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A BIBLIOMETRIC ANALYSIS OF HRM SYSTEMS AND FIRM INNOVATION

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ABSTRACT

In this paper, we explored the bibliometric network structure in the major literature on human resource management (HRM) systems and firm innovation. In the search of Web of Science, we identified 173 unique papers, including quantitative papers, qualitative papers, literature review, editorial letters, etc. The VOS viewer bibliometric results showed three clusters of firm innovation from the HRM systems perspective: innovation in products or services, innovation in processes, and innovation in people and organizations. Our paper also described the number of publications, co-authorship information, and affiliated universities and countries per firm innovation cluster.

Keywords: Human resource management systems, firm innovation, bibliometric analysis.

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1. INTRODUCTION

Innovation is critically important for researchers and practitioners, because it is related to the long-term survival of a firm (Cefis & Marsili, 2019). Knight (1967) suggested that firm innovation can be categorized by functional differences and the degree of radicalness. In the literature of firm innovation, more and more researchers studied firm innovation from a multi-dimension view. In the field of human resource management (HRM), especially HRM systems, researchers also explored different perspectives of firm innovation. For example, Ceylan (2013) studied relationships between commitment-based HR practices and product innovation, process innovation and organization innovation. Jimenez-Jimenez and Sanz-Valle (2005) examined the relationship between HR systems and firm innovation strategy. Similarly, Ko and Ma (2019) found positive relationships between strategic HRM and firm exploration strategy. Despite of the ongoing research interests of HRM systems and firm innovation, a thorough and systematic review of firm innovation from the HRM systems is missing. To fulfill this theoretical gap, we conducted a bibliometric analysis with 173 unique papers that focused on HRM systems and firm innovation.

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In this study, we defined an HRM system is an integration of at least three individual HRM practices. Unlike other research approaches, a bibliometric analysis provides a relatively objective view of the literature structure (Martín-Martín et al., 2018). Our objective and novelty include to explore different types of firm innovation from the HR perspective, visualize bibliometric network structures in the current literature of HRM systems and different types of firm innovation, and clarify future research direction in the field of HRM systems and firm innovation.

2. APPLIED BIBLIOMETRIC DATABASE

There are three main bibliometric databases: Google Scholar, Scopus, and Web of Science. Regarding coverage scope, these three databases have high and consistent overlaps (Harzing & Alakangas, 2016; Martín-Martín et al., 2018). However, Google Scholar is the superset of Scopus and Web of Science and includes substantial additional coverages. Most of the unique coverage in Google Scholar includes non-peer reviewed materials, company reports, or governmental files (Martín-Martín et al., 2018). Because of that, researchers have expressed concerns about using Google Scholar as the source of a bibliometric analysis. For instance, Jacsó (2010, 2012) concluded that Google Scholar is inappropriate for bibliometric research. Prins et al. (2016) suggested that Google Scholar should be used in fields with low coverage in Web of Science or Scopus or in fields that include highly diverse forms of outputs other than research articles.

Library scientists have explored the advantages and disadvantages of Scopus and Web of Science. Compared to Web of Science, Scopus includes a broad range of coverage (Martín-Martín et al., 2018; Mongeon & Paul-Hus, 2016). Scopus also includes a superb number of recent articles from low-impact journals (Chadegani et al., 2013). However, Web of Science has a strong coverage for journal articles that were published since 1990s and were written in English. Web of Science mainly covers a selective set of the most frequently used or cited journals (Lopez-Illescas et al., 2008). Although this field-based and language-specific trend is getting smaller (Vera-Baceta et al., 2019), Web of Science outperforms Scopus significantly in terms of journal classification accuracy (Wang & Waltman, 2016). Since 2004, China and Brazil have become two main contributors to research. Both showed a consistent preference for publishing in Web of Science over Scopus (Zhu & Liu, 2020). When balancing the strengths and weakness of Web of Science and Scopus, we decided to use Web of Science in the bibliometric analysis for human resource management and firm innovation for the following three reasons: 1) there are some influential innovation-related papers published before 2000; 2) the network of high-impact research articles tend to make more contribution to the field than do low-impact research articles; and 3) more and more researchers have paid attention to human resource management and firm innovation in emerging countries, such as China and Brazil.

2.1. Searching Terms and the Analytic Software

The search terms used in the present study in Web of Science are shown in Table 1 "*" indicate zero or more characters. Additionally, we used "new product" and "new process" as alternatives of "innovation." Other selection criteria included: 1) a human resource system should include at least three individual human resource practices; and 2) both HRM systems and firm innovation should be discussed at the firm level.

With these search terms and selection criteria, we identified 173 unique papers, including 46 quantitative papers with correlation tables, 48 quantitative papers without correlation tables, 31 qualitative papers or case studies, 38 literature reviews and theoretical papers, and 10 editorial letters and book chapters. The paper list is available upon request. Among these 173 papers, more than 50% of the papers had one or two authors (See Table 2). Although we searched all databases in Web of Science, all selected papers came from the Web of Science Core Collection. Regarding the tool for bibliometric analysis, we used VOSviewer, which is good at constructing and visualizing bibliometric networks (Pradhan, 2016).

