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Mobile Commerce Global Publications: A Quantitative and Qualitative Assessment during 2007-16

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ABSTRACT

The paper provides quantitative and qualitative description of mobile commerce research, as covered in Scopus database during 2007-16. Mobile commerce research registered 7.29 per cent growth, and averaged 3.78 citations per paper. The global output in mobile commerce research in 10 years was 4803 publications but just top 10 countries contributed bulk of (80.66 %) global publications share and 90.39 per cent global citations share during the period. China (with 30.0 per cent global publications share) is the world leader in mobile commerce research, followed by USA (15.59 % share) and others. The paper also provide information on their relative citation index, their international collaborative publications share, activity index of sub-fields in mobile commerce research and bibliographic characteristics of 25 highly cited paper. The paper also reports on top 20 most productive global organisations and authors in mobile commerce research and describes their characteristics on a series of parameters. The study concludes that mobile commerce research is still in its early stages of growth and development and not growing fast, as fast as mobile penetration. There is a need to provide institutional funding and policy support to R&D institutions to accelerate research growth, build and strengthen their research capacities, and encourage national and international research collaboration in this important area.

Keywords: Mobile commerce; International collaboration; Bibliometrics

1. INTRODUCTION

Mobile commerce aka m-commerce refers to retail marketing via mobile devices, allowing retailers and consumers to trade and interact on wireless networks using smartphones, iPads, and tablets. Mobile devices are equipped with computing power, mobile applications, payment gateways interfaces, and web-ready micro browsers which allow mobile communication, internet browsing, and processing business transactions for shopping and selling of goods and services and digital payments online. Mobile commerce is a sub-area of e-commerce and hence it is also referred to as wireless e-commerce. Conceptually, m-commerce is a fusion of mobile communication and online retailing. Mobile communication refers to wireless broadband internet connectivity, 24x7 connectivity anytime, anywhere, via any mobile device, whereas online commerce refers to mobility and flexibility to perform business transactions and financial payments in a wireless environment. M-commerce services includes online purchases, promotion, mobile advertising, relationship building activities, and customer support. With an array of e-services, m-commerce is heading towards rapid growth even in developing countries and radically transforming the way we do business, transact, access and conduct our personal shopping, businesses and finances. The major factors driving m-commerce growth include mobile technology innovations, mobile apps for commerce and digital payments, exponential growth in consumer demand, online customer support, real time data transfer, evolution of a new value chain, and access to retail transactions data and information. M-commerce as a discipline is into research pursuits in frontier technologies like wireless communication technologies, mobile devices, wireless networks, wireless platforms, mobile payment gateways, and mobile platforms, infrastructure and applications[1-2]

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1.1 Literature Review

Mobile commerce being a discipline of recent origin, quantitative research studies pursued till date in this area only few. In a bibliographic analysis study Hew[3] evaluated mobile commerce research across countries on indicators like publication productivity, impact factor, h-index, and citation counts by contributing countries, journals, authors, and research institutions. In addition, the author reported most cited articles and most studied mobile commerce applications. Chang and Wang[4] analysed 4821 paper on mobility that were published 1995 to 2013 and as indexed in the Web of Science database. Using co-word analysis technique, the authors discussed inter-relationship among mobile computing, commerce and applications from the perspective of their future implications as to how such areas are likely to gain prominence over the next few years. Nagai and Gunasekaran[5] reviewed 149 paper on m-commerce and reported gap between theory and practice under five broad categories: i) m-commerce theory and research, ii) wireless network infrastructure, iii) mobile middleware, iv)

wireless user infrastructure, and v) m-commerce applications and cases. Other mobile related bibliometric studies global and national in scope cover broader areas such as mobile research[6], mobile technology[7], mobile computing[8-9], mobile learning[10-13], mobile banking[14] and mobile payments[15-16].

