Combining topic modeling and bibliometric analysis to understand the evolution of technological innovation adoption in the healthcare industry

Received 20 June 2023
Revised 13 November 2023
Accepted 15 January 2024

Nicola Cobelli and Silvia Blasi
Department of Management, University of Verona, Verona, Italy

Abstract

Purpose – This paper explores the Adoption of Technological Innovation (ATI) in the healthcare industry. It investigates how the literature has evolved, and what are the emerging innovation dimensions in the healthcare industry adoption studies.

Design/methodology/approach – We followed a mixed-method approach combining bibliometric methods and topic modeling, with 57 papers being deeply analyzed.

Findings – Our results identify three latent topics. The first one is related to the digitalization in healthcare with a specific focus on the COVID-19 pandemic. The second one groups up the word combinations dealing with the research models and their constructs. The third one refers to the healthcare systems/professionals and their resistance to ATI.

Research limitations/implications – The study's sample selection focused on scientific journals included in the *Academic Journal Guide* and in the FT Research Rank. However, the paper identifies trends that offer managerial insights for stakeholders in the healthcare industry.

Practical implications – ATI has the potential to revolutionize the health service delivery system and to decentralize services traditionally provided in hospitals or medical centers. All this would contribute to a reduction in waiting lists and the provision of proximity services.

Originality/value – The originality of the paper lies in the combination of two methods: bibliometric analysis and topic modeling. This approach allowed us to understand the ATI evolutions in the healthcare industry.

Keywords Digital transformation, Healthcare management, Bibliometric analysis, Topic modeling, UTAUT, UTAUT2

Paper type Research paper

1. Introduction

The rapid increase of technology has catalyzed a profound fusion between medicine and cutting-edge technologies, such as digitalization, artificial intelligence and the internet of Things (IoT), revolutionizing the healthcare sector (Tani *et al.*, 2022). These innovations are driving improvements in diagnostics, personalized treatment options, remote patient monitoring and telemedicine, ultimately creating a more efficient, accessible and patient-centered healthcare future (Ciasullo *et al.*, 2022). IoT, in particular, stands at the forefront of this transformative process, delivering efficiency improvements and cost reductions, all the while emphasizing the enhancement of patient care through features like continuous monitoring, tracking, secure storage of vital statistics and medical information (Cannavale

European Journal of Innovation Management
Vol. 27 No. 9, 2024
pp. 127-149
Emerald Publishing Limited
1460-1060
DOI 10.1108/EJIM-06-2023-0497

et al., 2022). Furthermore, healthcare services are no longer confined to traditional clinical settings, being accessible in various environments. Wearable medical devices equipped with sensors play a new and fascinating role. These devices collect essential health data from the human body, measuring key health indicators (Vargheese and Viniotis, 2014). This technological integration is paving the way for a more interconnected and technologically driven healthcare landscape (Tani *et al.*, 2022).

However, despite the increasing emphasis on implementing new knowledge in practical healthcare contexts, prior research has underscored the adoption of technology innovation (ATI) at the organizational and systemic levels (Godfrey *et al.*, 2023). A deeper investigation into the necessity to explore the adoption of technological innovation in the healthcare industry is imperative to address these challenges comprehensively.

Venkatesh *et al.* (2003, 2012) investigated the variables affecting technology adoption in the business-to-consumer and business-to-business markets and developed the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2).

This paper, starting with a comprehensive literature review and employing topic modeling techniques to explore UTAUT and UTAUT2, aims to gain a deeper understanding of the prevailing research trends, key themes and emerging insights in the context of technology acceptance and adoption in the healthcare industry. Accordingly, our research questions are:

RQ1. How has the literature evolved in relation to technological acceptance in the healthcare industry, with a particular emphasis on the research models UTAUT and UTAUT2?

RQ2. What are the emerging innovation dimensions investigated in the healthcare industry?

To address this research questions, we first conduct a comprehensive bibliometric analysis, and second, we employ a topic modeling technique. A bibliometric analysis is a technique for identifying patterns and trends in a volume of literature. To assess publications, authors, journals or research institutes, as well as their relationships, it entails statistical analysis of bibliographic data, including citations. By giving insights into the significance and influence of research output, this approach aids in measuring and assessing the academic contributions made within a particular field and identify the steps forward research can and should do. Topic modeling was then chosen since it allows to identify and track emerging trends, also in healthcare industry (Jayaraman *et al.*, 2020), providing insights into which areas require further exploration. Additionally, through an examination of the distribution of topics in the literature, topic modeling can pinpoint knowledge gaps and areas that have been underexplored. This information proves valuable for researchers aiming to direct their efforts toward uncharted territory and for policymakers looking to tackle overlooked healthcare challenges.

2. Theory

The landscape of technology adoption and use is underpinned by a range of influential models, each offering distinct advantages and encountering their own set of disadvantages. The Theory of Reasoned Action (TRA) provides a structured foundation for understanding individual attitudes and subjective norms (Fishbein, 1979), while the Technology Acceptance Model (TAM) and the Motivational Model delve into user motivations and perceptions (Davis *et al.*, 1992), facilitating effective system design and evaluation. The Theory of Planned Behavior (TPB) extends TRA by incorporating Perceived Behavioral Control, enabling better

predictions for behaviors that require personal control (Ajzen, 1991). Combining TAM and TPB offers a more comprehensive view, capturing both motivational and control aspects (Taylor and Todd, 1995). Innovation Diffusion Theory guides understanding of the adoption process and the influence of early adopters and opinion leaders (Rogers and Williams, 1983), while the Social Cognitive Theory emphasizes observational learning and self-regulation in technology adoption (Compeau *et al.*, 1999). However, these models may oversimplify the complexities of real-world technology adoption, potentially lacking relevance in diverse cultural and contextual settings and facing challenges from rapid technological advancements.

The Unified Theory of Acceptance and Use of Technology (UTAUT) has emerged as an influential model that builds upon and intends to overcome limitations of the earlier technology adoption models (Gupta *et al.*, 2008).

The UTAUT model incorporates multiple factors overcoming the oversimplification of the previous models. In details, Venkatesh *et al.* (2003) proposes four pivotal dimensions influencing information technology intention and usage. The first is *Performance Expectancy*, meaning the extent to which an individual believes that using the system will assist them in improving job performance. The second dimension is the *Effort Expectancy*, which refers to the perceived ease with which the system can be used. The third dimension, *Facilitating Conditions* represents the extent to which a person believes that an organizational and technical infrastructure exists to support system use. The fourth dimension, *Social Influence*, represents the extent to which a person believes that others believe they should use the new system. UTAUT2 combines the above-described dimensions with three new ones (Venkatesh *et al.*, 2012). *Hedonic Motivation* is defined as the enjoyment or pleasure obtained from utilizing a system; *Price Value* is as the cognitive tradeoff between the technology apparent advantages and the expense of utilizing them (Dodds *et al.*, 1991); *Habit* represents as the amount of activities people tend to do automatically as a result of learning, whereas Kim *et al.* (2007) associate habit with automaticity. Although conceived identically, *Habit* has been operationalized in two unique ways: first, habit is considered as past behavior, and second, habit is measured as an individual's belief that the activity is automatic (Kim and Malhotra, 2005).

Moreover, UTAUT and UTAUT2 address the potential lack of applicability to diverse cultural and organizational contexts, a limitation that some of the previous models, such as the TAM, TRA and TPB, might encounter (Alshammari and Rosli, 2020). TAM, for example, focuses on perceived ease of use and perceived usefulness and it does not extensively consider cultural nuances or contextual variations. TRA is centered on individual attitudes and subjective norms, overlooking cultural and organizational influences. TPB extends TRA by including perceived behavioral control but still focuses on individual-level factors. UTAUT and UTAUT2 acknowledge that the impact of factors on technology adoption can vary depending on the specific context, that is the user, and the type of technology.

In addition, UTAUT and UTAUT2 recognize the dynamic nature of technology and its evolution aiming at overcoming the possibilities to become outdated. Other existing model, like TAM, since it was developed at a time when technological advancements were not as rapid as they are today, tends to be more static.

Finally, UTAUT and UTAUT2 go beyond individual factors and incorporate the collective influences that earlier models might not fully account for, emphasizing the influence of social factors on technology acceptance, and recognizing that user behavior is often shaped by social influences and expectations.

Although the UTAUT2 model was originally conceived to study the propensity for adoption in the business-to-consumer market, both UTAUT and UTAUT2 have been used in many studies concerning the healthcare industry from a business-to-business perspective (Schmitz *et al.*, 2022). Having highlighted the advantages described by the authors of these

models over their antecedents, we use the UTAUT and UTAUT2 models to deepen our understanding of ATI in the healthcare industry and to empirically verify whether they have been used as conceived or adapted or extended, due to the application industry, that is healthcare.

3. Methods

In this paper, we perform a bibliometric analysis and topic modeling to provide a comprehensive and multi-faceted perspective on the research field. The combination of bibliometric analysis and topic modeling provides a comprehensive perspective on the evolution of literature in the healthcare industry, particularly regarding the utilization of UTAUT and UTAUT2 research models (Donthu *et al.*, 2021). While bibliometric analysis offers a quantitative and historical view of this evolution, topic modeling introduces a qualitative dimension to the analysis. Topic modeling, a statistical technique in natural language processing (NLP), extracts themes and topics from extensive textual datasets, with the widely used Latent Dirichlet Allocation (LDA) method assuming that each document in a corpus comprises a mixture of various topics, each associated with a unique set of words (Vayansky and Kumar, 2020). LDA employs a probabilistic approach to estimate the distribution of topics across documents and the distribution of words within topics, refining these estimates iteratively until convergence is achieved (Gurcan *et al.*, 2021). This combined approach enables a holistic understanding of the trends and insights within the healthcare literature.

In detail, we performed a five-stage examination.

(1) we created a data collection of documents using UTAUT and UTAUT2 in the healthcare industry and analyzed basic descriptive statistics,

(2) we focused on the UTAUT and UTAUT2 models to map the history of the collection of documents to determine the evolutionary trajectory of publications in the area,

(3) we investigated the fundamental works by doing a co-citation network analysis on the complete collection of 57 papers,

(4) we explore the integration patterns of UTAUT and UTAUT2 models and

(5) we investigated the knowledge structure of existing works on UTAUT and UTAUT2 by performing topic modeling.

