Project Management Research in IJPM and PMJ: A Bibliometric Analysis

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***Abstract*—This study aims to assess the current development and trends of studies on project management through bibliometric analysis. To achieve this goal, we reviewed the 1209 papers published during the period spanning 2008–2017 in the field's two top journals: the International Journal of Project Management and Project Management Journal. The articles were downloaded from Web of Science, and quantitative analysis was conducted to find out which authors published the most frequently, and from which countries the most research originated. We also sought out the most cited references using CiteSpace, a visualization analysis tool. Finally, the hottest trends and most popular topics of the last ten years were examined to provide guidance for researchers in the field of project management.**

***Index Terms*—Project management research, bibliometric analysis, visual analysis, mapping knowledge domains.**

I. Introduction

Faced with fierce market competition and limited business resources, project management has risen in importance in recent years. Until 1996, the Project Management Institute (PMI) proposed a set of standardized content and processes for the field with the hope that project management would become its own domain of specialized knowledge. In PMI's definition, project management is a specialized technology field that combines management knowledge, technology, tools, and methods with project activity to meet or exceed the needs and expectations of the "Stakeholder." In short, a project manager must prioritize the following three objectives:

1. To reach the goal of project in terms of scope, time, cost and quality.
2. To realize the various needs and expectations of project stakeholders.
3. To strike a balance between identified "needs" and unidentified "expectations."

In other words, project management is a process that combines efficiency and efficacy to successfully execute a project, enabling tasks to be delivered on schedule, within budget, meeting all requirements and pre-defined objectives. Therefore, project management is an important research topic. In the past, systematic reviews of project management literature focused on research topics such as key success factors of project management; project risk; and project monitoring and control [1]–[3]. There is little specific guidance, however, on co-citation analysis of the field. CiteSpace is citation analysis software developed in the context of scientometric, data and information visualization. It can be used to discover development trends and emerging topics in a given field. Web of Science (WoS) is an online citation indexing database that also provides a bibliography of the literature of a given topic, along with author summaries and lists of cited works for each source. This study uses WoS and CiteSpace to trace the evolution of project management research. The literature review in Section II will bring together what is currently known about citation analysis studies on project management. In Section III, we describe the study methodology, including our data collection procedure and visualization analysis tool. In Section IV, we present the results of our analysis of the data on the differential performance of countries, the most prolific authors, and the most cited references. Finally, we conclude our study in Section V.

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II. Literature Review

Due to rapid changes in the corporate environment, organizations have become increasingly large, and the number of non-routine jobs has risen dramatically. Companies are gradually carrying out complex tasks in the form of projects. As scholars and industrialists eagerly work to validate project management in practice, the field has blossomed into a growing discipline, and related research has expanded into various management areas. Citation analysis, a method of systematic investigation of the development and trends of academic research., is one way to measure just how fast and how far the discipline has grown. Recent citation analysis studies in project management include works by Machado & Prá Martens [4] and Pollack & Adler [5]. Machado & Prá Martens used the Web of Science (ISI) to collect all 64 papers on "project management success" published during 2000–2014 and confirmed the development trend of the project management field of research by bibliometric analysis. Their results indicate that the biggest cluster of papers – all written by the same author, Aaron Shenhar – was of particular relevance in establishing the success of the project management field. Pollack & Adler [5], using scientometric techniques, revealed trends in project management studies published in the Scopus and ISI databases between 1962 and 2012. Their research reveals that the focus of project management research has shifted from a technical-engineering orientation to an organizational perspective.

III. Methodology and Data

According to Kloppenborg & Opfer [6], the International Journal of Project Management (IJPM) and Project

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Management Journal (PMJ) are influential mainstream journals in project management and are highly regarded by scholars. Therefore, we selected these two journals as the sources of research for this study. IJPM covers all areas of project management from systems to human aspects as well as the latest important issues. PMJ, the project management quarterly published by the Project Management Institute (PMI), is a leading academic journal of project management technology, research, theory and application [7]. In this study, WoS was used to collect studies and their citation relations. On July 05, 2017, we searched for publication name= ("International Journal of Project Management" or "Project Management Journal") and set the timespan parameters for 2008 to 2017. After searching both journals and compiling the results, we had collected 1209 articles from the WoS core collection. A visualized bibliometric method was also chosen for this study. For that portion of the study, we chose CiteSpace (v. 5.1.R3 SE), a visualization software developed on the JAVA platform by Chaomei Chen.

