A BIBLIOMETRIC ANALYSIS ON TECHNOSTRESS: AN EMERGING DISCIPLINE

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The present research work is the Bibliometric analysis aiming to explore the global research trends on *"Technostress"* covering a period of 30 years (from *1989 to 2018*) based on the data collected from the *"Web of Science"* which is one of the largest indexing and abstracting source. Accordingly, the data was harvested by entering a search keyword *"Technostress"* and limiting the time span from the year *1989 to 2018*, retrieving a total of *142* results which were later analyzed based on chosen parameters viz; document type, source title, year of publication, productive authors, discipline, authorship pattern etc. The findings reveal that, year 2018 and 2017 emerge to be the top productive years in terms of research output with the highest number of publications (29, 20.5%). Majority (36.6%) of the publications were contributed by USA, followed by China (13.3%). Preponderance (14.1%) of publications is published in "Computers in Human Behavior." The authorship pattern reveals that single author contributed 12.7% articles; whereas 87.3% are co-authored, however, among all authors "Tarafdar" tops the list and emerges as the most prolific author with the highest (14) of publications. Whereas, preponderance of research is contributed in the field Information Science/Library Science with English as top preferred language of publication.

Keywords: Technostress, Bibliometrics, Research Output, Research Productivity, Web of Science.

INTRODUCTION

In the era of tech savvy, every field and profession around the globe has been dynamically advanced, and has greatly benefitted the utilization of Information and Communication Technology (ICT). As we know, ICT helps in revolutionizing the information generation life cycle i.e. from generation to its dissemination. Consequently, technological revolution unquestionably brought an immense change in the system of working and paved way for faster and efficient functioning of operations. However, at the same time this transformation has put some challenge to the working individuals as

they need to adapt with tech savvy environment which requires technical efforts besides personal interest till they become habitual with novel technological scenarios. As a result, they often might not be comfortable with the implementation of ICT in their respective workplace, since it involves dynamic changes and uncertainty. In view of the fact, technicians experience a type of stress called Technostress that may have an unconstructive impact on the organizations where they are working.

CONCEPT OF TECHNOSTRESS

To elaborate the concept of Technostress, Brod (1984) as cited in (Isiakpona and Adebayo, 2011) defined Technostress as *"A modern disease of adaptation caused by inability to cope with the new computer technologies in a healthy manner."* In tune with same Tarafdar et al. (2007) described Technostress as *"a problem of adaptation as a result of a person's inability to cope with or to get used to information and communication technologies (ICT)"*. In a more precise manner Kena et al. (2016) described Technostress as a stress caused by individuals' interaction with ICTs. Besides, Tarafdar et al. (2007) have distinguished five parts of Technostress or makers of Technostress, which are:

1. **Techno-overload**: A circumstance where ICT clients are compelled to work quicker and more.

2. **Techno-invasion**: A circumstance where ICT clients felt that they could be reached whenever or continually "associated" which caused an obscuring between work-related and personal settings.

3. **Techno-complexity:** A circumstance where ICT clients feel that their aptitudes are deficient due to the multifaceted nature identified with ICT. Subsequently, they are compelled to invest energy and exertion to learn and comprehend the different parts of ICT.

4. **Techno-insecurity**: A circumstance where ICT clients feel compromised that they will lose their employment, being supplanted either by the new ICT or by others who are better in ICT contrasted with them.

5. **Techno-uncertainty**: A circumstance where ICT clients feel unsure and disrupted due to ceaselessly changing and overhauling nature of ICT. Moreover, there exist certain different terms that are equal with Technostress and utilized by different scientists, which are as *"Technophobia, Computer Phobia, Computer Anxiety, and Computer Stress"* Ennis (2005) as cited in (Prabhakaran & Mishra, 2012). To ascertain that the individuals are suffering from Technostress there are signs and symptoms in which sentiments of dread, migraines, mental weariness, alarm, bad dreams, terrorizing, fatigue, segregation, dissatisfaction, disturbance, insufficiency, and aversion are the basic indications among the library professionals. In this milieu the key reasons that emerge to be the root cause of Technostress including library professionals who have embraced the rapid pace of technological change, up gradation in library systems, increased workload, acceptance of standardization in hardware &

software and particularly shifting role of librarians (Van et al., 2003). Consequently, there exists a dire need of eradicating the menace and negative impacts of Technostress in the first and foremost way is to educating concerned individuals regarding the latest developments in ICT and training them at regular intervals of time.