For the construction of our sample, we searched in Title, Abstract and Keywords on the Scopus database, ISI Web of Science and the FT Research Rank. Specifically, we employed the following search string: ("health*") OR ("health care")) AND ((utaut*) OR ("utaut 2") OR ("Unified Theory of Acceptance and Use of Technolog*") OR ("Unified Theory of Acceptance and Use of Technolog* 2")) AND ((adoption) OR (acceptance)) to comprehensively capture and identify relevant literature and studies within the scope of our research questions.

The search string was limited to papers published in English within a specific subset of subject categories on the Scopus database, which includes Business, Management, Accounting, Social Sciences, Economics, Econometrics and Finance. Furthermore, we focused on papers published in international academic journals that are featured in the 2021 ranking of the Academic Journal Guide (AJG) by the Chartered Association of Business Schools or listed in the FT Rank. We decided to focus on the AJG and FT Rank since they guide the range, subject matter and relative quality of journals in which business and management academics publish their research. AJG and FT Rank have high internal and external reliability; they are sensitive to small variations in the ratings of journals and are

generally accepted as a fair means of ranking journals within their user community (Federkeil *et al.*, 2012). The data were collected in February 2023.

Unlike a typical narrative literature review, our technique yields scientific and transparent conclusions, which help to reduce study bias of the researcher performing the review process. Bibliometric data were analyzed with Bibliometrix, an R program developed by Aria and Cuccurullo (2017) for thorough science mapping analysis. The Bibliometrix R package (http://www.bibliometrix.org) contains tools for doing quantitative research with bibliometrics and scientometrics.

We conducted a topic modeling analysis using the R program, employing a sequence of steps to enhance the literature review. Initially, we identified abstracts from articles in journals ranked on the AJG and FT Rank that were published in English. Subsequently, we preprocessed the collected data, which involved cleaning the text, eliminating stop words, punctuation and non-informative terms. Following the preprocessing stage, we applied a topic modeling algorithm to the refined data. The output from this analysis was then carefully reviewed to identify the most significant topics and themes. This assessment included pinpointing the key terms associated with each topic and identifying the documents with the strongest connections. Ultimately, the insights gained from the topic modeling analysis played a vital role in shaping the literature review, offering valuable information about key authors, relevant studies and pertinent issues related to each topic.

4. Results

4.1 Descriptive statistics

We conducted an analysis of 57 English-language papers spanning from 2012 to 2023. The results of our analysis indicate that the exploration of ATI in the healthcare industry has primarily centered on the application of the UTAUT and UTAUT2 models, particularly in English-speaking countries. Within Europe, France stands out as the sole country with a significant scientific production. Additionally, studies on this topic have gained substantial prominence in countries including India, China, Bangladesh and Malaysia. In our sample, *Technological Forecasting & Social Change* is the leading journal in terms of the number of publications (six articles) related to this topic. Following closely is *Behaviour and Information Technology* with three articles.

The interest within the scientific community regarding the ATI by healthcare industry has significantly increased, particularly since 2018. This interest reached its peak in 2020, coinciding with the COVID-19 pandemic, when authors (e.g. Baudier *et al.*, 2021, 2023) dedicated their research to the realm of e-Health. During this period, in fact, healthcare workers swiftly adopted solutions such as telemedicine to maintain connections with their patients (Grinin *et al.*, 2022), while simultaneously many IT and biotechnology companies accelerated digitization efforts to improve the well-being of both healthcare providers and patients (Brem *et al.*, 2021). The exploration of ATI extends into various subdomains. Alam *et al.* (2022) and Singh (2022) have delved into the realm of mobile health (mHealth) and the adoption of innovative smart wearable technologies. Talukder *et al.* (2019) has expanded this exploration into the sphere of ATI within fitness and well-being, a dimension also explored by Gupta *et al.* (2008). In a separate avenue of study, Sabbir *et al.* (2021a, b) has channeled their efforts into investigating telemedicine and the online pharmacy sector.

Table 1 elucidates the evolution and significance of research models related to the ATI, with a focal point on the UTAUT and UTAUT2 models, shedding light on their origins and influential contributors. It is revealed that prior to the formulation of UTAUT, other authors, including Agarwal and Prasad (1998), delved into research models on ATI. Notably, the text emphasizes the pivotal role of authors like Venkatesh and Davis (2000) in the inception of the UTAUT model in 2003. In this vein, Venkatesh *et al.* (2012) conducted a systematic literature

Cited references	Local citations
Davis, F.D., 1989. Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Q.* 13, 319	12
Hoque, R., Sorwar, G., 2017. Understanding factors influencing the adoption of mHealth by the elderly: An extension of the UTAUT model. *Int. J. Med. Inform.* 101, 75–84	12
Venkatesh, Morris, Davis, Davis, 2003. User Acceptance of Information Technology: Toward a Unified View. *MIS Q.* 27, 425	12
Venkatesh, V., Davis, F.D., 2000. A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Manage. Sci.* 46, 186–204	11
Ajzen, I., 1991. The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* 50, 179–211	10
Fornell, C., Larcker, D.F., 1981. Structural Equation Models with Unobservable Variables and Measurement Error: Algebra and Statistics. *J. Mark. Res.* 18, 382–388	9
Davis, F.D., Bagozzi, R.P., Warshaw, P.R., 1992. Extrinsic and Intrinsic Motivation to Use Computers in the Workplace1. *J. Appl. Soc. Psychol.* 22, 1111–1132	7
Henseler, J., Ringle, C.M., Sarstedt, M., 2015. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *J. Acad. Mark. Sci.* 43, 115–135	7
Venkatesh, Thong, Xu, 2012. Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology. *MIS Q.* 36, 157	7
Agarwal, R., Prasad, J., 1998. A Conceptual and Operational Definition of Personal Innovativeness in the Domain of Information Technology. *Inf. Syst. Res.* 9, 204–215	6

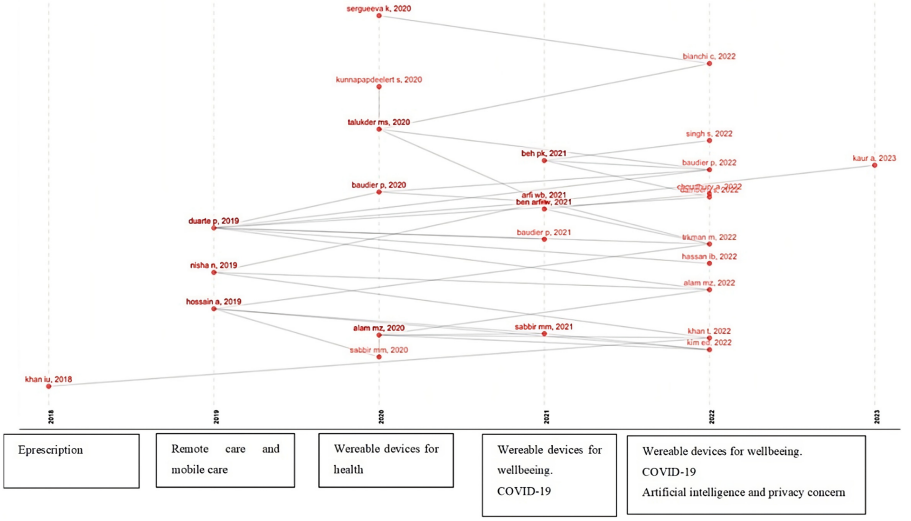
Table 1.
Top 10 most cited references

review to assess the applications of the UTAUT model, specifically in different sectors and product contexts, which laid the groundwork for the subsequent development of the UTAUT2 model. The analysis underscores a prevalent practice in the field, which is the combination of UTAUT and UTAUT2 models with statistical techniques like Structural Equation Modeling. This combined approach facilitates a deeper understanding of the complex relationships within these models, enhancing their applicability and explanatory power. Lastly, it is interesting the notable impact of the extension of the UTAUT model proposed by Hoque and Sorwar (2017), as evidenced by its high citation count in the sample.

4.2 Historiography

The historiography is built on direct citations. It draws the intellectual linkages in historical order.

The analysis presented in Figure 1 offers valuable insights into the chronological development of research on ATI within the healthcare domain. It is evident that the UTAUT model was initially applied to investigate ATI in healthcare by Khan *et al.* (2018), focusing on the topic of e-prescription. However, this early exploration remained relatively limited and received citations primarily from the same first author's publication in 2022 (Khan *et al.*, 2022). In 2019, a significant shift occurred, with three subsequent studies embracing the use of these models. Duarte and Pinho (2019), Nisha *et al.* (2019) and Hossain *et al.* (2019) studied the acceptance of remote care and mobile care. As a result, the need to understand the determinants of acceptance by healthcare providers and patients emerged. The years 2020 and 2022 emerged as pivotal periods for contributions in this field. In 2020, the research focus shifted to the acceptance of wearable health devices, as exemplified by Wang *et al.* (2020). Subsequently, in 2021, research on ATI, in the context of the pandemic and acceptance of wearable health and wellness devices, gained importance. In 2022, alongside these issues, scholarly attention expanded to privacy concerns associated with the disclosure of sensitive patient data on digital platforms (Pietronudo *et al.*, 2022). In summary, the early contributions



Source(s): Authors' own creation

Figure 1.
Historiograph citation network

were closely linked to the potential of providing healthcare services at a distance. Over time, researchers extended their inquiries to encompass issues beyond health, placing an increased emphasis on the security of patient information, except for studies directly associated with the unique circumstances of the pandemic period.

4.3 Co-citation network

The co-citation network analysis is one of the main classic techniques in bibliometrics. It shows the structure of a specific field through the linkages between nodes (e.g. authors, papers, journals) and uses cited journals as a unit of analysis (Aria and Cuccurullo, 2017).

Figure 2 presents the co-citation network, revealing the emergence of three distinct clusters.