Table 1: Search Terms in Web of Science Topics

"human resource“ AND "innovat*"
"human resource" AND ("new product*" NOT "innovat*")
"human resource" AND ("new process*" NOT "innovat*")
(“hr" NOT "human resource“) AND "innovat*"
("hr" NOT "human resource") AND ("new product*" OR "new process*" NOT "innovat*")
("high* performance* work*" OR "high* involvement* work*" OR "high* commitment* work*"NOT "human resource" NOT "hr") AND ("Innovat*")
("high* performance* work*" OR "high* involvement* work*" OR "high* commitment* work*“ NOT "human resource" NOT "hr") AND ("new product*" OR "new process*“ NOT "Innovat*")

Table 2: Co-Authorship Information by the Number of Authors in Papers that Exploring HRM Systems and Firm Innovation

No. of Authors in A Paper	No. of Papers	Accumulated Percentage
1	40	23.12%
2	62	58.96%
3	42	83.24%
4	16	92.49%
5	11	98.84%
6	1	99.42%
7	1	100.00%

3. RESULTS

3.1. Firm Innovation Overall

Firm innovation can be studied from different dimensions. Figure 1 presents the trend of publications with topics in human resource management systems and all types of firm innovation. The earliest publications in this field were in 1993. In general, there is a growing pattern of research in firm innovation with HRM systems. Based on current data, 2017 was the peak year for this field and included 25 publications with topics in HRM systems and firm innovation. Table 3 shows the top 20 journals based on the number of publications in the field of HRM systems and all types of firm innovation. The International Journal of Human Resource Management includes the largest

number of publications. Data in Table 3 demonstrates that papers on HRM systems and firm innovation are not necessarily published in journals with high impact factors or high ranks.

After processing the bibliometric data by VOSviewer, we got the co-authorship information by authors' countries of affiliation (see Table 4). These 10 clusters did not exhaust all possible co-authorship possibilities, but indeed showed some patterns of co-authorship in the field of HRM systems and firm innovation. For instance, cluster 1 includes Finland, Kazakhstan, Netherlands, Romania, Spain, and Sweden. It suggests that researchers from these 6 countries tend to collaborate with each other and develop research papers that explore how HRM systems associate, influence, and enhance firm innovation. It is important to notice that these co-authorship country clusters do not necessarily align with national cultural clusters. Researchers from different national cultural clusters tend to work together to explore relationships between HRM systems and firm innovation.

Information about authors' countries of affiliation also reflect the research activity of a country. Table 5 presents the number of firm innovation – HRM systems researchers per country. This information come from the author information of 173 identified papers. If one author wrote 3 papers in the field of firm innovation and HRM systems, she or he will contribute to 3 records for her/his country. Based on Table 5, researchers from Australia, China, and Spain were more enthusiastic in the exploration of relationships between HRM systems and firm innovation than were researchers from other countries. A straightforward view of results can be found in Figure 2 (the degree of blue is based on the research activity of a country).

Figure 1: Number of Publications on Firm Innovation and HRM Systems by Years

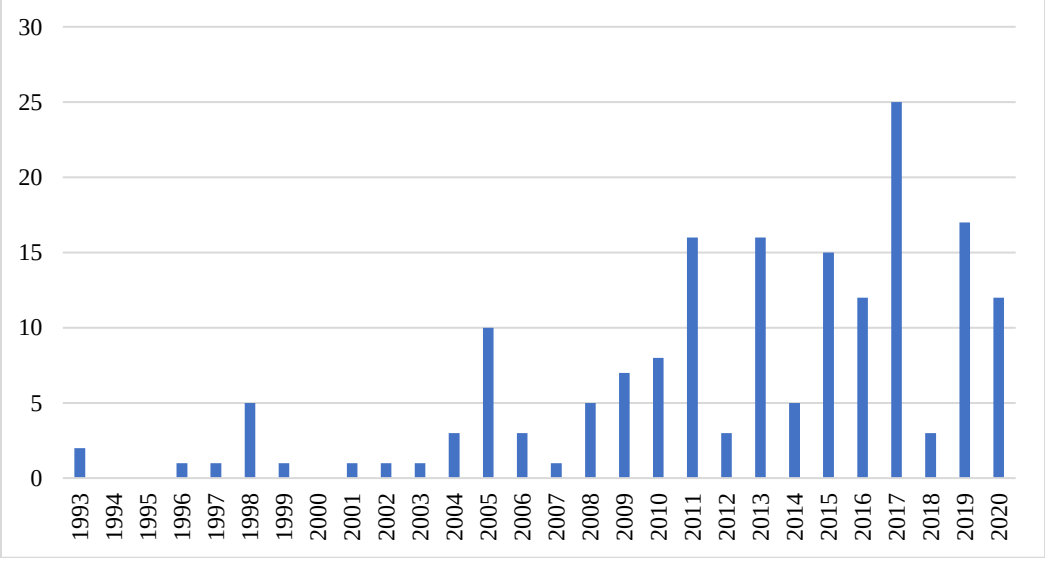


Table 3: Top 20 Journals by the Number of Publications in Firm Innovation HRM Systems

No. of Pub.	Rank	Journal Name	Impact Factor[1]	ABDC Rank[2]
27	1	International Journal of Human Resource Management	5.546	A
13	2	Human Resource Management	5.078	A*
12	3	International Journal of Manpower	1.610	A
7	4	Asian Journal of Technology Innovation	1.310	n.a.
7	4	Personnel Review	2.910	A
5	6	International Journal of Innovation and Learning	0.920	n.a.
5	6	International Journal of Innovation Management	2.026	n.a.
3	8	Employee Relations	2.310	B
3	8	Human Resource Management Journal	5.039	A
3	8	Industrial Marketing Management	6.960	A*
3	8	International Journal of Technology Management	1.348	B
2	12	Economics of Innovation and New Technology	2.650	B
2	12	European Journal of Innovation Management	4.200	C
2	12	Innovation-Organization & Management	2.962	n.a.
2	12	International Journal of Productivity and Performance Management	2.770	B
2	12	Journal of Business Research	7.550	A
2	12	Journal of Knowledge Management	8.812	A
2	12	Knowledge Management Research & Practice	2.744	n.a.
2	12	Research Policy	8.110	A*
2	12	Sustainability Accounting, Management and Policy Journal	2.900	B
2	12	Technovation	6.606	A

Note: [1]Clarivate Analytics InCites Journal Citation Reports Impact factor information in 2020.
[2]Australian Business Deans Council information in 2020.

