

## EVOLUTION OF PROJECT MANAGEMENT

## KEYWORDS

Project Management • Industry-focused Innovations •  
APM Body of Knowledge Framework • Bibliometric Analysis.

## ALIREZA ABBASI

• School of Engineering and IT, University of New South Wales (UNSW)  
• Canberra, Australia  
• [a.abbasi@unsw.edu.au](mailto:a.abbasi@unsw.edu.au)

## ALI JAAFARI

• Vice President, Education Centre of Australia  
• Sydney, Australia  
• [a.jafari@gmail.com](mailto:a.jafari@gmail.com)

## 1. INTRODUCTION

Project management (PM) “has to be about delivering business benefit through projects” (Morris, 2003). And it has been shown that organizations have increasingly been using projects and programs to achieve their strategic objectives since 1950s (Morris and Jamieson, 2004). Turner et al. (2013) state that “more than 20% of global economic activity takes place as projects, and in some emerging economies it exceeds 30%” (Turner et al., 2013). They have also noted that “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” (Turner et al., 2013).

The origins of modern project management come from quantitative research in planning-oriented techniques as an application of engineering sciences and optimization theory, while more recently social scientists started to look at the organizational and behavioural aspects of project organizations (Söderlund, 2004). Project management has been considered as an academic field and one of the key management disciplines consisting of both practical/empirical research and theoretical research (Kwak and Anbari, 2009), despite historical debate in the management education community as to whether it is a practice or an academic discipline.

Project Management  
Research and

# INDUSTRY- FOCUSED INNOVATIONS

## • ABSTRACT •

This paper investigates the quantity and quality of worldwide research production in the field of project management over a period of 35 years between 1980 and 2014 to advance our understanding of the evolution of project management as a field of endeavour. We observed the evolution of this field by analysing not only the quantity of publications, but also their quality (citations) per year and compared their growth trend in four periods to track the evolutionary trends over the last 35 years. The results of our analysis confirm that project management research has changed profoundly from both a theoretical perspective and application perspective. It appears that over the four study periods, the understanding of project management as a research and scientific field has broadened substantially to include human factors, strategy and organisational dynamics and complexity management. Furthermore, the results of this study reveal that the focus of research and application fluctuates across different industry sectors which is not static and perhaps demonstrates that evolution of project management is still strong with innovations occurring virtually across all industry fronts and academia.

Publications may be used as an indicator for the recent and actual development of emerging technologies and or future potentials (Hullmann and Meyer, 2003). Presenting an overview of bibliometric studies on project management research seems warranted. Finding the active parties (e.g. institutes, countries) in this field and how the related research areas have evolved and what its current status is, is considered central to this study. Having achieved a historical perspective by applying a cross-time and multi-level analysis, we have observed the evolution of this field by analysing publications' quantity and quality (citations) per year and comparing their growth trends in four periods. In addition to publication level, we apply the same analysis at institutes and country levels. In this paper, we identify and evaluate the most productive countries and institutes in project management research. Reviewing the literature on the development of the PM as an academic field and the change of topics covered over time, reveals diverse and sometimes contradictory results. It also broadly indicates that understanding of PM has advanced from the original focus on the execution of projects and suggests a paradigm shift in both theory and practice of PM.

The structure of the paper is as follows. In Section 2, we conduct a review of the literature on the development of project management as a field of study by reviewing the contributions from both academia and industry in this field and its evolutionary trends over time. Our method of data gathering and cleansing are explained in Section 3. The next section shows the analysis of the data and discussions of the results. Section 5 identifies emerging areas of research in the field and finally the paper ends with conclusions.

## 2. LITERATURE REVIEW

Kwak (2005) reviewed the literature to capture the history of modern project management and identified four distinct periods: prior to 1958 ("Craft system to Human Relations Administration"; 1958 – 1979 ("Application of Management Science"); 1980 – 1994 ("Production Center: Human Resources"); and 1995 to 2002 ("Creating a new environment"). However, project management (PM) has two faces, as a practice and or as an academic discipline, which both continue to grow and develop (Crawford and Pollack, 2007; Kwak and Anbari, 2009) but the main focus might shift from one to another. Therefore, to study the field we will look at the literature on considering project management both as a practice and as an academic field.

### --- 2.1. PM as a practice ---

This section investigates how professional practice and industry aspects of PM has supported the development of PM as a field of study. The history of PM as a practice / profession may go back to the time the pyramids in Egypt; but development of concepts, tools and techniques, such as Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), and Work Breakdown Structure (WBS), in defence and construction industries in 1950s has been seen as the starting point for the current PM as field of endeavour and the advance of contemporary PM (Snyder and Kline, 1987; Morris, 1997). Later professional organizations such as PMI (in 1969), APM, IPMA and AIPM were formed signalling a new era to develop bodies of knowledge (Turner et al., 2013).

Starting in the 1980s scholars and practitioners in the field of information

technology and in particular software development industry showed interest and supported the development of the field. Numerous researchers have shown the involvement of these industries with the development of PM as a field of endeavour. Betts and Lansley (1993), investigating papers published in International Journal of Project Management between 1983 and 1992 (for its first 10 years), found that these mainly reviewed practical experience and literature. They also asserted that "by far the most frequently addressed industry was construction, followed by papers relating to the information and service sector and the process industries" [p. 211]. Later, Evaristo and van Fenema (1999) stated that "the current knowledge based on the management of projects emanates from large capital construction projects responsible for only 10% of the projects." In the survey conducted by Pinto and Slevin (1987a), the construction industry constituted 44% of the sample. Later studies show involvement of other industries such as services or IT.

Themistocleous and Wearne (2000) identified construction (46%) and services (30%) as the two main industry sectors in PM based on the topic coverage in journals. In a later study White and Fortune (2002) reported the portion of respondents to their survey as follows; over 25% from the IT industry, 8% from engineering and 2% construction. We speculate that these numbers might not be the real reflection of the involvement of industries as a result of "the influence of sample choice on the results" (Crawford and Pollack, 2007). Nevertheless these show the influence of new parties in the development of PM field over time. This view is in line with the findings of (Crawford and Pollack, 2007) who state: "Regardless of the 'true' breakdown of project management amongst all industry sectors, it is clear from these studies that project management practice is heavily influenced by research emanating from the construction industry."

