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Digital Transformation: A Bibliometric Analysis

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Summary

Background: We need strong organizations. To achieve unprecedented progress we need the power of digital transformation. It has multiple advantages. It provides us actionable insights and touch points. The aim of the present study was to review and analyze the publishing trend on digital transformation literature.
Method: A bibliometric analysis was performed, and data were retrieved from Web of Science. The relevant data was collected and 195 relevant records were imported on April 14, 2021. The data analysis was performed using various bibliometric software. It is valuable tool to explore the achievement, persistent growth in literature. It also aid to recognize the gaps in understanding of pattern.
Results: USA has most publication and citation. It outperformed in terms of corresponding authorship. There is successful alignment between the Sweden and Finland. Lulea University of Technology has strong dominance for releasing meaningful literature. The study provides a point of reference for scholar, grant providers and domain experts to revisit the literature and understand the frills to explore more in the area of digital transformation.

Keywords: Digital transformation, Bibliometric analysis, Web of Science, Literature, Collaboration.

Introduction

Trends and needs keep on shifting. There are deep rooted dynamics and factors which are critical for the success of business. In present scenario the essential component of success is digital transformation. Organizations get a bigger vantage point through digital transformation. It delivers laudable returns. To make meaningful progress businesses are fully geared to harness the opportunity of digital transformation. India is rising on the curve of digitalization. The business had suffered deeply during the pandemic. Now circumstances have changed totally and it has been realized that the organizations need to evolve and adapt. Digital transformation is at the forefront for the organizations which support them to lead inclusively. It galvanizes the whole system.Digital transformation is defined as the use of technology to radically improve performance or reach of enterprises. (Westerman et al., 2011). Digital Transformation is now commonly interpreted as such usage of Information and Communication Technology, when not trivial automation is performed, but fundamentally new capabilities are created in business, public government, and in people's and society life.(Martin,2008). In the context of

globalization and digitalization, the digital transformation of business is becoming an inevitable trend (Hagberg et. al ,2016).

Bibliometric analysis is very much popular among academicians. It has been used widely to appraise the research productivity and growth. This paper uses bibliometric analysis (Yun,& Liu, 2019), and it is largely used in business and management areas(Cuccurullo et. al. 2016; . Akmal et. al., 2018; Zupic & Cater 2015) . Bibliometric analysis is a tool gradually increasing its importance in terms of the assessment and evaluation of the research impacts of authors, study groups or institutions (Pritchard, 1969a).

This study undertakes the past literature(2002-2020) of digital transformation under the category of management or business. Zupic and Cater (2015) define bibliometrics as a tool for analyzing the evolution of disciplines based on the intellectual, social, and conceptual structure. The bibliometric analysis significantly improves the quality of the literature review by introducing a transparent, systematic, and reproducible review process. It provides means for mapping the research fields and influential work without subjective bias that is imperative for holistic aid to the literature process (Ellegaard and Wallin, 2015).Focusing on the quantitative analysis and mathematical computation Senguta, (1985)asserted "Bibliometrics is a quantitative evaluation of publication patterns of all macro and micro communication along with their authorship by mathematical and statistical calculation".

Objective

The basic purpose of research is to explore the top authors production, authors keyword, collaboration, citations, scientific production, top journals, relevant affiliations and country's scientific production. The reservoir of research available in literature was used for quantitative analysis.

Data Sources

Firstly, the data was retrieved from the core collection of Web of Science (WoS) since it is considered one of the most relevant databases in the academic field. Table 1 shows the workflow of data collection and filtration.

Table 1: Steps for Data Collection

Step No.	Particulars	No. of Documents
1	Records taken from WoS Collection Keywords: "digital transformation" OR "digitalization" OR "digital innovation"	3750
2	Search refined by following • Categories- • Document Type- • Language-	Management & Business Article or Editorial Material English
3	No. of Document left after refinement	580
4	No. of Documents(with citation 10 or more)	195

Results & Discussion

Table 2 provides the descriptive information about the data. We finalized 195 documents for the study. It consists of articles, book chapters, proceeding papers and editorial material for a

period of 19 years starting from 2002 to 2020. We found 559 keywords plus in the documents. There were 664 author keywords in total.

The studies were written by 488 authors in total, 22 of them having a single name and 466 with multiple names. Each author has 0.4 documents in his account. In other words around three authors have contributed for one document.