The green cluster mainly focuses on ATI, focusing research on how the issues of privacy and trust influence the choices related to ATI. In particular, the studies by Gefen *et al.* (2003), Pavlov (2003) and Hsu *et al.* (2013) examine the key factors addressing privacy concerns and aiming at building trust in the absence of human interactions. Moreover, Duarte and Pinho (2019), Zhao *et al.* (2018) and Kohnke *et al.* (2014) explore how safeguarding personal data plays a critical role in building trust in technology and subsequently influences the adoption of mobile health solutions. In essence, this cluster concentrates on the intricate relationship between privacy, trust and the ATI.

The blue cluster brings together studies on ATI by end-users (Ghasemzadeh *et al.*, 2022). This cluster exhibits two distinct eras: one occurring before 2003, and the other emerging after 2003, with a notable time jump to 2010. In the period preceding 2003, the focus of research within this cluster revolves around the general concept of behavioral intention towards ATI by end-users (Compeau *et al.*, 1999; Fishbein, 1979). In the subsequent era, which spans from 2003 to 2010, the research within this cluster took on a more methodological approach. Scholars like Hair *et al.* (2011, 2013), Zhou *et al.* (2010) engaged in methodological studies to empirically test end-users' intentions towards ATI. These studies contributed valuable insights into the practical aspects of ATI adoption. Therefore, the blue cluster

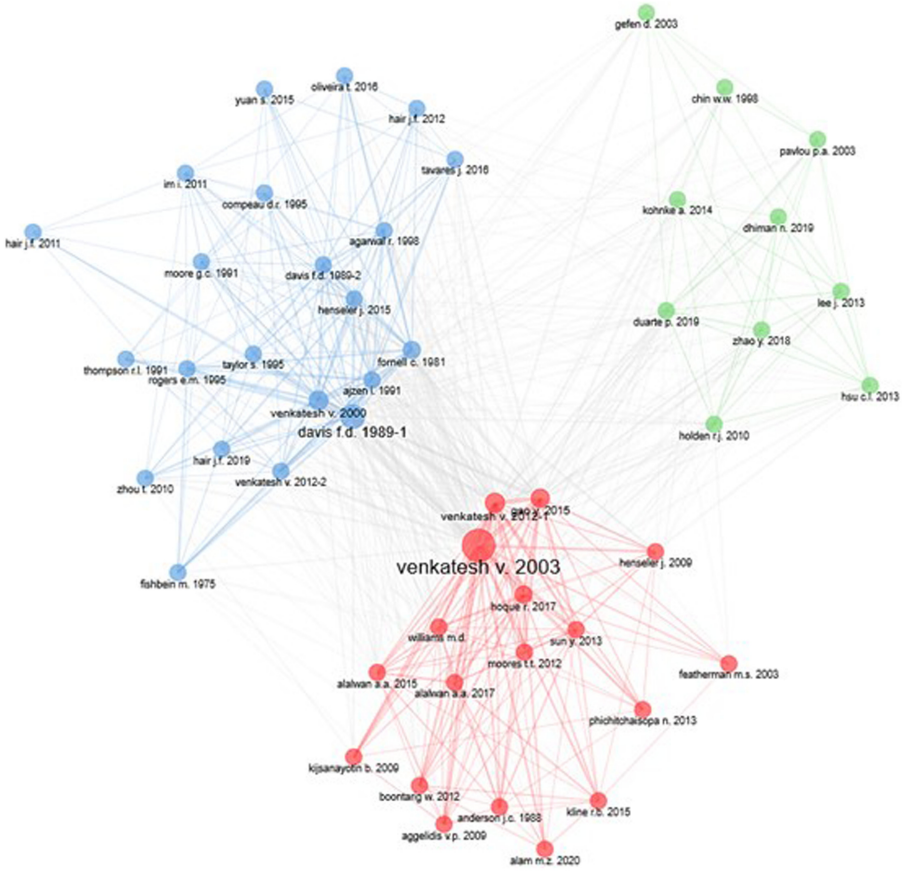


Figure 2.
Co-citation network plot

Source(s): Authors' own creation

represents the evolution of research related to end-users' attitudes and intentions towards ATI, progressing from foundational theoretical work to methodological investigations aimed at gaining practical insights into ATI by end-users (Ghasemzadeh *et al.*, 2022).

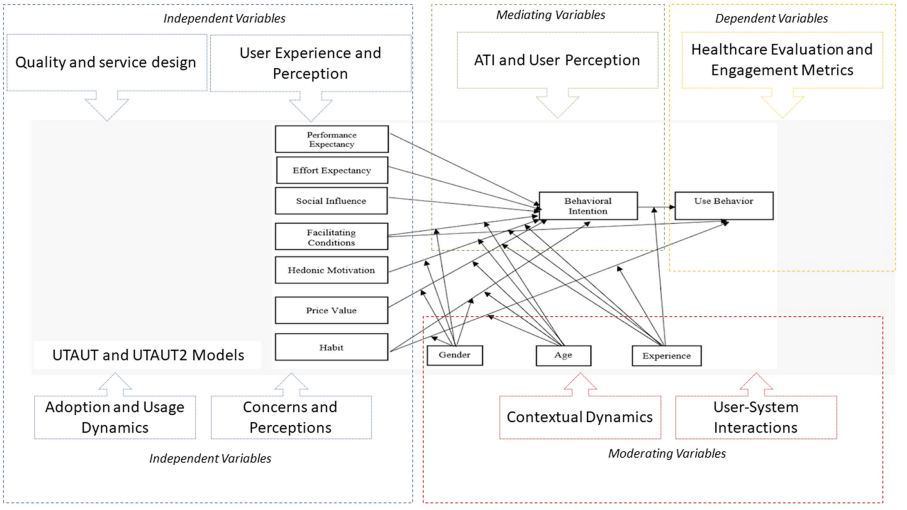
The red cluster is characterized by the significant influence of two seminal contributions by Venkatesh *et al.* (2003, 2012), which gave rise to the UTAUT and its extension UTAUT2. It is noted that in the cluster, there is the co-presence of contributions that study ATI both from a business-to-business perspective (Aggelidis and Chatzoglou, 2009; Moores, 2012; Phichitchaisopa and Naenna, 2013; Williams *et al.*, 2009) and business-to-consumer perspective (Alalwan *et al.*, 2017, 2019; Featherman and Pavlou, 2003). This cluster exhibits a rich diversity of research models employed to study ATI adoption. Notably, it includes extensions of the UTAUT and UTAUT2 models (Alalwan *et al.*, 2017, 2019; Alam *et al.*, 2020; Kijsanayotin *et al.*, 2009), as well as comparison of various research models aimed at assessing the validity and effectiveness of UTAUT and UTAUT2 (Phichitchaisopa and Naenna, 2013; Sun *et al.*, 2013).Furthermore, the cluster encompasses the adoption of different and preceding models like the Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB) and Theory of Reasoned Action (TRA) (Featherman and Pavlou, 2003;

Moores, 2012; Williams *et al.*, 2009). Lastly, some studies combine the use of UTAUT or UTAUT2 with other models to comprehensively study ATI (Aggelidis and Chatzoglou, 2009). In summary, the red cluster represents a rich and multifaceted landscape of research in the field of ATI, characterized by its in-depth exploration of ATI adoption from various angles, including different perspectives, research models and their combinations.

4.4 Exploring integration patterns of UTAUT and UTAUT2 models

Through a comprehensive analysis of published articles, which was made possible through the accurate use of bibliometric analysis and its results, we explore how UTAUT and UTAUT2 models have been adapted, extended or integrated with other constructs. The goal is to understand the evolving landscape of ATI research in healthcare industry and the different applications of UTAUT models in understanding user behavior and perceptions. Figure 3 provides a graphical representation of the results obtained.

In this study, we systematically organize relevant constructs into distinct clusters, each playing a crucial role in shaping the integration of UTAUT and UTAUT2 models. From the analysis, four distinct clusters arise among the independent variables. First, the "User Experience and Perception" cluster intricately captures the subjective dimensions of user engagement, ranging from emotional states like anxiety, assurance, enjoyment (AlQudah *et al.*, 2022; Baudier *et al.*, 2020b; Chong *et al.*, 2022; Khan *et al.*, 2022; Nisha *et al.*, 2019) to cognitive elements like perceived credibility and perceived privacy (Nisha *et al.*, 2019; Yousaf *et al.*, 2021), and individual characteristics like innovativeness and self-efficacy (AlQudah *et al.*, 2022; Baudier *et al.*, 2020b; Mukhopadhyay *et al.*, 2019; Sabbir *et al.*, 2021a, b). Second, the "Quality and Service Design" cluster, emphasizes the pivotal role of system and service quality, drawing on established models like the DeLone & McLean IS Model (Nisha *et al.*, 2019; Okumus *et al.*, 2018; Rahi *et al.*, 2021; Schmitz *et al.*, 2022; Talukder *et al.*, 2020). Third, the "Adoption and Usage Dynamics" cluster, encapsulates a broad spectrum of factors, providing a comprehensive understanding of the dynamic process of technology adoption. It includes factors related to the user's perception of the technology's benefits (Lo *et al.*, 2019), social influences (Lo *et al.*, 2019), and system-related factors (Baudier *et al.*, 2023; Baudier *et al.*,



Source(s): Authors' own creation

Figure 3.
Integration patterns of UTAUT and UTAUT2 models

2020b; Mukhopadhyay *et al.*, 2019). Lastly, the "Concerns and Perceptions" cluster delves into various concerns and perceptions that might affect technology adoption. It includes factors related to external events (Lu and Kosim, 2022), individual responses (Baudier *et al.*, 2021) and perceptions of the technology's severity and responsiveness (Nisha *et al.*, 2019; Rahi *et al.*, 2021; Sun *et al.*, 2013), shedding light on the multifaceted nature of user considerations.