### --- 2.2. PM as an academic field ---

This section examines the development of the PM field of study and tracks the change of topics covered over time using multiple approaches. Betts and Lansley (1993) reviewed the articles published in International Journal of Project Management (IJPM) during its first 10 years (1983–1992) and classified publications based on the industry sector, publishing countries, organisations, and institution types (e.g., universities, private practice, public sector). A broad range of PM topics has been observed in variety of industries, with construction being the leading industry. They also reported a lack of appropriate progress for the development of fundamental theoretical basis for the field. Later, Themistocleous and Wearne (2000) analysed the frequency of attention to PM 'Body of Knowledge' topics of the time in the papers published in the IJPM from 1984 to 1998. They reported topics such as Information management, risk management, project organisation and schedule management were the most attended topics; while were paid very little attention to business need and case, purchasing, marketing and sales, and no attention to project close-out.

Morris (2000) examined the most popular topics in papers and book reviews from IJPM, Project Management Journal (PMJ) and PM Network between 1990 and 1999, and reported 'project context' as the main focus followed by other topics such as procurement and the related areas of finance and contracts, project success criteria, strategy and requirement management. Urli and Urli (2000) conducted a scientometric analysis approach to identify association of keywords in the PM related papers in the ABI-INFORM elec-

tronic database published within the period 1987–1996. Their results lead to presenting the field of PM as three complementary categories: 'project management tools'; 'activity sectors'; and 'particularities of project management' (reflecting more on the areas of computers, construction, and R&D).

Reviewing PM research journal articles, PMI conference proceedings, doctorate dissertations published in English, and also US government research reports between 1960 and 1999, Kloppenberg and Opfer (2002) found that the focus had moved from development and use of automated PM software (in 1970s) and tools to risk management and earned value management (EVM) (in 1980s) and then to human resource aspects including team building and leadership (in 1990s). They also reported that the main research themes shifted from large government defence projects to commercial applications in construction, information systems, and new product development. They believe the shifts gave PM an important strategic role in industry rather than just a corporate mitigation tool in previous decades.

Söderlund (2004) suggested and discussed a number of research questions which scholars in the project management field should emphasize in order to build middle-range theories of different types of projects. Bredillet (2006) explored documents in the EBSCO Business Source Premier Database searching the keyword 'project management' in abstracts published from 1984 to 2004 and used co-word analysis to understand the main trends in the PM field. He found that these trends focus on strategic management issues, organizational issues (e.g., effective management, and/or use of resources and cost), creation of value for stakeholders, and technical issues. He concluded that PM field is becoming more focused on the implementation of organisational strategy.

Crawford et al. (2006) identified trends in project management based on reviewing previous studies which have categorised PM topics. They determined some trends as the significant PM topics if at least two studies identify the topics as significant. Their list of significant trends (topics) based on previous studies include: context/environment; information management; leadership; monitoring and controlling; performance; planning; procurement; project organisation; quality; risk; and scheduling. They also attempted to expose more recent trends (the topics which have received more emphasis) within the project management literature by investigating papers in the IJPM and PMJ published during 1994–2003, using keyword analysis and categorising 18 project management main topics including 48 individual topics. They reported "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, finalisation, scope and marketing tended to either be ignored by writers in 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 of interest to writers in the field, this interest is waning" (Crawford et al., 2006) (p. 183).

Hensman et al. (2004) reviewed the state of project management in Australia. They noted 4 major areas of focus. The first area was an attempt in the 1990's to broaden project management beyond the traditional areas of defence and construction and project delivery focus. Terms such as project-based organisations or management by projects and project culture were used to imply a field that is much broader in its reach, models and application areas than had been the case previously. Use of project management as a vehicle to achieve organisational strategy and or create new products and services demonstrated that project management principles were applicable in a variety of non-traditional areas but needed a major rethinking to unshackle it from the traditional rigidity of delivering a capital project. Many authors contributed to this new broader understanding

of project management, including Firth and Krut (1991), Gareis (1992), and Cleland (1994).

Lewis et al. (2002) found that in the "tough, dynamic, and demanding" world of new product development projects, traditional approaches proposing an either-or style of PM are no longer appropriate. Maylor (2001) in reference to the globalised and hyper competitive markets concluded that a new set of normative models of PM practice and performance are needed in place of the traditional models. Project-based management has been pivotal to success of many businesses particularly on the face of rising uncertainty, stricter regulatory requirement and changing stakeholder expectation (Jaafari, 2002).

The second area of focus places due emphasis on linking and managing pre-execution (upstream) and execution (downstream) activities within a vastly extended project life cycle. The move to extend the project life cycle beyond the execution phase suggests that the traditional focus had been rather limiting and in many instances inadequately reflected the critical importance of upstream activities, including aligning the project with the organisational strategy and meeting stakeholder needs as opposed to purely focusing on the client and contractual obligations in traditional execution driven approaches (Barnes and Wearne, 1993, Manivong and Jaafari, 1999, Jaafari and Manivong, 1999, Jaafari, 2001, Morris and Pinto, 2004).

The third area of focus is redefining project success criteria as the traditional trio success measures: time (schedule), cost (budget), scope (specification) were found to relate to the efficiency of the execution process and thus incapable of adequately characterising the underlying value of the project. A number of authors have thus defined success criteria as those that relate to the commercial value, its life cycle performance and its environmental and social impacts both positive and negative (Jaafari, 1998, Jaafari and Vlastic, 1999, Maylor, 2001, Manivong and Jaafari, 2000, Jaafari, 2000, Jaafari and Doloi, 2002).

A fourth area of focus concerns human resource management and socio-cultural and behavioural aspects of projects initially explored by (Pinto and Slevin, 1987b, Slevin and Pinto, 1986). It is now widely accepted that project managers need to learn not only the science of project management but more importantly the art of project management, the latter focusing on the human factors. The recognition that social and behavioural skills are important and can be learnt formally has come of late (Jaafari, 2003b, Jaafari, 2003a, Jaafari, 2003c). Behavioural side of PM is now perceived as critical to project success as technical and process management side (Winch, 2004, Thoms and Kerwin, 2004, Magenau and Pinto, 2004).

Turner et al. (2013) conducted an extensive review of academic research literature on PM and organized the literature into nine major schools of thought on the basis of the key premise that drives each one. These are: optimization, modelling, governance, behaviour, success, decision, process, marketing, and

contingency schools of thought. Clearly there are overlaps between the research topics of the nine PM schools and inevitable interactions (Kwak and Anbari, 2009).

More recently Pollack and Adler (2015) reviewed PM related articles considering the co-occurrence of keywords in the author keywords and to identify the emerging and fading trends of PM field and found there has been a shift in research articles in PM from “technical engineering” towards more “organisational” related studies by reporting recent trends on keywords such as ‘environmental issues’, ‘strategic planning’, ‘business and innovation’, ‘knowledge management’. Their approach appears similar to this study though they do not use a priori (predefined classification) as template rather they let data to define the classification (emergent classifications).