2. OBJECTIVES

The study seeks to undertake a quantitative and qualitative analysis of mobile commerce research across the world. The data for the study has been sourced from Scopus database covering 10 year period 2007-16. The broad objectives of the study are:

- To study mobile commerce research growth, country-wise contribution to international collaborative research, and identify top 10 productive countries in this area
- To distribute mobile commerce research by sub-areas in the subject, and report significant keywords characterising mobile commerce research
- To study publication productivity and citation impact of top 20 organisations and authors
- To study the medium of research communication and
- To study the bibliographic characteristics of highly cited papers.

3. METHODOLOGY

The mobile commerce publications were identified, retrieved, and downloaded using the Scopus database, an international multidisciplinary publications and citations database (http://www.scopus.com) covering 10 years period 2007-16. A search string was formulated to identify mobile commerce-related publications which contained search terms such as "mobile commerce'' or ''m-commerce'' or ''mcommerce" duly prefixed with "Article title tag" and "keywords tag" and restricted the search to the period 2007-16 in "date range tag". The search resulted into 4803 global publications on mobile commerce-related research during 2007-16. Further, the above search output was refined by country to identify top 10 productive countries by suffixing country name to "country tag" The global publications output was also refined by subject, collaborating countries, organisation-wise, author-wise and journal-wise, and others by using analytical provisions/tags as available in Scopus database. For citation data analysis, citations to publications were collected from date of their publication till 29 December 2016. The publications data was analysed across a series of raw and relative bibliometric indicators with a view to understand the dynamics of global research in mobile commerce. In data analysis, the authors used complete counting method wherein every contributing author or organisation covered in multiple authorship papers was fully counted. All authors or organisations to multi-authored papers have received equal credit in data counting and analysis.

((KEY(Mobile commerce or M-commerce or Mcommerce) AND PUBYEAR > 2006 AND PUBYEAR < 2017) or (TITLE(Mobile commerce or M-commerce or Mcommerce) AND PUBYEAR > 2006 AND PUBYEAR < 2017))

4. ANALYSIS

The global output in the field of mobile commerce cumulated to a total of 4803 publication in 10 year during 2007-16. Mobile commerce research registered 7.29 % growth per annum, up from 321 in 2007 to 416 publication in 2016. Of the total world output, 71.60 % (3439) appeared as conference papers, followed by 26.32 % (1264) as articles, 1.10 % (53) as reviews, 0.73 % (35) as book chapters and the rest as articles in press (29),editorial (8), short surveys (7), books (3), conference reviews (3) and letters and notes (1 each). The citation impact of global output on mobile commerce averaged to 3.78 citation (CPP) during the period as shown in Table 1.

Table 1. World literature on mobile commerce: Growth and citation impact during 2007-16

Publication Period	World		
	TP	TC	CPP
2007	321	2850	8.88
2008	619	3258	5.26
2009	517	2987	5.78
2010	515	1901	3.69
2011	437	1497	3.43
2012	476	2081	4.37
2013	442	1568	3.55
2014	601	1348	2.24
2015	459	554	1.21
2016	416	113	0.27
2007-11	2409	12493	5.19
2012-16	2394	5664	2.37
2007-16	4803	18157	3.78

TP = Total Papers; TC = Total Citations; CPP = Citations Per Paper

4.1 Most Productive Countries in Publications Output

The global research output in mobile commerce originated from 161 countries during 2007-16, but its distribution across publishing countries is highly skewed. The top 10 countries accounted for as much as 80.66 % global publications share, and their individual share varied widely between 2.77 % and 30.0 % during the period. Among top 10 countries, China had topped the list with 30 % global publication share, followed distantly by USA (15.59 % share), Taiwan (8.04 %), South Korea (5.08 % share), Germany and U.K. (4.58 % each), India (4.14), Canada and Spain (2.94 % each) and Italy (2.77 %) during 2007-16. These top 10 countries accounted for 90.39 % global citations share, and include 8 such countries had registered scored relative citation index above the world average of 1: Canada (2.54), USA (1.85), South Korea (1.75), Taiwan (1.59), Italy (1.18), U.K. (1.05) and India and Spain (1.02) during 2007-16.

