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PRERANA in Sanskrit means hope and inspiration. The primary objective of PRERANA journal is to enhance the standard of management education by drawing from conceptual and empirical research based articles reflecting current industry practices. PRERANA shall include contributions from eminent members of the academia and sharing of practices by experts from industry. The Journal will also contain book reviews, editorial abstracts and executive summaries of recent publications in management.

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DIGITAL NUDGING: A BIBLIOMETRIC ANALYSIS

Janitha N P¹ & Dr Sefiya K M²

ABSTRACT

Digital life is an integral part of our life these days. Intelligently crafted front ends of platforms often make us addicted to it. In this scenario, the research concerning digital nudging requires our attention. This paper attempts to mine insights from the research done so far using bibliometric analysis. Data was collected from the Scopus database based on the publications from 2005 to 2024. The study's objective is to perform performance analysis and co-occurrence analysis of obtained data to discover the themes and emerging research areas concerning digital nudging. VOSviewer software is used for analysing the data. Four themes relating to digital nudging could be identified through the study. Interestingly, the study also uncovered the increase of study among student groups.

Keywords: *Digital nudging, VOSviewer, Bibliometric analysis, Scopus, Performance analysis*

INTRODUCTION

We live in a world where almost everything can be done with technology. These technologies have become an inevitable part of our lives. Digital nudging means designing these technologies in a way that results in individuals behaving in a certain manner. The research relating to this still is in its early stages (Weinmann *et al.*, 2016). The elements of nudges in the user interface have started to be tested in fields like learning apps, e-commerce, etc. (Jesse *et al.*, 2021). In this context, a bibliometric analysis of this emerging field would give further information regarding the structure and important players in the area. Recent years have seen a significant increase in the attention given to bibliometric studies within business and other social science disciplines (Donthu *et al.*, 2021). These studies provide emerging scholars with a broad overview of a specific research topic. They also play a crucial role in advancing both the theory and practice within a particular knowledge domain (Mukherjee *et al.*, 2022).

This paper seeks to address the following research questions:

- R_{Q1}. Which authors, institutions, countries, journals, and publications hold the most influence in the field of digital nudging?
- R_{Q2}. What are the various themes related to digital nudging?
- R_{Q3}. What are the emerging themes related to digital nudging?

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The remainder of the paper is divided into three parts. The methods section provides information on how the data is collected and what analysis is performed. The results section discusses the results obtained after analysis along with tables and figures supporting it. Finally, the conclusion, limitations, and future research scope are discussed.

METHODS

For getting insights regarding performance and various themes related to digital nudging, the Scopus database has been used, since Scopus is the most extensive database of peer-reviewed literature (Scopus | The Largest Database of Peer-Reviewed Literature | Elsevier, n.d.). For extracting the Bibliometric data, several criteria have been followed. The researchers arrived at the keyword to be used after some trial and error methods. Researchers kept on revising the keywords as the extracting process went on.

Table 1 below shows the search criteria. In the end, 320 documents have been selected for the bibliometric analysis. The articles were published between 2005 and 2024. On this various descriptive data, such as the most influential authors, leading institutions and countries, as well as top journals and publications, were extracted to assess the topic’s performance over time. In addition to this, co-occurrence and content analysis were used to obtain an idea regarding the themes related to digital nudging. A co-occurrence analysis was performed using the software VOSviewer version 1.6.19.dr

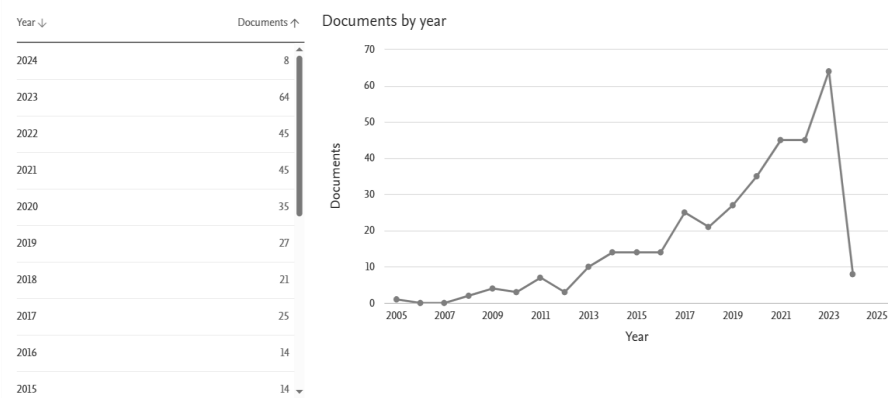
Table 1 Search criteria and article selection