The literature broadly indicates that understanding of PM has enlarged beyond the original focus on the execution of projects. A comparison of state of play in the 1950’s to the current state of play implies a paradigm shift in both theory and practice of PM. The literature review is broadly supported by our bibliometric analysis described below.

1. Context	2. People	3. Delivery	4. Interfaces
<b>1.1 Governance</b>	<b>2.1 Interpersonal skills</b>	<b>3.1 Integrative management</b>	<b>4.1 Accounting</b>
1.1.1 Project management	2.1.1 Communication	3.1.1 Business case	
1.1.2 Programme management	2.1.2 Conflict management	3.1.2 Control	<b>4.2 Health &amp; safety</b>
1.1.3 Portfolio management	2.1.3 Delegation	3.1.3 Information management	
1.1.4 Infrastructure	2.1.4 Influencing	3.1.4 Organisation	<b>4.3 Human resource management</b>
1.1.5 Knowledge management	2.1.5 Leadership	3.1.5 Planning	
1.1.6 Life cycle	2.1.6 Negotiation	3.1.6 Stakeholder management	<b>4.4 Law</b>
1.1.7 Success factors & maturity	2.1.7 Team work		<b>4.5 Security</b>
1.1.8 Sponsorship		<b>3.2 Scope management</b>	
	<b>2.2 Professionalism</b>	3.2.1 benefits management	<b>4.6 Sustainability</b>
<b>1.2 Setting</b>	2.2.1 Communities of practice	3.2.2 Change control	
1.2.1 Environment	2.2.2 Competence	3.2.3 Configuration management	
1.2.2 Operations management	2.2.3 Ethic frameworks	3.2.4 Change management	
1.2.3 Strategic management	2.2.4 Learning & development	3.2.5 Requirements management	
		3.2.6 Solutions development	
		<b>3.3 Schedule management</b>	
		3.3.1 Resource scheduling	
		3.3.2 Time scheduling	
		<b>3.4 Financial &amp; cost management</b>	
		3.4.1 Budgeting & cost control	
		3.4.2 Funding	
		3.4.3 Investment appraisal	
		<b>3.5 Risk management</b>	
		3.5.1 Risk context	
		3.5.2 Risk techniques	
		<b>3.6 Quality management</b>	
		3.6.1 P3 assurance	
		3.6.2 Reviews	
		<b>3.7 Resource management</b>	
		3.7.1 Contract	
		3.7.2 Mobilisation	
		3.7.3 Procurement	
		3.7.4 Provider selection & management	

FIGURE 01. APM Body of Knowledge Framework (6 ed.) (adapted from Association for Project Management of the UK)

### 3. DATA COLLECTION AND METHODOLOGY

#### --- 3.1. Data ---

To construct the database for this study, we extracted all publications that contained “project management” in the titles or keywords or abstracts and restricting to only journal articles published in English between 1980 and 2014 inclusive using Scopus. The records have been stored in a local application (Abbasi, Altman, 2010) for further cleaning and analysis. Our database consists of 20,574 publications from a variety of areas such as Engineering, Business and Management, Computer Science, Social Sciences, Environmental Sciences, Energy, Medicine, Chemistry.

#### --- 3.2. Methodology ---

In order to understand the dynamics of the PM field we focused on the keywords of the publications and compared the trends related to four different periods: (1) 1980-1989; (2) 1990-1999; (3) 2000 – 2009; and (4) 2010-2014. Scopus provides not only the authors’ keywords but also automatically generates keywords for each publication using the words used in the title,

abstract and also title of the references in an article, known as index keywords. We merged these keywords, removed duplicates and then applied these in our analysis.

We selected the APMBok framework categories, i.e., Context, People, Delivery, Interfaces and their sub-categories (Figure 1) to code the keywords to create a map for academic publications and PM practice. After a preliminary analysis we noticed that some keywords could not be coded against any of APMBok categories; these had the common theme of being a tool or methodology or technique. So, we created ‘Tools’ as a new category. In order to find the active industries in PM, we attempted to identify the publications’ relevant industries (i.e., Civil and Built Environment, ICT, Product Development, Process Plant, Health, Education, Environment, and Defence and Space) using a combination of the relevant words. After coding the keywords of publications with either the industries or the PM areas, we generated a report to obtain the number of publications for each category and sub-categories in APMBok (including Tools) and also industries. We then ran the reports to map the PM categories against the industries to see which industries are active in which PM area.

### 4. ANALYSIS AND DISCUSSION

#### --- 4.1. Tracking “Project management” Research ---

The most popular journals, and active countries in PM have been identified in the following sections. Further, the most important and dynamic sub-disciplines within PM research are shown based on the frequency of publications and citations for a range of keywords. Figure 2 represents the number of publications per year over the 35 years period. The overall trend shows a slow increase between 1980 and 2002 (except a bump in 1996) followed by a rapid increase until 2008. Surprisingly the numbers have dropped dramatically afterwards and remain almost static since 2010.

Table 1 shows the coverage of articles in our corpus and lists the journals in a descending order of number of publications for each time period and also the overall 35 year period. As shown, in 2000s journals such as IJPM, JCEM, IEEE-TEM and IEEE Software have almost doubled their number of publications compared to 1990s. In addition, journals such as CME (Construction Management and Economics) can be seen to be ranked 3rd in total but were not

