as it can reshapes completely the project environment (Löwstedt, 1985).

Although papers were the basic source of information in this study, several books point to new directions towards the understanding of projects and their management. It is worth to cite some of them here:

- *The social psychology of organizing*, by **Karl Weick** (1979).

- *The reflective practitioner: how professionals think in action*, by **Donald Schön** (1983).

- *Sensemaking in organizations*, by Karl Weick, (1995).

- *Of grammatology*, by **Jacques Derrida** (1998).

- *Projects as arenas for renewal and learning processes*, by Rolf A. Lundin and Midler, editors (1998).

- *Making sense of the organization*, by Karl Weick (2000).

- *Projects as business constituents and guiding motives*, by Rolf A. Lundin and Francis Hartman, editors (2000).

- *Making social science matter: why social inquiry fails and how it can succeed again*, by **Bent Flyvbjerg** (2001).

- *Making projects critical*, by Damian Hodgson and Svetlana Cicmil (2006).

- *A grammar of organizing*, by Maria Bengtsson (2007).

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[5] Named after quantum mechanics.

- *Making sense of project realities: theory, practice and the pursuit of performance*, by **Charles Smith** (2007).
- *Images of projects*, by Mark Winter and Tony Szczepanek (2009).

Is there a "new thinking strand" about projects or project management? Although this is a challenge question, one can see from this study that there is a lot of investigations related to the soft approach. In particular after the RPM Network (Winter et al., 2006) and the ephemera special issue on PM (Cicmil et al., 2009), new ideas and directions started to be discussed. The publications in 2010 in both project management journals signal a trend in the direction of new ways to think about projects and their management. This new thinking considers the hard approach combined with new dimensions like social interactions, project actuality analysis, sense making, etc.

Project is the central element of study and investigations. Management is one aspect of a project. Project as an organization is a convenient concept as it can allows the exploration of all management research lines in the study of projects. The following could be possible research areas (or disciplines) for project studies: *project theory*, *project structure and design*, *project analysis (micro and macro)*, *project management*, etc. Project management is then a particular discipline (or phase) in the study and practice of projects. Project education could follow a similar structure of disciplines.

In respect to generality of project´s methods and techniques, it is suggested the introduction of universal and existential quantifiers. These quantifiers (logical "for all" and "there exists") should be used to make clear how general or specific a project theory or model is. Together with the images of projects (Winter & Szczepanek, 2009) and a quantum projects approach a new way of thinking about projects emerges.

The investigation of time (not schedule or timing) and reflexivity in organization studies may contribute to foster our understanding of projects and their management.

Researching the actuality of projects (Dawson, 1997; Cicmil *et al.*, 2006) points to a more general *project analysis* discipline than the systems analysis based approach. Concertive control by self-managing teams (Barker, 1993) represents a grand theme for further research.

Project success factors have been a topic of study often found in the two main project management journals. The suggested discipline of project analysis may be a way of structure the study of project success. This also can be combined to the project actuality research approach.

The concept of project life cycle should be enlarged, integrating with product and organization life cycle. This certainly will help to understand better project environments and the new approaches. In particular, pre-development (front-end) and new product development deserve some attention in this enlarged project life cycle view.

## Project Management Meta-analysis Studies

Before some conclusions can be drawn it is worth to compare this work with similar ones (*PM meta-analysis studies*).

Betts and Lansley (1995) analyze the first ten years of the IJPM. The characteristics of the journal carried out in the paper is divided into two five year periods, the hypothesis being that the first corresponds to the journal's formative years, and the second to its maturing period. According to the authors care needs to be taken not to confuse the development of the journal with the development of the discipline, although without doubt the development of one is closely related to the development of the other. All the papers published in the IJPM during 1983-92 were included in this study. Ten volumes were published, comprising 40 issues with 347 papers written by 352 authors from 32 countries. There were 1978 authored pages in total. The result is a quantitative analysis. Main contributions were in form of insights (61%), new techniques (15%) and model building (12%). Main subjects presented by the papers were: project organization (15%), human factors (15%), project planning (12%), project environment (12%) and conceptual models (10%). As of industry sector the main contributors were construction (54%), information/service industries (14%) and process industries (13%).

**Morris** (2000) analyzed all the 763 papers and book reviews published in the Project Management Journal, the Project Management Network, and the International Journal of Project Management between 1990 and 1999. The five most popular topics are: examples or issues relative to particular project contexts; project management in general; risk management; control; and project management competency development. The challenge of research in project management, according to Morris, is to build a broad, multi-industry, theoretically grounded, explanation of what is required to initiate and accomplish projects successfully.