4.2 International Collaboration

The international collaborative share of top 10 countries in their national output varied widely from 12.95 % to 53.19 %, with Canada accounting for the highest national share (53.19 %), followed by U.K. (45.00 %), USA (38.05 %), Spain (37.59

Table 2. Top 10 countries publication, citation output, global publication and international collaborative publication share during 2007-16

Countries	Number of papers			Share of papers			TC	CPP	ICP	%ICP	RCI
	2007-11	2012-16	2007-16	2007-11	2012-16	2007-16	2007-16	2007-16	2007-16	2007-16	2007-16
China	934	507	1441	38.77	21.18	30.00	2526	1.75	190	13.19	0.46
USA	306	443	749	12.70	18.50	15.59	5236	6.99	285	38.05	1.85
Taiwan	190	196	386	7.89	8.19	8.04	2326	6.03	50	12.95	1.59
South Korea	106	138	244	4.40	5.76	5.08	1611	6.60	66	27.05	0.70
Germany	106	114	220	4.40	4.76	4.58	580	2.64	70	31.82	1.75
U.K.	86	134	220	3.57	5.60	4.58	871	3.96	99	45.00	1.05
India	79	120	199	3.28	5.01	4.14	771	3.87	28	14.07	1.02
Canada	67	74	141	2.78	3.09	2.94	1354	9.60	75	53.19	2.54
Spain	54	87	141	2.24	3.63	2.94	546	3.87	53	37.59	1.02
Italy	43	90	133	1.78	3.76	2.77	592	4.45	49	36.84	1.18
	1971	1903	3874	81.82	79.49	80.66	16413		965		
World	2409	2394	4803	100.0	100.0	100.0	18157	3.78			
Share of 10 Countries in World Total	81.82	79.49	80.66				90.39				

TC = Total Citations; CPP = Citations Per Paper; ICP = International Collaborative Papers; RCI = Relative Citation Index

%), Italy (36.84 %), Germany (31.82 %), South Korea (27.05 %), India (14.07 %), China (13.19 %) and Taiwan (12.95 %) during 2007-16 as shown in Table 2.

4.3 Subject-Wise Distribution of Research Output

In Scopus database indexed publications, the global research output in mobile commerce published during 2007-16 is distributed across seven sub-disciplines, with computer science receiving the highest publications share (75.66 %), followed by engineering (30.56 %), business, accounting & management (20.53 %), social sciences (11.56 %), mathematics (10.16 %), decision science (7.79 %) and Economics, Econometrics & Finance (3.25 %) during 2007-16. The research activity in mobile commerce across its sub-fields is dynamic, changing with time. The average activity index of the world is computed as 100. The activity index of engineering increased from 90.59 to 109.47, followed by mathematics (from 55.16 to 145.13) and others during 2007-11 and 2012-16. On the other hand the activity index of computer science declined down from 102.82 to 97.17, followed by business, accounting & management (from 130.83 to 68.98), and others. Among subjects, decision science achieved the highest citation impact of 8.49 citations per paper, followed by business, accounting & management (5.12), economics, econometrics & finance (4.68), social sciences (4.56), computer science (4.06), engineering (3.44) and mathematics (1.79) during 2007-16 as shown in Table 3.

