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A VOS-Viewer Bibliometric Analysis of UTAUT-2 Model of Technology Adoption

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Abstract: - This research aims to analyze the published research on UTAUT2 (a unified theory of acceptance and use of technology) from 2012 to 2023, focusing on the research pattern and growth patterns. The research on UTAUT2 from 2012 is summarised using a bibliometric strategy and a systematic literature review analysis. There were 115 papers reviewed for their study designs, theoretical underpinnings, methodological approaches, authorship distribution, funding agencies, academic publications, and overall contributions to the corpus of UTAUT2 knowledge. The data was visualized using VOS viewer, and future study topics were proposed using the TCCM framework, an acronym for theory (T), context (C), characteristics (C), and methodology (M). Based on the results, interest in UTAUT2 is increasing as a topic of study. The top 15 most-cited publications were subjected to a systematic literature review, which examined the new models' parsimony. Also, the research includes a special part devoted to discussing the origins of UTAUT2 and the people who have been instrumental in its promotion. Title, abstract, and keyword searches in Scopus provided the data for this analysis. Papers from the Scopus database published in the UTAUT2 research field were used for this analysis. In the future, researchers may do a meta-analysis of the various bibliometric clusters. Practitioners may utilize the findings of this study to better plan for the future of technology acceptance, adoption, and use. To the authors' knowledge, this is one of the earliest studies to use the TCCM framework to analyze the patterns and growth trends within the UTAUT2 research literature to make predictions about the direction of future research

Keywords: UTUAT-2; Technology Adoption; Technology Acceptance: VOS Viewer; Bibliometric Analysis;

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1. Introduction

Information technologies, which were formerly available mostly to institutional users before the emergence of the Internet and cell phones in the 21st century, are now fundamental to modern life. For some time, information systems (IS) scholars have been probing the variables that influence people's openness to and use of new information technologies. This field of study, known as technology adoption and diffusion research, is well-established in the current IS literature (IT) [1]. There is a wide variety of ideas, settings, units of analysis, and research techniques in the existing literature, demonstrating the breadth and depth of this field of study [2]. Many theories and models have emerged due to the wide variety of study settings regarding technology, user type, location, adoption time, and the task that is done. Multiple theories, such as the Technology Acceptance Model (TAM) [3], the Dissemination of Innovation (DoI) [4], the Theory of Planned Behaviour (TPB) [5], and the Task Technology Fit (TTF) Theory [6], have been used to examine various elements of adoption and diffusion [7]. Following an elimination process based on commonalities between

leading technology adoption models, UTAUT was created by [8] for the business world with an emphasis on the extrinsic motivation of organizational users. The explosion in popularity of consumer electronics necessitated bringing the UTAUT paradigm, which centres on hedonic value and intrinsic motivation, into the consumer arena. Thus, hedonic incentives, price value, and habit were added to the first UTAUT to become UTAUT2 [9]. Voluntary usage is not a moderator in UTAUT2 since any institutional mandate does not bind customers, and consumer behaviour is generally based on unique ideas. UTAUT2's predictive power is significantly higher than that of UTAUT, with the former accounting for approximately 74% of the variance in customers' behavioural intention and the latter for 52% of the variance in consumers' technological usage of focus technology [8].

Despite just being introduced in 2012, the UTAUT2 Model has already attracted over 4,800 citations in Scopus from several fields of research and beyond, attesting to its superior predictive performance. When applied alone or in conjunction with other theories and external factors, UTAUT2 provides researchers with a useful theoretical lens through which to examine issues surrounding adopting new technologies in various settings [10]. Research on UTAUT2 is not limited to the typical customer. Multiple user categories, such as "Citizens" adopting m-health and "nurses" wanting to house telehealth, have been studied with UTAUT2 deployment [11]. In 2017, there were more than 5 billion unique mobile users, a cross-section of the world's tech-using population. This makes mobile the most widely adopted consumer technology on a worldwide scale. This recent uptick in mobile subscribers is a major factor in expanding the global ICT industry [12].

Several tech firms have emerged as the world's most valuable businesses, with Apple, Alphabet, and Microsoft taking the top three spots. The implications for future studies of how people accept and use technological innovations are fascinating in light of this. A comprehensive assessment of the current UTAUT2 studies will show the Model's limitations and propose promising paths for future study, which is particularly important given UTAUT2's major position in individual research on technology adoption. The following procedures will allow us to accomplish this study's goal: First, we will search for studies that mentioned UTAUT2 theory using a cited reference search strategy; second, we will systematically assess and classify papers that cited UTAUT2 based on model use. Third, utilizing TCCM and VOS Viewer to assess UTAUT2 theory; and fourth, leveraging the context dimension to synthesize UTAUT2 extensions and find interesting research directions.

2. Background

Technology adoption studies have been conducted for over six decades, during which time researchers have uncovered new key variables that impact consumers' behaviour in making technology adoption decisions [13]. Several theories and models of consumer behaviour, including Everett Roger's Diffusion of Innovation Theory (DOI) in 1960, Martin Fishbein and Ajzen's Theory of Reasoned Action (TRA) in 1975, and Bandura's Social Cognitive Theory in 1990, have been informed by these discoveries (1986). In 2012, Venkatesh, Thong, and Xu created the Extended UTAUT2 Model [14].

Researchers become perplexed when faced with many conflicting hypotheses since each has advantages and disadvantages, and none seems to be a perfect fit for their study about technology adoption models. By thoroughly evaluating and integrating many conceptions used in preceding models published between 1960 and 2000, Venkatesh developed the UTAUT by Morris, Davis, and Davis in 2003 to address this problem [8]. The four key constructs considered by the UTAUT are the following: performance expectation (PE), effort expectation (EE), social influence (SI), and facilitating condition (FC). These factors directly affect Behavioural Intention (BI), which affects actual Use Behaviour (UB), the end consequence of utilizing the system [10].

To broaden the applicability of UTAUT to a variety of consumer technology use contexts, further research should test UTAUT2 in different countries, with different age groups, and with different technologies; conduct experiments that manipulate the predictors; and use the scales as manipulation checks as suggested [10]. Further research needs to investigate additional antecedents, such as involvement and other factors related to the buyer profile, variables related to the vendor, such as reliability or reputation, and even different variables linked to the country's culture or the product itself. It would be fascinating to speculate on these variables' impact on the performance of other cutting-edge business mediums, such as mobile phones, retail technology and technology-enabled supply chains.