LITERATURE REVIEW

In view of the current scenario where ICT is the fastest growing industry and everyone is facing competitive pressure in this new fangled digital environment as in businesses, schools, universities besides in our personal lives. Since, the selection, usage, fast dissemination of ICT in instructing and examination has brought various demands and difficulties in different fields. Accordingly, to cope up with digital environ individuals are distinctively facing stress related to technological transformations commonly known Technostress. In line with Wang et al. (2008) ; Sinha and Sinha (2012) found that *"Technostress is the feeling of anxiety and it has a negative impact on thoughts, behaviours, attitudes, and body when a person is expected to deal with technology."* Apart from this, varied studies have been conducted to deliberate and discuss about the concept of Technostress (Ennis, 2005; Tarafdar et al., 2007). Accordingly, Ayyagari et al. (2011); Tarafdar et al. (2007) strongly emphasized that tending to Technostress is amazingly critical for associations since it can affect people's wellbeing and profitability. In tune with same, many a preceding research on Technostress has by and large focused on the

consequences of Technostress like the studies conducted by Abbey et al. (2017); Ennis (2005); Porter and Kakabadse (2006); Ragu-Nathan et al. (2008); Tarafdar et al. (2007). Commenting on the same Ahmad (2009); Kumar et al. (2013); Yebowaah et al. (2017) observed that Technostress prompts negative examinations of employment, decreased profitability, expanded turnover and non-appearance, and helpless assignment execution bringing about occupation disappointment and lower authoritative fulfillment.

Dina (2016) detected that the implication of Technostress can result in serious physical and physiological illness as well as major resource loss for their organizations. Identifying the cause of Technostress, Al-Qallaf (2006) is of the opinion that several factors are responsible for Technostress in an organization. They identified the lack of formal preparing as the main source of Technostress. Masey and Stedman (1995); Rosen and Weil (2000) divulge that the increment in requests for innovation was among the primary ascribing variables to included employment stress. Clute (1998) also discovered that the regular reasons for Technostress in working environment incorporate absence of participatory administration styles, insufficiency of correspondence and deficiency of employees' inclusion. Venfleet and Wallace (2003) declared brisk pace of progress in innovation as a cause of Technostress. A study conducted by Jena and Mahanti (2014) found that Technostress had critical impacts of age, gender, innovation mindfulness, and residency (span of services). Compeau and Higgins (1995); Taylor and Todd

(1995) observed a strong association between innovation mindfulness and individual responses to computing technology. Commenting on the same Yebowaah et al. (2017) highlighted that the limited knowledge regarding ICT emerges as one of the vital causes of Technostress among the Library Professionals. To support the fact Taylor and Todd (1995) reveal that mindfulness about cutting edge PC innovation prompts more unfortunate PC related touchiness and PC fear. Moreover, Commenting on Technostress among Library professionals, a study by Ragu-Nathan et al. (2008) reveal that nowadays library professionals greatly rely on technology to carry out their routine operations particularly the exhaustive use of ICT to put forward information service to the patrons may evoke the negative opportunities and stress among them.

Bichteler (1987) while reporting on Technostress in libraries inspected a portion of the feelings of trepidation, dissatisfactions, and misinterpretations, which hamper the powerful utilization of PCs. The scientist saw that Technostress among library staff individuals might result from ineffectively structured workstations, deficient preparing and arranging and usage with respect to the management. In line with same Ahmad and Amin (2012); Laspinas (2015); Isiakpona and Adebayo (2011) observed that majority of the library professionals are affected by Technostress while doing their obligations every day as a result of technological changes. Although much literature have been published regarding the varied aspects of Technostress, however, regardless of the fact not much literature is available related to Bibliometric

aspect of Technostress. Accordingly, the study will attempt to explore the trends of research in the particular field that will help researchers to ascertain varied Bibliometric facts regarding Technostress

OBJECTIVES OF THE STUDY

1. To evaluate the chronological research output in the field of Technostress;
2. To analyze the geographical distribution of research publications;
3. To trace the top cited article and source titles;
4. To identify core journals of research publications;
5. To assess subject domain of research publications;
6. To evaluate the authorship pattern of research publications;
7. To identify the top most productive authors; and
8. To analyze the preferred document type and language of these publications.