4.4 Most Productive Organisations: Research Output and Citations Profile

About 1853 participated in m-commerce research, of which 1544 organisation each contributed 1-5 paper, 213 organisation each 6-10 papers, 74 organisation each 11-20 papers, 22 organisation each 21-86 paper during 2007-16. The 20 most productive organisation publication productivity in mobile commerce research varied from 21 to 86 publication per organisation. Together these top 20 global organisation accounted for 13.74 % (660 publications) global publication share and 18.55 % (3368) global citation share during 2007-16. The bibliometric characteristics of these top 20 organisations

Table 3. Subject-wise break-up of global publications output on mobile commerce research during 2007-16

Subject	Number of papers (TP)			Activity index		TC	CPP	%TP
	2007-11	2012-16	2007-16	2007-11	2012-16	2007-16	2007-16	2007-16
Computer science	1874	1760	3634	102.82	97.17	14768	4.06	75.66
Engineering	667	801	1468	90.59	109.47	5052	3.44	30.56
Business, accounting & management	647	339	986	130.83	68.98	5053	5.12	20.53
Social science	297	258	555	106.69	93.26	2529	4.56	11.56
Mathematics	135	353	488	55.16	145.13	873	1.79	10.16
Decision science	230	144	374	122.61	77.25	3177	8.49	7.79
Economics, econometrics & finance	99	57	156	126.53	73.31	730	4.68	3.25
World output	2409	2394	4803	100.00	100.00			

TP=Total Papers; TC=Total Citations; CPP=Citations Per Paper

are presented in Table 4.

- Only six organisations registered publications output above the 20 organisations average of 33.0: Beijing University of Post & Telecommunications, China (86 papers), Huazhong University of Science & Technology, China (57 papers), Wuhan University, China (54 papers), Beijing Jiatotong University, China (36 papers), Aalto University, Finland (35 papers) and National Chiao Tung University, Taiwan (34 papers) during the period.
- Seven organisations registered citation impact above the group of 5.1 citations per publication during 2007-16: Pennsylvania State University, USA (19.21), City University of Hong Kong (15.25), Aalto University, Finland (14.20), Nanyang Technological University, Singapore (9.45), National Chiao Tung University, Taiwan (8.53), National Chung Hsing University, Taiwan (6.64) and Shanghai Jiatong University, China (5.26) during 2007-16.
- Nine organisations contributed their share of international collaborative publications above the group average share (16.82 %) of all organisations: City University of Hong Kong (64.29 %), Pennsylvania State University, USA (48.28 %), Shanghai Jiatong University, China (25.81 %), Tongji University, China (24.0 %), Tsinghua University, China (23.33 %), Aalto University, Finland (22.86 %), Dalian University of Technology, China (20.0 %), Xian Jiaotong University, China (19.05 %) and Nanyang Technological University, Singapore (18.18 %) during the period.
- Seven organisations registered the relative citation index above the group average (1.35) of all organisations: Pennsylvania State University, USA (5.08), City University of Hong Kong (4.03), Aalto University, Finland (3.76), Nanyang Technological University, Singapore (2.50), National Chiao Tung University, Taiwan (2.26), National Chung Hsing University, Taiwan (1.76) and Shanghai Jiatong University, China (1.39) during the period.

Table 4. Bibliometric features of most productive global organisations in mobile commerce research during 2007-16

Name of the Organisation	TP	TC	CPP	HI	ICP	%ICP	RCI
Beijing University of Post & Telecommunications, China	86	117	1.36	5	14	48.28	0.36
Huazhong University of Science & Technology, China	57	234	4.11	7	18	64.29	1.09
Wuhan University, China	54	110	2.04	5	8	25.81	0.54
Beijing Jiatotong University, China	36	27	0.75	3	6	24	0.20
Aalto University, Finland	35	497	14.20	5	7	23.33	3.76
National Chiao Tung University, Taiwan	34	290	8.53	7	8	22.86	2.26
Shanghai Jiatong University, China	31	163	5.26	5	6	20	1.39
Jiangxi University of Finance & Economics, China	31	99	3.19	4	4	19.05	0.84
Dalian University of Technology, China	30	145	4.83	5	4	18.18	1.28
Tsinghua University, China	30	56	1.87	4	4	16	0.49
Pennsylvania State University, USA	29	557	19.21	12	9	15.79	5.08
City University of Hong Kong	28	427	15.25	9	4	14.81	4.03
Zhejiang University, China	27	75	2.78	5	3	8.33	0.73
South China University of Technology, China	27	45	1.67	4	7	8.14	0.44
Korea Advanced Institute of Science & Technology	27	47	1.74	4	2	7.69	0.46
Chaoyang University of Technology, Taiwan	26	74	2.85	5	2	7.41	0.75
National Chung Hsing University, Taiwan	25	166	6.64	7	2	7.41	1.76
Tongji University, China	25	31	1.24	3	1	3.23	0.33
Nanyang Technological University, Singapore	22	208	9.45	3	1	2.94	2.50
Xian Jiaotong University, China	21	28	1.33	3	1	1.85	0.35
Total of 20 organisations	660	3368	5.10	5.25	111	16.82	1.35
Total of World	4803	18157	3.78				
Share of top 20 organisations in world total output	13.74	18.55					