2.1.UTAUT-2 Model

UTAUT2 expands upon UTAUT by incorporating the concepts of hedonic motivation, monetary value, and routine. It is expected that a person's name, age, gender, and experience would attenuate the impact of these categories on their behavioural intention and technology use. From 56% to 74% in behavioural intention and from 40% to 52% in technology usage, the results showed that the proposed improvements in UTAUT2 significantly improved the variation explained. Furthermore, Venkatesh et al. (2012) data show that habit has both direct and indirect influences on technology usage, with these effects changed by individual variables such as

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age, gender, and level of expertise. Extending the Unified Framework for Understanding How People Engage with and benefit from New Technologies (UTAUT2). Venkatesh and their co-workers are shown in the figure below [15].

Modelling the interplay between the three moderators—age, gender, and experience—and the two direct determinants of behavioural intention—Price Value (PV) and Habit (H)—the UTAUT2 is depicted in Figure 1.

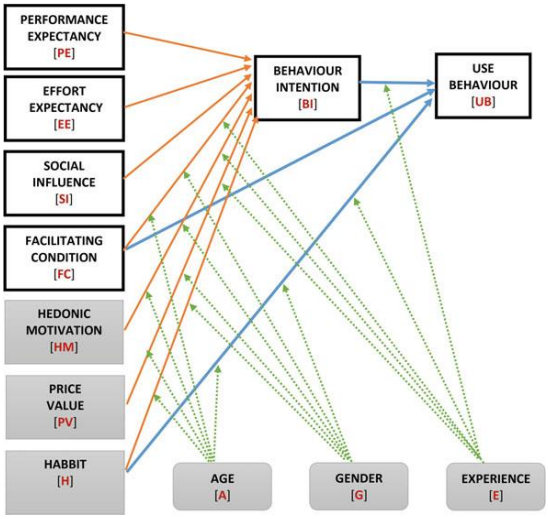

Figure 1: UTAUT-2 Model Architecture | Source: [15]

The original UTAUT Model is presented next to the improved UTAUT2, which includes the shaded constructs (HM, PV, and H) and the three moderators (A, G, and E) that were added to UTAUT to improve its predictive capacity. All seven independent variables (PE, EE, SI, FC, HM, PV, and H) are demonstrated to affect the BI construct, which affects the UB construct (blue line), as seen in the orange lines. The blue line indicates a direct relationship between UB and the two constructs or independent variables (FC and H). Green dashed lines represent the moderating factors [15]. Therefore, there is room to investigate the potential of UTAUT2 in analyzing consumer behaviour in ICT applications in various business sectors worldwide, as it has been broadly acknowledged by the research community and evaluated in a different environment.

3. Methodology

This research aims to analyze the literature produced on the UTAUT2 Model between 2012 and 2023 to determine which characteristics are significant and affect consumer behaviour across various ICT application sectors worldwide. Following this is a discussion of (1) the content analysis technique, (2) the contents analysis findings, (3) the results and consequences of the analysis that clarify how the UTAUT2 Model may be used, and (4) the bounds of the discussion and some ideas for further research. To the best of the authors' knowledge, no previous research has been conducted on the topics above, making this paper novel in that it sheds light on a neglected area that merits further investigation, specifically how developers and also existing organizations of ICT applications can enhance their offerings to achieve 100% customer satisfaction and increased brand loyalty. Academics, researchers, ICT app developers, businesses that use ICT apps, governments, and other interested parties may all learn something from this study.

The study reviews the literature on the UTAUT2 Model, specifically analyzing and identifying the most and least impacting constructs, including the independent and dependent factors and the moderating demographic variables, published between 2012 and January 2023. Using terms like "Extended UTAUT and UTAUT-2, "Emerald," "Elsevier," "Inderscience," "JSTOR," "MDPI," "Sage," "Springer," "Taylor and Francis," "Google Scholar," and "other open sources," a thorough search of Scopus databases was undertaken. Only academic publications and conference papers were included in the search. Following the paper discovery process, criteria for choosing papers were developed. The studies included in this meta-analysis used the standard UTAUT measures (PE, EE, SI, and FC) and any of the expanded UTAUT2 measures (HM, PV, and H). In the end, we narrowed it down to 115 articles for deeper inspection. The papers are analyzed in light of several factors, such as the methodology used, the types of relationships between Model constructs, the explained variation between Model constructs, moderating factors, and explanatory variables, and how closely they adhere to the findings of the prior studies. In Figure 2, we see the sequence of actions that constitutes a search for relevant articles.

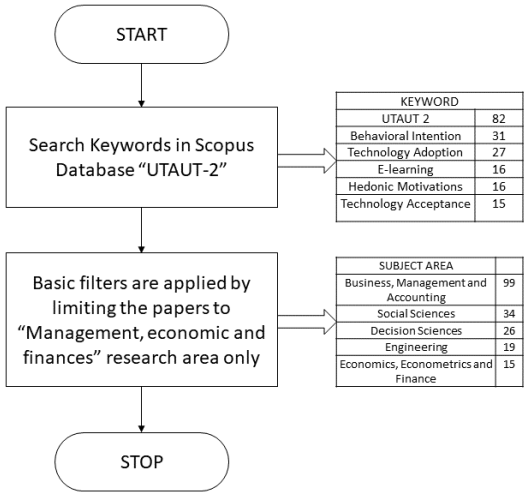

Figure 2: Article Search Methodology | Source: Author Created

This study is carried out in a combined VOS analysis and systematic review to be successful. To determine which publications between 2012 and 2023 mentioned the foundational article (Venkatesh et al.), this study uses bibliographic data collected by Scopus. From that first round of searching, we gleaned 115 unique items. After checking the availability of the complete papers, 28 were downloaded out of the 115 that were first examined. We methodically evaluated these publications to show the many forms, contexts, and applications of UTAUT2.

4. Results & Analysis

The results of the bibliometric analysis conducted are presented in this section. In the presentation of results, we first characterize the current state of technology adoption; then, we do a keyword analysis of active research areas within the framework of the UTAUT-2 technology adoption model. The following two parts provide an examination of co-authorship and co-citation.

As described in the scholarly works already in existence, bibliometric analysis is a statistical technique for conducting quantitative analysis on huge collections of scientific data, such as a library's holdings of published research papers, to illuminate the primary research areas surrounding a given concept and providing insight into potential future research directions [16]. Van Eck and Waltman claim that a large portion of the usefulness of bibliometric analysis is tied to the visual interpretation of the findings. This is why VOS viewer was chosen as the study's primary software platform [17].