Table 2: Descriptive Characteristics

Description	Results
Timespan	2002:2020
Sources (Journals, Books, etc)	73
Documents	195
Average years from publication	4.11
Average citations per documents	45.37
Average citations per year per doc	8.538
References	10757
DOCUMENT TYPES	
Article	181
article; book chapter	1
article; proceedings paper	1
editorial material	12
DOCUMENT CONTENTS	
Keywords Plus (ID)	559
Author's Keywords (DE)	664
AUTHORS	
Authors	488
Author Appearances	574
Authors of single-authored documents	22
Authors of multi-authored documents	466
AUTHORS COLLABORATION	
Single-authored documents	22
Documents per Author	0.4
Authors per Document	2.5
Co-Authors per Documents	2.94
Collaboration Index	2.69

To understand the pattern of scientific production over the years we can get the snapshot with the help of Figure 1.It shows the annual scientific production per year. Initially it was short in number but it took a leap from 2014 onwards.

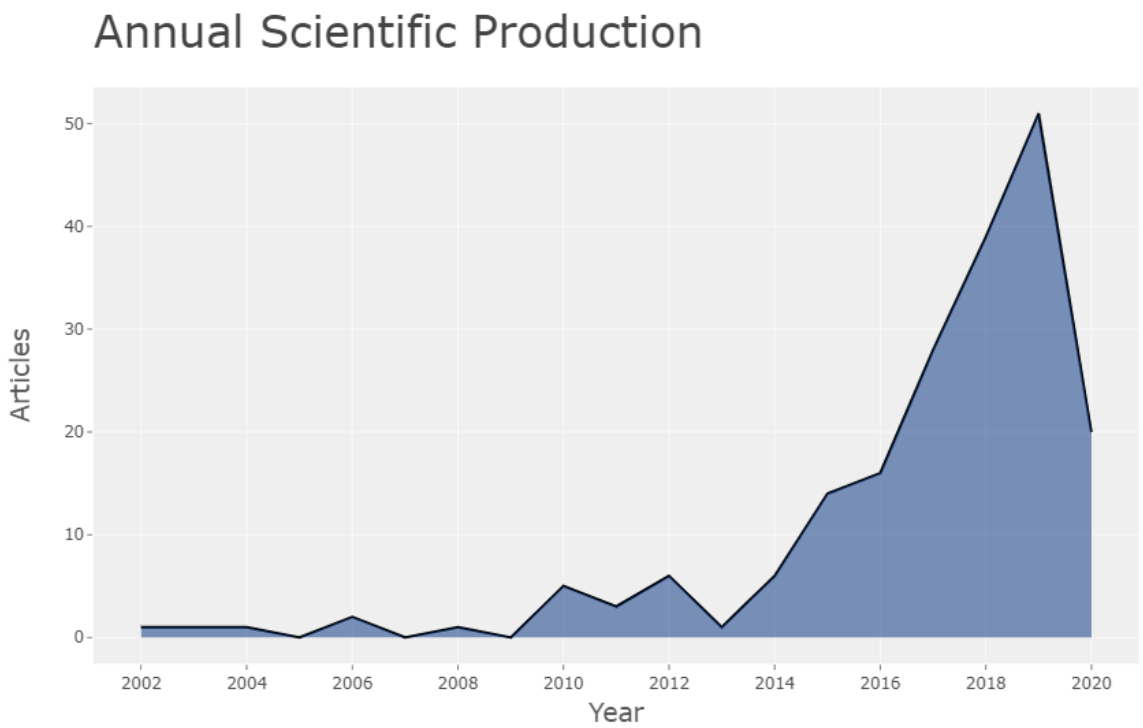

Figure 1: Annual Scientific Production

Figure 2 shows citation per year for digital transformation. It was less before 2010.There was remarkable shift in 2010.Again in 2014 there was a big jump. From 2018 onwards we can see an upward trend.