Filtering criteria	Reject	Accept
Search Criteria		
Search engine: Scopus		
Search date: 18 January 2024		
Search term: “digital nudg*” OR “nudg* technology” OR “persuasive technology” OR “online nudg*” OR “digital persuasion” OR “choice architecture in digital” OR “digital choice architecture” OR “technology mediated nudg*” OR “cyber nudg*” OR “nudg* in digital platforms” OR “internet nudg*” OR “electronic nudg*” OR e-nudg* OR “virtual nudg*” OR “web-based nudg*” OR “virtual rewards” OR “online gamifi*” OR “digital gamifi*”		2,157
Subject area: “Social sciences”, “Business, management and accounting”, “Psychology”, “Arts and humanities”, and “Economics, econometrics and finance”	1,637	520
Document type: “Articles” and “Review”	169	351
Language screening: Include documents in English only	11	342

RESULTS

1.1. General descriptive statistics

Figure 1 and Figure 2 represent the distribution of digital nudging research throughout the period.



The above figure indicates that the digital nudging field has produced the greatest number of articles in the year 2023. The field shows a study growth over a period of time.

While examining the production of articles over the period by various sources, Figure 2 Computer in Human Behaviour and Behaviour and Information Technology are the leading journals in this field. However, the recent leader in this field is the International Journal of Human Computer Interaction.

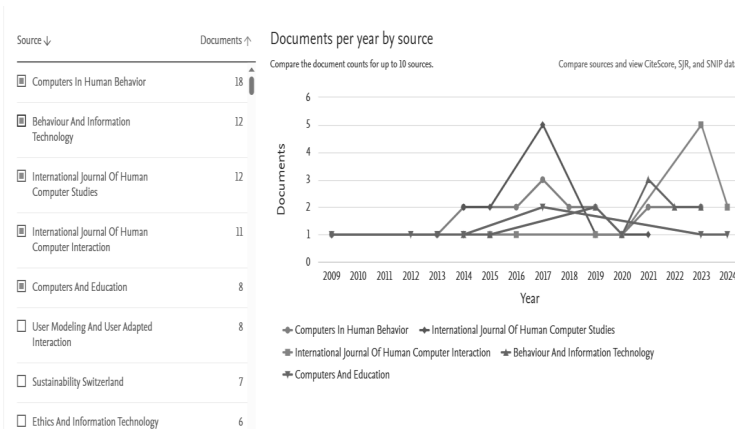


Figure 2 showing documents per year by source Source: Scopus

Table 1- Leading authors, affiliated institutions, and countries publishing on digital nudging, as identified from the Scopus database

Top Authors			Top Institutions			Top Countries		
Author	TP	TC	Institution	TP	TC	Country	TP	TC
Juho Hamari	9	2899	Technische Universiteit Eindhoven	18	179	United States	61	1674
Samuel Kai Wa Chu	8	103	The University of Hong Kong	10	111	Netherlands	44	1219
Rita Orji	8	365	Universiteit Twente	10	174	United Kingdom	35	1517
Jaap Ham	6	137	Tampere University	9	2899	Germany	29	688
Harri Oinas-Kukkonen	6	118	Oulun Yliopisto	6	118	Canada	19	877
Maurits Kaptein	4	282	Dalhousie University	6	69	Italy	18	198
Jonna Koivisto	4	1391	University of Saskatchewan	5	334	Finland	17	3135
Shen Qiao	4	32	The Education University of Hong Kong	5	36	Malaysia	17	100
Susanna Siu-sze Yeung	4	32	Aalborg University	5	72	Spain	17	145
Raian Ali	3	53	Florida State University	4	293	China	16	216

From the above the top authors, organisations, and countries that engaged with research in the digital nudging field could be well understood. Professor Jumo Hamari from Tampere University, Finland is an important author in the research field of digital nudging with 9 publications and 2899 citations. His citations give his institution and country an edge over other institutions and countries. However, if the numbers of articles produced are taken into account Technische Universiteit Eindhoven is the top university with 18 publications and the United States is the top country with 61 publications.

Table 2-The leading journal publishing on digital nudging, identified using VOSviewer software.

Journal	TP	TC
Computers in Human Behavior	18	1815
International Journal of Human Computer Studies	12	762
Behaviour And Information Technology	12	218
International Journal of Human-Computer Interaction	11	63
Computers and Education	8	339
User Modeling and User-Adapted Interaction	8	292
Sustainability (Switzerland)	7	110
Ethics and Information Technology	6	291
Personal and Ubiquitous Computing	5	333
British Journal of Educational Technology	5	73

Table 3- The top publication based on citation count, identified using VOSviewer software.