Nees Jan van Eck developed it, and Ludo Waltman of Leiden University's Centre for Science and Technology Studies (CWTS) in 2010 to make it easier to construct network-based maps and then examine and explore such maps. VOSviewer can extrapolate and build networks of academic works, such as journals and magazines, scholars and research institutions, nations, keywords, and concepts. Some ways in which the nodes in these networks are connected include co-authorship, co-occurrence, citation, bibliographic coupling, and co-citation. According to Van Eck and Waltman, the tool's utility comes from the fact that it can collect data from a wide range of scientific databases, such as web of science, Scopus, dimensions, and PubMed files, and reference managers, such as RIS, EndNote, and RefWorks files [17].

4.1.UTAUT-2 Adoption Status

Venkatesh et al. (2010) established a foundational paradigm to concentrate on the consumer's perspective for an expanded version of UTAUT, UTAUT2, which included three factors: hedonic motivation, price/value, and habit. This incorporates a predictive capacity into the Model, which boosts its potential for projecting user uptake by as much as 74% [9]. The theoretical approach's practical aspect was already well-established as a standard, overarching structure in the IT sector. The abundance of research shows that the Model is useful for studying several aspects of the spread of new technologies, including adopting these tools in novel ways and within different social and cultural settings. Virtual classrooms and learning; financial services; and online commerce are just a few examples of areas that regular user, behavioural, and standard approaches.

4.1.1. Annual Publishing Trends

According to the yearly publishing trends (Fig.3), Scopus published its first paper on "e-learning adoption" in 2012. From 2012 to 2018, the growth rate has been stable but not noteworthy. During 2019–2022, Scopus published 16–35 technology adoption using UTAUT-2 Model publications. After 2018, several academics focused on the referred research subject, resulting in an exponential rise in Scopus database publications to about 115 by 2023.

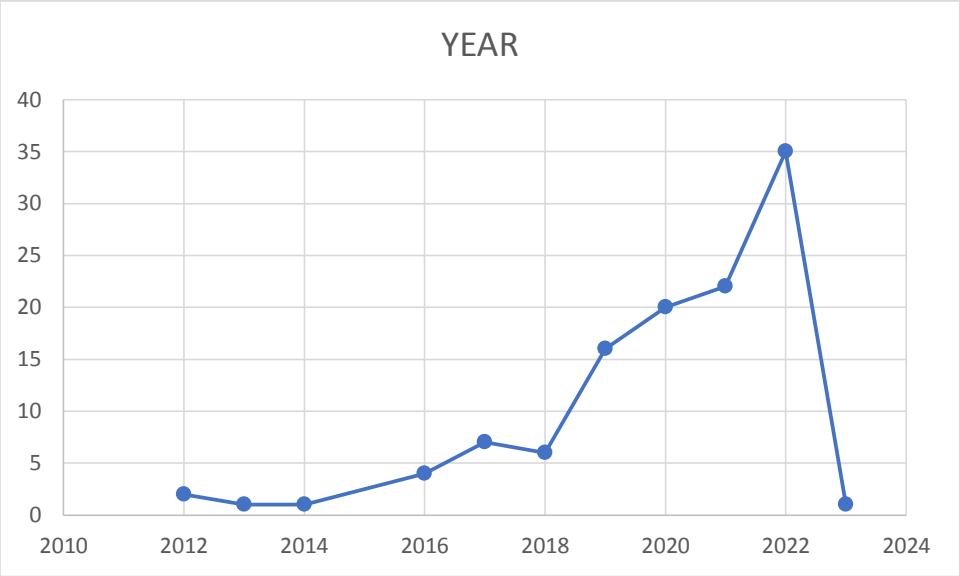

Figure 3: Yearly Publication Trends

Governments, businesses, students, and educators have all begun to focus on the possibilities presented by the UTAUT-2 Model for Technology Adoption, as reported by [18]. The worldwide digital transformation movement has resulted in several difficulties in implementing new technologies [19], which has led to this aggregation of viewpoints. Between 2019 and 2022, disruptive technologies like virtual and augmented reality have also seen the most important breakthroughs, which are now considered superior technology for building novel instructional strategies [20]. Figure 4 illustrates the network distribution with colour code indications from dark blue toward yellow. Where dark blue is the old publication between 2019 to 2020, the publications between 2020 to 2021 are coloured light blue to green, where Covid-19, mobile applications, and consumer behaviours are analyzed more. The publication from 2021 to 2023 is focused on UTAUT-2 Model, and China is the recent entry into the technology adoption model UTAUT-2 Model application into their research.