Table 4: Co-authorship Country Clusters of Publications in Firm Innovation and HRM Systems

Cluster	Countries	Cluster	Countries
1	Finland, Kazakhstan, Netherlands, Romania, Spain, and Sweden	6	Brazil, Canada, and China
2	Australia, Denmark, India, Scotland, and Wales	7	Mexico, Taiwan, United States
3	England, Malaysia, Vietnam	8	Ireland and North Ireland
4	Germany, Norway, South Korea, and Switzerland	9	Pakistan and Saudi Arabia
5	Cyprus, France, Italy, and New Zealand	10	Qatar and United Arab Emirates

Table 5: Research Activity by Countries of Firm Innovation-HRM Systems Researchers

Country	No.	Country	No.	Country	No.
Australia	45	Italy	14	Romania	3
Brazil	7	Japan	1	Russia	1
Canada	5	Kazakhstan	1	Slovenia	12
China	55	Laos	2	South Korea	7
Cyprus	2	Malaysia	17	Spain	52
Denmark	10	Mexico	1	Sweden	7
Finland	15	Netherlands	4	Switzerland	5
France	7	New Zealand	7	Tanzania	1
Germany	5	Norway	2	Thailand	3
Greece	3	Pakistan	8	Turkey	5
India	1	Philippines	2	United Arab Emirates	5
Indonesia	6	Poland	5	United Kingdom	37
Iran	2	Portugal	2	United States	38
Ireland	13	Qatar	1	Vietnam	3

Note: The research activity score refers to the number of firm innovation and HRM systems researchers of a country. These numbers come from the author information of 173 identified papers. Based on the purpose of this study, if one author shows in different papers, s/he will contribute to multiple records of her/his country.

Figure 2: Research Activity by Countries of Firm Innovation-HRM Systems Researchers

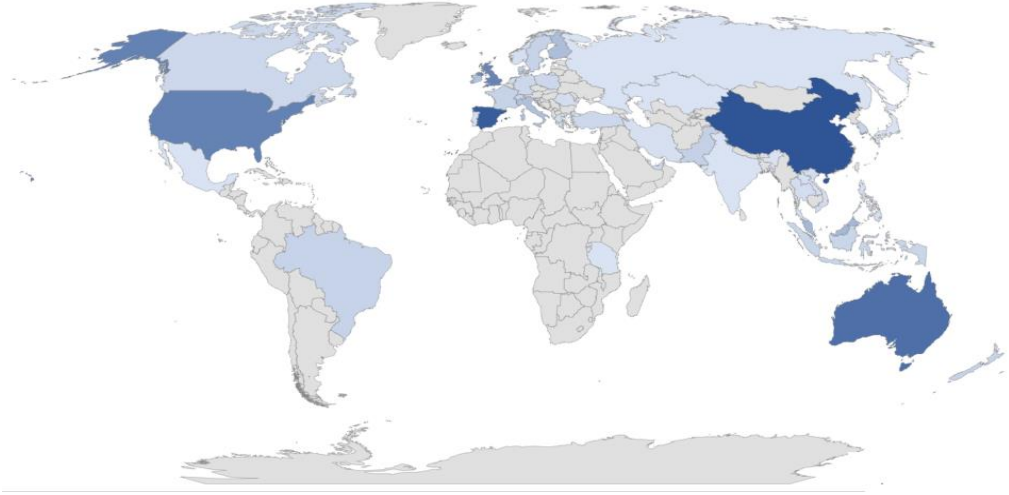


Table 6 shows the top 20 universities that are most actively engaged in firm innovation and HRM systems research. The research activity score is calculated based on the authors and their affiliations information from the 173 identified papers. If one paper includes three authors and they all come from the same university, the university gets three points on research activities from that paper. As shown in Table 6, Monash University is the most active university in the research field about firm innovation and HRM systems. University Tunku Abdul Rahman is the most active Malaysian university that engages in the research between firm innovation and HRM systems. It is worth noting that among the top 20 universities in firm innovation and HRM system, five universities are in Australia and four universities are in Spain.

Table 6: Research Activity by Countries of Firm Innovation-HRM Systems Researchers

Rank	Research Activity	University	Located Country
1	19	Monash University	Australia
2	15	University Tunku Abdul Rahman	Malaysia
3	14	Lappeenranta University of Technology	Finland
4	13	University of Murcia	Spain
5	12	University of Management and Technology	United States
6	10	University of Ljubljana	Slovenia
7	9	Renmin University	China
8	8	University of Bergamo	Italy
8	8	University of Las Palmas de Gran Canaria	Spain
8	8	University of Wollongong	Australia
11	7	RMIT University	Australia
11	7	University of Castilla-La Mancha	Spain
11	7	University of Melbourne	Australia
14	6	Aarhus University	Denmark
14	6	Abu Dhabi University	United Arab Emirates
14	6	Philippine Institute for Development Studies	Philippines
14	6	Universidad Pablo de Olavide	Spain
14	6	University of Western Australia	Australia
19	5	Aston Business School	United Kingdom
19	5	Multimedia University	Malaysia

Note: The research activity score refers to the number of firm innovation and HRM systems researchers of a university. These numbers come from the author information and affiliation information of 173 identified papers. Based on the purpose of this study, if one paper is written by several authors of the same university, this university gets multiple scores.