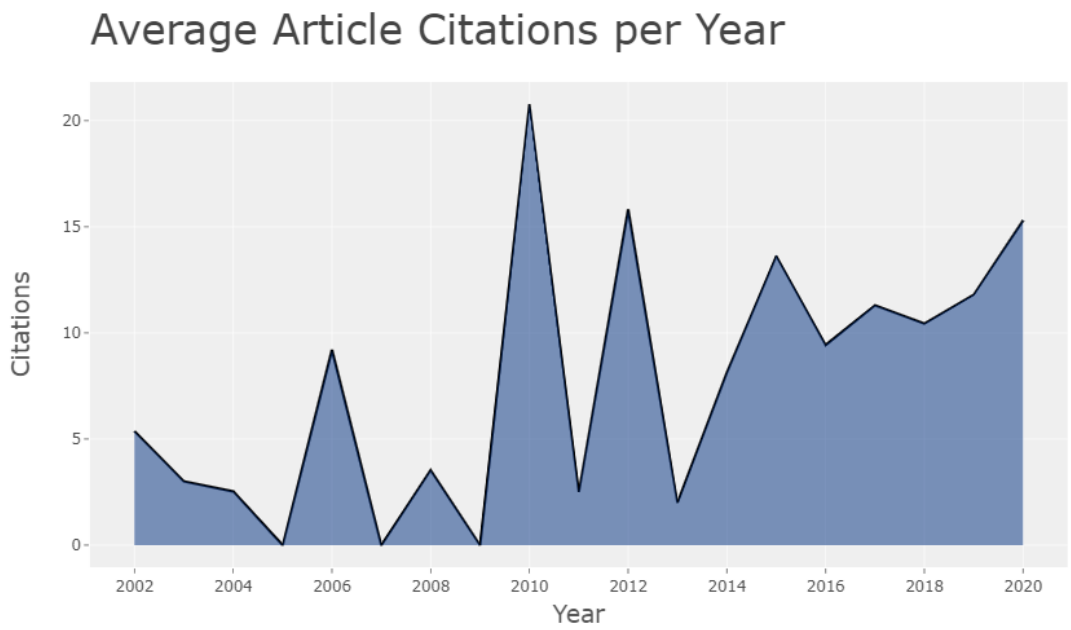

Figure 2: Average article citation per year

We employed source impact and Bradford law to gain knowledge about the journals of immense value in the field of digital transformation. Articles were graded with the help of h index, m index, g-index, total citation, net production and start year of the publication. Bradford

law is a method to explore about top journals. It categorizes the journals into three zones. We get a detailed and deep picture through three different zones. Zone 1 comprises of core journals available in literature. Technological Forecasting And Social Change, MIS Quarterly Executive, MIS Quarterly, Journal of Business Research, Business Horizons, Industrial Marketing Management were Zone 1 journals. Figure 3 represents the Zone 1 journals through Bradford Law.

Table 3: Top Ten journals according to source impact

Top Ten Journals	h_index	g_index	m_index	TC	NP	PY_start
Technological Forecasting And Social Change	14	20	1.75	490	20	2014
Mis Quarterly Executive	12	13	1.090909091	612	13	2011
MIS Quarterly	11	11	0.916666667	1561	11	2010
Journal Of Business Research	10	10	2.5	239	10	2018
Business Horizons	8	8	1.142857143	314	8	2015
Industrial Marketing Management	7	7	1.4	132	7	2017
Journal Of Information Technology	6	6	0.3	383	6	2002
Journal Of Retailing And Consumer Services	5	5	0.714285714	113	5	2015
Organization Science	5	5	0.5	843	5	2012
Research-Technology Management	5	5	0.714285714	223	5	2015