TP = Total Papers; TC = Total Citations; CPP = Citations Per Paper; HI = h-index; ICP = International Collaborative Papers; RCI = Relative Citation Index

4.5 Most Productive Authors: Research Output and Citations Profile

- About 1965 author participated in m-commerce research, of which 1911 journal each contributed 1-5 paper, 49 authors each 6-10 paper and 5 author 11-12 paper during 2007-16. The 20 most productive organisations publication productivity in mobile commerce varied from 7 to 12 publication per author and together these authors accounted for 3.62 % (174 publication) global publication share and 7.59 % (1379) global citation share during 2007-16. The bibliometric characteristics of these top authors are presented in Table 5.
- Only nine author registered publications output above the 20 author average of 8.7 paper per author: C.C. Chang and A. Holzinger (12 paper each), D. Chang, C.L. Chen and K.B. Ooi (11 paper each), B. Lin and Q. Min (10 paper each), J. Huang and Y. Lu (9 paper each) during the period.
- Six author registered citations impact above the group average of 9.65 citation per publication of all authors: A.Y.L. Chong (41.86), V.K. Tuunainen (30.38), K.B. Ooi (27.36), Y. Lu (23.22), Q. Min (12.80) and B. Lin (10.40) during the period.
- Seven author registered h-index above the group average (3.1) of all authors: Y.Lu and B.Lin (7 each), K.B. Ooi (6), A.Y.L. Chong and C.C. Chang (5 each), Q. Min and J.Huang (4 each) during the period.
- Eight author contributed their share of international collaborative publications above the group average of (30.10 % share of all authors: J. Huang (100.0 %), A.Y.L. Chong (85.7), B. Lin (80.0 %), Y. Lu (66.7 %), K.B. Ooi (45.5 %), Q.Min (40.0 %), V.K. Tuunainen (37.5 %) and A. Holzinger (33.3 %) during the period.
- Six author had the relative citation index value above the group average of 2.55 of all authors: A.Y.L. Chong (11.07), V.K. Tuunainen (8.04), K.B. Ooi (7.24), Y. Lu (6.14), Q. Min (3.39) and B. Lin (2.75) during the period.

Table 5. Bibliometric features of most productive authors in mobile commerce research during 2007-16