Our results reveal two distinct groups of moderating variables in the integration of the UTAUT and UTAUT2 models. The first, labeled "Contextual Dynamics," explores the nuanced influence of contextual factors, distinguishing between hospital and non-hospital settings and incorporating broader country-level considerations such as life expectancy and health quality (Chong *et al.*, 2022). This cluster illuminates the pivotal role of the environment in shaping technology adoption. The second cluster, denoted as "User-System Interactions," delves into the intricate interplay of individual and organizational dynamics. From user expertise and experience to health-related user considerations, the inclusion of constructs like perceived organizational support, perceived severity/vulnerability, privacy concerns and various facets of self-efficacy, the cluster provides a holistic understanding of user-system interactions (Beh *et al.*, 2021; Calisto *et al.*, 2022; Chong *et al.*, 2022; Engin and Gürses, 2019; Mukhopadhyay *et al.*, 2019; Nisha *et al.*, 2019; Okumus *et al.*, 2018; Rahi *et al.*, 2021).

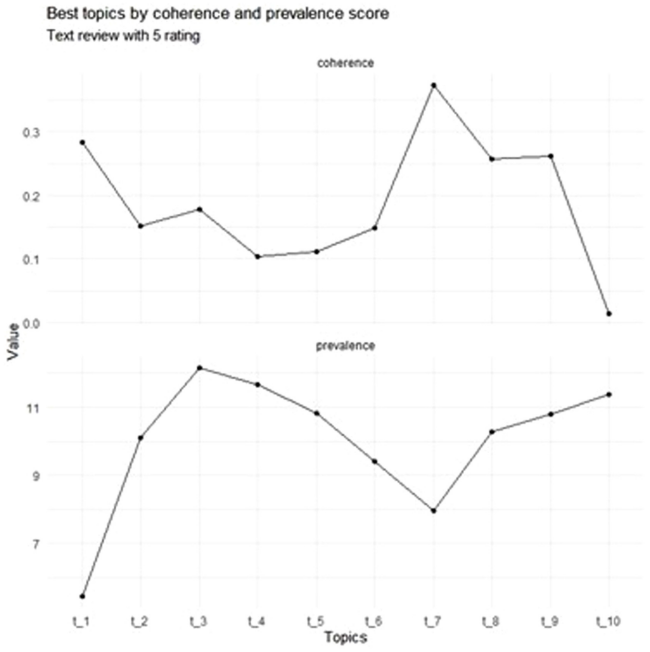
The constructs grouped under "ATI and User Perception," serve as mediating variables in the integration of the UTAUT and UTAUT2 models. Within this group, the construct "Artificial Intelligence Guidance" recognizes the central role of guidance in shaping users' adoption decisions in the intricate field of artificial intelligence. The integration of the "Attitude" construct provides a solid theoretical foundation, emphasizing the importance of user attitudes within the framework of the TPB (AlQudah *et al.*, 2022). While the consideration of "Cost of Switching" sheds light on the economic implications that users face when switching to ATI (Kim *et al.*, 2022). In addition, the treatment of "Privacy Concern," "Risk," "Security," and "Trust" acknowledges the multifaceted nature of users' perceptions, which mediate their adoption decisions (Arfi *et al.*, 2021; Calisto *et al.*, 2022; Choudhury *et al.*, 2022; Trkman *et al.*, 2023; Wei *et al.*, 2022). Finally, the inclusion of "User Experience" emphasizes the mediating role of overall satisfaction and usability in shaping attitudes toward AI adoption (Chong *et al.*, 2022).

Finally, the constructs classified within "Healthcare Evaluation and Engagement Metrics" serve as dependent variables in the integration/modification of the UTAUT and UTAUT2 models. In this cluster, we encounter constructs such as "Clinician Resistance," underscoring the significant influence health professionals wield in shaping the path of health technology adoption (Kim and Malhotra, 2005); "Health Satisfaction," emphasizing the pivotal role of user contentment in evaluating the success and overall impact of health technologies (Yousaf *et al.*, 2021) and "Intention to Recommend," highlighting the importance of social dynamics and network effects in adoption decision-making (Talukder *et al.*, 2019). Additionally, incorporating "Self-reported use" and "Usage behavior" as dependent variables provides a dual perspective, merging users' subjective insights with objective metrics, thereby offering a comprehensive assessment of technology use patterns (AlQudah *et al.*, 2022; Trkman *et al.*, 2023).

4.5 Topic modeling

Before delving into the analysis of the topic model, Figure 4 presents the coherence and prevalence measures. These are two important measures used in topic modeling to assess the quality of the generated topics (Kherwa and Bansal, 2021).

Coherence measures the degree of semantic similarity between the words within a topic. It is an important metric for evaluating the interpretability and usefulness of a topic. Higher coherence values indicate that the words within a topic are semantically similar and reflect a



Source(s): Authors' own creation

Figure 4.
Coherence and prevalence measures

coherent theme. Prevalence, on the other hand, measures the extent to which a topic is distributed across the corpus. It is an important metric for evaluating the importance and relevance of a topic (Spooren and Degand, 2010). Higher prevalence values indicate that a topic is more widespread and relevant to the corpus (Jelodar *et al.*, 2019; Misra *et al.*, 2011; O'Callaghan *et al.*, 2015).

Figure 5 provides a graphical representation of the most recurrent word combinations and allows identification of three different topics. The first topic is related to the digitalization in healthcare with a specific focus on COVID-19 pandemic. The second topic encompasses word combinations related to research models such as UTAUT, UTAUT2 and their extensions, along with their associated constructs. The third topic refers to the healthcare systems and their resistance to ATI. Accordingly, Table 2 presents the assignment probabilities for each contribution in our sample, indicating their most probable topic category.

Source(s): Authors' own creation

Figure 5.
The topics identified

ID	Authors and year	Topic 1	Topic 2	Topic 3
1	Kaur *et al.* (2023)	0.058	0.492	0.45
2	Calisto *et al.* (2022)	0.804	0.016	0.18
3	Khan *et al.* (2022)	0.001	0.37	0.629
4	Choudhury *et al.* (2022)	0.519	0.333	0.147
5	Damberg (2022)	0.056	0.943	0.001
6	Chong *et al.* (2022)	0.178	0.603	0.219
7	Trkman *et al.* (2023)	0.001	0.026	0.973
8	AlQudah *et al.* (2022)	0.683	0.001	0.316
9	Singh (2022)	0.001	0.001	0.998
10	Xavier Macedo de Azevedo *et al.* (2022)	0.977	0.023	0.000
11	Lu and Kosim (2022)	0.012	0.986	0.001
12	Kim *et al.* (2022)	0.083	0.011	0.905
13	Maleka and Matli (2022)	0.945	0.034	0.021
14	Baudier *et al.* (2023)	0.771	0.228	0.002
15	Bianchi *et al.* (2022)	0.01	0.989	0.001
16	Alismaili *et al.* (2021)	0.988	0.001	0.011
17	Wei *et al.* (2022)	0.001	0.057	0.942
18	Tsao *et al.* (2022)	0.997	0.002	0.002
19	Alam *et al.* (2022)	0.012	0.976	0.012
20	Yousaf *et al.* (2021)	0.015	0.983	0.001
21	Arfi *et al.* (2021)	0.002	0.002	0.997
22	Pandey *et al.* (2021)	0	0	0.999
23	Baudier *et al.* (2021)	0.682	0.216	0.102
24	Arfi *et al.* (2021)	0.013	0.037	0.95
25	Sabbir *et al.* (2021a, b)	0.871	0.027	0.102
26	Beh *et al.* (2021)	0.001	0.998	0.001
27	Baudier *et al.* (2020a, b)	0.001	0.042	0.957
28	Dhiman *et al.* (2019)	0.001	0.906	0.093
29	Mukhopadhyay *et al.* (2019)	0.96	0.001	0.039
30	Baudier *et al.* (2020a)	0.83	0.012	0.158
31	Sergueeva *et al.* (2020)	0.002	0.869	0.129
32	Alam *et al.* (2020)	0.014	0.699	0.288
33	Sabbir *et al.* (2021a)	0.001	0.998	0.001
34	Kunnapapdeelert and Pitchayadejanant (2020)	0.032	0.946	0.022
35	Agyei and Adzobu (2020)	0.832	0.155	0.013
36	Mukerjee *et al.* (2020)	0.012	0.218	0.77
37	Talukder *et al.* (2020)	0.001	0.433	0.566
38	Engin and Gürses (2019)	0.012	0.179	0.809
39	Duarte and Pinho (2019)	0.016	0.968	0.016
40	Lo *et al.* (2019)	0.002	0.628	0.371
41	Badran (2019)	0.79	0.131	0.079
42	Talukder *et al.* (2019)	0.001	0.624	0.375
43	Hossain *et al.* (2019)	0.069	0.061	0.87
44	Nisha *et al.* (2019)	0.068	0.931	0.001
45	Khan *et al.* (2018)	0.022	0.707	0.271
46	Okumus *et al.* (2018)	0.017	0.966	0.017
47	Mukred *et al.* (2017)	0.001	0.998	0.001
48	Jang *et al.* (2016)	0.985	0.014	0.001
49	Dwivedi *et al.* (2016)	0.883	0.001	0.116
50	Yee-Loong Chong *et al.* (2015)	0.001	0.998	0.001
51	Sun *et al.* (2013)	0.027	0.933	0.04

Table 2.
Probabilities of assignment to the most likely topic for all documents

(*continued*)

ID	Authors and year	Topic 1	Topic 2	Topic 3
52	Bhandari and Snowdon (2012)	0.985	0.001	0.014
53	Schmitz *et al.* (2022)	0.032	0.844	0.124
54	Rahi *et al.* (2021)	0.817	0.141	0.042
55	Wu *et al.* (2021)	0.012	0.045	0.942
56	Weeger and Gewald (2015)	0.843	0.001	0.156
57	Aria and Archer (2018)	0.989	0.001	0.01

Note(s): Topic 1: Digitalization in healthcare and the COVID-19 pandemic
Topic 2: Research models
Topic 3: Healthcare system and system resistance to adopt

Table 2.