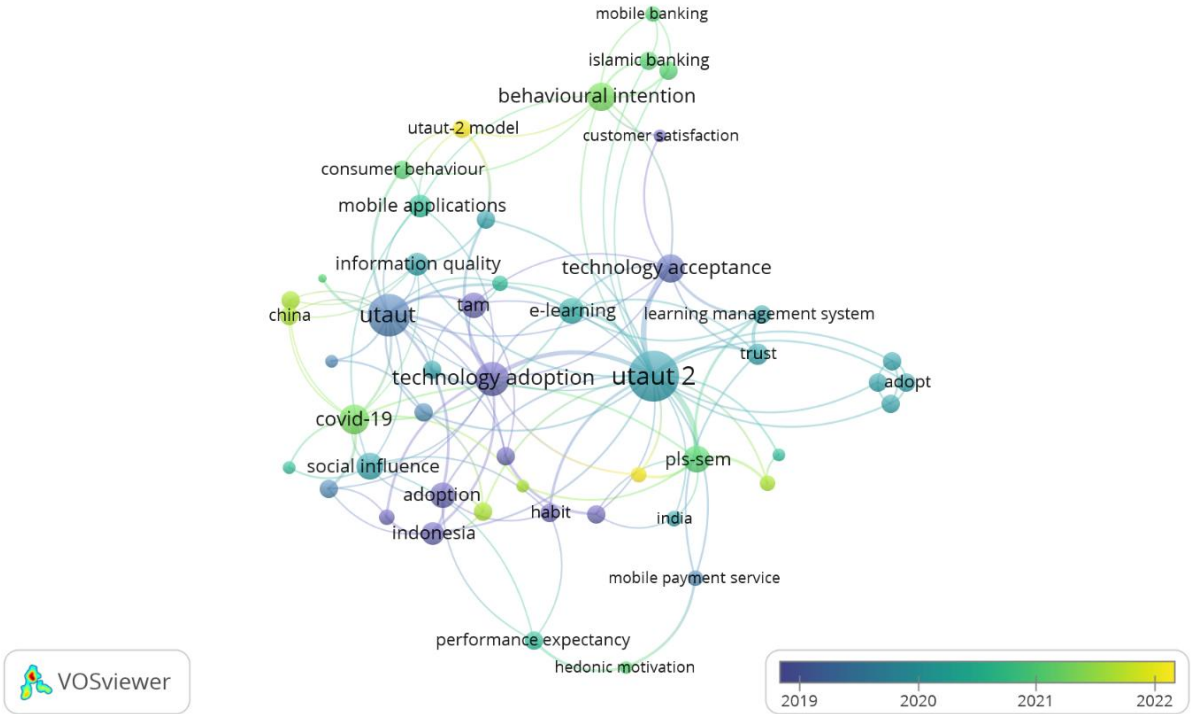

Figure 4: Yearly Publication Network

4.1.2. Organizational Distribution

By looking at the authors' institutions, the top 10 organizations whose authors have written on technology adoption using the UTAUT-2 Model resulted in a combined 39 publications (Fig.), which is 33.91 percent of the total number of papers on the subject. 12 papers from Bina Nusantara University in Indonesia account for 10.34% of the published scientific data sample. Indonesia, with 28 articles (24.43% of the total), is the top published article and is ahead of India (18 papers), Malaysia (11 papers), and China (9 papers).

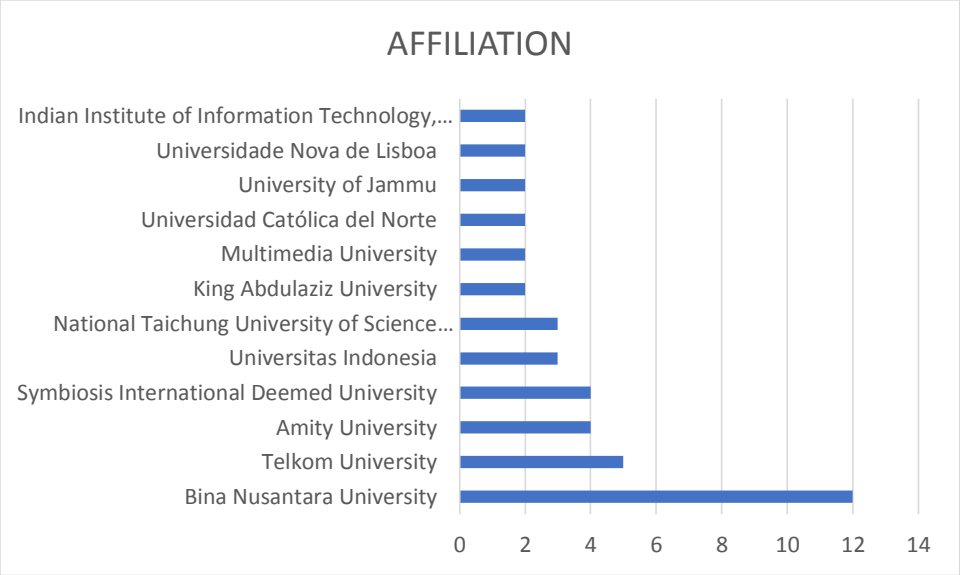

Figure 5: Top 10 Author's Organization Distribution

From Telkom University (Tel-U) Indonesia, Indrawati et al. have published the most; their combined efforts have resulted in four separate works, three of which were presented at conferences and one published in a scholarly journal. The authors of the cited works discuss the difficulties and potential benefits of merging mobile apps with mobile payment systems in various case studies, as well as the advantages of transferring the relevant data to an electronic record management system (ERMS). There are 40 citations for these works in Scopus and 90 in Google Scholar, despite being published from 2017 to 2019 (Fig. 5).

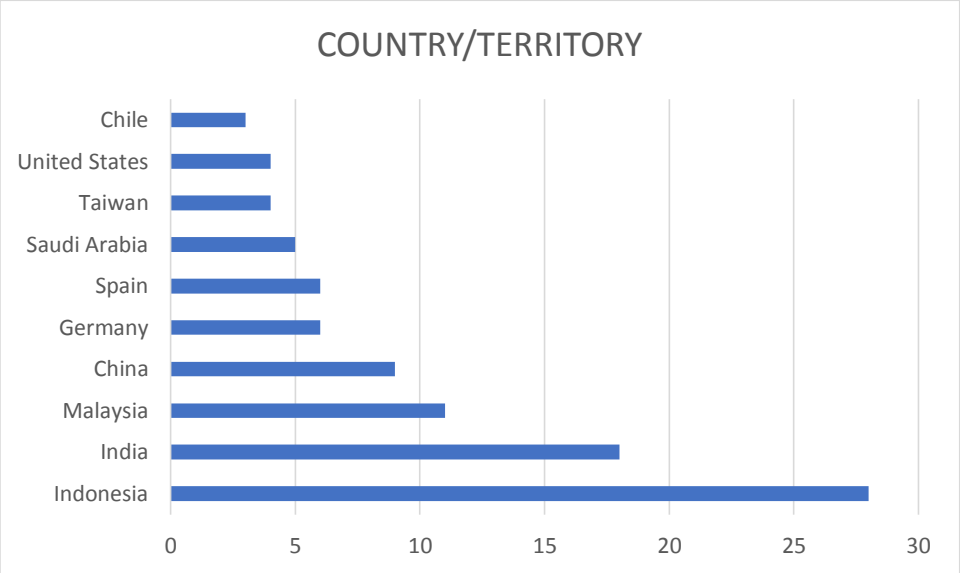

Figure 6: Top 10 Countries of Publication

4.1.3. Journal Distribution

The majority (57.39%) of the 115 publications used in the analysis are studies published in 66 scholarly journals. Concurrently, 24 of these papers appeared in the top 10 journals, with "Sustainability Switzerland" having the highest article count, with 5. The percentage is 7.24% of the whole sample. As modest as it may appear, remember that 9 of the most-cited journals produce more than twice as many papers each year. There are also six first-quartile journals, three second-

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quartile journals, and one conference proceeding among the top ten (Table 1 Fig. 6).