Authors	Affiliation of the Author	TP	TC	CPP	HI	ICP	%ICP	RCI
C.C. Chang	Feng Chia University, Taiwan	12	101	8.42	5	1	8.3	2.23
A. Holzinger	Graz University Hospital, Austria	12	38	3.17	3	4	33.3	0.84
D. Chang	Beijing Jiaotong University, China	11	16	1.45	3	0	0	0.38
C.L. Chen	Chaoyang University of Technology, Taiwan	11	21	1.91	3	1	9.1	0.51
K.B. Ooi	University of Tunku Abdul Rahman Kampar, Malaysia	11	301	27.36	6	5	45.5	7.24
B. Lin	Louisiana State University in Shreveport, USA	10	104	10.4	7	8	80	2.75
Q. Min	Dalian Univesity of Technology, China	10	128	12.8	4	4	40	3.39
J. Huang	Chinese University of Hong Kong	9	58	6.44	4	9	100	1.7
Y. Lu	Huazhong University of Science & Technology, China	9	209	23.22	7	6	66.7	6.14
Y.F. Chung	Tunghai University, Taiwan	8	35	4.38	3	0	0	1.16
A. Ghezzi	Polittecnico di Milano, Italy	8	31	3.88	3	2	25	1.03
C. Piao	Shijiazhuang Tiedao University, China	8	5	0.63	2	0	0	0.17
K. Pousttchi	Business School, German University, Augsburg, Germany	8	33	4.13	2	1	12.5	1.09
A. Rangone	Polittecnico di Milano, Italy	8	12	1.5	2	0	0	0.4
V.K. Tuunainen	Helsinki School of Economics, Aalto University, Finland	8	243	30.38	2	3	37.5	8.04
U. Varshney	Georgia State University, USA	8	33	4.13	3	2	25	1.09
J. Zhang	Huazhong University of Science & Technology, China	8	5	0.63	1	0	0	0.17
R. Zhang	Beijing Jiaotong University, China	8	2	0.25	1	0	0	0.07
X. Chen	Guangdong University of Foreign Studies, China	7	4	0.57	1	0	0	0.15
A.Y.L. Chong	University of Nottingham , U.K.	7	293	41.86	5	6	85.7	11.07
	Total of 20 authors	174	1379	7.93	3.1	46	26.4	2.1
	Total of World	4803	18157	3.78				
	Share of top 20 authors in World total output	3.62	7.59					

TP=Total Papers; TC=Total Citations; CPP=Citations Per Paper; HI=h-index; ICP=International Collaborative Papers; RCI=Relative Citation Index

4.6 Medium of Research Communication

Of the global output in mobile commerce, 59.73 % (2869) appeared as conference papers, 27.75 % (1333) in journals, 11.76 % (565) in book series, 0.81 % (39) in trade publications and 0.77 %(37) in books. About 412 participated in m-commerce research, of which 370 journal each contributed 1-5 paper, 26 journal each 6-10 paper, 11 journal each 11-20 paper and 5 journal each 21-65 paper during 2007-16. Most productive journal (20) in global mobile commerce research contributed from 9 to 65 paper each and together registered 28.81 % global journal shares (384 paper) during 2007-16, which decreased from 31.12 % to 27.50 % from 2007-11 to 2012-16. The top most productive journal was International Journal of Mobile Communication with 65 paper, followed by Telecommunication Policy (47 paper), Electronic Commerce Research & Applications (32 paper), Telematics & Informatics (22 paper), etc. during 2007-16 as shown in Table 6.

Table 6. Mobile commerce research 20 most productive journals during 2007-16

Journals	Number of papers		
	2007-11	2012-16	2007-16
International Journal of Mobile Communication	40	25	65
Telecommunication Policy	10	37	47
Electronic Commerce Research & Applications	15	17	32
Telematics & Informatics	2	20	22
Computers in Human Behaviour	6	15	21
Decision Support Systems	11	9	20
Technological Forecasting & Social Change	1	18	19
Expert Systems with Applications	9	9	18
IT Professional	3	14	17
Wireless Personal Communication	15	0	15
Journal of Electronic Commerce in Organisations	7	7	14
Journal of Computational Informational System	11	1	12
Advances in Information Sciences & Services	4	7	11
IEEE Transactions on Mobile Computation	1	10	11
Industrial Management & Data System	2	9	11
Journal of Systems & Software	4	7	11
IEEE Communication Magazine	2	8	10
Technology in Society	4	6	10
Behaviour & Information Technology	3	6	9
International Journal of Multimedia & Ubiquitous Engineering	0	9	9
Total of 20 journals	150	234	384
Total global journal output	482	851	1333
Share of top 20 journals in global journal output	31.12	27.50	28.81

4.7 Significant Keywords

37 significant keywords which contribute to research trends in mobile commerce have been identified and they listed in Table 7 in the decreasing order of their frequency of occurrence during 2007-16.