Topic 1 (red – Digitalization in healthcare and COVID-19 pandemic) can be divided in two subgroups. The first subgroup predominantly focuses on studies related to ATI from the perspective of healthcare professionals (Weeger and Gewald, 2015). In this context, the most recurring keywords pertain to technologies that support healthcare operators, such as "assistive system" (Calisto *et al.*, 2022; Tsao *et al.*, 2022), "assistive technology" (Xavier Macedo de Azevedo *et al.*, 2022), "intelligent agents" (Choudhury *et al.*, 2022), "medical apps" (Agyei and Adzobu, 2020) and "medical records" (Badran, 2019; Mukhopadhyay *et al.*, 2019). Conversely, the second subgroup within Topic 1 is oriented towards investigating ATI from the perspective of end-users. Here, the focus is on issues related to access to health service (Bhandari and Snowdon, 2012) with a particular focus on the COVID-19 pandemic (Baudier *et al.*, 2021, 2023; Maleka and Matli, 2022). The studies within this subgroup examine the adoption and acceptance of telemedicine (Dwivedi *et al.*, 2016; Rahi *et al.*, 2021). Additionally, this second subgroup explores the perceived usefulness of the technology itself (AlQudah *et al.*, 2022; Aria and Archer, 2018), generational perspectives (Baudier *et al.*, 2020a, b; Jang *et al.*, 2016; Sabbir *et al.*, 2021a, b) and loyalty to healthcare services (Alismaili *et al.*, 2021). In summary, Topic 1 encompasses diverse research strands within the overarching theme of healthcare digitalization and its significance during the COVID-19 pandemic, highlighting the distinct but interconnected interests of healthcare professionals and end-users in the realm of ATI.

Topic 2 (green – UTAUT Innovations: Fitness Apps, Wearables and M-Health Adoption) groups studies putting UTAUT and UTAU2 models to the test, employing advanced analytical techniques such as neural network analysis, as in the case of Kunnapapdeelert and Pitchayadejanant (2020), Sabbir *et al.* (2021a, b) and Yee-Loong Chong *et al.* (2015). Researchers extended the models by introducing additional dimensions. These extensions encompass concepts like personal innovativeness (Dhiman *et al.*, 2019; Lo *et al.*, 2019; Okumus *et al.*, 2018; Sabbir *et al.*, 2021a, b; Yee-Loong Chong *et al.*, 2015) and perceived risk (Lu and Kosim, 2022; Schmitz *et al.*, 2022). Finally, the UTAUT and UTAUT2 models were used in conjunction with other existing constructs, showcasing the versatility of these frameworks (Beh *et al.*, 2021; Damberg, 2022; Dhiman *et al.*, 2019).

Within this extensive field of research, two distinct sub-areas emerge, each focusing on specific dimensions of technology adoption. The first sub-area delves into the adoption of fitness apps and wearable technologies (Beh *et al.*, 2021; Bianchi *et al.*, 2022; Damberg, 2022; Dhiman *et al.*, 2019; Sergueeva *et al.*, 2020; Talukder *et al.*, 2019; Yousaf *et al.*, 2021). A second sub-area studies the adoption of mobile health services (or m-health services) (Duarte and Pinho, 2019; Kaur *et al.*, 2023; Nisha *et al.*, 2019; Okumus *et al.*, 2018; Sun *et al.*, 2013). Furthermore, within this second sub-area, there is a notable concentration on m-health services in developing countries (Alam *et al.*, 2020, 2022; Khan *et al.*, 2018; Mukred *et al.*, 2017). In summary, Topic 2 provides a comprehensive view of research that revolves around the application and extension of the UTAUT and UTAUT2 models, fostering a nuanced

exploration of technology adoption in the realms of fitness apps, wearable technologies and mobile health services.

Topic 3 (blue – Healthcare system and system resistance to adopt) offers a distinct socio-political perspective on ATI, with a particular focus on the responsibilities of health information systems (Pandey *et al.*, 2021). The contributions within this topic collectively underscore the critical role of these systems in addressing privacy concerns and the perception of risk. These concerns are examined from multiple angles, encompassing the viewpoints of private citizens (Arfi *et al.*, 2021; Ben Arfi *et al.*, 2021; Baudier *et al.*, 2020a; Khan *et al.*, 2022; Singh, 2022; Talukder *et al.*, 2020) and public organizations, such as hospitals (Engin and Gürses, 2019; Trkman *et al.*, 2023). In the context of public organizations, with a specific focus on hospitals, the research investigates challenges related to the adoption of ATI, particularly considering the resistance to change among clinicians. Works by Hossain *et al.* (2019) and Kim *et al.* (2022) delve into the complexities of this aspect, where the protection of personal data managed by public operators takes center stage (Mukerjee *et al.*, 2020). In this topic the perceived sense of trust and transparency emerges as central determinants in understanding the dynamics of technology adoption among both citizens and health professionals (Wei *et al.*, 2022; Wu *et al.*, 2021). In summary, Topic 3 sheds light on the intricate interplay of privacy concerns, risk perceptions, trust and transparency in shaping the decisions of private citizens and healthcare professionals, emphasizing the multifaceted nature of ATI within the healthcare industry.

The three topics, examined in this analysis, converge to offer a holistic and nuanced perspective on ATI in the healthcare industry shedding on the intricate dynamics involving various stakeholders, including healthcare professionals, end-users and healthcare organizations. Through these lenses, we gain a deeper understanding of the diverse interests and perspectives that underpin the adoption of healthcare technologies. Healthcare professionals, driven by the pursuit of enhanced efficiency and patient care, seek innovative solutions that support their work, while end-users, particularly in the context of the COVID-19 pandemic, navigate the adoption of technologies to access and benefit from healthcare services. Moreover, the topics underscore the complex interplay of factors influencing technology adoption, spanning the technological, sociopolitical and individual realms. This comprehensive view recognizes that the adoption of healthcare technologies is not solely a technological endeavor, but a multifaceted process deeply entwined with sociopolitical considerations and the unique characteristics of individuals and organizations.

5. Discussion and conclusions

In this paper, we use bibliometric methods and topic modeling to explore how the literature evolved concerning technological acceptance in the healthcare industry and to identify the emerging innovation trends and opportunities in the healthcare industry. The exploration of ATI in healthcare industry, with a focus on the UTAUT and UTAUT2 models, has developed especially in recent years driven in part by the COVID-19 pandemic, and shows a solid and persistent interest in understanding user behavior and perceptions.

The analysis of the co-citation network, particularly within the red cluster, provides valuable insights into the prevailing usage patterns of the UTAUT and UTAUT2 models within the literature on technological acceptance in the healthcare industry. The undeniable influence of seminal contributions by Venkatesh *et al.* (2003, 2012) in this cluster marks the inception of the UTAUT model and its subsequent extension, UTAUT2. Surprisingly, only one contribution, namely Kunnapapdeelert and Pitchayadejanant (2020), directly adopts the UTAUT model without extensions. This rarity raises intriguing questions about the perceived limitations or evolving needs that might drive researchers to extend these models in various ways. The prevalent trend across the sampled articles is the extension of UTAUT and

UTAUT2 with additional dimensions, moderators and mediators, as visually depicted in the provided Figure 3. This widespread practice underscores the versatility and adaptability of these frameworks to the intricate contexts of healthcare technology adoption. While offering a more nuanced exploration of factors, the extensive use of extensions prompts reflection on potential concerns, including the risk of model proliferation and challenges in synthesizing findings. This observation calls for a critical discussion within the academic community about the balance between customization and standardization, aiming for a more robust and comparable body of knowledge in the evolving landscape of healthcare technology acceptance.

The analysis through topic modelling revealed several emerging trends in the adoption of healthcare technologies. The first topic emphasizes the diversity of perspectives in the digitization of healthcare. The dual focus on healthcare professionals and end-users highlights the need for a comprehensive approach that takes into account the diverse needs and concerns of these stakeholders. This trend suggests an emerging emphasis on inclusivity, recognizing that successful digitization efforts must consider the perspectives of those providing and receiving healthcare services. The second topic demonstrates the extensive use of UTAUT and UTAUT2 models in studying the adoption of fitness apps, wearables and mobile health services. The application of advanced analytical techniques and the introduction of additional dimensions reflect a trend towards a more nuanced exploration of technology adoption. The third topic highlights the socio-political dimension of healthcare technology adoption, emphasizing the responsibilities of health information systems. The focus is on privacy concerns, perceived risks and resistance to change within the healthcare system. Across all topics, the recurring emphasis on trust and transparency emerges as a central trend. Whether examining the dynamics between healthcare professionals and technology or the concerns of private citizens, the importance of building trust in technology adoption processes is evident. This trend signals a recognition that successful healthcare technology adoption is not solely a technological challenge but also a socio-political and ethical imperative, requiring transparent communication and ethical considerations.

5.1 Managerial implications

The identified trends in this paper offer managerial insights for stakeholders in the healthcare industry. Managers overseeing the implementation of healthcare technologies should recognize the existence of diverse perspectives, advocating for customized strategies that address the distinct needs of both healthcare professionals and end-users. The adaptability of UTAUT models underscores the necessity for technological solutions that can traverse varied contexts, prompting managers to encourage the development of technologies adaptable to diverse socio-economic and cultural settings. Trust and transparency emerge as central themes, highlighting the need for informed decision-making by prioritizing user trust through transparent communication about technology features and risks. For managers dealing with healthcare information systems, addressing privacy concerns and understanding resistance to change becomes crucial. Strategies must align technology implementation with privacy regulations and guidelines while mitigating resistance among healthcare professionals. Lastly, managers, especially in developing countries, are urged to adopt a global perspective, considering the unique challenges and opportunities in resource-constrained settings. This approach facilitates the creation of adaptable and scalable solutions on a global scale, ensuring successful healthcare technology adoption in an ever-evolving landscape.

5.2 Limitations and further research

This study has some limitations that should be acknowledged. Firstly, it is pertinent to note that the study would benefit from longitudinal research encompassing multiple countries.