Table 1: Type of documents retrieved from the Scopus Database

DOCUMENT TYPE	FREQUENCY	PROPORTION
Article	66	57.39
Conference Paper	43	37.39
Review	3	2.63
Book Chapter	2	1.73
Conference Review	1	0.86
Total	**115**	**100**

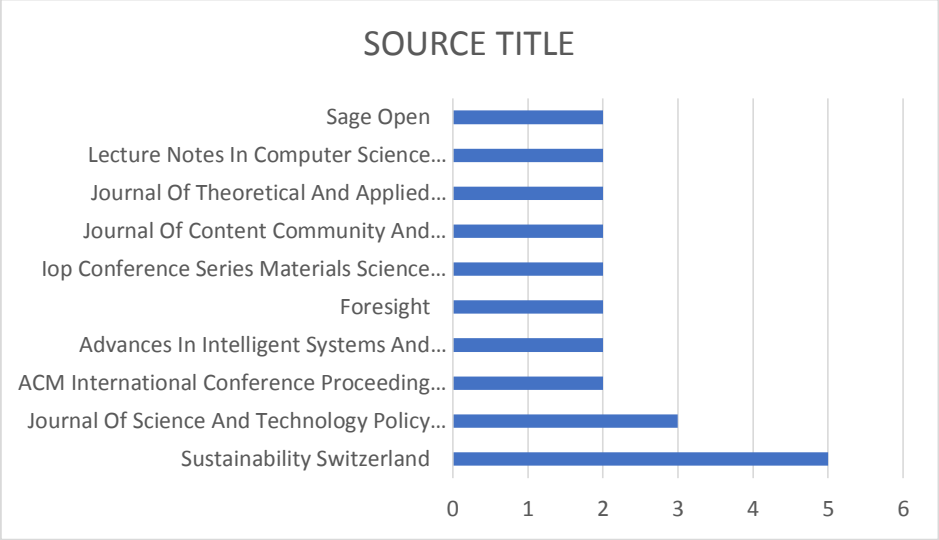

Figure 7: Top 10 Sources of the published articles

4.1.4. Citation Analysis

In addition to the overall value of a work's scientific and practical contribution, the number of citations of that study also tends to impact other factors more pertinent to the research team, such as cash allocations and even prospective prizes [21]. Scopus data on the adoption and application of UTAUT-2 indicates that all intrinsic publications have been cited 1126 times. Figure 7 shows that out of a total of 930 citations, 82% came from just the top 10 countries, with India (556), Spain (186), and Indonesia (48) accounting for the largest shares.

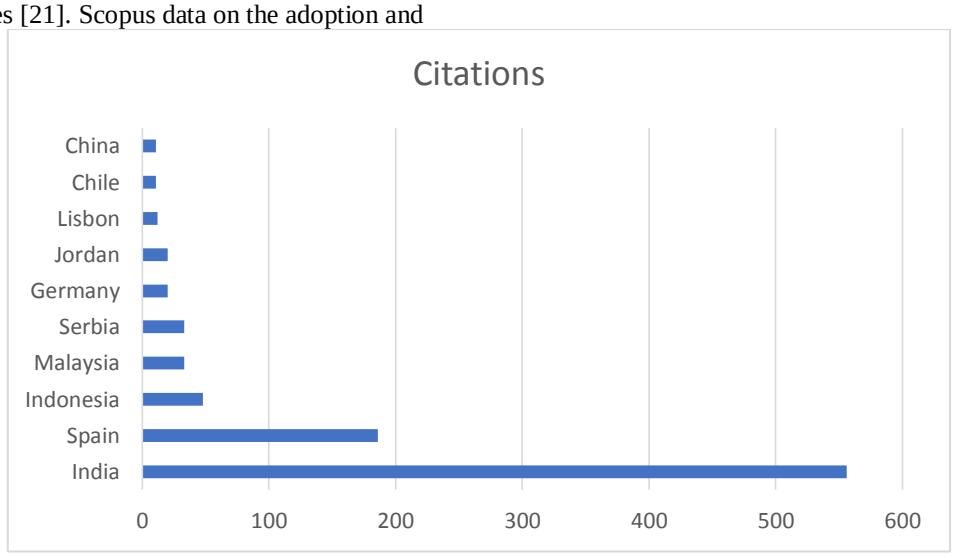

Figure 8: Top 10 Countries with citation score

According to the available literature, an author's influence amongst their peers may be measured by the number of times a certain publication has been mentioned, denoted by the H-index. Many argued against the [22] proposal to utilize the H-index to rank researchers according to their scientific impact. On the other hand, H-index has been embraced globally by both educational organizations and governmental and financing entities as a credible evaluation of the researcher's work.

Spain has the highest H-index (41), followed by India (35), Indonesia (31), Taiwan (7), and Malaysia (5). Spain tops India as the nation that has published the most articles about UTAUT-2's use and acceptance. China has an H-index of 4, has published more than 8 papers, and ranks near the bottom of the top 10 countries in terms of publication number; this suggests that, despite producing a large volume of publications, China may need to improve the overall quality for the scientific community to recognize them as valuable contributions to the advancement of the research mentioned above topic.

4.1.5. UTAUT-2 Authorship Network Analysis

Complex research projects require teams of experts from different fields to work together to ensure reliable results [23]. Examining the relationships between authors can provide a fine-grained picture of the novelty of a study's subject matter by revealing the authors' nationalities, the institutions with which they are affiliated, and the study's overall impact.

A. Analysing Country Vs. Co-Authorship

Analysis of international collaboration on research papers requires looking at the level of cooperation between nations and which ones have the most impact on the area. Fig. shows the global distribution of authors researching Technology Adoption using UTAUT-2 models. The size of the nodes represents the strength of the countries represented. On the other hand, the collaboration between institutions in different countries is represented by the thickness and distance of the links between their nodes. The colours on the map represent a spectrum of research interests. There are the most articles published in Indonesia (28), India (18), Malaysia (11), China (9), Germany (6), Spain (6), Saudi Arabia (5), Taiwan (4), and the United States (11). Four clusters of co-authorship may also be seen between India, the United States, Saudi Arabia, China, Pakistan, and Bangladesh. Connecting to both Indonesia and Portugal, Malaysia serves as a hub for all three countries.

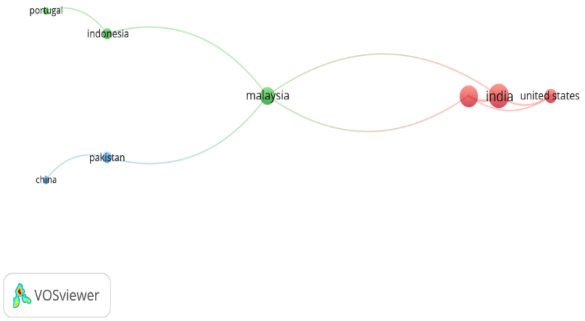

Figure 9: Co-Author and Country Analysis

B. Notable Publications Citations

The scientific world generally agrees that the more citations a work has, the better it must be. For this reason, we assessed the top 15 most-cited publications in our sample of research on Technology Adoption and the UTAUT-2 Model to gauge the potential influence of these topics on the advancement of knowledge. Table 2 provides information about the most-cited works, including their titles, journals, authors, years, and citation totals. All 10 of the most-cited publications were written very recently, between 2003 and 2023, if they are the theoretical pillars of the discipline. Though there has been a significant increase in the number of publications on the subject matter, the total number of citations has climbed drastically since 2019. Journals with articles citing titles shown in Figure 10 and Table 2 can be found in Sustainability Switzerland (188), Frontiers in Psychology (74), International Journal of Environmental Research and Public Health (68), Education and Information Technologies (66), and Computers in Human Behaviour (52).