When exploring the bibliometric structure by the co-occurrence of authors' keywords, we used the association strength normalization approach and got the structure as shown in Figure 3. The structure includes three clusters: Cluster 1 is in red; Cluster 2 is in green; and Cluster 3 is in blue. Details of each cluster can be found in Table 7. After carefully reviewing the papers under each cluster, we identified three types of firm innovation from the human resource management system view: 1) innovation in people and organization refers to the changes of collective mindsets or believes; 2) innovation in processes refers to the changes of organizational or production processes; and 3) innovation in products or services refers to the updates at the endpoints.

Cluster 1 includes specific information about human capital, intellectual capital, and organizational performance. According to the recourse-based view, human capital resources are essential for firm long-term performance, survival, and success (Barney, 1991; Peteraf, 1993). Therefore, we believe that Cluster 1 mainly explores innovation in products or services. Cluster 1 also includes China as a keyword. We think that this is because researchers in this clusters tend to collect data from China and mention China in their keywords.

Cluster 2 uniquely covers keywords such as strategy and leadership. According to motivation theory and social exchange theory, HRM systems can align employees' interests with employers' interests and motivate employees both directly and indirectly (Howard et al., 2016; Kanfer, 1990; Petri & Govern, 2012; Steers et al., 2004). HRM systems can create innovation-supportive or innovation-friendly environments through the reciprocity between an organization and its employees (Boehm et al., 2014; Collins & Smith, 2006; Liu et al., 2017). These ideas connect well with attraction-selection-attrition concepts (Bretz et al., 1989; Schneider, 1987). Therefore, we

think that Cluster 2 focuses on how HRM systems enhance innovation in people. The last cluster exclusively includes learning in the keywords.

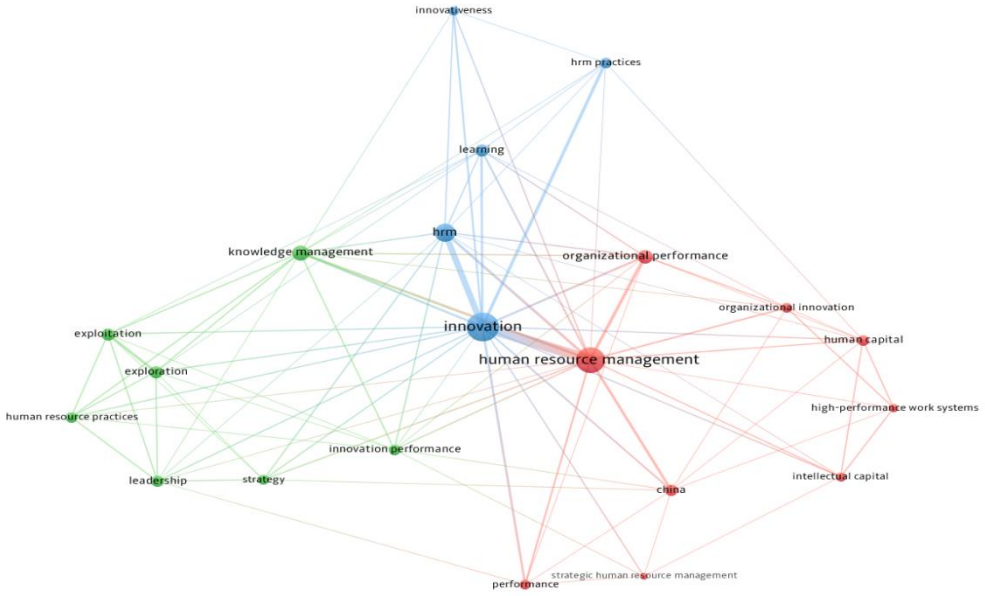
Organizational learning theory suggests that firms need to balance between explorative learning and exploitative learning for long-term business survival and success (March, 1991). In the literature, researchers tend to consider organizational learning as an essential part of organizational processes (Huber, 1991; Huber et al., 2009; Wang et al., 2007). Therefore, we believe that Cluster 3 investigates how HRM systems influence innovation in processes.

With these clustering criteria, we reviewed all 173 identified papers and categorized them into three types. we found 33 papers about innovation in people and organizations, 47 papers about innovation in processes, and 126 papers about innovation in products or services. If one paper discussed more than one type of firm innovation, this paper would show up in different firm innovation categories. Therefore, the sum of papers in three innovation categories may be larger than the total number of identified papers.

Table 7: Co-Occurrence Clusters of Authors' Keywords in Firm Innovation and HRM Systems

Cluster	Authors' Keywords
1	China, high-performance work systems, human capital, human resource management, intellectual capital, organizational innovation, organizational performance, performance, strategic human resource management
2	Exploitation, exploration, human resource practices, innovation performance, leadership, strategy
3	HRM, HRM practices, innovation, innovativeness, learning

Figure 3: Research Activity by Countries of Firm Innovation-HRM Systems Researchers



3.2. Innovation in Products or Services

For innovation in products or services, we identified 126 unique papers, including 38 quantitative papers with correlation tables, 31 quantitative papers without correlation tables, 20 qualitative papers or case studies, 31 literature reviews and theoretical papers, and 6 editorial letters and book chapters. Among these 126 papers, more than 50% of the papers had one or two authors (See Table 8). Figure 4 presents the trend of publications with topics in human resource management systems and innovation in products or services. The earliest publications in this field were in 1993. In general, there is a growing pattern of researchers exploring innovation in products or services and HRM systems. Based on the current data, 2017 is the peak year for this field and includes 24 publications with topics in HRM systems and innovation in products or services.