METHODOLOGY

In order to cover the laid objectives, the study harvested data from the "Web of Science" one of the largest citations and abstracting database, offering a far-reaching reference search. It offers access to numerous databases that alludes to cross-disciplinary examination, which will take into account inside and out investigation of particular sub-fields within an edifying or scientific discipline. Accordingly the data extracted from Web of Science was limited to search publications published on "Technostress" with further filtration of time span from 1989-2018. 142 records were retrieved which were

then analyzed based on chosen parameter by using certain software applications viz; Bibexcel, Hiscite and VOSviewer.

RESULTS AND DISCUSSIONS

Chronological Distribution of Research Publications

Data analysis reveals that the researchers have started publishing on Technostress since1989 although at very meager quantum (0.70%). It is observed that there is a premier growth-rate of publications in the years 2017 and 2018 (20.50%). However, the lowest growth rate of publication (0.70% to 3%) is witnessed during 1989- 2012 indicating mild rise of research in the particular period. These findings are in tune with the study conducted by Grummeck-Braamt et al. (2021) indicating evolution of the knowledge structure in the field of Technostress over time (1950- 2019). The Table 1 presents a

Table 1: Year wise Research Output

Year	No. of Publications	Cumulative No. of Publications	Percentage	TLCS	TGCS
1989	1	1	0.70	7	34
1990	0	1	0	0	0
1991	0	1	0	0	0
1992	1	2	0.70	0	0
1993	1	3	0.70	2	8
1994	1	4	0.70	0	1
1995	0	4	0	0	0
1996	0	4	0	0	0
1997	1	5	0.70	13	45
1998	1	6	0.70	2	5
1999	1	7	0.70	7	11
2000	0	7	0	0	0
2001	3	10	2.11	5	17
2002	0	10	0	0	0
2003	1	11	0.70	0	5
2004	1	12	0.70	1	2
2005	3	15	2.11	34	105
2006	1	16	0.70	0	4
2007	1	17	0.70	74	139
2008	3	20	2.11	28	252
2009	1	21	0.70	2	13
2010	1	22	0.70	49	91
2011	4	26	3.00	127	272
2012	3	29	2.11	23	79
2013	7	36	5.00	53	167
2014	8	44	5.63	74	351
2015	18	62	12.67	147	359
2016	22	84	15.50	43	172
2017	29	113	20.50	41	154
2018	29	142	20.50	7	19
Total	142		100.00	743	882

lucid picture of the annual number of documents published on Technostress during 1989-2018. It also provides a detailed description about the cumulative number of publications; Total Local Citation Score (TLCS) and Total Global Citation Score (TGCS).

Geographical Distributions of Publications

40 countries have contributed their research output in the field of Technostress, although the scientific literature on Technostress is contributed from various countries globally, yet certain countries have produced comparatively more research output. It is observed from the analysis that among all countries the USA tops the list with preponderance of publications (36.6%), besides having the highest Total Global Citation Score (TGCS) 1266 compared to other nations. On the other hand, Brazil occupies last rank with meager (2.4%) contribution of publications having Zero Total Local Citation Score (TLCS) and Total Global Citation Score (TGCS) respectively. The Table (2) and Figure (1) represents the top ten countries contributing the highest percentage of publications on Technostress.