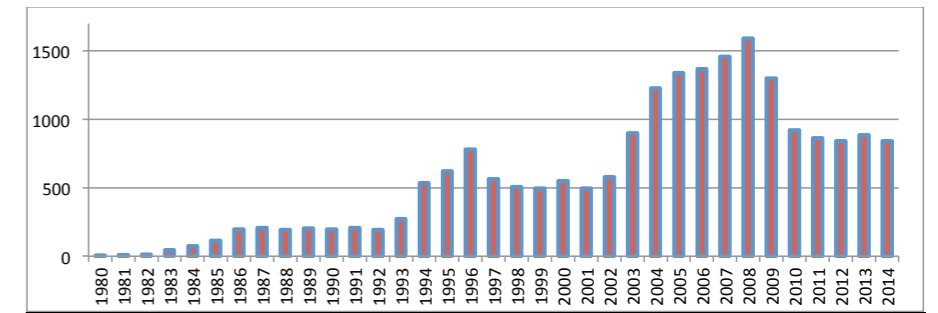


FIGURE 02. Frequency of published journal papers per year

	1980-1989	1990-1999	2000 - 2009	2010-2014	1980-2014				
Journal Name	# Pub	Journal Name	# Pub	Journal Name	# Pub				
1 IJPM	14	IJPM	292	IJPM	62	IJPM	428	IJPM	1497
2 JCEM	73	JCEM	171	JCEM	53	JCEM	203	JCEM	985
3 JME	32	JME	135	CME	29	CME	162	CME	460
4 IEEE-TEM	29	EJOR	94	JME	14	PMJ	129	JME	380
5 Comp & Indust	17	IEEE Software	64	AIC	11	AIC	81	EJOR	241
6 TRR	15	IEEE-TEM	59	IEEE	10	JME	69	IEEE-TEM	216
7 J Inst. Eng. - India	14	Railway Gazette	56	EJOR	10	ECAM	43	AIC	215
8 Info. &	14	TRR	56	IEEE-TEM	10	JCompCivil Eng	37	IEEE Software	191
9 Software Eng	14	IJHydDam	56	ECAM	99	ExpSysApp	36	JPIIEP	157
10 Data Processing	13	Military	42	JPIIEP	86	JCivEngMgt	33	ECAM	142

TABLE 01. Number of publications based on the source (journal names)

- 1. IJPM: Journal International Project Management
- JCEM: Journal of Construction Engineering and Management
- JME: Journal of Management in Engineering
- CME: Construction Management and Economics
- AIC: Automation in Construction
- TRR: Transportation Research Record
- EJOR: European Journal of Operational Research
- IEEE-TEM: IEEE Transactions on Engineering Management
- ECAM: Engineering Construction and Architectural Management
- JCivEngMgt: Journal of Civil Engineering & Management
- JCompCivilEng: Journal of Computing in Civil Engineering
- ExpSysApp: Expert Systems Applications
- JPIIEP: Journal of Professional Issues in Eng Education and Practice
- IJHydDam: International Journal of Hydropower & Dams
- J Inst. Eng: Journal of the Institution of Engineers (India): Civil Engineering Division

so active during the first three periods though it was first published in 1983. Further investigation revealed that CME increased the number of publications per year in 2000s. We suspect that the increased publication rate can partially explain the sharp increase of the number of publications between 2003 and 2008 in Figure 1.

Table 2 shows the top 20 productive countries in the PM field of study for the four periods of study and also the overall number of publication over the 35 year time period. As shown and expected the developed countries with high reputation universities such as the USA, and the UK were among the top 5 countries that produced more PM-related articles in journals during all the periods. However, the ranking of other countries does not follow a clear trend. For instance, China which ranked 12th and 18th respectively during the first two periods jumped to 6th and then 3rd respectively over the last two periods. The biggest surprises are actually for the last period as there are countries such as Iran and Malaysia which were not among the top 20 productive countries over the past 30 years but were ranked 8th and 14th respectively during the 2010-2014.

The data shows an exponential increase in the number of publications for most of the countries in the sample. For instance, US institutions were publishing about 25 publications per year on average during 1980s while the number has elevated to more than 300 publications on average per year during 2000s and about 200 during 2010-2014.

Although five industry-based institutes (i.e. Philips Research, Alcatel-Lucent Bell Labs, Manufacturing Systems, Siemens AG, and Merck & Co., Inc.) can be listed among top 20 productive institutes in the field of PM in 1980s but no industry is among the top of the list afterwards except IBM only during 1990s. This may suggest that industry played an important role in pioneering the development of this field by producing academic publications in journals while originally only few universities were involved in project management research.



Rank	1980-1989		1990-1999		2000 - 2009		2010-2014		1980-2014	
	Country	# Pub	Country	#	Country	#	Country	# Pub	Country	# Pub
1	USA	248	USA	1458	USA	3127	USA	1028	USA	5861
2	UK	92	UK	527	UK	1445	UK	485	UK	2549
3	Canada	23	Canada	173	Germany	556	China	389	Canada	991
4	Germany	22	Germany	105	Canada	555	Australia	347	Australia	937
5	India	15	Japan	84	Australia	512	Canada	240	China	863
6	Netherlands	13	Australia	75	China	443	Taiwan	201	Germany	844
7	Denmark	8	Netherland	64	France	371	Germany	161	Taiwan	585
8	Israel	8	Hong Kong	55	Hong Kong	366	Iran	132	Netherlan	558
9	Switzerland	6	India	54	Taiwan	355	Netherland	131	Hong	550
1	Japan	5	Italy	47	Netherland	350	Hong Kong	127	France	543
1	Sweden	3	France	45	Italy	323	France	125	Italy	470
1	China	3	Israel	42	Sweden	292	Sweden	109	Sweden	440
1	Italy	3	Singapore	41	Spain	290	Spain	102	Spain	409
1	Australia	3	Switzerland	37	Japan	254	Malaysia	101	Japan	389
1	Brazil	2	Sweden	36	India	219	India	99	India	387
1	France	2	Taiwan	29	South	202	South	97	South	315
1	Greece	2	Denmark	28	Finland	186	Italy	97	Finland	306
1	New	2	China	28	Singapore	179	Finland	92	Singapore	298
1	Norway	2	Finland	27	Switzerland	149	Singapore	76	Switzerlan	235
2	Portugal	2	Turkey	26	Greece	137	South Africa	73	Turkey	225

TABLE 02. Number of publications based on countries of the authors

Rank	1980-1989		1990-1999		2000 - 2009		2010-2014		1980-2014	
	Keyword	#P	Keyword	#P	Keyword	#P	Keyword	#Pu	Keyword	#Pu
1	Management	20	Scheduling	29	Construction mgt	33	Construction mgt	20	Construction mgt.	55
2	Planning	17	Planning	28	Construction	30	Risk management	11	Construction	41
3	Management	12	Construction	27	Risk mgt.	18	Construction	10	Risk management	32
4	Data processing	12	Management	24	Scheduling	14	Construction	99	Construction	24
5	Software	7	Project	23	Knowledge mgt.	13	Production	85	Scheduling	23
6	Systems	7	Project planning	21	Simulation	13	Simulation	73	Simulation	22
7	Scheduling	6	Simulation	20	PD	12	Knowledge mgt.	68	Knowledge mgt.	20
8	Risk analysis	6	Risk mgt.	19	Construction	11	Project success	62	Innovation	17
9	Software	6	software PM	19	Innovation	10	Innovation	62	PD	16
1	Expert systems	6	Risk	18	Optimization	91	Project	61	Production	15
1	Organization	6	Construction	16	design	89	Scheduling	55	Management design	15
1	Organization	6	Heuristics	15	NPD	78	IT	53	IT	13
1	Prototyping	5	quality	15	Productivity	78	Management	48	Optimization	13
1	training	5	PERT	14	Managing project	76	Project	47	Planning	13
1	Forecasting	5	training	14	Decision makin	75	Case study	47	Productivity	13
1	software project	4	PD	13	Case study	73	Sustainability	46	Case study	13
1	Control systems	4	Evaluation	13	Management	71	Performance	46	IT	12
1	Decision-making	4	Integration	13	Production	71	Critical-success	44	Decision making	12
1	Performance	3	Risk analysis	12	Inf. Systems	68	Complexity	44	Project scheduling	12
2	Systems analysis	3	design	12	Info. mgt.	68	Leadership	44	Project planning	11