4.8 Highly Cited Papers

Of the global output of 4803 paper in mobile commerce, only 25 (0.52 %) received 107 to 460 citation per paper since their publication during 2007-16. 69 author and 49 organisations have participated in 25 high cited papers and they comprised of 6 national and 10 international collaborative papers, and cumulated 4537 citation, and their citation impact averaged to 181.5 citations per paper. Of the 10 international collaborative papers, USA was collaborator in all of the 10 paper, Canada and South Korea (in 5 paper each), Finland, H. Kong and Taiwan (in 3 paper each), Singapore (in 2 paper), and India, China, Malaysia, Turkey and U.A.E (in 1 paper each). Of the 25 highly cited paper, 21 were published as articles, 3 as review paper and 1 as conference paper. 25 highly cited paper appeared in 16 journal. The largest number of papers(4 paper each) were published in Decision Support Systems (IF=2.604) and Information & Management (IF=3.317), followed by 3 paper in Computers in Human Behaviour (IF=4.61) and 1 paper each in Advanced Energy Materials (IF=15.23), Computer Standards & Interfaces (IF=1.633), IEEE Communications Magazine (IF=4.007) , IEEE Network (IF=2.54), IEEE Transactions on Robotics (IF=4.11), IEEE Transactions on Selected Areas in Communication (IF=3.453), Industrial Management & Data Systems (IF=1.278), Information Systems Journal (IF=1.89), International Journal of Mobile Communication (IF=0.765), International Journal of Production Economics (IF=4.34), International Materials Review (IF=7.914), Journal of Management Information System (IF=3.025) and Journal of Strategic Information System (IF=2.595).

5. SUMMARY AND CONCLUSIONS

Mobile commerce is an emerging area of research involved mainly in studies exploring new mobile commerce applications, technologies, and devices such as wireless user infrastructure, wireless network infrastructure and mobile middleware. Though mobile commerce research studies have spread across as many as 161 countries, however bulk of global output (80.66 %) in this field comes mainly from just 10 top countries only. China leads the ranking with 30.0 % global publications share, followed distantly by USA with 15.59 % share. The top 20 global organisations and top 20 authors account for 13.74 % and 3.62 % global publications share respectively. The global citation impact of mobile commerce research in 10 year averaged to just 3.78 citations per paper and highly cited papers account for just 0.52 % share. Given such discouraging qualitative and quantitative trends, it is evident that mobile commerce research is still in its early stages of growth and development and not growing fast, as fast as mobile penetration. Recognising that mobile commerce research has major potential to transform and push countries towards the path of cashless and digital economy, major developing countries like India should resolve to provide institutional

Table 7. List of significant keywords in literature on mobile commerce research during 2007-16

Keywords	Frequency	Keywords	Frequency
Commerce	2320	Mobile agents	214
E-commerce	2148	Social networks (online)	206
Mobile commerce	1379	Costs	204
Mobile telecommunication systems	1360	Network security	203
Mobile devices	911	Mobile payments	168
Wireless networks	566	Mobile services	161
Mobile computing	517	Mobile users	127
Wireless telecommunication systems	427	Mobile technology	125
Internet	396	Mobile	97
Sales	372	Mobile internet	85
Mobile applications	323	Mobile ad hoc networks	71
Global system for mobile communications	320	Mobile banking	77
Marketing	308	Mobile marketing	63
Information systems	293	Mobile business	61
Competition	272	Mobile environment	60
Information management	236	Mobile advertising	59
Information technology	229	Mobile platform	51
Mobile security	219	Mobile telecommunications	51
Mobile communications	213		

funding and policy support to accelerate research growth, build and strengthen research capacities, and encourage national and international research collaboration in this important area.

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