This would enable a comprehensive understanding of trends in the acceleration or deceleration of the ATI process within the healthcare industry. While the COVID-19 pandemic has been identified as a catalyst for ATI, this study does not provide conclusive evidence that it alone was sufficient for systematic ATI. Thus, future research could delve into the sustained impact of events like the pandemic on ATI processes over time. Second, Moreover, the study's sample selection focused exclusively on scientific journals included in the Academic Journal Guide (AJG) 2021 ranking by the Chartered Association of Business Schools (CABS) or in the FT Rank. Although this approach offers a well-defined and reputable subset, it introduces potential issues. Future research should consider broadening the sample selection to encompass a wider range of sources, including grey literature, conference proceedings and reports. Additionally, the study's temporal scope, despite its flexibility, reveals a concentration of scientific contributions emerging post-2015 and gaining significant traction around 2020. Future research could explore earlier or future periods to trace the evolution of ATI-related studies. Finally, addressing the objection raised about the sample's narrow focus on AJG and FT50 journals, it's crucial to reiterate that innovation in the healthcare industry, especially concerning ATI, demands careful planning, interdisciplinary collaboration and diverse skill sets. However, future research may benefit from expanding the scope to include a broader spectrum of journals while ensuring a rigorous selection process to maintain the quality and relevance of the data.

References

Agarwal, R. and Prasad, J. (1998), "A conceptual and operational definition of personal innovativeness in the domain of information technology", *Information Systems Research*, Vol. 9 No. 2, pp. 204-215, doi: 10.1287/isre.9.2.204.

Aggelidis, V. and Chatzoglou, P. (2009), "Using a modified technology acceptance model in hospitals", *International Journal of Medical Informatics*, Vol. 78 No. 2, pp. 115-126, doi: 10.1016/j.ijmedinf.2008.06.006.

Agyei, D.D. and Adzobu, P. (2020), "Factors influencing professional nurses' acceptance and use of mobile medical apps in Ghana", *Journal of Information Technology Management*, Vol. 12 No. 1, pp. 27-42.

Ajzen, I. (1991), "The theory of planned behavior", *Organizational Behavior and Human Decision Processes*, Vol. 50 No. 2, pp. 179-211, doi: 10.1016/0749-5978(91)90020-T.

Alalwan, A.A., Dwivedi, Y.K. and Rana, N.P. (2017), "Factors influencing adoption of mobile banking by Jordanian bank customers: extending UTAUT2 with trust", *International Journal of Information Management*, Vol. 37 No. 3, pp. 99-110, doi: 10.1016/j.ijinfomgt.2017.01.002.

Alalwan, N., Al-Rahmi, W.M., Alfarraj, O., Alzahrani, A., Yahaya, N. and Al-Rahmi, A.M. (2019), "Integrated three theories to develop a model of factors affecting students' academic performance in higher education", *IEEE Access*, Vol. 7, pp. 98725-98742, doi: 10.1109/ACCESS.2019.2928142.

Alam, M.Z., Hoque, M.R., Hu, W. and Barua, Z. (2020), "Factors influencing the adoption of mHealth services in a developing country: a patient-centric study", *International Journal of Information Management*, Vol. 50, pp. 128-143, doi: 10.1016/j.ijinfomgt.2019.04.016.

Alam, M.Z., Alam, M.M.D., Uddin, M.A. and Mohd Noor, N.A. (2022), "Do mobile health (mHealth) services ensure the quality of health life? An integrated approach from a developing country context", *Journal of Marketing Communications*, Vol. 28 No. 2, pp. 152-182, doi: 10.1080/13527266.2020.1848900.

Alismaili, S.N.R., Shanmugam, M., Kasim, H.A. and Magalingam, P. (2021), "A modified UTAUT model for hospital information systems geared towards motivating patient loyalty", pp. 207-216, doi: 10.1007/978-3-030-70713-2_21.

AlQudah, A.A., Al-Emran, M., Daim, T.U. and Shaalan, K. (2022), "Toward an integrated model for examining the factors affecting the acceptance of queue management solutions in healthcare", *IEEE Transactions on Engineering Management*, pp. 1-17, doi: 10.1109/TEM.2022.3223520.

Alshammari, S.H. and Rosli, M.S. (2020), "A review of technology acceptance models and theories", *Innovative Teaching and Learning Journal (ITLJ)*, Vol. 4 No. 2, pp. 12-22.

Arfi, W.B., N., I.B., Kondrateva, G. and Hikkerova, L. (2021), "The role of trust in intention to use the IoT in eHealth: application of the modified UTAUT in a consumer context", *Technological Forecasting and Social Change*, Vol. 167, 120688, doi: 10.1016/j.techfore.2021.120688.

Aria, R. and Archer, N. (2018), "Using an educational video vs. in-person education to measure patient perceptions of an online self-management support system for chronic illness", *Computers in Human Behavior*, Vol. 84, pp. 162-170, doi: 10.1016/j.chb.2018.01.041.

Aria, M. and Cuccurullo, C. (2017), "bibliometrix: an R-tool for comprehensive science mapping analysis", *Journal of Informetrics*, Vol. 11 No. 4, pp. 959-975, doi: 10.1016/j.joi.2017.08.007.

Badran, M.F. (2019), "eHealth in Egypt: the demand-side perspective of implementing electronic health records", *Telecommunications Policy*, Vol. 43 No. 6, pp. 576-594, doi: 10.1016/j.telpol.2019.01.003.

Baudier, P., Ammi, C. and Deboeuf-Rouchon, M. (2020a), "Smart home: highly-educated students' acceptance", *Technological Forecasting and Social Change*, Vol. 153, 119355, doi: 10.1016/j.techfore.2018.06.043.

Baudier, P., Kondrateva, G. and Ammi, C. (2020b), "The future of Telemedicine Cabin? The case of the French students' acceptability", *Futures*, Vol. 122, 102595, doi: 10.1016/j.futures.2020.102595.

Baudier, P., Kondrateva, G., Ammi, C., Chang, V. and Schiavone, F. (2021), "Patients' perceptions of teleconsultation during COVID-19: a cross-national study", *Technological Forecasting and Social Change*, Vol. 163, 120510, doi: 10.1016/j.techfore.2020.120510.

Baudier, P., Kondrateva, G., Ammi, C., Chang, V. and Schiavone, F. (2023), "Digital transformation of healthcare during the COVID-19 pandemic: patients' teleconsultation acceptance and trusting beliefs", *Technovation*, Vol. 120, 102547, doi: 10.1016/j.technovation.2022.102547.

Beh, P.K., Ganesan, Y., Iranmanesh, M. and Foroughi, B. (2021), "Using smartwatches for fitness and health monitoring: the UTAUT2 combined with threat appraisal as moderators", *Behaviour and Information Technology*, Vol. 40 No. 3, pp. 282-299, doi: 10.1080/0144929X.2019.1685597.

Ben Arfi, W., Ben Nasr, I., Khvatova, T. and Ben Zaied, Y. (2021), "Understanding acceptance of eHealthcare by IoT natives and IoT immigrants: an integrated model of UTAUT, perceived risk, and financial cost", *Technological Forecasting and Social Change*, Vol. 163, 120437, doi: 10.1016/j.techfore.2020.120437.

Bhandari, G. and Snowdon, A. (2012), "Design of a patient-centric, service-oriented health care navigation system for a local health integration network", *Behaviour and Information Technology*, Vol. 31 No. 3, pp. 275-285, doi: 10.1080/0144929X.2011.563798.

Bianchi, C., Tuzovic, S. and Kuppelwieser, V.G. (2022), "Investigating the drivers of wearable technology adoption for healthcare in South America", *Information Technology and People*, Vol. 36 No. 2, pp. 916-939, doi: 10.1108/ITP-01-2021-0049.

Brem, A., Viardot, E. and Nylund, P.A. (2021), "Implications of the coronavirus (COVID-19) outbreak for innovation: which technologies will improve our lives?", *Technological Forecasting and Social Change*, Vol. 163, 120451, doi: 10.1016/j.techfore.2020.120451.

Calisto, F.M., Nunes, N. and Nascimento, J.C. (2022), "Modeling adoption of intelligent agents in medical imaging", *International Journal of Human-Computer Studies*, Vol. 168, 102922, doi: 10.1016/j.ijhcs.2022.102922.

Cannavale, C., Esempio Tammaro, A., Leone, D. and Schiavone, F. (2022), "Innovation adoption in inter-organizational healthcare networks – the role of artificial intelligence", *European Journal of Innovation Management*, Vol. 25 No. 6, pp. 758-774, doi: 10.1108/EJIM-08-2021-0378.

Chong, A.Y.L., Blut, M. and Zheng, S. (2022), "Factors influencing the acceptance of healthcare information technologies: a meta-analysis", *Information and Management*, Vol. 59 No. 3, 103604, doi: 10.1016/j.im.2022.103604.

Choudhury, A., Asan, O. and Medow, J.E. (2022), "Effect of risk, expectancy, and trust on clinicians' intent to use an artificial intelligence system – Blood Utilization Calculator", *Applied Ergonomics*, Vol. 101, 103708, doi: 10.1016/j.apergo.2022.103708.

Ciasullo, M.V., Carli, M., Lim, W.M. and Palumbo, R. (2022), "An open innovation approach to co-produce scientific knowledge: an examination of citizen science in the healthcare ecosystem", *European Journal of Innovation Management*, Vol. 25 No. 6, pp. 365-392, doi: 10.1108/EJIM-02-2021-0109.

Compeau, D., Higgins, C.A. and Huff, S. (1999), "Social cognitive theory and individual reactions to computing technology: a longitudinal study", *MIS Quarterly*, Vol. 23 No. 2, p. 145, doi: 10.2307/249749.

Damberg, S. (2022), "Predicting future use intention of fitness apps among fitness app users in the United Kingdom: the role of health consciousness", *International Journal of Sports Marketing and Sponsorship*, Vol. 23 No. 2, pp. 369-384, doi: 10.1108/IJSMS-01-2021-0013.

Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. (1992), "Extrinsic and intrinsic motivation to use computers in the Workplace1", *Journal of Applied Social Psychology*, Vol. 22 No. 14, pp. 1111-1132, doi: 10.1111/j.1559-1816.1992.tb00945.x.

Dhiman, N., Arora, N., Dogra, N. and Gupta, A. (2019), "Consumer adoption of smartphone fitness apps: an extended UTAUT2 perspective", *Journal of Indian Business Research*, Vol. 12 No. 3, pp. 363-388, doi: 10.1108/JIBR-05-2018-0158.