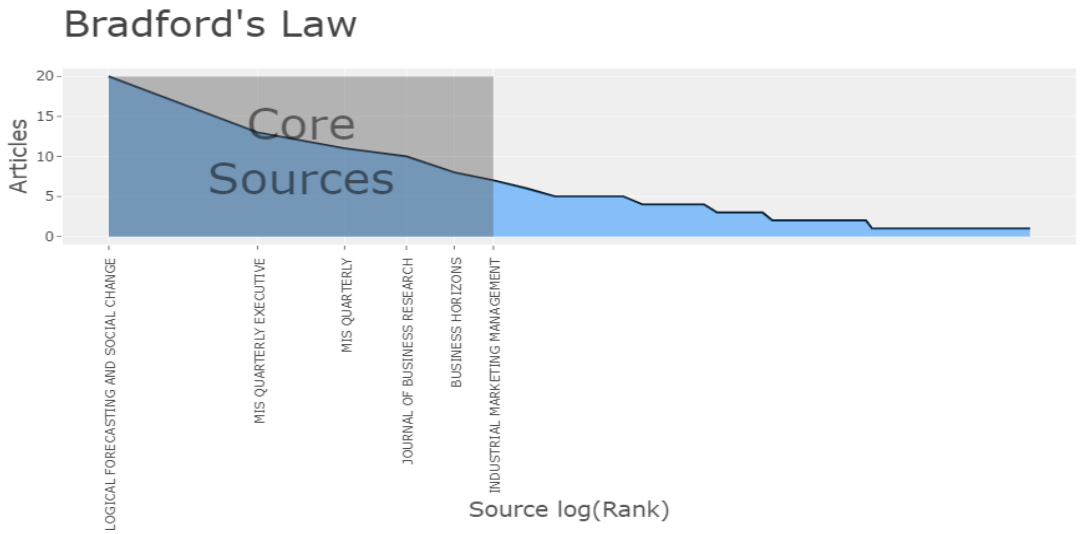

Figure 3: Bradford Law

We can see a list of repeated words in Table 4 under two subfields namely Keywords Plus and Authors Keywords. The keyword technology, strategy and performance were not used frequently by the authors. Digital transformation is possible through better technology, so technology is used as keyword. High grade technology will help the business to innovate and improve the performance. It can be taken as a strategic move. We can see that innovation, performance and strategy were used in literature as keywords. Figure 4 represents word cloud. Keywords plus were used to create the word cloud. The less occurred words are small in size and considerably repeated words are larger in word cloud.

Table 4: Core Words/Most Frequent Words

Core Words			
Field – Keywords Plus		**Field- Author's Keywords**	
Words	**Occurrences**	**Words**	**Occurrences**
Technology	38	digitalization	40
Innovation	34	digital innovation	28
Performance	25	digital transformation	27
Strategy	25	digitization	13
information-technology	20	innovation	12
Knowledge	20	industry 4. 0	11
Future	18	big data	9
Capabilities	17	servitization	9
Perspective	17	business model	8
Systems	16	platforms	7

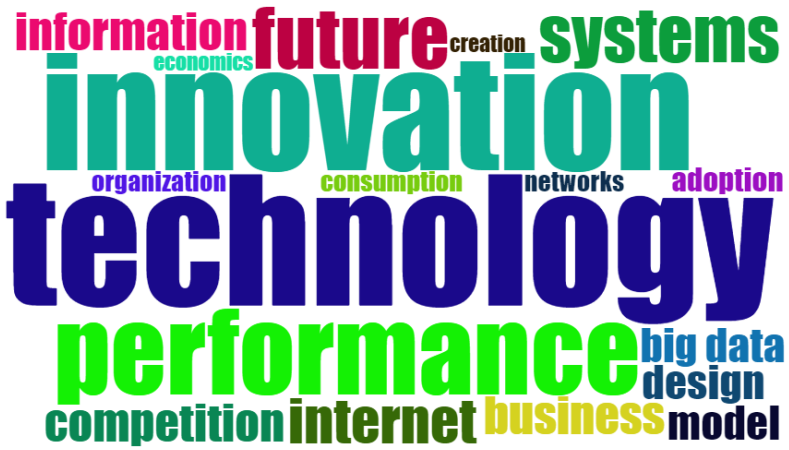

Figure 4: Word Cloud

Figure 5 explains the relevant affiliations. First position is occupied by Lulea University of Technology. University of Liechtenstein and University of St. Gallen have second and third position respectively in the list of affiliation.