Kloppenborg and Opfer, (2002) describes the methodology and results of a research effort that identified the project management research published in English since 1960. An annotated bibliography was created of 3,554 articles, papers, dissertations and government research reports. Trends were identified in each of the nine PMBOK's knowledge areas. A workshop was conducted with experienced practitioners to help interpret the identified trends and to predict future directions for project management research. Cost, time, quality and risk were the most cited knowledge areas. Plan (29%) and control (23%) were the most cited process areas. Construction (21%) and information systems (21%) the most frequently cited industries.

In (**Crawford** *et al.*, 2006) the authors uncover the trends of emphasis within the project management literature over the period 1994–2003, by analyzing articles in the IJPM and the PMJ. Trends identified in this study are then compared to trends of emphasis identified in a variety of previous studies of changes to the field. Results are based on a quantitative approach. The clearest trends uncovered by this study

include a clear reduction in focus on Interpersonal Issues and Quality Management in the project management literature over the last 10 years, while an increase in the significance of Project Evaluation and Improvement can be seen over the same period. Comparison of results from multiple studies has provided the opportunity for triangulation, and has mitigated against errors inherent in relying on a single research method. Synthesis of results revealed that Relationship Management, Resource Management, Time Management, Cost Management and Risk Management all displayed consistent significance throughout the study period. However, by contrast, Finalization, Scope and Marketing tend to either be ignored by writers on project management or identified as not being of significance. Project Evaluation and Improvement and Strategic Alignment are both increasing in their significance to the field. Evidence also suggests that the significance of Quality Management and Interpersonal Issues has peaked, and that while these issues have previously been interest to writers in the field, this interest is waning.

**Bredillet** (2008) presents, in a series of editorials articles, the results of research undertaken in order to investigate the dynamic of evolution of the field of project management. The co-word analysis technique is used. Four periods of time are studied: 1914-1987 (The Genesis of Project Management); 1988-1994 (The Rise of Project Management); 1995-2004 (The Times of Glory); 2005-2010 (Time of Maturity or Time of Inflection). In the sixth article of the series Bredillet shows the organizational cluster (subnetwork) evolution over the four studied periods. The cluster (of words) is the output of the co-word analysis algorithm. The analysis uses a four quadrants diagram. The cluster moved from an area where themes are peripheral and undeveloped (quadrant 4) to one where themes are central and undeveloped (quadrant 2). If this theme has not yet reached a status of strategic theme, the fact that it reached a status of central main theme while remaining generic (low density) is significant.

Finally, it is worth to mention the excellent editorial of **Turner** (2010). A relevant quantitative comparison for articles published in the IJPM between 1987, 1997 and 2007 is performed considering the following aspects: numbers of citations by papers; sources of papers being cited by papers; numbers and sources of citation of papers published; research methodologies used; and topics of articles. In the 20 years period from 1987 to 2007 there is a widening of the topics covered in the journal, reflecting the widening of the range of journals cited from other management fields. In 1987 there were just 25 topics covered, and the most popular was Engineering and Construction, being the subject of slightly over a quarter of the papers. In 1997 there were 33 topics covered and 54 in 2007. So there was an accelerating increase in the scope of the subject. Interest in Construction actually grew, with the number of papers covering the subject going from 26% to 33% and then to 36%. The next most popular subjects in 1997 were computer support, time management and risk management. The interest in risk management continued in 2007, but there was then a very strong interest in Partnerships and Alliances. There was also

a strong interest in Human Resource management and developing individual competence combined. Program management and portfolio management appeared in 2007.

## Conclusions and Perspectives

Some limitations of the SR process need to be stated. Additional search strings could be used ("theory", "future" are, for example, new search strings that were thought after the SR). A more independent validation of the research protocol could be performed. However, the final set of studies seemed to be adequate.

As stated earlier this research effort is part of a research program whose objective is to develop a framework for the management of software projects, looking for new paradigmatic ways to understand an manage such projects. Project analysis, categorization, complexity, innovation, knowledge construction, leadership, politics and power, social interactions, stakeholder analysis, uncertainty, and value creation are new dimensions derived from this study that should be investigated in the future. Finally, it is expected that this research work leads to a sense making process toward a better understanding of the nature of projects and their management.

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