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## Citation of Research Literature Output on Smart Card Technology: A Scientometric Study

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### Abstract

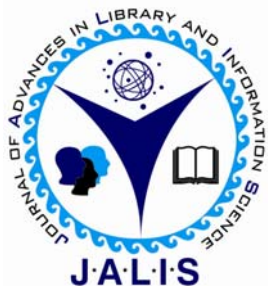
*This study will analyze the increasing smart card technology related publications, utilizing scientometric approach. Scientometric investigation of smart card technology literature indexed by the web of science (WoS) database for the time span 1999-2012 with regard to development of publications and citations, nationwide and worldwide collaboration, highly creative organizations, highly creative authors, highly favoured journals and highly cited publications, etc. will be conducted*

### Keywords

Bibliometrics, Scientometrics, Smart Card Technology

### Electronic access

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## INTRODUCTION

Scientometric is a vital area of information research because it comprises a singular set of methods for the observation and analysis of information assets and for the administration of knowledge in communal and organizational contexts. Procedures of investigation embody qualitative, quantitative and machine advances. In general, scientometric investigation use data on figures and authors of scientific publications and on articles and therefore the citations in that to assess the output of countries, to spot nationwide and internationwide systems, and to chart the development of latest (multi-disciplinary) fields of research and expertise, likewise on grab the inner reasoning of research development Scientometric indicators like “number of papers”, “number of citations” and “citation per paper” became progressively essential as devices for analyzing technical undertakings and their relationship with financial and social development. Sooryamoorthy and Radhamany<sup>1</sup> (2010) examined the health study in South Africa. Their research tried to find out if the reported stride of development in the output of technical papers in surgery is an effect of partnerships that scholars have with their counterparts inside the association, or inside the country, or with those in other nations. Bolaños-Pizarro, Máxima et al.<sup>2</sup> (2010) analyzed the cardiovascular study in Spain, the productivity, visibility and citation influence in a worldwide especially European context. Special attention is granted to worldwide collaboration. Miguel, Sandra, Moya-Anegón et al.<sup>3</sup> (2010) investigated the influence of the socio-economic crisis of 2001 on the technical system in Argentina. The present study does so by means of a set of scientometric indicators that reflect financial effort, human assets dedicated to research, publications, collaborative relations, and the worldwide visibility of technical contributions. Pouris, Anastassios<sup>4</sup> (2010) concluded through scientometric assessment that all nations are inclined to have the identical aim in their disciplinary priorities and underemphasize disciplines such as technology, components science and molecular biology. It has expressed anxiety that the present study infrastructures are inadequate to aid in reaching the objectives evolved in the local Indicative Strategic Development design of the Community. Kaur, Har et al.<sup>5</sup> (2010) analyzed India’s presentation based on its publication yield in dental sciences throughout 1999–2008, taking into concern several parameters, including the country’s annual mean growth rate, mean citations per paper, worldwide

collaboration yield and share and contribution by major collaborative partners, assortment of peak 15 most creative authors, patterns of connection in nationwide and worldwide periodicals and characteristics of its 45 high cited papers. Glänzel, Wolfgang<sup>6</sup> (2010) investigated the role of the h-index and the characteristic scores and scales in testing the follow properties of scientometric distributions. Joshi, Kirti et al.<sup>7</sup> (2010) has analyzed the area of forest mycology (study of fungi) with a prime aim on the global trends of publication output and its citation influence for the papers released during 1987-2008. The results show that number of publications has bigger significantly particularly during 2004 -2008. Sagar, Anil et al.<sup>8</sup>. (2010) investigated the Scientometric mapping of Tsunami publications. A spurt in the number of publications was discerned after the Indonesia's tsunami appeared on 26 December, 2004.

## METHODOLOGY

Data was assembled from the Science Citation Index (SCI) which is accessible by the Web of science (WoS). SCI database is one of the very comprehensive databases covering all aspects of science. The study period (1999-2012) is chosen as the database is accessible in appliance from since 1982. The research papers published by investigators in the area of smart card technology enclosed in the annual version of Science Citation index database were taken as the major source for the present study.

## OBJECTIVES

The objectives of the study are as follows:

- To study the growth of Literature in the field of Smart card Technology as reflected in the Web of science
- To identify the core journals in the field of smart card technology research, TGCS, TLCS and TLCR.
- To examine and analyze the authorship pattern in smart card technology research, TLCR, TGCS and TLCR.
- The source-wise and year-wise distribution of Smart card technology research output of the study

## Data Collection tools and techniques

The data are going to be down loaded from the web of database and therefore the records are going to be born-again into a database for the convenience of

reckoning and analyzing, principles and laws governing Scientometric tools are going to be applied to the data collected. Appropriate statistical techniques are going to be applied where needed.