IV. Analysis and Results

A. Most Productive Countries

Productivity is defined as generating scholarship that appears in the sample. The ten most productive countries and their most prolific contributors are shown in Table I. European countries dominate the list, though Australia comes in at the top with 190 publications, and both North America (the United States and Canada) and Asia (China and Taiwan) are represented twice. Though more articles originate in Australia, articles from England are cited most often per item, most often per year, and most often overall. The h-index is based on the set of the scientist's most cited papers and the number of citations that they have received in other publications. China, Canada, France, and Finland have the same h-index, China has the most citations among the group, while Finland is highest in average citation per item. On the other hand, Finland and Norway have same publication counts, Finland has the most total cites, average citation per year, average citation per item, and h-index.

TABLE I: Top Productive Country and its Contributing Authors, 2008–2017

Rank	Country	Count	Total cites	Average citations per year	Average citations per item	h-index	Top contributing authors
1	Australia	190	1812	139.28	9.54	22	WHITTY SJ(8) VAN DER HOORN B(7) ZWIKAEL O(7)
2	England	182	2117	162.85	11.63	26	MAYLOR H (8) WILLIAMS T (8) BRADY T (7)
3	USA	171	1842	204.67	10.77	22	KLEIN G (8) KWAK YH (8) PATANAKUL P (8)
4	China	157	1393	107.15	8.87	18	MULLER R (9) CHEUNG SO (8) SHAO JT (7)
5	Canada	93	1069	106.09	11.49	18	AUBRY M (15) HOBBS B (12) IKA LA (9)
6	France	71	929	71.46	13.08	18	MULLER R (11) TURNER R (7) MIDLER C (6)
7	Finland	60	857	85.70	14.28	18	ARTTO K (15) MARTINSUO M (11) AHOLA T (9)
8	Norway	60	628	69.78	10.47	15	MULLER R (21) SODERLUND J (8) KLAKEGG OJ (7)
9	Sweden	56	837	93.00	14.95	17	MULLER R (10) BLOMQUIST T (6) ERIKSSON PE (4)
10	Taiwan	54	511	56.78	9.46	12	KLEIN G (7) CHOU JS (5) JIANG JJ (5)

TABLE II: Top Ten Most Productive Countries in Project Management Scholarship, 2008–2017

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Australia	2	13	12	18	18	21	31	31	29	15	190
England	6	13	17	20	20	17	24	29	23	13	182
USA	17	25	15	22	11	9	17	29	15	11	171
China	2	9	7	20	11	10	26	29	27	16	156
Canada	11	9	11	8	14	4	8	15	11	2	93
France	1	4	22	6	7	5	12	8	5	1	71
Finland	2	9	4	8	5	12	5	5	8	2	60
Norway	3	4	8	2	9	5	7	10	10	2	60
Sweden	2	4	9	7	7	8	7	5	5	2	56
Taiwan	-	3	4	13	9	10	2	8	4	1	54

Table II breaks down the number of publications for the top 10 most productive countries by year for the time period ranging from 2008 to 2017. In 2008, Australia's publication count was not the largest, but it began leading the way in 2013. Since 2014, China has been the most prolific country after Australia. It is noteworthy that the contribution of

France increased significantly in 2010 (from 4 to 22 articles) and then dropped to a number closer to its previous level (from 22 to 6 articles) the very next year–where it would more or less remain. Although Taiwan started its contributions in 2009, and eventually it became one of the top contributing countries.