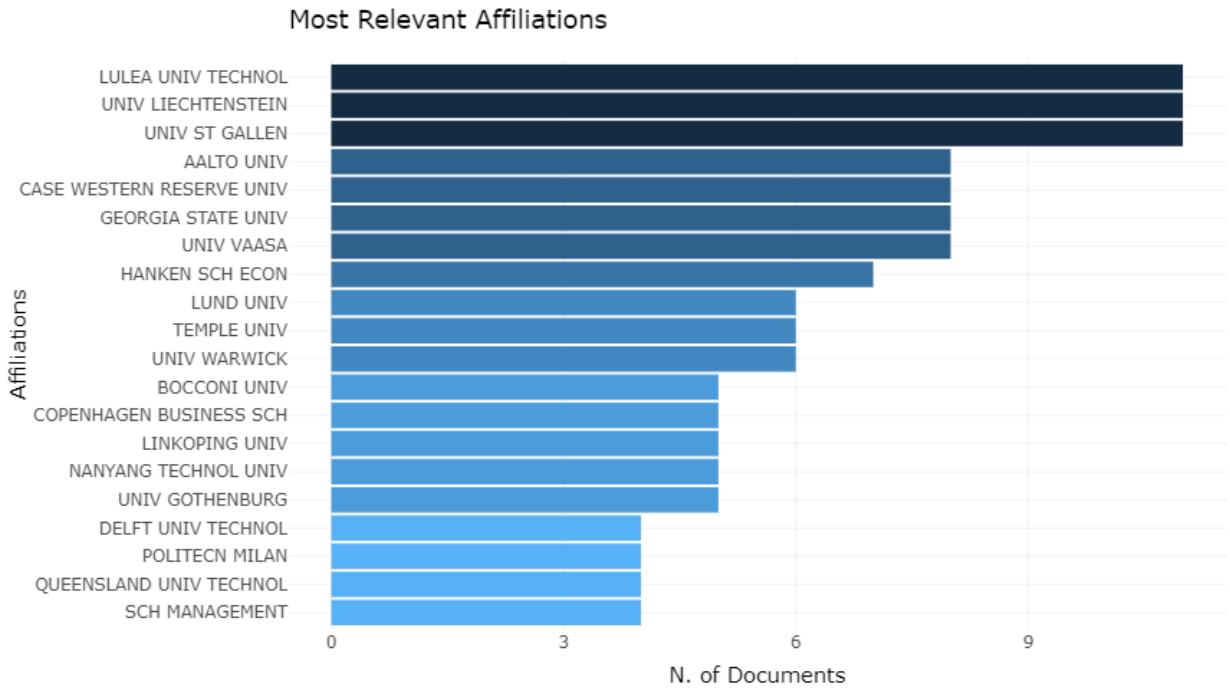

Figure 5: Most Relevant Affiliations

Corresponding author countries are shown in table 5. The list includes top twenty countries. Brazil occupies the last position. USA tops the list in total publication (37) and single country publication (25).United Kingdom has maximum multiple country publication (13) and holds second position in the list.

Table 5: Corresponding Author Country

Country	Articles	Freq	SCP	MCP	MCP_Ratio
USA	37	0.18687	25	12	0.324
UNITED KINGDOM	23	0.11616	10	13	0.565
GERMANY	22	0.11111	16	6	0.273
FINLAND	16	0.08081	6	10	0.625
SWEDEN	16	0.08081	8	8	0.5
ITALY	12	0.06061	7	5	0.417
DENMARK	10	0.05051	4	6	0.6
SWITZERLAND	8	0.0404	3	5	0.625
FRANCE	7	0.03535	4	3	0.429
NETHERLANDS	7	0.03535	4	3	0.429
SPAIN	6	0.0303	2	4	0.667
AUSTRALIA	5	0.02525	2	3	0.6
AUSTRIA	3	0.01515	1	2	0.667
CHINA	3	0.01515	2	1	0.333
SINGAPORE	3	0.01515	1	2	0.667
CANADA	2	0.0101	1	1	0.5
CZECH REPUBLIC	2	0.0101	2	0	0
HUNGARY	2	0.0101	2	0	0
BELGIUM	1	0.00505	0	1	1

BRAZIL	1	0.00505	0	1	1

Table 6 shows collaboration network between the countries. There is low degree of collaboration. Maximum collaboration is between Sweden and Finland (11 publication).United Kingdom and Germany came together in 8 publications. We can see USA and Sweden at third position contributing 7 publications in total.

Table 6: Collaboration Network

From	To	Frequency
Sweden	Finland	11
United Kingdom	Germany	8
USA	Sweden	7
USA	United kingdom	7
Finland	Switzerland	6
Sweden	Norway	6
United kingdom	Finland	6
USA	Denmark	6
Finland	Norway	5
Sweden	Switzerland	5

Thematic map covers two major aspects of authors keywords; one is centrality and the other one is density. X axis represents centrality and y axis covers density. Centrality gauge the importance of the chosen theme and density compute the growth of the theme. Figure 6 explains the thematic map. Thematic map is divided into four quadrants. Quadrant 1(lower left) highlights the emerging themes which have huge potential. Moreover this quadrant also explains the declining or succumb themes. Quadrant 2 (lower right) explores basic themes or transversal themes which have high degree of centrality and low degree of density. These themes were highly explored. Quadrant 3(upper right) covers the themes which comprises of high density and high centrality. Quadrant 4(upper left) represent low centrality themes. Table 7 represents cluster representation and themes. We could put our conscious focus on emerging themes. It will empower us to shift the themes to next quadrant. Parida V., Henfridsson O. and Lyytinen K. took the top places in the list of best authors. Information regarding other authors is presented in Figure 7.