The data are going to be down loaded from the web of Science database and thus the notes are going to be born-again into a database for the convenience of considering and investigating, principles and laws ruling Scientometric tools are going to be applied to the facts and figures assembled. Befitting statistical methods are going to be applied where needed.

## RESULTS AND DISCUSSION

### Year wise distribution of documents

During 1999 - 2012 a total of 232 publications were published in smart card technology by global. The average Number of Publications produced per year was 16.57. The highest number of publications each 20 was produced in 2000, 2003, 2004 and 2010 Table 1 was given year wise growth and collaboration rate in smart card technology. It can be clearly visualized from the table 1 that growth of the literature was very low during 2008. It Indicate that research in smart card technology received a major impetus this period.

**Table 1 Year wise distribution of documents**

Year	No. of Records	Cumulative	Cumulative Percentage
1999	13	13	5.60
2000	20	33	14.22
2001	18	51	21.98
2002	16	67	28.88
2003	20	87	37.50
2004	20	107	46.12
2005	17	124	53.45
2006	19	143	61.64
2007	15	158	68.10
2008	12	170	73.28
2009	17	187	80.60
2010	20	207	89.22
2011	18	225	96.98
2012	7	232	100.00

### Author's wise document in TLCS

The most productive author in TLCS is Harvey I, Johnson IT, Lambert N, Looise B, Plumb J, Robinson

M, Rolfe P and Wheeler C with each 3 (TLCS 10) papers dealing with smart card Technology of all papers published in this research field. The authors of the seminal publication on smart card technology

given Table 2 Plouffe CR 2 (TLCS 7) record, respectively. It can be clearly visualized from the below table.4

**Table 2: Author's wise Document Distribution in TLCS**

S.No	Author	Records	Percent	TLCS	TLCS/t	TLCSx	TGCS	TGCS/t	TLCR	TLCSb	TLCSe
1	Harvey I	3	1.3	10	1.25	4	18	2.25	6	9	0
2	Johnson IT	3	1.3	10	1.25	4	18	2.25	6	9	0
3	Lambert N	3	1.3	10	1.25	4	18	2.25	6	9	0
4	Looise B	3	1.3	10	1.25	4	18	2.25	6	9	0
5	Plumb J	3	1.3	10	1.25	4	18	2.25	6	9	0
6	Robinson M	3	1.3	10	1.25	4	18	2.25	6	9	0
7	Rolfe P	3	1.3	10	1.25	4	18	2.25	6	9	0
8	Wheeler C	3	1.3	10	1.25	4	18	2.25	6	9	0
9	Plouffe CR	2	0.9	7	0.58	7	144	12.00	0	2	1
10	Shugan SM	4	1.7	7	0.69	1	142	13.63	6	3	0
11	Vandenbosch M	2	0.9	7	0.58	7	144	12.00	0	2	1
12	Hulland JS	1	0.4	5	0.42	5	111	9.25	0	1	1
13	Xie JH	3	1.3	5	0.47	0	119	11.07	4	2	0
14	Aubert BA	1	0.4	3	0.25	3	31	2.58	0	1	2
15	Chung Y	3	1.3	3	0.30	1	21	2.50	3	2	-
16	Gil YH	1	0.4	3	0.30	1	17	1.70	0	2	0
17	Gregori S	3	1.3	3	0.65	1	5	1.05	2	-	-
18	Hamel G	1	0.4	3	0.25	3	31	2.58	0	1	2
19	Moon D	4	1.7	3	0.30	1	22	2.61	4	2	-
20	Muresan R	3	1.3	3	0.65	1	5	1.05	2	-	-

**Author's wise document in TGCS**

The most productive author in TGCS is Li Y and Wong CP with 2(TGCS188) and 1(TGCS188) papers dealing with smart card technology of all papers

published in this research field. The authors of the seminal publication on smart card technology have given Table 3 Plouffe CR and Vandenbosch M each 2(TGCS 144) record, respectively. It can be clearly visualized from the below table.3