Table 2: Geographical Distributions of Publications

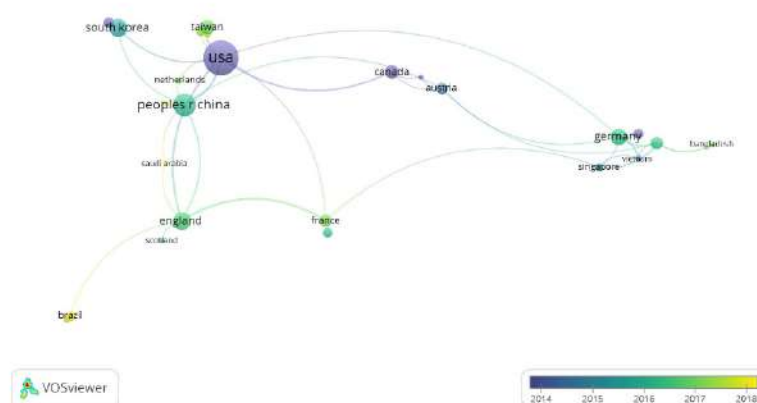| Country	Publications		TLCS	TGCS
	No.	%		
USA	52	36.6	429	1266
China	19	13.3	117	239
South Korea	14	9.9	37	142
Germany	11	7.8	59	190
England	10	7.0	40	115
Canada	8	5.7	20	106
Australia	7	5.0	8	28
Austria	6	4.2	33	93
Japan	5	3.5	2	29

Figure 1: Geographical Distributions of Publications

Highly Productive Journals

To ascertain the core journals on "Technostress" it is observed that the publications are published in about 97 journals. However, among them the preponderance (14.1%) of articles are published in the journal of *'Computers in Human Behaviour'* followed by *'Information System Journal'*; *'Journal of Management Information Systems'* and *'Telematics and Informatics'* each contributing (3.5%) of publications respectively. The Table 3 provides rank list of acme 10 journals along with impact factor, TLCS and TLGS of publications.

Table 3: Top ten productive journals

Journals	No. of publications	Percentage	Impact factor	TLCS	TGCS
Computers in Human Behaviour	20	14.1	3.435	131	451
Information System Journal	5	3.5	4.267	84	182
Journal of Management Information Systems	5	3.5	2.356	124	310
Telematics and Informatics	5	3.5	3.789	19	64
Journal of the Association for Information Systems	4	2.8	2.839	23	40
Information Technology & People	3	2.1	1.639	6	12
Behaviour Information Technology	2	1.4	1.380	4	6
Business Information System Engineering	2	1.4	3.392	16	39
Communications of the ACM	2	1.4	3.063	62	103
Computers & Education	2	1.4	4.538	1	35

Highly Cited Articles

The Analysis reveal that the top cited article emerges out to be "*The Consequences of Technostress for End Users in Organizations: Conceptual Development and Empirical Validation*" with 176 total citations followed by "*The dark side of Smartphone usage: Psychological traits, compulsive behavior and Technostress*" and "*Technostress: Technological Antecedents and Implications*" each with 171 total citations. On the other hand, among top ten articles, "*Crossing to the Dark Side: Examining Creators, Outcomes, and Inhibitors of Technostress*" occupies 10th rank with 54 citations. The Table 4 presents the overview of top ten cited articles along with average citations per year are shown.

Top ten subject domains

Although a number of disciplines are contributing to "Technostress" research from different perspectives, however, majority (30.9%) of publications are contributed from the subject domain of "*Information Science/Library Science*" followed by Computer Science/ Information Systems with 22.5% publications. On the other hand, meager (2.85%) contribution of articles emerges to be in the field of "*Computer Science Interdisciplinary Applications*" and accordingly holding 10th rank in the preferred subject domain for Technostress research. The Table 5 presents ranked list of subject domains in the field of Technostress research.