B. Most Influential Authors

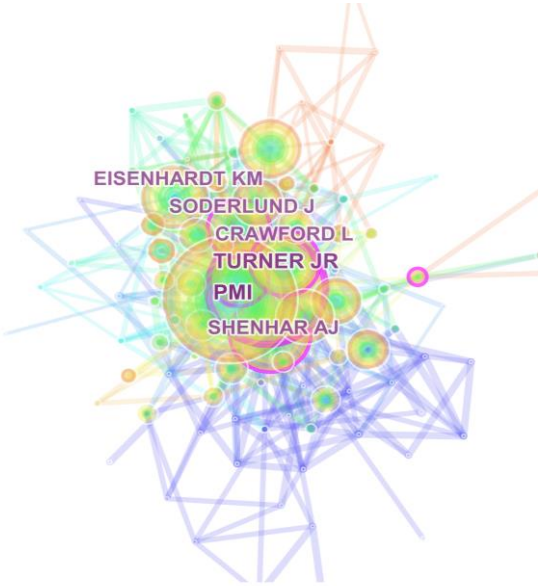

Fig. 1. Visualization of the most productive authors in project management scholarship, 2008–2017.

TABLE III: TOP SIX MOST INFLUENTIAL AUTHORS IN PROJECT MANAGEMENT SCHOLARSHIP

No.	Author	Cited frequency	Centrality
1	Turner, J. R.	292	0.32
2	Shenhar , A. J.	212	0.16
3	Söderlund, J.	184	0.14
4	Crawford, L.	184	0.12
5	PMI	347	0.08
6	Eisenhardt, K. M.	183	0.04

Fig. 1, the visualization of cited authors, shows the most influential researchers on project management; corresponding data appear in Table III. Each node represents an author. The co-occurring frequency of the authors appeared determines the circle size. The top frequency is held by an institutional author, PMI (Project Management Institute). PMI is committed to promoting the standardization of project management knowledge and establishing a professional certification system. PMI's most iconic standard document, the PMBOK® Guide, has become the most widely accepted standard for project management knowledge and practice. The betweenness centrality of a node in the network is a measure of the importance of the node's position in the network. The larger the number of betweenness centrality, the higher the influence of the node [8]. J. Rodney Turner ranks on the top of the list. He has published 16 books, including The Handbook of Project-Based Management, a bestseller published by McGraw-Hill. Professor Turner's research area is the management of complex projects and project management in small to medium-enterprises.

C. Key Literature Analysis

The key reference is usually given a milestone because of its pioneering contribution (see Table IV). Of the top ten references, four appear in Cluster 1, and two articles appear in each of Clusters 2, 4 and 7. According to cited frequency sort, the first three most frequently cited works are editions of the PMBOK® Guide published by Project Management Institute: The most often cited is the 4th edition, published in 2008 [9], which is followed immediately by the 5th (2013) [10] and 2nd editions (2004) [11]. The fourth-most cited references is Winter, M. *et al.*'s [12] article "Directions for Future Research in Project Management: The Main Findings of a UK Government-Funded Research Network" in which the authors develop a new research network from the viewpoint of rethinking project management. This study, based on a comprehensive analysis of research material produced over a 2-year period, presented a five-direction research network. The five directions of the framework is project complexity, social process, value creation, project conceptualization, and practitioner development. The fifth-most cited reference is Yin's [13] Case Study Research: Design and Methods, a workflow manual on case study detailing program design and evidence analysis. The scope of application mentioned in the book includes social sciences such as sociology, political science, management, public policy, international economy, education, evaluation and urban planning. Blomquist, *et al* [14] "Project-as-Practice: In Search of Project Management Research that Matters" is the sixth-most cited reference. This study suggests that understanding practice will explain the hidden mechanism of project behavior and contribute to the reflection of project management. 2007's Reinventing Project Management: The Diamond Approach to Successful Growth and Innovation is the seventh-most cited reference. Shenhar & Dvir's [15] "diamond framework" for planning and managing projects consists of four components: novelty, technology, complexity and pace. In their book, they urge project-manager and project-content adaptation and as well as the importance of maintaining flexibility throughout the project lifecycle. Söderlund's [16] "Pluralism in Project Management: Navigating the Crossroads of Specialization and Fragmentation" is the eighth-most cited reference. This paper adopted seven "schools of thought" to analyze the status of research on project management over the past 50 years. Cicmil, *et al.*'s [17] "Rethinking Project Management: Researching the Actuality of Projects," the ninth-most cited references, urges practitioner's lived experience of projects to improve project management. Finally, the tenth-most cited reference, Müller & Turner's [18] "Matching the Project Manager's Leadership Style to Project Type," is suggests that project managers' leadership competencies effect the success of their projects, and different leadership competencies are appropriate for different types of projects.