**Table 3 Author's wise Document Distribution in TGCS**

S.No	Author	Records	Percent	TLCS	TLCS/t	TLCSx	TGCS	TGCS/t	TLCR	TLCSb	TLCSe
1	Li Y	2	0.9	0	0.00	0	180	25.71	1	0	0
2	Wong CP	1	0.4	0	0.00	0	180	25.71	1	0	0
3	Plouffe CR	2	0.9	7	0.58	7	144	12.00	0	2	1
4	Vandenbosch M	2	0.9	7	0.58	7	144	12.00	0	2	1
5	Shugan SM	4	1.7	7	0.69	1	142	13.63	6	3	0
6	Xie JH	3	1.3	5	0.47	0	119	11.07	4	2	0
7	Hulland JS	1	0.4	5	0.42	5	111	9.25	0	1	1
8	Ghovanloo M	1	0.4	0	0.00	0	77	8.56	0	0	0
9	Najafi K	1	0.4	0	0.00	0	77	8.56	0	0	0
10	Kim K	5	2.2	1	0.10	0	51	5.51	3	0	-
11	Juang WS	3	1.3	2	0.22	2	49	5.44	1	0	-
12	Lin LM	1	0.4	0	0.00	0	47	7.83	3	0	0
13	Wang SC	1	0.4	0	0.00	0	47	7.83	3	0	0
14	Wu JH	1	0.4	0	0.00	0	47	7.83	3	0	0

15	Song YJ	1	0.4	1	0.10	0	46	4.60	0	0	0
16	Abrial A	1	0.4	2	0.17	2	43	3.58	0	0	0
17	Bouvier J	1	0.4	2	0.17	2	43	3.58	0	0	0
18	Renaudin M	1	0.4	2	0.17	2	43	3.58	0	0	0
19	Senn P	1	0.4	2	0.17	2	43	3.58	0	0	0
20	Vivet P	1	0.4	2	0.17	2	43	3.58	0	0	0

**Author’s wise document in TLCR**

The most productive author in TLCR is Harvey I , Johnson IT , Lambert N , Looise B , Plumb J , Robinson M , Rolfe P , Shugan SM and Wheeler C with 3,3,3,3,3,3,4 and 3 (TLCR 6) papers dealing

with smart card technology of all papers published in this research field. The authors of the seminal publication on smart card technology given Table 4 Tam KY 2(TLCR 5) record, respectively. It can be clearly visualized from the below table.4

**Table 4: Author’s wise Document Distribution**

S.No	Author	Records	Percent	TLCS	TLCS/t	TLCSx	TGCS	TGCS/t	TLCR	TLCsb	TLCSe
1	Harvey I	3	1.3	10	1.25	4	18	2.25	6	9	0
2	Johnson IT	3	1.3	10	1.25	4	18	2.25	6	9	0
3	Lambert N	3	1.3	10	1.25	4	18	2.25	6	9	0
4	Looise B	3	1.3	10	1.25	4	18	2.25	6	9	0
5	Plumb J	3	1.3	10	1.25	4	18	2.25	6	9	0
6	Robinson M	3	1.3	10	1.25	4	18	2.25	6	9	0
7	Rolfe P	3	1.3	10	1.25	4	18	2.25	6	9	0
8	Shugan SM	4	1.7	7	0.69	1	142	13.63	6	3	0
9	Wheeler C	3	1.3	10	1.25	4	18	2.25	6	9	0
10	Tam KY	2	0.9	0	0.00	0	3	0.83	5	0	-
11	Brown SA	1	0.4	0	0.00	0	2	0.67	4	-	-
12	Chan FKY	1	0.4	0	0.00	0	2	0.67	4	-	-
13	Hu PJH	1	0.4	0	0.00	0	2	0.67	4	-	-
14	Moon D	4	1.7	3	0.30	1	22	2.61	4	2	-
15	Pan SB	4	1.7	3	0.30	1	22	2.61	4	2	-
16	Thong JYL	1	0.4	0	0.00	0	2	0.67	4	-	-
17	Venkatesh V	1	0.4	0	0.00	0	2	0.67	4	-	-
18	Xie JH	3	1.3	5	0.47	0	119	11.07	4	2	0
19	Blakely T	1	0.4	0	0.00	0	3	0.50	3	0	0
20	Cheng YW	1	0.4	1	0.10	1	6	0.60	3	0	0

**Journal wise document in TLCS**

The most productive Journal in TLCS is Journal of Human Nutrition and Dietetics with 3 papers dealing with smart card technology and 1.3% (TLCS 10) of

all papers published in this research field. The journal of the seminal publication on smart card technology given table 5, Information Systems Research and Marketing Science appear on rank 2 respectively.