Table 9 presents the number of researchers who publish in innovation in products or services and HRM systems per country. This information comes from the author information of the 126 identified papers. If one author contributed to 3 papers in the field of innovation in products or services and HRM systems, she or he would be included 3 times in her/his country. Based on Table 9, researcher from Australia, China, and Spain were more enthusiastic about exploring the relationships between HRM systems and innovation in products or services than were researchers from other countries. A straightforward view of results can be found in Figure 5 (the degree of blue is based on the research activity of a country). Using the same logic, Table 10 demonstrates the research activity of universities in the field of innovation in products or services and HRM system. Of the 20 identified universities, 4 universities are in Spain.

Figure 4: Number of Publications on Innovation in Products or Services and HRM Systems

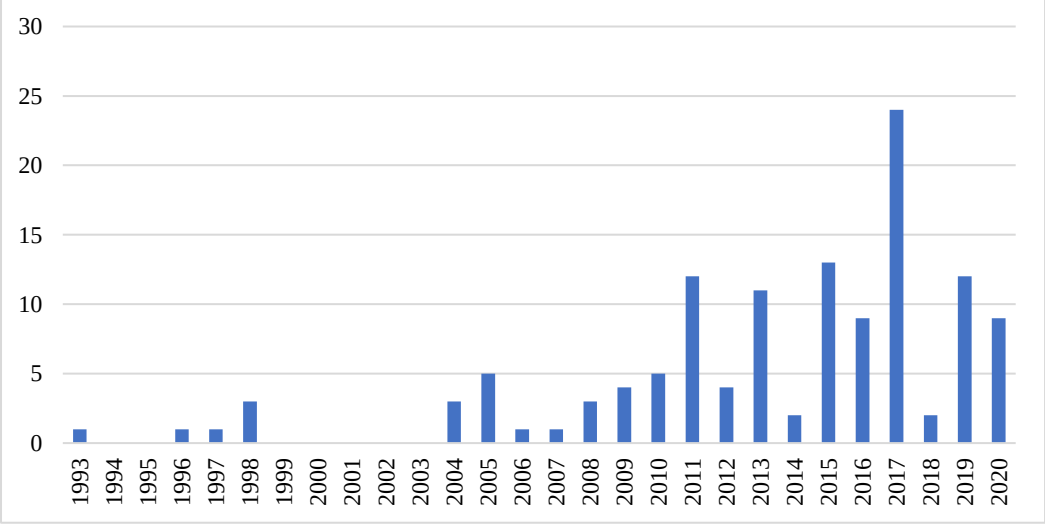


Table 8: Co-Aauthorship Information by the Number of Authors in Papers in Papers That Exploring Innovation in Products or Services and HRM Systems

No. of Authors in A Paper	No. of Papers	Accumulated Percentage
1	23	18.25%
2	43	52.38%
3	37	81.75%
4	11	90.48%
5	10	98.41%
6	1	99.21%
7	1	100.00%

Table 9: Research Activity by Countries of Innovation in Products or Services-HRM Systems Researchers

Country	No.	Country	No.	Country	No.
Australia	38	Iran	2	Portugal	2
Brazil	3	Ireland	13	Saudi Arabia	1
Canada	4	Italy	9	Slovenia	12
China	38	Japan	1	South Korea	4
Cyprus	2	Laos	2	Spain	47
Denmark	8	Malaysia	12	Sweden	5
England	8	Netherlands	4	Switzerland	4
Finland	14	New Zealand	7	Tanzania	1
France	4	Northern Ireland	1	Turkey	6
Germany	5	Norway	2	United Arab Emirates	1
Greece	2	Pakistan	8	United Kingdom	20
India	1	Philippines	2	United States	24
Indonesia	6	Poland	2	Vietnam	3

Note: The research activity score refers to the number of innovation in products or services and HRM systems researchers of a country. These numbers come from the author information of 126 identified papers. Based on the purpose of this study, if one author shows in different papers, s/he will contribute to multiple records of her/his country.

Figure 5: Research Activity by Countries of Innovation in Products or Services-HRM Systems Researchers

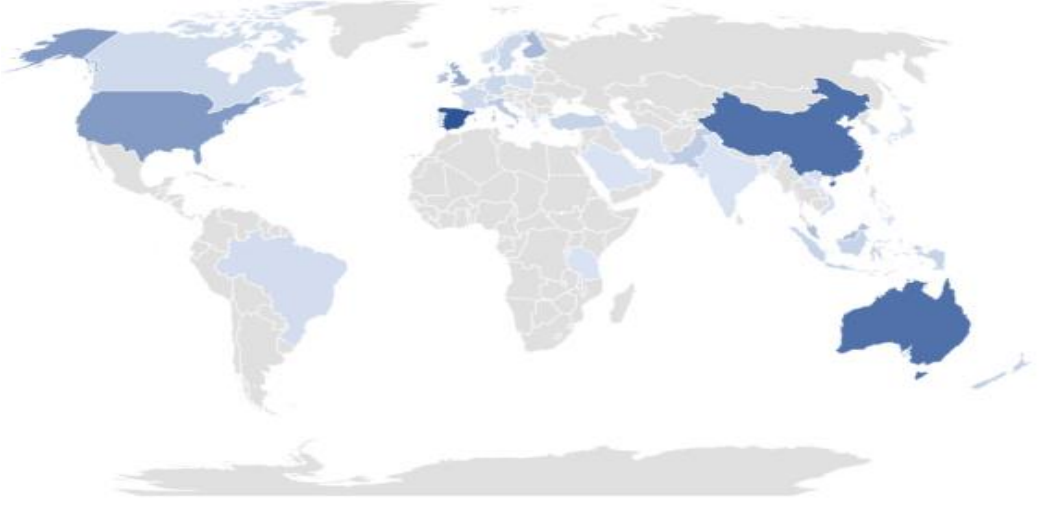


Table 10: Research Activity by Universities of Innovation in Products or Services-HRM Systems Researchers