TABLE IV: TOP 10 KEY REFERENCES IN RESEARCH OF PROJECT MANAGEMENT, 2008–2017

Rank	Freq	Centrality	References	Cluster #
1	127	0.12	[9]	7
2	87	0.08	[10]	4
3	69	0.01	[11]	1
4	52	0.18	[12]	1
5	43	0.02	[13]	4
6	42	0.06	[14]	2
7	42	0.02	[15]	1
8	38	0.12	[16]	2
9	31	0.13	[17]	1
10	31	0.08	[18]	7

D. Most Popular Topics

The timeline view shows the timespan and the research process of each cluster. From the cluster analysis we know the main research topic of project management. Modularity Q and mean silhouette scores were assessed for the overall structural properties of the network. In accordance with Lee & Chen [19], a modularity Q greater than 0.3 means that the resulting network community structure is significant, while the acceptable value for silhouette was above 0.5. The results indicated an acceptable level, modularity Q=0.6816, mean silhouette= 0.8996. As shown in Fig. 2, Cluster 7 sustains a period spanning 11 years, from 2005 to 2015, whereas Cluster 10 is relatively short-lived, lasting only 6 years from 2004 through 2009. In addition, case study, project management practice, project portfolio control, and decision making are relatively early subjects of popular research. The most popular research topics in the recent future are public projects, taxonomical examinations and non-governmental organizations response.

The labels for each cluster can be tagged with the title terms, keywords, and abstract terms of citing articles to the cluster. Table V lists eleven major clusters by size, which is determined by the number of elements in each cluster. The average publication year of a cluster reveals its relative age. For example, the average publication year of Cluster 0 is 2005, so it is an older cluster. Cluster 4 is a newly formed cluster in that the average publication year is 2011.

Cluster 4 has a large number of referenced red rings; we chose five of the most commonly cited references and five cited papers in this cluster (see Table VI). The most cited reference in this cluster was published by PMI in 2013. The 5th edition of the PMBOK® Guide reflects the coordination and knowledge that project managers should have in their implementation and provides the basis for project management needed for each project. This internationally recognized standard is a necessary tool for project managers to implement project management practices and deliver organizational results. The second-most cited reference, Yin [13], provides a clear definition of case study methods as well as a discussion of design and analysis techniques. In addition, this book includes examples of a typical case study from a variety of academic fields. The third-most cited reference is by Müller *et al.* [20]. In this study, Sweden and Germany, as an example, studied the multicultural-project-team decision-making process and examined various styles of cultural differences. In the fourth-most cited reference in this cluster, Lenfle and Loch [21] point out that expanding the project management discipline can make uncertainty projects create greater value for the organization. The fifth-most cited reference, Pemsel and Müller's [22] "Investigate the Model of Knowledge: Governance in Project-Based Organizations (PBOs)," suggests that executives' preconceptions have a significant impact on knowledge management practices. Cluster 4 consists of 25 co-citation articles. The selected five citing articles were all published in 2017, and they cited 8–16 percent of the articles in Cluster 4. For example, Levie [23] has a coverage of 0.16 (16%) of the 25 references in this cluster. Therefore, Levie [23], Liu [24] and Wu [25] are the three citation articles with the most relevance to Cluster 4.

The distribution of countries in the eleven largest clusters is shown in Table VII. Among the 11 clusters, the top three distributions are England, United States and Australia. England has the largest number of papers in Clusters 0, 2, 3, 7 and 8, meaning that case studies, public projects, taxonomical examinations, direction-how-personality traits, and public project development are more popular topics in England. United States has the largest number of papers in Clusters 1, 4, 5, and 6, making work on project management practice, non-governmental organizations responses, project portfolio control, and decision making the most common in the United States. Finally, the largest number of papers in Cluster 9 is from Germany; therefore, project portfolio is the most popular topic of research from Germany. Likewise, Finland has the most papers in Cluster 10, so the favored topic among researchers there is senior management involvement.