Dodds, W.B., Monroe, K.B. and Grewal, D. (1991), "Effects of Price, brand, and store information on buyers' product evaluations", *Journal of Marketing Research*, Vol. 28 No. 3, pp. 307-319, doi: 10.1177/002224379102800305.

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N. and Lim, W.M. (2021), "How to conduct a bibliometric analysis: an overview and guidelines", *Journal of Business Research*, Vol. 133, pp. 285-296, doi: 10.1016/j.jbusres.2021.04.070.

Duarte, P. and Pinho, J.C. (2019), "A mixed methods UTAUT2-based approach to assess mobile health adoption", *Journal of Business Research*, Vol. 102, pp. 140-150, doi: 10.1016/j.jbusres.2019.05.022.

Dwivedi, Y.K., Shareef, M.A., Simintiras, A.C., Lal, B. and Weerakkody, V. (2016), "A generalised adoption model for services: a cross-country comparison of mobile health (m-health)", *Government Information Quarterly*, Vol. 33 No. 1, pp. 174-187, doi: 10.1016/j.giq.2015.06.003.

Engin, M. and Gürses, F. (2019), "Adoption of hospital information systems in public hospitals in Turkey: an analysis with the unified theory of acceptance and use of technology model", *International Journal of Innovation and Technology Management*, Vol. 16 No. 6, doi: 10.1142/S0219877019500433.

Featherman, M.S. and Pavlou, P.A. (2003), "Predicting e-services adoption: a perceived risk facets perspective", *International Journal of Human-Computer Studies*, Vol. 59 No. 4, pp. 451-474, doi: 10.1016/S1071-5819(03)00111-3.

Federkeil, G., van Vught, F.A. and Westerheijden, D.F. (2012), "An evaluation and critique of current rankings", pp. 39-70, doi: 10.1007/978-94-007-3005-2_4.

Fishbein, M. (1979), "A theory of reasoned action: some applications and implications", *Nebraska Symposium on Motivation*, Vol. 27, pp. 65-116.

Gefen, K., Straub and Straub (2003), "Trust and TAM in online shopping: an integrated model", *MIS Quarterly*, Vol. 27 No. 1, p. 51, doi: 10.2307/30036519.

Ghasemzadeh, K., Escobar, O., Yordanova, Z. and Villasalero, M. (2022), "User innovation rings the bell for new horizons in e-health: a bibliometric analysis", *European Journal of Innovation Management*, Vol. 25 No. 6, pp. 656-686, doi: 10.1108/EJIM-04-2021-0181.

Godfrey, C.M., Kircher, C., Ashoor, H.M., Ross-White, A., Glandon, L., Wilson, R., McSharry, J., Tricco, A.C., Zitzelsberger, L., Kaan, D. and Sears, K. (2023), "Absorptive capacity in the adoption of innovations in health: a scoping review", *JBI Evidence Synthesis*, Vol. 21 No. 1, pp. 6-32, doi: 10.11124/JBIES-21-00436.

Grinin, L., Grinin, A. and Korotayev, A. (2022), "COVID-19 pandemic as a trigger for the acceleration of the cybernetic revolution, transition from e-government to e-state, and change in social relations", *Technological Forecasting and Social Change*, Vol. 175, 121348, doi: 10.1016/j.techfore.2021.121348.

Gupta, B., Dasgupta, S. and Gupta, A. (2008), "Adoption of ICT in a government organization in a developing country: an empirical study", *The Journal of Strategic Information Systems*, Vol. 17 No. 2, pp. 140-154, doi: 10.1016/j.jsis.2007.12.004.

Gurcan, F., Ozyurt, O. and Cagitay, N.E. (2021), "Investigation of emerging trends in the E-learning field using latent dirichlet allocation", *The International Review of Research in Open and Distributed Learning*, Vol. 22 No. 2, pp. 1-18, doi: 10.19173/irrodl.v22i2.5358.

Hair, J.F., Ringle, C.M. and Sarstedt, M. (2011), "The use of partial least squares (PLS) to address marketing management topics", *Journal of Marketing Theory and Practice*, Vol. 19 No. 2, pp. 135-138, doi: 10.1080/10696679.2011.11046435.

Hair, J.F., Ringle, C.M. and Sarstedt, M. (2013), "Partial least squares structural equation modeling: rigorous applications, better results and higher acceptance", *Long Range Planning*, Vol. 46 Nos 1-2, pp. 1-12, doi: 10.1016/j.lrp.2013.01.001.

Hoque, R. and Sorwar, G. (2017), "Understanding factors influencing the adoption of mHealth by the elderly: an extension of the UTAUT model", *International Journal of Medical Informatics*, Vol. 101, pp. 75-84, doi: 10.1016/j.ijmedinf.2017.02.002.

Hossain, A., Quaresma, R. and Rahman, H. (2019), "Investigating factors influencing the physicians' adoption of electronic health record (EHR) in healthcare system of Bangladesh: an empirical study", *International Journal of Information Management*, Vol. 44, pp. 76-87, doi: 10.1016/j.ijinfomgt.2018.09.016.

Hsu, C.-L., Lee, M.-R. and Su, C.-H. (2013), "The role of privacy protection in healthcare information systems adoption", *Journal of Medical Systems*, Vol. 37 No. 5, p. 9966, doi: 10.1007/s10916-013-9966-z.

Jang, S.H., Kim, R.H. and Lee, C.W. (2016), "Effect of u-healthcare service quality on usage intention in a healthcare service", *Technological Forecasting and Social Change*, Vol. 113, pp. 396-403, doi: 10.1016/j.techfore.2016.07.030.

Jayaraman, P.P., Forkan, A.R.M., Morshed, A., Haghighi, P.D. and Kang, Y. (2020), "Healthcare 4.0: a review of frontiers in digital health", *WIREs Data Mining and Knowledge Discovery*, Vol. 10 No. 2, doi: 10.1002/widm.1350.

Jelodar, H., Wang, Y., Yuan, C., Feng, X., Jiang, X., Li, Y. and Zhao, L. (2019), "Latent Dirichlet al location (LDA) and topic modeling: models, applications, a survey", *Multimedia Tools and Applications*, Vol. 78 No. 11, pp. 15169-15211, doi: 10.1007/s11042-018-6894-4.

Kaur, A., Ahuja, P., Jain, J., Singh, S. and Garg, A. (2023), "Is youth ready for the looming technology frontier in healthcare? Examining intentions and adoption of mobile health (mHealth)", *Business Perspectives and Research*, Vol. 11 No. 1, pp. 63-80, doi: 10.1177/22785337221091017.

Khan, I.U., Yu, Y., Hameed, Z., Khan, S.U. and Waheed, A. (2018), "Assessing the physicians' acceptance of E-prescribing in a developing country", *Journal of Global Information Management*, Vol. 26 No. 3, pp. 121-142, doi: 10.4018/JGIM.2018070109.

Khan, T., Khan, K.D., Azhar, M.S., Shah, S.N.A., Uddin, M.M. and Khan, T.H. (2022), "Mobile health services and the elderly: assessing the determinants of technology adoption readiness in Pakistan", *Journal of Public Affairs*, Vol. 22 No. 4, doi: 10.1002/pa.2685.

Kherwa, P. and Bansal, P. (2021), "A comparative empirical evaluation of topic modeling techniques", *International Conference on Innovative Computing and Communications: Proceedings of ICICC 2020*, Singapore, Springer, pp. 289-297, doi: 10.1007/978-981-15-5148-2_26.

Kijsanayotin, B., Pannarunothai, S. and Speedie, S.M. (2009), "Factors influencing health information technology adoption in Thailand's community health centers: applying the UTAUT model", *International Journal of Medical Informatics*, Vol. 78 No. 6, pp. 404-416, doi: 10.1016/j.ijmedinf.2008.12.005.

Kim, S.S. and Malhotra, N.K. (2005), "A longitudinal model of continued IS use: an integrative view of four mechanisms underlying postadoption phenomena", *Management Science*, Vol. 51 No. 5, pp. 741-755, doi: 10.1287/mnsc.1040.0326.

Kim, H.-W., Chan, H.C. and Gupta, S. (2007), "Value-based adoption of mobile Internet: an empirical investigation", *Decision Support Systems*, Vol. 43 No. 1, pp. 111-126, doi: 10.1016/j.dss.2005.05.009.

Kim, E.D., Kuan, K.K.Y., Vaghasiya, M.R., Penm, J., Gunja, N., El Amrani, R. and Poon, S.K. (2022), "Passive resistance to health information technology implementation: the case of electronic medication management system", *Behaviour and Information Technology*, Vol. 42 No. 13, pp. 1-22, doi: 10.1080/0144929X.2022.2117081.

Kohnke, A., Cole, M.L. and Bush, R. (2014), "Incorporating UTAUT predictors for understanding home care patients' and clinician's acceptance of healthcare telemedicine equipment", *Journal of Technology Management and Innovation*, Vol. 9 No. 2, pp. 29-41, doi: 10.4067/S0718-27242014000200003.

Kunnapapdeelert, S. and Pitchayadejanant, K. (2020), "Hybrid SEM-neural networks for predicting electronics logistics information system adoption in Thailand healthcare supply chain", *International Journal of Business Performance and Supply Chain Modelling*, Vol. 11 No. 1, p. 54, doi: 10.1504/IJBPSCM.2020.108887.

Lo, A., Jenkins, P.H. and Choobineh, J. (2019), "Patient's acceptance of IT-assisted self-monitoring: a multiple-case study", *Journal of Computer Information Systems*, Vol. 59 No. 4, pp. 319-333, doi: 10.1080/08874417.2017.1365666.

Lu, M.-P. and Kosim, Z. (2022), "An empirical study to explore the influence of the COVID-19 crisis on consumers' behaviour towards cashless payment in Malaysia", *Journal of Financial Services Marketing*. doi: 10.1057/s41264-022-00182-9.

Maleka, N.H. and Matli, W. (2022), "A review of telehealth during the COVID-19 emergency situation in the public health sector: challenges and opportunities", *Journal of Science and Technology Policy Management*. doi: 10.1108/JSTPM-08-2021-0126.