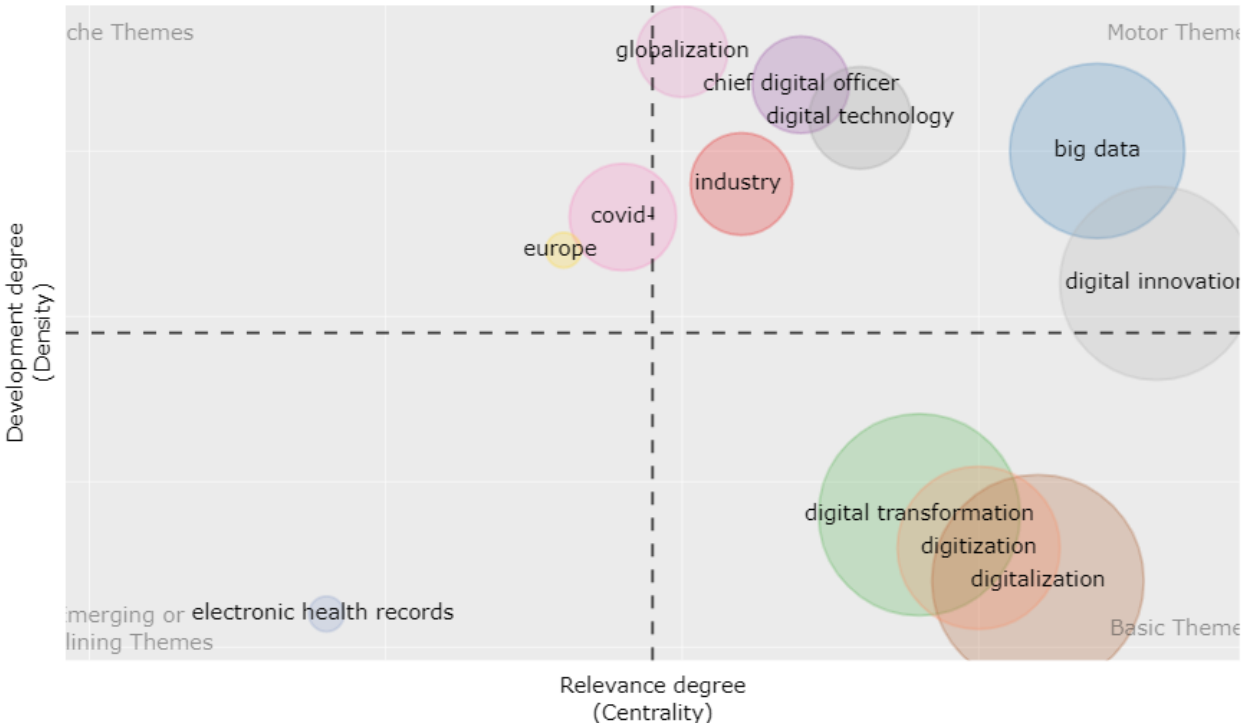

Figure 6: Thematic Map(Author's Keyword)

Table 7: Themes and Authors Keyword in Thematic Map

Cluster Representation	Theme
Digital Transformation	Basic Theme
Digitization	
Digitalization	
Electronic Health Records	Emerging Theme
Big Data	Motor Theme
Digital Innovation	
Industry	
Chief Digital Officer	
Digital Technology	
Globalization	
Covid 19	Niche Themes
Europe	