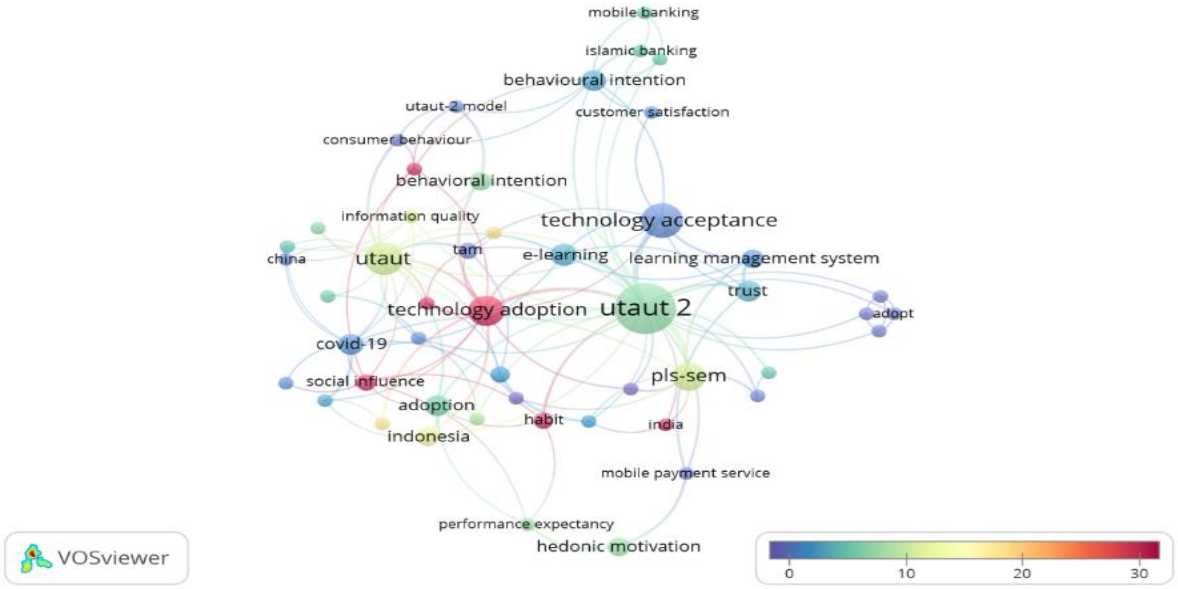

Figure 10: Keywords and Citation Network

Table 2: Top 15 cited papers of Technology Adoption UTAUT-2 Model

Authors	**Year**	**Title**	**Journal**	**Citation Count**
Venkatesh V., Morris M.G., Davis G.B., Davis F.D.	2003	User acceptance of information technology: Toward a unified view	MIS Quarterly: Management Information Systems	19943
Venkatesh V., Thong J.Y.L., Xu X.	2016	Unified theory of acceptance and use of technology: A synthesis and the road ahead	Journal of the Association for Information Systems	792
Brown S., Dennis A., Venkatesh V.	2010	Predicting collaboration technology use: Integrating technology adoption and collaboration research	Journal of Management Information Systems	375
San Martin H., Herrero A.	2012	Influence of the user's psychological factors on the online purchase intention in rural tourism: Integrating innovativeness to the UTAUT framework	Tourism Management	365
Sun Y., Wang N., Guo X., Peng Z.	2013	Understanding the acceptance of mobile health services: A comparison and integration of alternative models	Journal of Electronic Commerce Research	279
Chao C.-M.	2019	Factors determining the behavioural intention to use mobile learning: An application and extension of the UTAUT model	Frontiers in Psychology	267
Chan F.K.Y., Thong J.Y.L., Venkatesh V., Brown S.A., Hu P.J.-H., Tam K.Y.	2010	Modelling citizen satisfaction with mandatory adoption of an E-Government technology	Journal of the Association for Information Systems	237

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El-Masri M., Tarhini A.	2017	Factors affecting the adoption of e-learning systems in Qatar and USA: Extending the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)	Educational Technology Research and Development	209
Chopdar P.K., Korfiatis N., Sivakumar V.J., Lytras M.D.	2018	Mobile shopping apps adoption and perceived risks: A cross-country perspective utilizing the Unified Theory of Acceptance and Use of Technology	Computers in Human Behavior	180
Sumak B., Sorgo A.	2016	The acceptance and use of interactive whiteboards among teachers: Differences in UTAUT determinants between pre- and post-adopters	Computers in Human Behavior	136

The UTAUT was suggested by Venkatesh et al.,2003, with a foundational model that includes four primary determinants of intention and usage and up to four moderators of key interactions. Using the raw data, UTAUT beat the other eight individual models with an adjusted R2 of 69%. Two other organizations confirmed UTAUT's accuracy with an adjusted R2 of 70%. Managers may utilize UTAUT to predict the success of new technology releases and identify the factors contributing to users' acceptance of new systems, allowing them to proactively develop interventions such as training, marketing, etc. [8]. Venkatesh et al. (2012, 2016) present UTAUT expansions, renamed UTAUT-2 into four categories: new exogenous, endogenous, moderation, and outcome mechanisms. Weber's (2012) theory assessment approach conceptually examines the literature. Cross-context theorizing is used to evaluate and facilitate UTAUT literature's theoretical contributions toward e-governance [24]. The authors provide a multi-level approach by integrating our theoretical research with eight variables of technology adoption and application environment. Major theoretical contributions to the field of technology adoption and application are synthesized by this framework, which draws from prior UTAUT extensions and discovers new libraries of context effects and contextual moderation. [15]. Brown et al. (2010) created a model by merging UTAUT principles with collaborative technology ideas, including social presence theory, media richness theory, and task closure. Collaboration technologies were chosen for the construction. The concept was evaluated in two scenarios using two collaborative tools. The authors observed that UTAUT moderated the impact of collaboration research components on the desire to employ a collaboration tool [9].