Rank	Research Activity	University	Located Country
1	11	Lappeenranta University of Technology	Finland
2	10	Monash University	Australia
2	10	University of Ljubljana	Slovenia
4	7	University of Wollongong	Australia
5	6	Aarhus University	Denmark
5	6	Universidad Pablo de Olavide	Spain
5	6	University of Melbourne	Australia
8	5	Multimedia University	Malaysia
8	5	Renmin University	China
8	5	University of Castilla-La Mancha	Spain
8	5	University of Las Palmas de Gran Canaria	Spain
8	5	University of Murcia	Spain
8	5	University Tunku Abdul Rahman	Malaysia
14	4	Southwestern University of Finance and Economics	China
14	4	University College Cork	Ireland
14	4	University of Electronic Science and Technology of China	China
14	4	University of Management and Technology	United States
14	4	University of Otago	New Zealand
14	4	University of Oulu	Finland
14	4	University of the Punjab	Pakistan

Note: The research activity score refers to the number of innovation in products or services and HRM systems researchers of a university. These numbers come from the author information and affiliation information of 126 identified papers. Based on the purpose of this study, if one paper is written by several authors of the same university, this university gets multiple scores.

3.3. Innovation in Processes

For innovation in processes, we identified 47 unique papers, including 15 quantitative papers with correlation tables, 13 quantitative papers without correlation tables, 8 qualitative papers or case studies, 7 literature reviews and theoretical papers, 4 book chapters and editorial letters. Among these 47 papers, more than 50% of the papers had one or two authors (See Table 11). Figure 6 presents the trend of publications with topics in human resource management systems and innovation in processes. The earliest publications in this field were in 1998. In general, there is a growing pattern of researchers exploring innovation in processes and HRM systems. Based on the current data, 2011 is the peak year for this field and includes 9 publications with topics in HRM systems and innovation in processes.

Table 12 presents the number of researchers who published in innovation in processes and HRM systems per country. This information comes from the author information of the 47 identified papers. If one author contributed to 3 papers in the field of innovation in products or services and HRM systems, she or he would be included 3 times in her/his country. Based on Table 12, researchers from Australia, Italy, Malaysia, and Spain were more enthusiastic about exploring the relationships between HRM systems and innovation in processes than were researchers from other countries. A straightforward view of results can be found in Figure 7 (the degree of blue is based on the research activity of a country). Using the same logic, Table 13 demonstrates the research activity of universities in the field of innovation in processes and HRM systems. Of the 20 identified universities, 4 universities are in Australia and 3 universities are in Spain.

Figure 6: Number of Publications on Innovation in Processes and HRM Systems

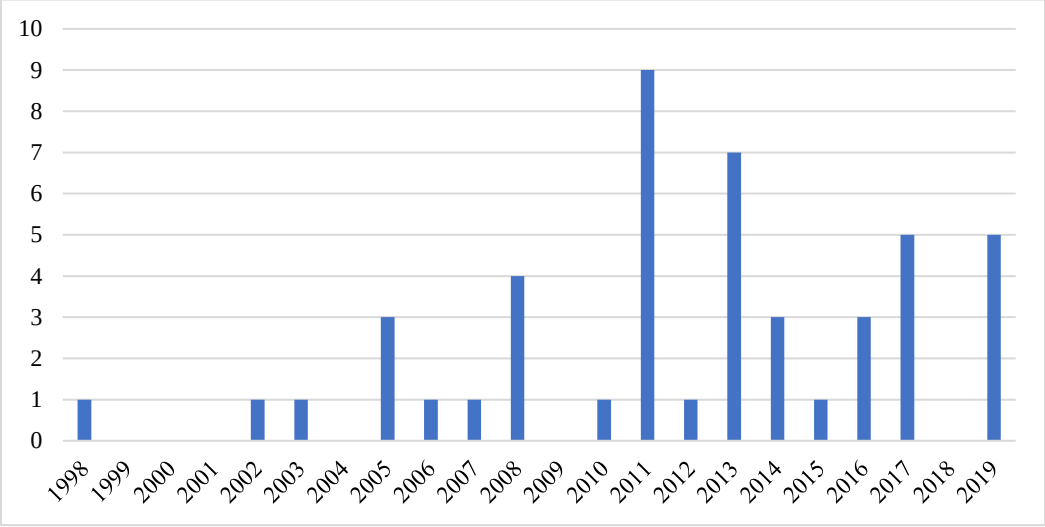


Table 11: Co-authorship Information by the Number of Authors in Papers that Exploring Innovation in Processes and HRM Systems

No. of Authors in A Paper	No. of Papers	Accumulated Percentage
1	11	23.40%
2	20	65.96%
3	7	80.85%
4	7	95.74%
5	2	100.00%

Table 12: Research Activity by Countries of Innovation in Processes-HRM Systems Researchers

Country	No.	Country	No.	Country	No.
Australia	23	Kazakhstan	1	Russia	1
Brazil	4	Macau	2	South Korea	3
China	5	Malaysia	9	Spain	12
Denmark	2	Mexico	1	Sweden	1
Finland	1	New Zealand	1	Turkey	3
France	4	Pakistan	4	United Arab Emirates	3
Germany	2	Philippines	2	United Kingdom	2
Indonesia	1	Qatar	1	United States	8
Italy	9	Romania	3		

Note: The research activity score refers to the number of innovation in processes and HRM systems researchers of a country. These numbers come from the author information of 47 identified papers. Based on the purpose of this study, if one author shows in different papers, s/he will contribute to multiple records of her/his country.