TABLE 03. Most frequently used author keywords based on number of publications

Rank	1980-1989		1990-1999		2000 - 2009		2010-2014		1980-2014	
	Keyword	#Pu	Keyword	#Pub	Keyword	#Pu	Keyword	#Pu	Keyword	#Pub
1	Scheduling	196	Case study	1789	Construction mgt.	633	Construction mgt.	129	Construction mgt.	7841
2	Performance	174	IS research	1663	Construction	631	Production plannin	822	Construction industry	6992
3	Project	173	ethnography	1663	Risk mgt.	496	Risk mgt.	635	Risk mgt.	6393
4	Success	167	Interpretivist	1663	Knowledge mgt.	324	Construction	613	Scheduling	3981
5	Lagrange	155	Critical	1663	Innovation	307	Construction	509	Construction	3762
6	Integer	155	Hermeneutics	1663	Scheduling	298	Knowledge mgt.	464	Knowledge mgt.	3717
7	User	125	Field study	1663	PD	285	Project success	446	Product development	3570
8	Software	120	Performance	910	Critical success fa	285	Project performanc	416	Case study	3472
9	Software	114	Parallel	854	Construction	281	Project	390	Innovation	3382
10	Life cycle	104	MPI-2	854	Simulation	207	Simulation	373	Critical success factors	3209
11	Management	66	MPI	854	NPD	204	sustainable	323	Project scheduling	2758
12	Project	65	Portability	854	Project scheduling	200	IT	319	Simulation	2743
13	System design	65	Benchmark	854	Managing project	195	Project Portfol	312	Performance	2371
14	Risk analysis	62	Risk mgt.	777	Uncertainty	186	Critical succe	310	NPD	2339
15	Systems	61	PD	593	Software	179	Complexity	302	Productivity	2316
16	Cost overrun	60	software	567	Optimization	175	Sustainability	296	Project success	2299
17	Development	60	Scheduling	549	Learning	174	Leadership	295	Uncertainty	2288
18	System dev.	60	software PM	546	Productivity	171	Case study	291	Change mgt.	2251
19	Developmt	60	Project	533	Decision making	167	change mgt.	280	IT	2163
20	System dev.	60	Methodology	494	IT	163	China	262	Learning	2161

TABLE 04. Most cited author keywords

--- 4.2. PM Research Trends ---

In order to identify the trends during the development of the project management field, we used the keywords listed for each publication. Our assumption is that the more a keyword is used in publications the more it characterises its importance in publications of the period under consideration. Thus, we have used keyword frequency to determine the main focus of the research conducted by the scholars and practitioners during each period and how the field has evolved (developed) over time. Table 3 shows the top 20 keywords that have been used frequently during the four time periods and the overall 35 years.

The results show that the prime focus was on software/IT industry and or quantitative management of projects (e.g. tools and optimisation techniques, and estimation methods) during 1980s and 1990s. The focus seems to have shifted to construction industry, risk management and soft skills (e.g. innovation, leadership, and knowledge management) since 2000s.

It has been commonly accepted in scientometrics and bibliometrics literature that the number of citations a publication receives reflects the quality of that publication (Abbasi and Jaafari, 2013). Number of citations is thus a proxy for measuring the importance and influence of the published work. Therefore, we have repeated the analysis by listing the number of top keywords which are cited most frequently instead of keywords repeated in more publications. Table 4 shows the author keywords of PM publications and the sum of citations each keyword has received. It reflects almost similar trends to the frequency of keywords in Table 3.

Due to space limitation Tables 3 and 4 list the top 20 keywords; clearly we will miss a more extensive range of keywords due to this limitation. To analyse further the topics in PM, we attempted to code the keywords using APMBok framework categories and subcategories (presented in Figure 1) and also list of industries. As shown in Table 6, Civil-Built Environment has been the most productive industry during the 35 years with 1,630 publications followed by ICT, Product Development and Environment with 1048, 642, and 454 publications respectively. 'Context' has received the most attention in most of publications followed by 'Delivery' and 'Tools' except for ICT with more focus on 'Tools', Health and Defence - Space on 'Delivery', and Education on 'People'.

Industry vs. APMBok areas (plus Tools)

Industry/APMBok areas	Publication Count
<b>Civil-Built Environment</b>	<b>1630</b>
1. Context	801
3. Delivery	367
6. Tools	219
4. Interfaces	138
2. People	105
<b>ICT</b>	<b>1048</b>
6. Tools	417
3. Delivery	312
1. Context	272
2. People	43
4. Interfaces	4
<b>Product Development</b>	<b>642</b>
1. Context	246
6. Tools	191
3. Delivery	133
2. People	51
4. Interfaces	21
<b>Environment</b>	<b>454</b>
1. Context	297
6. Tools	66
3. Delivery	50
4. Interfaces	21
2. People	20
<b>Process Plant</b>	<b>273</b>
1. Context	120
3. Delivery	95
6. Tools	24
4. Interfaces	21
2. People	13
<b>Health</b>	<b>230</b>
3. Delivery	72
4. Interfaces	69
1. Context	37
2. People	31
6. Tools	21
<b>Education</b>	<b>110</b>
2. People	50
1. Context	41
6. Tools	15
4. Interfaces	3
3. Delivery	1
<b>Defence-Space</b>	<b>43</b>
3. Delivery	15
6. Tools	14
2. People	6
4. Interfaces	4
1. Context	4
<b>Total</b>	<b>4430</b>

TABLE 05. The frequency of publications for coded Industry and PM area keywords

As expected from the high number of publications, in almost all the PM areas Civil-Built Environment ranked as number one in terms of the number of publications, (except for 'Tools' which ICT has the most records) but interestingly Environment and Health are ranked second for 'Context' and 'Interfaces' respectively despite their low number of publications compared to other industries such as ICT and Product Development.