San Martín & Herrero (2012) includes the five explanatory variables of performance expectancy, effort expectancy, social impact, enabling conditions, and innovativeness, and it is based on the UTAUT. The findings of an empirical study conducted on a sample of 1083 customers who had previously visited several rural accommodation websites show that positive online purchase intent is impacted by the number of reviews posted about the property [25].

Sun et al. (2013) examines consumers' acceptance of health technologies as a health and technology behaviour; you should consider proposing a unified model that integrates technology acceptance theories and health behaviour. The Unified Model outperforms other models, including the Technology Acceptance Model, the Theory of Planned Behaviour, and the Protection Motive Theory. This study suggests that future studies on the acceptability of health technologies should split the difference between professional and consumer health technologies and examine the theories of technology acceptance and health behaviour [26].

A new integrative model, presented by Chao C.-M., was created to account for college students' beliefs, intentions, and actions (BIs) about mobile learning. Using the UTAUT model as a conceptual framework, we added five predictor components to this well-validated framework: mobile self-efficacy, perceived enjoyment, satisfaction, trust, and public relations. A total of 1,562 m-learners contributed data. The Model's internal consistency and reliability showed its explanatory power. According to this study, contentment greatly affects university students' BIs toward m-learning. BI enhanced with PE, trust, and EE. PE, EE, and satisfaction were impacted by student enjoyment. Pleasure increased with mobile self-efficacy. Finally, PE and PR hurt BI's m-learning. Understanding new technology adoption helps improve learning and pedagogy. Educational decision-makers may benefit from this study [27].

El-Masri and Tarhini (2017) used UTAUT2 with Trust as an external variable to assess university students' e-learning acceptance. It included effort expectation, performance expectations, price value, habit, social influence, enabling conditions, trust, and hedonic motivation. Qatar, a developing nation, and the US tried the idea (USA). Qatar and the US have never studied e-learning adoption. Performance anticipation, hedonic drive, habit, and trust predicted BI in both groups. Despite predictions, price value and BI are unrelated. E-learning use grew in developing nations due to effort expectations and societal impact, but not in developed nations. It enabled environments to improve e-learning in developed nations [28].

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Chopdar et al. .study contain limitations that future research might resolve. Both panels were sampled from millennials. Therefore the study's results are confined to that age range. To completely understand m-shopping app user behaviour, future studies should include a more diversified population of age, income, education, and employment. Market size, such as App store downloads, can shed light on consumer acceptance and dissemination of technical breakthroughs. This study used a cross-sectional methodology. Thus future studies should incorporate long-term techniques like latent growth models. This will reveal consumers' perceptions and behaviour changes over time. Future studies should examine if shopping app motivations and obstacles vary [29].

Šumak & Šorgo's (2016). Despite its limitations, the study contributes to UTAUT factors in educational technology used in schools, particularly IWBs. This study developed and verified a model to understand prospective and current IWB user acceptability. To compare possible users, user type was introduced as a moderating variable to the main UTAUT model [30].

UTAUT and UTAUT-2's meteoric rise in popularity illustrates how rapidly technologies may spread worldwide. Many studies have examined the potential of these technologies in many fields as teaching, travel, and online commerce. In 2023, more research into the retail and unstructured retail sectors was needed to understand better the general acceptability and utilization of the many technologies being adopted for various purposes.

C. Analysis of Co-Citation

There exists a co-citation relationship, as defined by [31] contend; co-citation occurs when two different things (articles, journals, authors) appear in the reference list of a single referencing item. This may be utilized to probe study fields' interconnectedness and hierarchical structure. In light of this, we have conducted a targeted co-citations study utilizing the UTAUT-2 Model to reveal potential connections between authors, papers, and journals related to the issue of technology adoption. Figure 12 illustrates the co-citations between the countries.

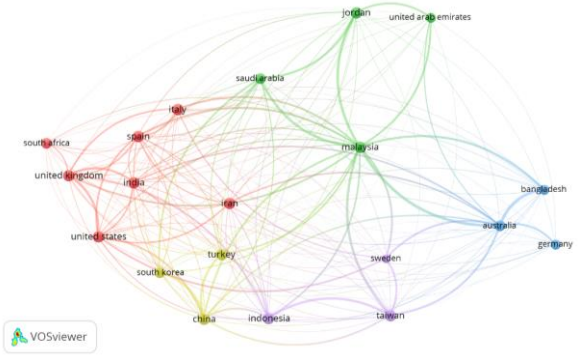

Figure 11: Co-Citation Country Network

D. Co-Citation Reference Analysis

In the context of research papers, this means that when two papers are cited in one article, it is reasonable to assume that the two studies are related. Researchers can get a sense of the evolution and structure of a particular study topic by looking at the citations that have been made to each other. A study subject's entire set of features may be attained through the network analysis technique of grouping the discovered articles into clusters. The publications more directly connected to the technology adoption and UTAUT-2 model are represented in the reference co-citation network by larger nodes and richer colours than those less directly related (Fig. 13).

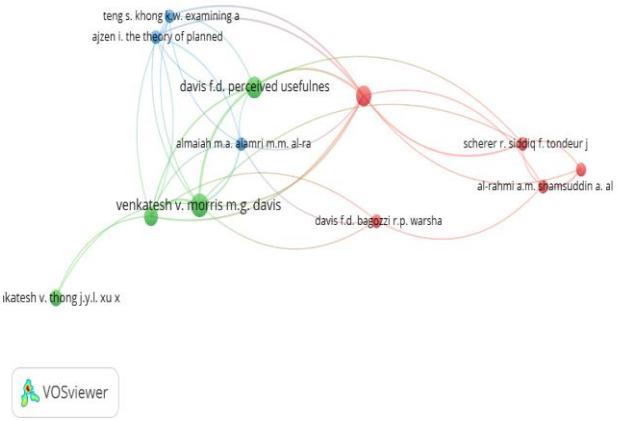

Figure 12: Co-Citation Reference Analysis

This study set out to conduct a bibliometric analysis of related literature about the UTAUT-2 Model for the diffusion of innovative technologies. Even though the first papers on the "UTAUT-2" topic came out in 2003, There was a clear increase in the number of articles published in 2013 about implementing this new learning approach based on digital technology. From 2013 to 2023, the number of publications increased significantly. While the "UTAUT-2 technology adoption model" has been of interest to scientists and governments since at least 2011, it wasn't until 2017 that it took off. As a result, the annual volume of published articles increased exponentially.