**Table 5 Journal wise document distribution in TLCS**

S.No	Journal	Records	Percent	TLCS	TLCS/t	TGCS	TGCS/t	TLCR
1	Journal of Human Nutrition and Dietetics	3	1.3	10	1.25	18	2.25	6
2	Information Systems Research	1	0.4	5	0.42	111	9.25	0
3	Marketing Science	2	0.9	5	0.47	109	9.72	2
4	Electric Journal	2	0.9	3	0.30	26	2.60	2
5	IEEE Transactions on Consumer Electronics	2	0.9	3	0.30	54	5.83	1

6	International Journal of Medical Informatics	4	1.7	3	0.24	72	10.08	3
7	Proceedings of the Institution of Civil Engineers-Municipal Engineer	2	0.9	3	0.33	14	1.56	0
8	Social Science & Medicine	1	0.4	3	0.25	31	2.58	0
9	California Management Review	1	0.4	2	0.22	16	1.78	1
10	Computer Methods and Programs in Biomedicine	2	0.9	2	0.29	14	2.00	2
11	Computer Networks	5	2.2	2	0.25	18	3.17	0
12	Future Generation Computer Systems	1	0.4	2	0.20	33	3.30	0
13	IEEE Journal of Solid-State Circuits	6	2.6	2	0.17	174	16.82	1
14	IEEE Transactions on Computers	1	0.4	2	0.40	4	0.80	0
15	Journal of Organizational Computing and Electronic Commerce	3	1.3	2	0.15	4	0.40	1
16	Journal of Product Innovation Management	1	0.4	2	0.17	33	2.75	0
17	NTT Review	2	0.9	2	0.18	7	0.64	1
18	Computer Communications	2	0.9	1	0.50	7	3.50	0
19	Computers & Security	1	0.4	1	0.20	19	3.80	2
20	Cryptographic Hardware and Embedded Systems Ches 2003, Proceedings	1	0.4	1	0.10	40	4.00	0

**Journal wise document in TGCS**

The most productive Journal in TGCS is Materials Science & Engineering R-Reports with 1(TGCS 180) papers dealing with smart card technology and 0.4%

of all papers published in this research field. The journal of the seminal publication on smart card technology given table 6, IEEE Journal of Solid-State Circuits and Information Systems Research appear on rank 2 and 3 respectively

**Table 6: Journal wise Document Distribution in TGCS**

S.No	Journal	Recs	Percent	TLCS	TLCS/t	TGCS	TGCS/t	TLCR
1	Materials Science & Engineering R-Reports	1	0.4	0	0.00	180	25.71	1
2	Ieee Journal of Solid-State Circuits	6	2.6	2	0.17	174	16.82	1
3	Information Systems Research	1	0.4	5	0.42	111	9.25	0
4	Marketing Science	2	0.9	5	0.47	109	9.72	2
5	International Journal of Medical Informatics	4	1.7	3	0.24	72	10.08	3
6	IEEE Transactions on Consumer Electronics	2	0.9	3	0.30	54	5.83	1
7	Microelectronics Reliability	1	0.4	1	0.10	46	4.60	0
8	Cryptographic Hardware and Embedded Systems CHES 2003, Proceedings	1	0.4	1	0.10	40	4.00	0
9	Journal of Vacuum Science & Technology B	1	0.4	0	0.00	34	2.83	0
10	Future Generation Computer Systems	1	0.4	2	0.20	33	3.30	0
11	Journal of Product Innovation Management	1	0.4	2	0.17	33	2.75	0
12	Computer Standards & Interfaces	3	1.3	0	0.00	32	3.56	0
13	Social Science & Medicine	1	0.4	3	0.25	31	2.58	0
14	ETRI Journal	2	0.9	3	0.30	26	2.60	2
15	Studies in Comparative International Development	1	0.4	0	0.00	26	3.25	0
16	Soldering & Surface Mount Technology	1	0.4	1	0.08	25	2.08	0
17	Computers and Electronics in Agriculture	1	0.4	0	0.00	23	1.64	0
18	Topics in Cryptology - CT-RAS 2001, Proceedings	1	0.4	0	0.00	21	1.75	0
19	Annals of Emergency Medicine	1	0.4	0	0.00	20	6.67	1
20	Advances in Cryptology-EUROCRYPT 2001, Proceedings	1	0.4	0	0.00	19	1.58	0

**Journal wise document in TLCR**

The most productive Journal in TLCR is Journal of Human Nutrition and Dietetics with 3(TLCR 6) papers dealing with smart card technology and 1.3% of all papers published in this research field. The

journal of the seminal publication on smart card technology given table 7, Journal of the Association for Information Systems and International Journal of Human-Computer Studies appear on rank 2 and 3 respectively.