APMBok areas (plus Tools) vs. Industry

APMBok areas/Industry	Publication Count
<b>1. Context</b>	<b>1818</b>
Civil-Built Environment	801
Environment	297
ICT	272
Product Development	246
Process Plant	120
Education	41
Health	37
Defence-Space	4
<b>3. Delivery</b>	<b>1045</b>
Civil-Built Environment	367
ICT	312
Product Development	133
Process Plant	95
Health	72
Environment	50
Defence-Space	15
Education	1
<b>6. Tools</b>	<b>967</b>
ICT	417
Civil-Built Environment	219
Product Development	191
Environment	66
Process Plant	24
Health	21
Education	15
Defence-Space	14
<b>2. People</b>	<b>319</b>
Civil-Built Environment	105
Product Development	51
Education	50
ICT	43
Health	31
Environment	20
Process Plant	13
Defence-Space	6
<b>4. Interfaces</b>	<b>281</b>
Civil-Built Environment	138
Health	69
Process Plant	21
Product Development	21
Environment	21
ICT	4
Defence-Space	4
Education	3
<b>Grand Total</b>	<b>4430</b>

In order to show the trend over time we have split the analysis over the four periods of time as shown in Table 6. The data is presented in a descending order of publication count for each industry and also PM area, as a proxy for the focus of the industry and PM areas applied for studying that industry in each period of time. We only presented the percentage values and data bars for industries and PM areas with the publication count of more than 5% of all the publications for that period.

As can be seen from Table 6, Product Development (PD) has been found as the most popular industry referred to in 1980s followed by Civil and Built Environment (C-BE) and ICT, all having strong existence in the PM literature (i.e., relatively high number of related research activities). Although the same 3 industry groups are in the top of the list for all four periods, their order changes: ICT jumped from the third in 1980s to the first rank in 1990s and 2000s and C-BE became the first between 2010-15, followed by ICT. Other noteworthy findings are Process Plant (PP) and Environment industries getting reasonable attention since 1990s and Health after 2010.

Comparing the use of different PM areas (using the APMBok framework), we found that each industry has had its own unique focus and understanding of PM. For example, C-BE related publications focused more on 'Context' and 'Delivery' aspects of PM during all the periods and it was the case in all other industries in 1980s and 1990s except in ICT and Education. ICT-related publications tended to focus more on 'Tools' and 'Delivery' areas since 1990s onward.

5. CONCLUSIONS

In order to uncover the development of the project management field and also understand how it has evolved over time, we constructed a database comprising information on 20,574 journal articles for a period of 35 years from 1980 to 2014. Unlike the majority of previous studies we did not limit our data sets to specific journals or conferences. Using publication data, we presented an overview of bibliometric studies, which traced the emergence of "project management" research areas. Our study demonstrates how scientific and applied research in project management has evolved over a 35-year time span. Following from Hullmann and Meyer (2003) it is safe to assume that the findings indicate the recent and actual development of research areas as well as



	1980 - 89	1990 - 99	2000 - 09	2010 - 14
	<b>Product Development (439)</b> 37%	<b>ICT (1316)</b> 34%	<b>ICT (2610)</b> 28%	<b>Civil-Built Environment (1630)</b> 37%
1	1. Context (376) 32%	3. Delivery (478) 12%	6. Tools (1206) 13%	1. Context (801) 18%
	3. Delivery (38)	6. Tools (459) 12%	3. Delivery (761) 8%	3. Delivery (367) 8%
	6. Tools (15)	1. Context (339) 9%	1. Context (537) 6%	6. Tools (219)
	2. People (10)	2. People (34)	2. People (100)	4. Interfaces (138)
		4. Interfaces (6)	4. Interfaces (6)	2. People (105)
	<b>Civil-Built Environment (325)</b> 27%	<b>Product Development (927)</b> 24%	<b>Product Development (2214)</b> 23%	<b>ICT (1048)</b> 24%
2	1. Context (212) 18%	1. Context (741) 19%	1. Context (1505) 16%	6. Tools (417) 9%
	3. Delivery (84) 7%	3. Delivery (97)	6. Tools (320)	3. Delivery (312) 7%
	6. Tools (21)	6. Tools (60)	3. Delivery (269)	1. Context (272) 6%
	2. People (6)	2. People (27)	2. People (66)	2. People (43)
	4. Interfaces (2)	4. Interfaces (2)	4. Interfaces (54)	4. Interfaces (4)
	<b>ICT (274)</b> 23%	<b>Civil-Built Environment (723)</b> 19%	<b>Civil-Built Environment (1945)</b> 21%	<b>Product Development (642)</b> 14%
3	1. Context (106) 9%	3. Delivery (345) 9%	1. Context (903) 10%	1. Context (246) 6%
	3. Delivery (87) 7%	1. Context (239) 6%	3. Delivery (595) 6%	6. Tools (191)
	6. Tools (72) 6%	6. Tools (65)	6. Tools (241)	3. Delivery (133)
	4. Interfaces (6)	2. People (42)	4. Interfaces (119)	2. People (51)
	2. People (3)	4. Interfaces (32)	2. People (87)	4. Interfaces (21)
	<b>Process Plant (50)</b>	<b>Process Plant (359)</b> 9%	<b>Environment (1095)</b> 12%	<b>Environment (454)</b> 10%
4	1. Context (23)	1. Context (163)	1. Context (613) 6%	1. Context (297) 7%
	3. Delivery (20)	3. Delivery (148)	6. Tools (259)	6. Tools (66)
	6. Tools (4)	6. Tools (22)	3. Delivery (94)	3. Delivery (50)
	2. People (2)	4. Interfaces (17)	4. Interfaces (79)	4. Interfaces (21)
	4. Interfaces (1)	2. People (9)	2. People (50)	2. People (20)
	<b>Environment (44)</b>	<b>Environment (303)</b> 8%	<b>Process Plant (920)</b> 10%	<b>Process Plant (273)</b> 6%
5	1. Context (32)	1. Context (215) 6%	1. Context (419)	1. Context (120)
	3. Delivery (9)	6. Tools (42)	3. Delivery (320)	3. Delivery (95)
	6. Tools (2)	3. Delivery (37)	6. Tools (103)	6. Tools (24)
	4. Interfaces (1)	4. Interfaces (5)	4. Interfaces (52)	4. Interfaces (21)
		2. People (4)	2. People (26)	2. People (13)
	<b>Health (29)</b>	<b>Health (123)</b>	<b>Health (415)</b>	<b>Health (230)</b> 5%
6	3. Delivery (15)	3. Delivery (64)	3. Delivery (156)	3. Delivery (72)
	1. Context (12)	1. Context (30)	4. Interfaces (89)	4. Interfaces (69)
	2. People (1)	2. People (18)	1. Context (69)	1. Context (37)
	6. Tools (1)	6. Tools (6)	6. Tools (57)	2. People (31)
		4. Interfaces (5)	2. People (44)	6. Tools (21)
	<b>Defence-Space (21)</b>	<b>Defence-Space (72)</b>	<b>Education (137)</b>	<b>Education (110)</b>
7	1. Context (14)	3. Delivery (37)	2. People (60)	2. People (50)
	3. Delivery (6)	1. Context (19)	1. Context (39)	1. Context (41)
	6. Tools (1)	2. People (7)	6. Tools (29)	6. Tools (15)
		6. Tools (7)	4. Interfaces (5)	4. Interfaces (3)
		4. Interfaces (2)	3. Delivery (4)	3. Delivery (1)
	<b>Education (6)</b>	<b>Education (19)</b>	<b>Defence-Space (128)</b>	<b>Defence-Space (43)</b>
8	1. Context (2)	2. People (7)	3. Delivery (60)	3. Delivery (15)
	3. Delivery (2)	1. Context (5)	6. Tools (26)	6. Tools (14)
	6. Tools (2)	6. Tools (4)	1. Context (20)	2. People (6)
		3. Delivery (3)	2. People (20)	1. Context (4)
			4. Interfaces (2)	4. Interfaces (4)
	All (1188)	All (3842)	All (9464)	All (4430)