Table 4: Top Ten Highly Cited Articles

Name of the Title	Total Citations	Average Citations per Year
The Consequences of Technostress for End Users in Organizations: Conceptual Development and Empirical Validation	176	14.67
The dark side of Smartphone usage: Psychological traits, compulsive behavior and Technostress	171	28.5
Technostress: Technological Antecedents and Implications	171	19
The impact of technostress on role stress and productivity	137	10.54
Impact of Technostress on End-User Satisfaction and Performance	91	9.1
The effects of technostress and switching stress on discontinued use of social networking services: a study of Facebook use	65	13
Giving too much social support: social overload on social networking sites	64	12.8
Information and communication technology overload and social networking service fatigue: A stress perspective	55	13.75
Understanding Employee Responses to Stressful Information Security Requirements: A Coping Perspective	55	9.17
Crossing to the Dark Side: Examining Creators, Outcomes, and Inhibitors of Technostress	54	6

Table 5: Top ten subject domains

Subject	Publications	
	No.	%
Information Science/Library Science	44	30.9
Computer Science/Information Systems	32	22.5
Psychology Multidisciplinary	24	16.9
Psychology Experimental	20	14.1
Management	19	13.4
Business	7	4.9
Communication	7	4.9
Psychology Applied	6	4.2
Public Environmental Occupational Health	6	4.2
Ergonomics	5	3.5
Computer Science Interdisciplinary Applications	4	2.8

Highly prolific authors

The analysis on Prolific Authors reveals that a total of 194 authors have published their research on "Technostress". However, considering the most productive authors among them are those who have at least three or more research publications. The analysis show that among all "*Tarafdar*" is the top productive author with majority (14, 9.85%) publications followed by *"Tu, Q"* (6, 4.22%). On the other hand, *"Ali"* occupies the last rank among the most productive authors with just three publications. The Table 6

Table 6: Highly prolific authors

Authors	No. of Publications	Percentage	Rank	TLCS	TGCS
Tarafdar, V	14	9.85	1	200	582
Tu, Q	6	4.22	2	182	509
Cao ,XF	5	3.52	3	10	26
Ragu-Nathan ,TS	5	3.52	3	178	503
Riedl, R	5	3.52	3	33	89
Cooper, CL	4	2.81	4	7	10
Ali, A	3	2.11	5	6	19

shows the most productive authors from all over the world with the number of publications, affiliation and citation scores.

Authorship pattern

The authorship pattern clearly reveals that more than three authors, followed by (30.3%) triple authored publications author preponderance (38.7%) publications. On the other hand, the least number (12.7%) are single authored publications. This evidently reveals that the trend of multi-authorship is dominant indicating that researchers largely choose mutual and collaborative works. The Table 7 shows the authorship pattern of authors of the scientific literature on Technostress.

Table 7: Authorship Pattern

No. of Authors	Publications	
	No.	%
Single	18	12.7
Two	26	18.3
Three	43	30.3
> 3	55	38.7
Total	142	100

Top Ten Productive Institutions

Evaluating a research institution helps to gain an insight about its research contributions that helps evaluate the intellectual growth of an institution. The Table 10 provides a list of top ten productive institutions around the globe in the

Table 8: Top Ten Productive Institutions

Sl. No.	Name of the Institution	No. of Publications	Percentage (%)
1	California State University System	8	5.63
2	Chinese Academy of Sciences	8	5.63
3	University of Science Technology of China	8	5.63
4	Rochester Institute of Technology	7	4.92
5	University of Toledo	7	4.92
6	City University of Hong Kong	7	4.92
7	HEC Montreal	6	4.22
8	California State University Fullerton	6	4.22
9	HEFEI University and Technology	5	3.52
10	University of Lancaster	5	3.52

field of Technostress. It is observed from the analysis that most (5.63%) of research articles were published by authors affiliated with *"California State University System"*, *"Chinese Academy of Sciences"* and *"University of Science Technology of China"*. On the other hand, *"HEFEI University and Technology"* and *"University of Lancaster"* are contributing least no. of five publications among top ten productive institutions.

CONCLUSION

The Bibliometric analysis on Technostress reveals that research output in a particular field has been progressively mounting, which can be seen from the analysis, that in the initial years from 1989 to 2012 only 24 research publications have been published. However, the research in the field has now gained the momentum from 2013, which indicates that the researchers have become adherently conscious about the importance of Technostress research. Moreover, the study reveals that among all, USA and China are the leading research contributors in that particular field indicating the other nations also need to get sensitized regarding research on Technostress. Consequently, owing to the fact that Technostress has become a global concern, research in the particular field is still in its infancy that needs potential impetus to overcome that concerns emerging because of Technostress.

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