**Table 7 Journal wise document distribution in TLCR**

S.NO	JOURNAL	RECS	percent	TLCS	TLCS/T	TGCS	TGCS/T	TLCR
1	journal of human nutrition and dietetics	3	1.3	10	1.25	18	2.25	6
2	journal of the association for information systems	1	0.4	0	0.00	2	0.67	4
3	international journal of human-computer studies	2	0.9	1	0.10	6	0.60	3
4	international journal of medical informatics	4	1.7	3	0.24	72	10.08	3
5	international journal of research in marketing	1	0.4	0	0.00	17	2.13	3
6	microelectronics journal	2	0.9	0	0.00	4	0.57	3
7	public health nutrition	1	0.4	0	0.00	3	0.50	3
8	transportation research part c-emerging technologies	1	0.4	0	0.00	0	0.00	3
9	computer methods and programs in biomedicine	2	0.9	2	0.29	14	2.00	2
10	computers & security	1	0.4	1	0.20	19	3.80	2
11	ETRI journal	2	0.9	3	0.30	26	2.60	2
12	EURASIP journal on advances in signal processing	1	0.4	0	0.00	0	0.00	2
13	European journal of information systems	1	0.4	0	0.00	3	0.75	2
14	international journal of innovative computing information and control	3	1.3	1	0.33	3	1.00	2
15	marketing science	2	0.9	5	0.47	109	9.72	2
16	transportation research record	3	1.3	0	0.00	0	0.00	2
17	Acm journal on emerging technologies in computing systems	1	0.4	0	0.00	0	0.00	1
18	advances in information and computer security, proceedings	1	0.4	0	0.00	0	0.00	1
19	annals of emergency medicine	1	0.4	0	0.00	20	6.67	1
20	British journal of nutrition	1	0.4	0	0.00	13	3.25	1

**Source wise distribution documents**

Smart card technology Scientists communicated their research results through a variety of communication channels. Table – 8 provides the distribution of publications in various channels of communication. It was observed that 65.9 percent of the literature was published in Article followed by 28.0 percent in Proceeding Paper, 2.6 percent in Review, 1.3 percent in Editorial Material and other documents below one percent.

**Table 8 : Source Wise Distribution Documents**

Document Type	Records	Percent	TLCST	TGCS
Article	153	65.9	59	1074
Article; Proceedings Paper	65	28.0	6	276
Review	6	2.6	0	196
Editorial Material	3	1.3	2	24
News Item	2	0.9	0	1
Reprint	2	0.9	0	1
Meeting Abstract	1	0.4	0	0

**Country wise documents distribution**

There were as many as 20 countries carrying out research in the field of smart card technology. Table 9 provides a list of collaboration countries whose research output is more than 50 publications. USA is top producing country with 44 publications (19.0%, TLCS 15, TGCS 635) followed by Unknown with 31 publications (13.4%, TLCS 7 TGCS 221), Taiwan with 23 Publications (9.9%, TLCS 6, TGCS 205), respectively.

**Table 9 Country wise Documents Distribution**

S.No	Country	Records	Percent	TLCS	TGCS
1	USA	44	19.0	15	635
2	Unknown	31	13.4	7	221
3	Taiwan	23	9.9	6	205
4	Canada	12	5.2	14	188
5	Switzerland	1	0.4	5	111
6	South Korea	20	8.6	5	82
7	Peoples R China	16	6.9	3	49
8	UK	17	7.3	13	48
9	Italy	12	5.2	0	38
10	Japan	14	6.0	3	38
11	Belgium	5	2.2	0	36
12	Germany	7	3.0	1	34
13	Spain	8	3.4	0	26
14	Sweden	1	0.4	1	25
15	Netherlands	8	3.4	0	23
16	France	8	3.4	0	20
17	Turkey	3	1.3	1	9
18	Slovenia	1	0.4	2	8
19	Australia	4	1.7	1	7
20	Malaysia	3	1.3	1	6

**CONCLUSION**

This study paper has investigated 232 publications on smart card technology and cited inside the web of science database throughout 1999-2012. The benchmark varies of publications one time a year was 16.57. The unconditional best alter of publications each 20 was disclosed in 2000, 2003, 2004 and 2010 and extremely low all through 1999. The most effective cited journal is periodical of Human Nutrition and Dietetics (TLCS 10), Materials research & Engineering R-Reports (TGCS 180) and periodical of Human Nutrition and Dietetics (TLCS 6). USA is prime producing homeland with 44 publications TLCS 15 TGCS 635. The most cited author is Harvey I, Johnson IT, Lambert N, Looise B,

Plumb J, Robinson M, Rolfe P and Wheeler C with each 3 papers, Li Y and Wong CP with 2(TGCS188) papers considering with smart card technology of all papers published in this study field.

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