TABLE 06. Ranking the most frequently studied Industries and PM areas

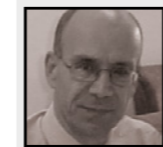
their future potential applications in the field of project management.

There is no doubt that PM as a field is growing rapidly; not only through the number of publications in academia but also membership in professional bodies. The range and diversity of keywords extracted from the selected publications demonstrate a widening of perspective and development of new dimensions of the field of project management with ramifications for both research and practice. The growth in research activities over the study period broadly correlates with the growth in the number of practitioners joining professional associations in this field, presumably to widen their perspective and acquire new skills. As an illustration, PMI membership grew from about 334,000 in 2010 to 445,000 in 2014. Our findings support earlier findings by Crawford et al. (2006) that project management as a field of endeavour has experienced step changes rather than incremental development. It is too early to assume that PM has entered its maturity phase even though the number of publications have plateaued post 2010.

A broad overview of Tables 2-7 highlight that the more developed a country is the more diverse is the range of industries and applications of PM. Whereas in the past PM was closely associated with the civil and built environment and the defence industries, nowadays it is in common use in all service industries and government programs.

Our findings show profound changes in the PM as a field of endeavour from both a theoretical perspective (e.g. PM areas) and application perspective (e.g. host industries). We have shown that the focus of research and application fluctuates across different industry sectors but this is not static and perhaps demonstrates that evolution of PM is still strong with innovations occurring virtually across all industry fronts and academia. ♦

• AUTHORS •



**PROFESSOR A. JAAFARI** currently holds the position of Vice-President, Academic in Education Centre of Australia. Professor Jaafari is the founder and Past President (2004-2015) of Asia Pacific International College. APIC is a recognised degree-granting Australian Higher Education Institution with undergraduate and postgraduate programs in project management, business and information systems. From 1982 to 2004 Professor Jaafari held numerous academic positions at the University of Sydney, including Chair Professor of Project Management. He pioneered the discipline of project management at the University and designed and developed numerous academic programs at both undergraduate and graduate levels that influenced the education of engineers and project managers. He was the chief architect of the Project Management Graduate Program that won a number of national and international awards, and was recognised as a trail-blazing program. In 1990-3 he was Chief Manager, Project Management, at Snowy Mountains Engineering Corporation (SMEC) and in that role he

was responsible for leading a number of projects in both Australia and overseas. Professor Jaafari has been an active contributor to the literature, including journals and international conferences. He has authored over 190 publications, and presented numerous keynote or plenary lectures in the past 20 years. He is on the editorial board and a reviewer for a number of journals, including the International Journal of Project Management, the International Journal of Information Technology Project Management, etc. Professor Jaafari has also presented seminars and executive training programs in project and strategic management to over 6,000 executives and managers in Europe, Middle East and Asia. He has acted as an expert consultant to a number of Australian organisations, the European Commission and numerous government agencies in Asia and the Middle East. Professor Jaafari has held a number of visiting academic positions in universities in the US, Europe and Asia. Professor Jaafari is perhaps best known for developing competence-based transformative graduate programs at both the University of Sydney and APIC. These programs herald a shift to project-based experiential and reflective learning.

• REFERENCES •

ABBASI, A., & ALTMANN, J. (2010). A social network system for analyzing publication activities of researchers. In On collective intelligence (pp. 49-61). Springer, Berlin, Heidelberg.

ABBASI, A. & JAAFARI, A. 2013. Research impact and scholars' geographical diversity. Journal of Informetrics, 7, 683-692.

BARNES, N. M. L. & WEARNE, S. H. 1993. The future for major project management. International Journal of Project Management, 11, 135-141.

BETTS, M. & LANSLEY, P. 1993. Construction Management and Economics: A review of the first ten years. Construction Management and Economics, 11, 221-245.

BREDILLET, C. N. 2006. The future of project management: mapping the dynamics of project management field in action. Global project management handbook: planning, organizing, and controlling international projects. New York: McGraw-Hill.

CLELAND, D. I. 1994. A personal perspective of MPM. Project Management Journal, 25, 6-7.

CRAWFORD, L. & POLLACK, J. 2007. How generic are project management knowledge and practice? Project Management Journal, 38, 87-97.

CRAWFORD, L., POLLACK, J. & ENGLAND, D. 2006. Uncovering the trends in project management: Journal emphases over the last 10 years. International Journal of Project Management, 24, 175-184.

EVARISTO, R. & VAN FENEMA, P. C. 1999. A typology of project management: emergence and evolution of new forms. International Journal of Project Management, 17, 275-281.

FIRTH, G. & KRUT, R. 1991. Introducing a project management culture. European Management Journal, 9, 437-443.