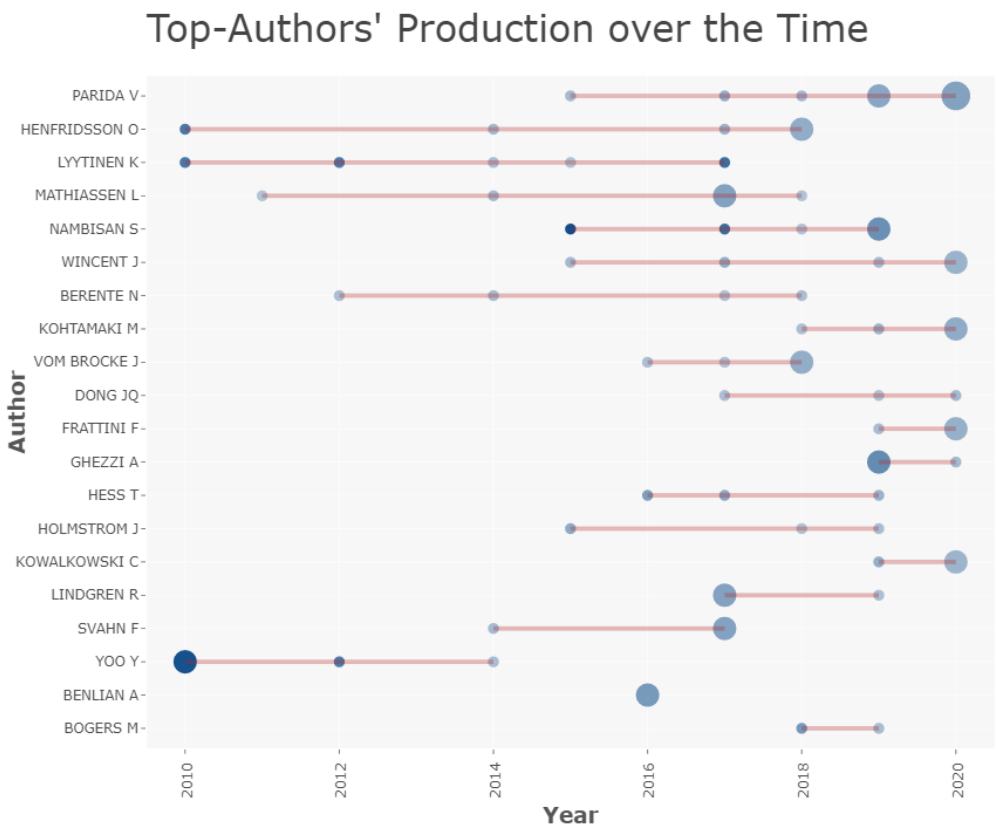

Figure 7: Author's production over time

Table 8 represents the most cited countries and frequency of scientific production. USA tops the both list.

Table 8: Most Cited Countries & Country's Scientific Production

Most Cited Countries		Country's Scientific Production	
Country	**Total Citations**	**Region**	**Freq**
USA	3616	USA	114
United Kingdom	1111	Sweden	59
Germany	693	United Kingdom	55
Sweden	671	Germany	49
Denmark	411	Finland	35
Finland	348	Italy	35
Switzerland	287	Switzerland	25
Italy	265	Netherlands	19
Austria	198	Denmark	17
France	193	France	15
Spain	127	Australia	13
Netherlands	102	China	13
Canada	97	Spain	13
Hungary	96	Liechtenstein	11

Singapore	93	Austria	8
Australia	80	Norway	7
Brazil	80	Singapore	7
China	56	Belgium	5
Norway	54	Brazil	5
Czech Republic	52	South Korea	4

Conclusion

The literature provided us new insights and capabilities. By thoughtfully understanding the literature we can broaden our ideas, motivations and creativity. With time the pace of digital transformation accelerated drastically. The study finds that Technological Forecasting And Social Change, MIS Quarterly Executive, MIS Quarterly are three major journals with maximum influence. Technology, innovation and performance were frequently used in keywords plus. Digitalization, digital innovation and digital transformation were the frequent author's Keyword. Lulea University of Technology is one of the spectacular affiliations for the available literature on digital transformation. The available literature is powerful and of enormous importance.USA is holding number one position for corresponding authorship. It have 37 articles in his account which is a remarkable effort and also it has led many favorable outcomes. Sweden and Finland have majority of collaboration in research which was inclusive and successful. To enrich the experience and peak the performance Sweden, Norway and Switzerland worked together as a team. USA has most publication and citation.

Limitation and Future Research Directions

The researcher used Web of Science data base for research purpose. Other database can be used to strengthen the research result. Future researchers can undertake meta -analysis of the study**.** To develop a deeper understanding documents for lengthen time period and from different categories can be taken up for wider perspective.

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