4.1.6. Research Keywords Analysis

The evaluation was carried out in the content of each chosen publication by examining their keywords once we had completed a thorough contextual analysis of each record in the research sample. By looking at how often certain terms and phrases appear together, it may be evaluated whether aspects of the scientific study of technology adoption and application of the UTAUT-2 Model need further attention. 367 keywords were used in the 115 papers that made up the research sample, but only eight appeared more than once. For VOSviewer to provide a visually examined and perceptible keywords co-occurrence network, the threshold for keywords with less than three occurrences was set at three [32].

By looking at the keywords co-occurrence network (Fig.8), where the keywords are represented by coloured circles of varying sizes based on the frequency with which they appear in titles and abstracts of publications, we can see that the most frequently used keywords are: (a) "UTAUT-2" (82); (b) "Behavioural Intention" (31); (c) "Technology Adoption" (27); (d) "Hedonic Motivations" (16); (e) Technology Acceptance (15); Five distinct groups of keywords were also extracted. The strength of the connection between any two nodes is reflected by how far apart they are from one another. The line's thickness represents the degree to which the two words appear together. Connections between keywords serve as the nodes. Researchers still put more emphasis on acceptance and the existence of behavioural intentions towards the use of technology rather than on its actual application and assimilation at every level of the adoption process, which may be seen as evidenced by a more in-depth investigation of these linkages.

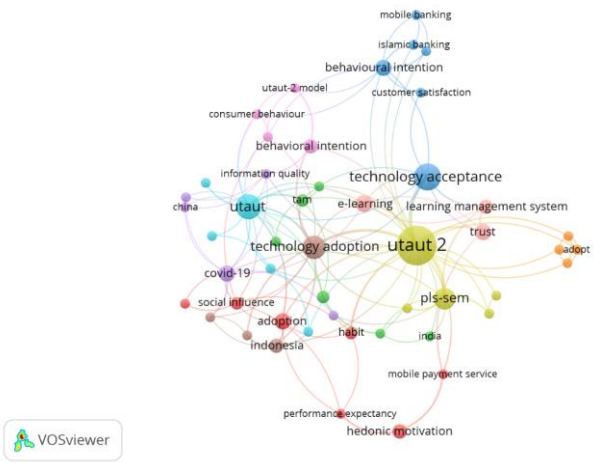

Figure 13: Keyword Co-occurrences

UTAUT-2 is a widely used model in the field of information systems that provides a comprehensive framework for understanding and predicting technology adoption and usage. Some of the applications of the UTAUT-2 Model include:

Technology acceptance research: UTAUT-2 is often used as a theoretical framework in technology acceptance research to explain why people adopt or reject technology.

User behaviour prediction: The UTAUT-2 Model can predict how users will interact with a particular technology based on the factors influencing their acceptance and usage.

Technology design: The UTAUT-2 Model can inform the design of technology systems by considering the factors influencing user acceptance and usage.

Employee adoption: The UTAUT-2 Model can be used to understand why employees adopt or reject technology in the workplace and to predict how they are likely to use it.

E-commerce: The UTAUT-2 Model can be used to understand why consumers adopt or reject e-commerce systems and predict how they are likely to use them.

Mobile technology: The UTAUT-2 Model can be used to understand why people adopt or reject mobile technology and predict how they will use it.

The UTAUT-2 Model has been applied in various contexts, including health care, education, and financial services. By providing a comprehensive understanding of the factors that influence technology acceptance and usage, the UTAUT-2 Model can be used to inform technology design, predict user behaviour, and optimize technology adoption and usage. The achieved Scopus database articles do not discuss the UTAUT-2 Model used for analyzing technology adoption by unstructured retailers.

The UTAUT-2 Model can be applied to understand and predict technology adoption in unstructured retailers. This can help retailers improve the design and implementation of their technology systems and increase their adoption and usage among employees and customers. In unstructured retailers, factors such as trust, perceived ease of use, and perceived usefulness are likely to play a significant role in technology adoption. For example, if employees do not trust the technology or if they do not believe that it will be useful for their work, they may be less likely to adopt and use it. Similarly, if customers perceive the technology as difficult to use, they may be less likely to use it. Other variables, such as social influence and habit, may influence technology adoption in unstructured retailers. For example, employees may be more likely to adopt technology if they see others using it successfully or develop a habit of using it as part of their work routine. By considering these and other factors in the UTAUT-2 Model, retailers can develop a more comprehensive understanding of the drivers of technology adoption in their unstructured retail environment. This can help them design and implement technology systems that are more likely to be adopted and used by employees and customers.

Additionally, the UTAUT-2 Model can be used to predict the likely adoption and usage patterns of technology systems, helping retailers optimize their technology investments and improve the overall performance of their businesses.

5. Conclusion

The current work provides evidence that bibliometric analysis, specifically a retrospective examination of rich and broad research topics, may be regarded as a scientific approach that yields credible results. As discussed in the first portions of the study, the bibliometric technique establishes itself as a solid research approach that may help both senior and young researchers. While UTAUT and UTAUT-2 have been the focus of many researchers for over 15 years and are widely believed by practitioners to be fully integrated into current technology adoption research, a review of the published literature reveals that this assumption has not yet been fully proven, with acceptance and early-stage adoption being the issues at hand. Researchers and practitioners realize that the study may be improved by using scientific records from scientific repositories other than Scopus, even if they recognize that UTAUT and UTAUT-2 do not have the same value regarding technology adoption. After giving the data and their implications some thought, it becomes clear that a whole new section containing qualitative and quantitative results analysis would be quite helpful (for example, a Focus Group). From our point of view, this would make it possible for highly qualified experts to give their thoughts on both the results and what might happen in the future in the field of study of the technology adoption model.

UTAUT-2 is an updated version of the original UTAUT model, which Venkatesh proposed by Morris, Davis, and Davis in 2003. The UTAUT-2 Model builds on the original UTAUT model by adding several new variables and modifying the original Model. Some of the key evolutions in the UTAUT-2 Model include:

The addition of two new moderators: hedonic motivation and habit. The integration of personality traits into the Model as a moderator. The inclusion of social influence as a predictor of technology acceptance and use. The incorporation of the theory of planned behaviour into the Model. The addition of trust as a predictor of technology acceptance and use. The expansion of the scope of the Model to include a wider range of technology types and usage contexts.

The UTAUT-2 Model remains one of the most widely used and well-regarded models for explaining and predicting technology acceptance and usage. By incorporating these additional variables, the UTAUT-2 Model provides a more comprehensive and nuanced understanding of the factors influencing technology adoption and usage.

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