Figure 7: Research Activity by Countries of Innovation in Processes-HRM Systems Researchers

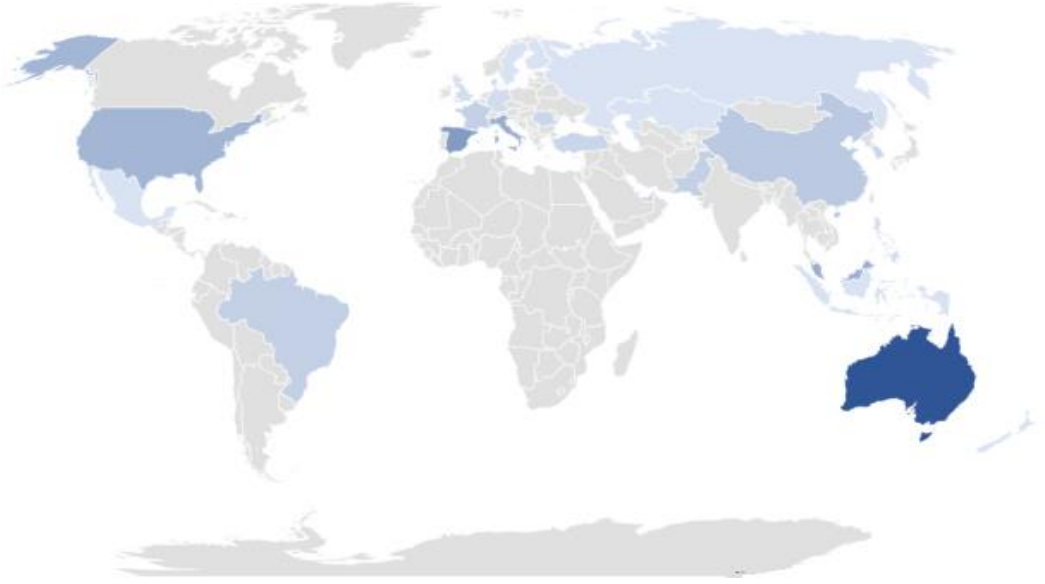


Table 13: Research Activity by Universities of Innovation in Processes-HRM Systems Researchers

Rank	Research Activity	University	Located Country
1	9	Monash University	Australia
2	6	University of Murcia	Spain
3	5	University Tunku Abdul Rahman	Malaysia
4	4	Fundação Getúlio Vargas	Brazil
4	4	University of Bergamo	Italy
4	4	University of Management and Technology	United States
7	3	Abu Dhabi University	United Arab Emirates
7	3	University of Ferrara	Italy
7	3	University of Las Palmas de Gran Canaria	Spain
7	3	University of Western Australia	Australia
7	3	University POLITEHNICA of Bucharest	Romania
12	2	Deakin University	Australia
12	2	Girne American University	Cyprus
12	2	Philippine Institute for Development Studies	Philippine
12	2	Renmin University	China
12	2	RMIT University	Australia
12	2	Universiti Teknologi Malaysia	Malaysia
12	2	University of Castilla-La Mancha	Spain
12	2	University of Gothenburg	Sweden
12	2	University of Macau	China

Note: The research activity score refers to the number of innovations in processes and HRM systems researchers of a university. These numbers come from the author information and affiliation information of 47 identified papers. Based on the purpose of this study, if one paper is written by several authors of the same university, this university gets multiple scores.

3.4. Innovation in People and Organizations

For innovation in people and organizations, we identified 33 unique papers, including 14 quantitative papers with correlation tables, 8 quantitative papers without correlation tables, 6 qualitative papers or case studies, and 5 literature reviews and theoretical papers. Among these 33 papers, more than 50% papers had one or two authors (See Table 14). Figure 8 presents the trend of publications in the topic of human resource management systems and innovation in people and organizations. The earliest publications in this field were in 1993. In general, there is a growing pattern of researchers exploring innovation in people and organization and HRM systems. Based on the current data, 2013 was the peak year for this field and included 6 publications with topics in HRM systems and innovation in people and organizations.

Table 15 presents the number of researchers who published in innovation in people and organization and HRM systems per country. This information comes from the author information of 33 identified papers. If one author contributed to 3 papers in the field of innovation in products or services and HRM systems, she or he will be included 3 times in her/his country. Based on Table 15, researchers from the United States, China, and Spain were more enthusiastic about exploring the relationships between HRM systems and innovation in people and organization than were researchers from other countries. A straightforward view of results can be found in Figure 9 (the degree of blue is based on the research activity of a country). Using the same logic, Table 16 demonstrates the research activity of universities in the field of innovation in processes and HRM system. Of the 14 identified universities, 3 universities are in China and 2 universities are in United States.

Figure 8: Number of Publications on Innovation in People and Organizations and HRM Systems