TABLE V: THE ELEVEN LARGEST CLUSTERS OF CO-CITED REFERENCES

Cluster ID	Size	Silhouette	Mean (Year)	Label
0	41	0.673	2005	case study
1	36	0.793	2004	PM practice
2	30	0.769	2010	public project
3	29	0.904	2010	taxonomical examination
4	25	0.761	2011	non-governmental organizations response
5	25	0.777	2003	project portfolio control
6	21	0.939	2003	decision making
7	21	0.75	2009	direction-how personality trait
8	18	0.845	2008	project portfolio
9	17	0.864	2008	public project development
10	5	0.944	2006	senior management involvement

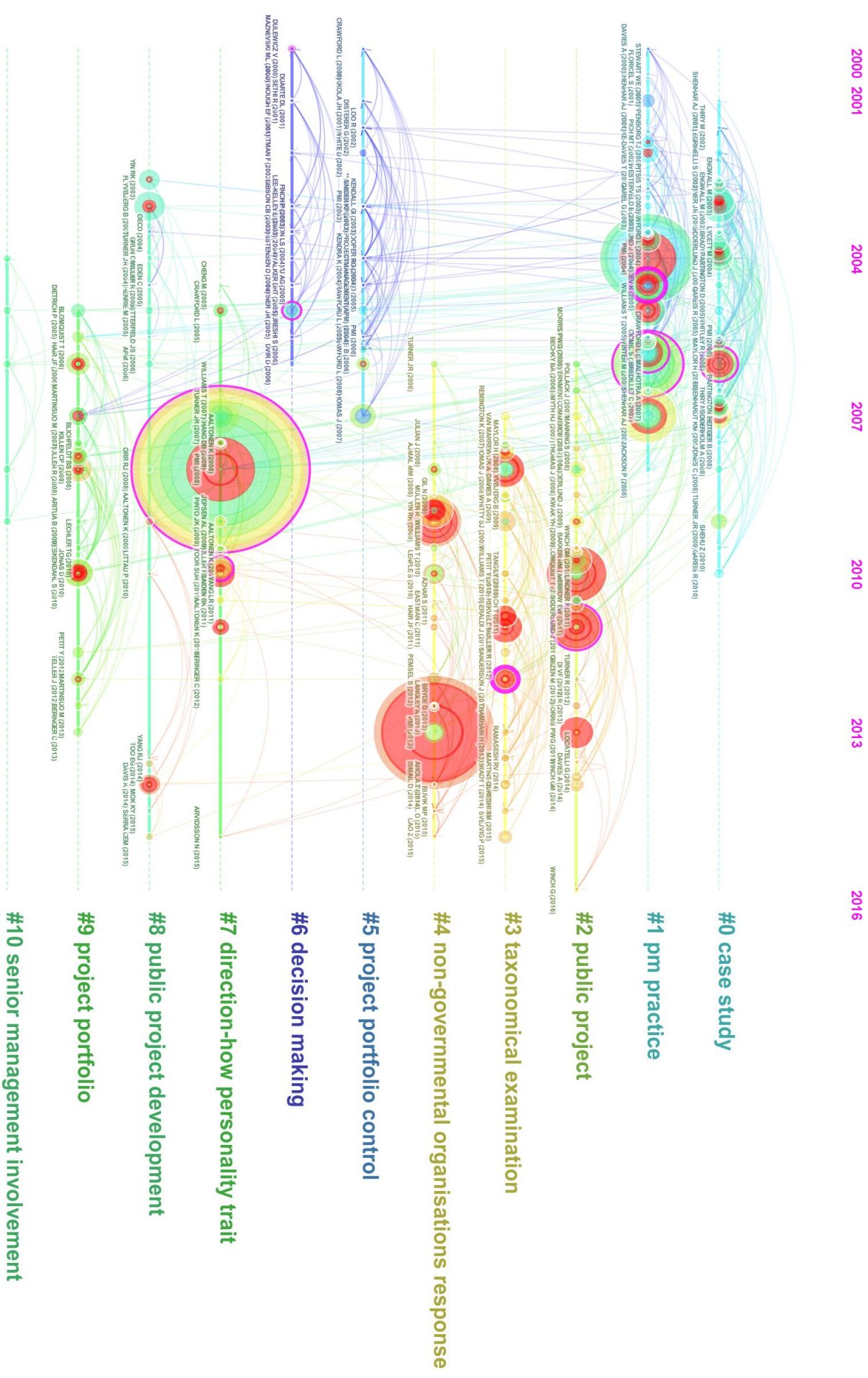

Fig. 2. A timeline visualization of 11 clusters.

TABLE VII: THE DISTRIBUTION OF COUNTRIES IN THE ELEVEN LARGEST CLUSTERS

Countries\Cluster ID	0	1	2	3	4	5	6	7	8	9	10
Africa(South Africa)								1			
Arabia								1			
Australia	1	5	1	3	2	5	1	1	2	1	
Austria	4								1		
Canada	2	4	2	3	1	5	2		1	1	
China			1		1						
Denmark				1		1		1		1	
England	16	8	10	8	3	5	5	5	5	1	1
Finland	1	1		1	2	1		3	1	4	3
France		1	2	1	1				1		
Germany	2		2	1	1	1		1	1	5	
Hong Kong		1		1					1		
India	1						1				
Iran			1								
Ireland				1							
Israel		1					1				
Italy			1								
Korea				1	1						
Malaysia					1						
Norway					1						
Singapore		1									
Sweden	6	2	3	3	3			1		2	
Switzerland	2										
Taiwan								1			
Thailand								1			
USA	4	11	5	3	7	7	10	4	4	2	1
Netherlands	2	1	2	2	1		1	1	1		
Total	41	36	30	29	25	25	21	21	18	17	5

V. CONCLUSIONS

In this study, we used Web of Science to collect 1209 records from the two leading project management journals (IJPM and PMJ), then used CiteSpace to analyze these studies. A number of interesting findings emerged from this process; first, the ten most productive countries are Australia, England, United States, China, Canada, France, Finland, Norway, Sweden and Taiwan. It is noteworthy that the contribution of China increased significantly in 2014.