Reference	Article Title	Journal	Times Cited, (Scopus)
Huotari & Hamari (2017)	A definition for gamification: anchoring gamification in the service marketing literature	Electronic Markets	586
Koivisto & Hamari (2014)	Demographic differences in perceived benefits from gamification	Computers in Human Behavior	570
Tussyadiah et al. (2018)	Virtual reality, presence, and attitude change: Empirical evidence from tourism	Tourism Management	555
Hamari (2017)	Do badges increase user activity? A field experiment on the effects of gamification	Computers in Human Behavior	426
Hamari & Koivisto (2015)	Why do people use gamification services?	International Journal of Information Management	405
Buckley & Doyle (2016)	Gamification and student motivation	Interactive Learning Environments	393
Liu et al. (2017)	Toward meaningful engagement: A framework for design and research of gamified information systems	MIS Quarterly: Management Information Systems	365
Xi & Hamari (2019)	Does gamification satisfy needs? A study on the relationship between gamification features and intrinsic need satisfaction	International Journal of Information Management	312
Orji et al. (2014)	Modeling the efficacy of persuasive strategies for different gamer types in serious games for health	User Modeling and User-Adapted Interaction	228
Hummel & Maedche (2019)	How effective is nudging? A quantitative review on the effect sizes and limits of empirical nudging studies	Journal of Behavioral and Experimental Economics	219

As per Table 3, most of the highly cited papers in the digital nudging field is published in 2010's. This indicates that the major developments in the field have happened in the last decade. Seminal papers in this field were published in the 2010's, after the widespread use of a plethora of applications for managing day-to-day activities became widespread.

Co-occurrence analysis

Co-word or co-occurrence analysis gives the most frequent keywords that occurred together. So, words are the unit in a co-word analysis. This would give insights into the themes related to the topic (Donthu *et al.*, 2021).

Figure 3 clearly shows that persuasive technology is the highest frequent term that occurred. Behavioural research and gamification follow it. The figure also shows that 4 clusters are related to digital nudging. The colour of each node represents a cluster. After analysing the words of the 4 clusters 4 themes are identified concerning digital nudging. These are ‘Aspects of digital nudging’, ‘Experiments with digital nudging’, ‘Cognitive and affective changes due to digital nudging’ and ‘Behavioural changes due to digital nudging’

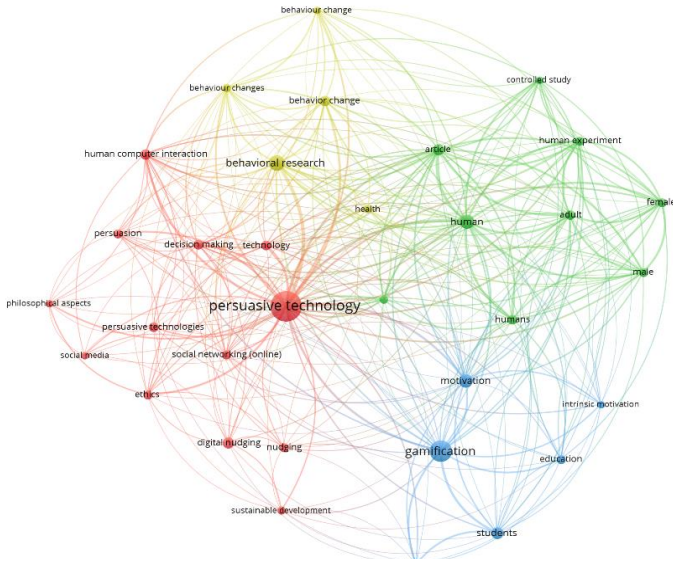


Figure 3- Network visualisation of Co-occurrence analysis

Source: Own elaboration

Identification of emerging research field - Identification of emerging fields of digital nudging research are identified using overlay visualization of co-occurrence analysis and content analysis of abstracts of recently published articles. Figure 4 shows that the emerging aspects that are explored concerning digital nudging are decision-making, behaviour changes and intrinsic motivation. It is also interesting that students are also studying in connection with digital nudging and its related aspects in recent studies. After the content analysis of abstracts of recent articles, the reason for the emphasis on student groups in recent studies was found. The influence of digital nudging techniques and game elements among various categories of students are explored in recent studies. (Hong *et al.*, 2024; Murray *et al.*, 2024; Wang & Sari, 2024; Xiao & Hew, 2024).

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