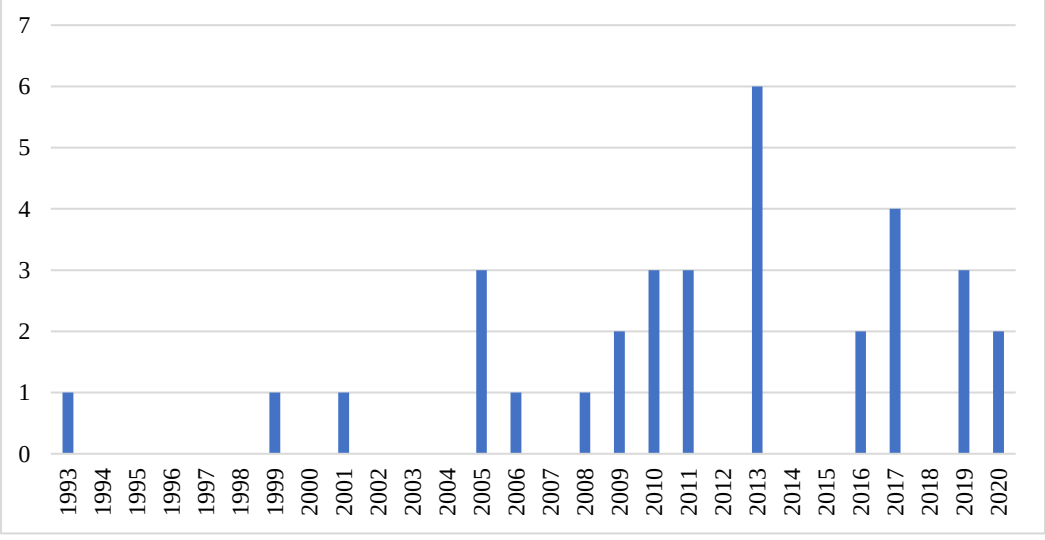


Table 14: Co-Authorship Information by the Number of Authors in Papers that Exploring Innovation in People and Organizations and HRM Systems

No. of Authors in A Paper	No. of Papers	Accumulated Percentage
1	10	30.30%
2	16	78.79%
3	3	87.88%
4	1	90.91%
5	3	100.00%

Table 15: Research Activity by Countries of Innovation in People and Organizations-HRM Systems Researchers

Country	No.	Country	No.	Country	No.
Australia	3	Malaysia	8	Spain	4
China	11	New Zealand	2	Thailand	3
Finland	4	Pakistan	4	Turkey	2
France	1	Philippines	2	United Arab Emirates	3
Germany	1	Poland	1	United Kingdom	3
Greece	1	Qatar	1	United States	12
Italy	2	Slovenia	3	Spain	4

Note: The research activity score refers to the number of innovations in people and organization and HRM systems researchers of a country. These numbers come from the author information of 33 identified papers. Based on the purpose of this study, if authors show in different papers, they will contribute to multiple records of their countries.

Figure 9: Research Activity by Countries of Innovation in People and Organizations-HRM Systems Researchers

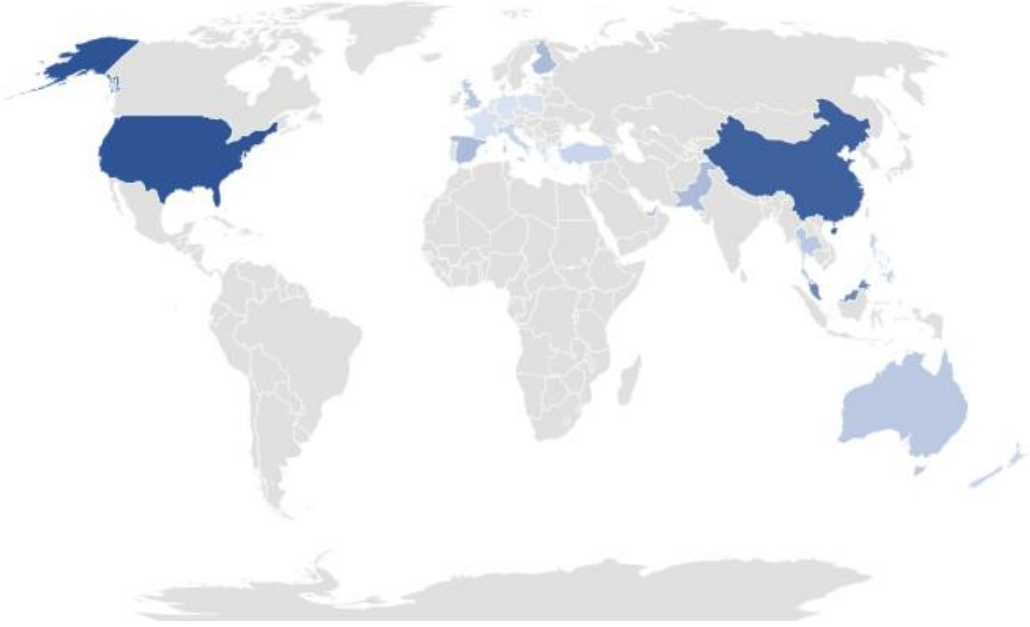


Table 16: Research Activity by Universities of Innovation in People and Organizations-HRM Systems Researchers

Rank	Research Activity	University	Located Country
1	5	University Tunku Abdul Rahman	Malaysia
2	4	Peking University	China
2	4	University of Management and Technology	United States
3	3	Abu Dhabi University	United Arab Emirates
3	3	Lappeenranta University of Technology	Finland
3	3	Monash University Malaysia	Malaysia
3	3	Shanghai Jiao Tong University	China
8	2	Arizona State University	United States
8	2	Asian Institute of Technology	Thailand
8	2	Philippine Institute for Development Studies	Philippine
8	2	Renmin University	China
8	2	RMIT University	Australia
8	2	Uludag University	Turkey
8	2	University of Murcia	Spain

Note: The research activity score refers to the number of innovation in people and organizations and HRM systems researchers of an university. These number come from the author information and affiliation information of 33 identified papers. Based on the purpose of this study, if one paper is written by several authors of the same university, this university gets multiple scores.

4. CONCLUSION

The bibliometric analysis presents a relatively objective view of the literature review. Our bibliometric analysis results suggest that, in general, researchers have a growing interest in exploring how HRM systems influence firm innovation (innovation in products or services, innovation in processes, and innovation in people and organizations). The research collaborations exist across authors' national cultures or national cultural clusters. The bibliometric network structure, based on the co-occurrence of authors' key words, found three clusters in the field of HRM systems and firm innovation. This structure suggests that most publications focus on the innovation in products or services. Therefore, more studies are needed about innovation in people and organizations and innovation in processes.

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