Second, the most influential authors on project management are PMI, J. Rodney Turner, Aaron J. Shenhar, Jonas Söderlund, Lynn Heather Crawford , and Kathleen M. Eisenhardt. It is worth noting that the Project Management Institute has compiled a set of project management techniques with structured and skillful tools known as the Guide to the Project Management Body of Knowledge (PMBOK® Guide). The PMBOK® Guide outlines the required process for completing a project (Initiation, Planning, Execution, Monitoring and Controlling, and Closing), defining a set of common knowledge areas (Integration Management, Category Management, Time Management, Cost Management, Quality Management, Human Resource Management, Communication Management, risk management, procurement management, etc.) as well as providing planning and implementation guidelines.

Third, the most cited references are PMBOK® Guide, "Directions for future research in project management: The main findings of a UK government-funded research network," and "Case Study Research: Design and Methods."

Fourth, the ten most popular trending topics are case study, project management practice, public project, taxonomical examination, non-governmental organizations

response, project portfolio control, decision making, direction-how personality trait, public project development, project portfolio, and senior management involvement.

In this study, the research results presented by the secondary data analysis method herein can help scholars in the field understand the development and application of project management theory. At the same time, the results also forecast possible directions for the future development of project management research. Based on time and labor costs, this study only draws from two project management journals (IJPM and PMJ) to create a sample for the analysis. The collected articles are therefore not necessarily representative of all project management research articles. The two journals chosen, however, are top journals in project management, and they were selected with the hope of increasing the representativeness of the research. In future studies, we expect to make more use of visualization technology to visualize the relevant literature in the field; deeply analyze the frontier and inherent laws of development; and propose specific guiding measures and suggestions for the further development and improvement of project management theory.

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