GAREIS, R. 1992. Management of networks of projects. AACE International Transactions.

HENSMAN, N., VALENTA, K. & JAAFARI, A. 2004. Project Management in Australia: state of play and trends. Sixth International Conference of International Research Network of Organizing by Projects (IRNOP VI). Abo Akademi University, Turku, .

HULLMANN, A. & MEYER, M. 2003. Publications and patents in nanotechnology. Scientometrics, 58, 507-527.

JAAFARI, A. 1998. Project managers of the next millennium: do they resemble project managers of today? 14th World Congress on Project Management Slovenia: International Project Management Association.

JAAFARI, A. 2000. How to achieve greater customer satisfaction through life cycle project management. 15th IPMA World Congress on Project Management. London, England: The Association for Project Management, UK and International Project Management Association.

JAAFARI, A. 2001. Management of risks, uncertainties and opportunities on projects: time for a fundamental shift. International Journal of Project Management, 19, 89-101.

JAAFARI, A. 2002. Knowledge, leadership, competencies, mindsets and the role of educational and research institutions. The First International Conference on Construction in the 21st Century (CITC2002): Challenges and Opportunities in Management and Technology. Miami, FL, USA.

JAAFARI, A. 2003a. Project management in the 21st century: the human and behavioural challenges. Project Management Research Conference (PM-Days). Vienna, Austria.

JAAFARI, A. 2003b. Project Management in the age of chaos: a study of professionalism in 21st century. Proceedings of the 17th IPMA World Congress on Project Management. Moscow, Russia.

JAAFARI, A. 2003c. Project Management in the age of complexity and change. Project Management Journal, 34, 47-57.

JAAFARI, A. & DOLOI, H. K. 2002. A simulation model for life cycle project management. Journal of Computer-Aided Civil and Infrastructure Engineering, 17, 162-174.

JAAFARI, A. & MANIVONG, K. 1999. The need for life cycle integration of project processes. Engineering, Construction and Architectural Management.

JAAFARI, A. & VLASIC, A. 1999. Integration of soft issues into a life cycle project management system. International Conference on Construction Process Re-engineering, CPR-99. Sydney, Australia.

KLOPPENBORG, T. J. & OPFER, W. A. 2002. The current state of project management research: trends, interpretations, and predictions. Project Management Journal, 33, 5-18.

KWAK, Y.-H. 2005. A brief history of project management. Greenwood Publishing Group.

KWAK, Y. H. & ANBARI, F. T. 2009. Analyzing project management research: Perspectives from top management journals. International Journal of Project Management, 27, 435-446.

LEWIS, M. L., WELSH, M. A., DEHLER, G. E. & GREEN, S. G. 2002. Product development tensions: exploring contrasting styles of project management. Academy of Management Journal, 45, 546-64.

MAGENAU, J. & PINTO, J. K. 2004. Power influence, and negotiation in project management. In: MORRIS, P. W. G. & PINTO, J. K. (eds.) The Wiley Guide to Managing Projects.

MANIVONG, K. K. & JAAFARI, A. 1999. A life cycle project management model to maximise value for clients. International Conference on Construction Process Re-Engineering, CPR-99. Sydney, Australia.

MANIVONG, K. K. & JAAFARI, A. 2000. A life cycle project management model for global collaboration. International Conference on Construction Information Technology, INCITE2000. Hong Kong.

MAYLOR, H. 2001. Beyond the Gantt chart: Project management moving on. European Management Journal, 19, 92-100.

MORRIS, P. W. G. 1997. The management of projects, Thomas Telford.

MORRIS, P. W. G. Researching the unanswered questions of project management. Proceedings of PMI Research Conference 2000: PM Research at the turn of the millennium, 2000. 87-102.

MORRIS, P. W. G. The irrelevance of project management as a professional discipline. 17th World Congress on Project Management, 2003.

MORRIS, P. W. G. & JAMIESON, H. A. Translating corporate strategy into project strategy: realizing corporate strategy through project management. 2004. Project Management Institute.

MORRIS, P. W. G. & PINTO, J. K. 2004. The Wiley Guide to Managing Projects.

PINTO, J. K. & SLEVIN, D. P. 1987a. Critical factors in successful project implementation. Engineering Management, IEEE Transactions on, 22-27.

PINTO, J. K. & SLEVIN, D. P. 1987b. Critical factors in successful project implementation. IEEE Transactions on Engineering Management, 1, 22-27.

POLLACK, J. & ADLER, D. 2015. Emergent trends and passing fads in project management research: A scientometric analysis of changes in the field. International Journal of Project Management, 33, 236-248.

SLEVIN, D. P. & PINTO, J. K. 1986. The project implementation profile: new tool for project managers. Project Management Journal, 17, 57-70.

SÖDERLUND, J. 2004. Building theories of project management: past research, questions for the future. International journal of project management, 22, 183-191.

THEMISTOCLEOUS, G. & WEARNE, S. 2000. Project management topic coverage in journals. International Journal of Project Management, 18, 7-11.

THOMS, P. & KERWIN, J. J. 2004. Leadership of project teams. In: MORRIS, P. W. G. & PINTO, J. K. (eds.) The Wiley Guide to Managing Projects.

TURNER, J. R., ANBARI, F. & BREDILLET, C. 2013. Perspectives on research in project management: the nine schools. Global Business Perspectives, 1, 3-28.

URLI, B. & URLI, D. 2000. Project management in North America, stability of the concepts. Project Management Journal, 31, 33-43.

WHITE, D. & FORTUNE, J. 2002. Current practice in project management—An empirical study. International journal of project management, 20, 1-11.

WINCH, G. M. 2004. Managing project stakeholders. In: MORRIS, P. W. G. & PINTO, J. K. (eds.) The Wiley Guide to Managing Projects.

• AUTHORS •



**DR ALIREZA ABBASI** is Director of Postgraduate Studies and Coordinator of Project Management programs in the University of New South Wales (UNSW) at Canberra. He obtained his PhD in Project Management from the University of Sydney in 2012 before joining the School of Engineering and Information Technology (SEIT) at UNSW Canberra. He also holds a graduate certificate in University Learning and Teaching from UNSW Sydney. His research and teaching interests include project

management, management science, information systems management and network science. He has written a book, three book chapters and over 60 technical journal and conference papers. Dr Abbasi has had several appointments and been involved in different projects in IT/Software, Oil, Education and R&D sectors. He is an active member of several professional bodies including Australian Institute of Project Management (AIPM), Project Management Institute (PMI), and Australian and New Zealand Academy of Management (ANZAM).