Misra, H., Yvon, F., Cappé, O. and Jose, J. (2011), "Text segmentation: a topic modeling perspective", *Information Processing and Management*, Vol. 47 No. 4, pp. 528-544, doi: 10.1016/j.ipm.2010.11.008.

Moores, T.T. (2012), "Towards an integrated model of IT acceptance in healthcare", *Decision Support Systems*, Vol. 53 No. 3, pp. 507-516, doi: 10.1016/j.dss.2012.04.014.

Mukerjee, H.S., Deshmukh, G.K., Mukherjee, D. and Chawla, N. (2020), "Investigating influence of moderators in adopting Internet: Indian seniors perspective", *Global Business Review*, Vol. 24 No. 4, doi: 10.1177/0972150920908690.

Mukhopadhyay, S., Basak, R., Carpenter, D. and Reithel, B.J. (2019), "Patient use of online medical records: an application of technology acceptance framework", *Information and Computer Security*, Vol. 28 No. 1, pp. 97-115, doi: 10.1108/ICS-07-2019-0076.

Mukred, A., Singh, D. and Safie, N. (2017), "Investigating the impact of information culture on the adoption of information system in public health sector of developing countries", *International Journal of Business Information Systems*, Vol. 24 No. 3, p. 261, doi: 10.1504/IJBIS.2017.082036.

Nisha, N., Iqbal, M. and Rifat, A. (2019), "The changing paradigm of health and mobile phones", *Journal of Global Information Management*, Vol. 27 No. 1, pp. 19-46, doi: 10.4018/JGIM.2019010102.

Okumus, B., Ali, F., Bilgihan, A. and Ozturk, A.B. (2018), "Psychological factors influencing customers' acceptance of smartphone diet apps when ordering food at restaurants",

International Journal of Hospitality Management, Vol. 72, pp. 67-77, doi: 10.1016/j.ijhm.2018.01.001.

O'Callaghan, D., Greene, D., Carthy, J. and Cunningham, P. (2015), "An analysis of the coherence of descriptors in topic modeling", *Expert Systems with Applications*, Vol. 42 No. 13, pp. 5645-5657, doi: 10.1016/j.eswa.2015.02.055.

Pandey, N., Jha, S. and Rai, V. (2021), "Ayushman Bharat: service adoption challenges in universal healthcare system", *South Asian Journal of Business and Management Cases*, Vol. 10 No. 1, pp. 35-49, doi: 10.1177/2277977921991915.

Pavlou, P.A. (2003), "Consumer acceptance of electronic commerce: integrating trust and risk with the technology acceptance model", *International Journal of Electronic Commerce*, Vol. 7 No. 3, pp. 101-134, doi: 10.1080/10864415.2003.11044275.

Phichitchaisopa, N. and Naenna, T. (2013), "Factors affecting the adoption of healthcare information technology", *EXCLI Journal*, Vol. 12, pp. 413-436.

Pietronudo, M.C., Zhou, F., Caporuscio, A., La Ragione, G. and Risitano, M. (2022), "New emerging capabilities for managing data-driven innovation in healthcare: the role of digital platforms", *European Journal of Innovation Management*, Vol. 25 No. 6, pp. 867-891, doi: 10.1108/EJIM-07-2021-0327.

Rahi, S., Khan, M.M. and Alghizzawi, M. (2021), "Factors influencing the adoption of telemedicine health services during COVID-19 pandemic crisis: an integrative research model", *Enterprise Information Systems*, Vol. 15 No. 6, pp. 769-793, doi: 10.1080/17517575.2020.1850872.

Rogers, E.M. and Williams, D. (1983), *Diffusion of Innovations*, The Free Press, Glencoe, IL, Innovations, 1962.

Sabbir, M.M., Islam, M. and Das, S. (2021a), "Understanding the determinants of online pharmacy adoption: a two-staged SEM-neural network analysis approach", *Journal of Science and Technology Policy Management*, Vol. 12 No. 4, pp. 666-687, doi: 10.1108/JSTPM-07-2020-0108.

Sabbir, M.M., Taufique, K.M.R. and Nomi, M. (2021b), "Telemedicine acceptance during the COVID-19 pandemic: user satisfaction and strategic healthcare marketing considerations", *Health Marketing Quarterly*, Vol. 38 Nos 2-3, pp. 168-187, doi: 10.1080/07359683.2021.1986988.

Schmitz, A., Díaz-Martín, A.M. and Yagüe Guillén, M.J. (2022), "Modifying UTAUT2 for a cross-country comparison of telemedicine adoption", *Computers in Human Behavior*, Vol. 130, 107183, doi: 10.1016/j.chb.2022.107183.

Sergueeva, K., Shaw, N. and Lee, S.H. (Mark) (2020), "Understanding the barriers and factors associated with consumer adoption of wearable technology devices in managing personal health", *Canadian Journal of Administrative Sciences/Revue Canadienne Des Sciences de l'Administration*, Vol. 37 No. 1, pp. 45-60, doi: 10.1002/cjas.1547.

Singh, S. (2022), "The moderating role of privacy concerns on intention to use smart wearable technologies: an integrated model combining UTAUT2 theoretical framework and privacy dimensions", *Journal of Global Marketing*, Vol. 36 No. 2, pp. 1-19, doi: 10.1080/08911762.2022.2141167.

Spooren, W. and Degand, L. (2010), "Coding coherence relations: reliability and validity", *Corpus Linguistics and Linguistic Theory*, Vol. 6 No. 2, doi: 10.1515/cllt.2010.009.

Sun, Y., Wang, N., Guo, X. and Peng, Z. (2013), "Understanding the acceptance of mobile health services: a comparison and integration of alternative models", *Journal of Electronic Commerce Research*, Vol. 14 No. 2, p. 183.

Talukder, M.S., Chiong, R., Bao, Y. and Hayat Malik, B. (2019), "Acceptance and use predictors of fitness wearable technology and intention to recommend", *Industrial Management and Data Systems*, Vol. 119 No. 1, pp. 170-188, doi: 10.1108/IMDS-01-2018-0009.

Talukder, M.S., Sorwar, G., Bao, Y., Ahmed, J.U. and Palash, M.A.S. (2020), "Predicting antecedents of wearable healthcare technology acceptance by elderly: a combined SEM-Neural Network

approach", *Technological Forecasting and Social Change*, Vol. 150, 119793, doi: 10.1016/j.techfore.2019.119793.

Tani, M., Troise, C., De Bernardi, P. and Han, T. (2022), "Innovating the supply chain in health-related crises: some evidence from ISINNOVA case", *European Journal of Innovation Management*, Vol. 25 No. 6, pp. 716-734, doi: 10.1108/EJIM-11-2021-0579.

Taylor, S. and Todd, P. (1995), "Decomposition and crossover effects in the theory of planned behavior: a study of consumer adoption intentions", *International Journal of Research in Marketing*, Vol. 12 No. 2, pp. 137-155, doi: 10.1016/0167-8116(94)00019-K.

Trkman, M., Popovič, A. and Trkman, P. (2023), "The roles of privacy concerns and trust in voluntary use of governmental proximity tracing applications", *Government Information Quarterly*, Vol. 40 No. 1, 101787, doi: 10.1016/j.giq.2022.101787.

Tsao, Y.-C., Barus, F.A.S. and Ho, C.-W. (2022), "Impacts of the fifth-generation technology on sustainability", *International Journal of Logistics Research and Applications*, pp. 1-20, doi: 10.1080/13675567.2022.2026903.

Vargheese, R. and Viniotis, Y. (2014), "Influencing data availability in IoT enabled cloud based e-health in a 30 day readmission context", *Proceedings of the 10th IEEE International Conference on Collaborative Computing: Networking, Applications and Worksharing*, ICST, doi: 10.4108/icst.collaboratecom.2014.257621.

Vayansky, I. and Kumar, S.A.P. (2020), "A review of topic modeling methods", *Information Systems*, Vol. 94, 101582, doi: 10.1016/j.is.2020.101582.

Venkatesh, V. and Davis, F.D. (2000), "A theoretical extension of the technology acceptance model: four longitudinal field studies", *Management Science*, Vol. 46 No. 2, pp. 186-204, doi: 10.1287/mnsc.46.2.186.11926.

Venkatesh, Morris, Davis and Davis (2003), "User acceptance of information technology: toward a unified view", *MIS Quarterly*, Vol. 27 No. 3, p. 425, doi: 10.2307/30036540.

Venkatesh, V., Thong, J.Y. and Xu, X (2012), "Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology", *MIS Quarterly*, Vol. 36 No. 1, p. 157, doi: 10.2307/41410412.

Wang, H., Tao, D., Yu, N. and Qu, X. (2020), "Understanding consumer acceptance of healthcare wearable devices: an integrated model of UTAUT and TTF", *International Journal of Medical Informatics*, Vol. 139, 104156, doi: 10.1016/j.ijmedinf.2020.104156.

Weeger, A. and Gewald, H. (2015), "Acceptance and use of electronic medical records: an exploratory study of hospital physicians' salient beliefs about HIT systems", *Health Systems*, Vol. 4 No. 1, pp. 64-81, doi: 10.1057/hs.2014.11.

Wei, X., Peng, X. and Prybutok, V. (2022), "Consumer behavioral intention of adopting emerging healthcare technology", *IEEE Transactions on Engineering Management*, Vol. 71, pp. 1-11, doi: 10.1109/TEM.2022.3140952.

Williams, M.D., Dwivedi, Y.K., Lal, B. and Schwarz, A. (2009), "Contemporary trends and issues in it adoption and diffusion research", *Journal of Information Technology*, Vol. 24 No. 1, pp. 1-10, doi: 10.1057/jit.2008.30.

Wu, W., Wu, Y.J. and Wang, H. (2021), "Perceived city smartness level and technical information transparency: the acceptance intention of health information technology during a lockdown", *Computers in Human Behavior*, Vol. 122, 106840, doi: 10.1016/j.chb.2021.106840.

Xavier Macedo de Azevedo, F., Heimgärtner, R. and Nebe, K. (2022), "Development of a metric to evaluate the ergonomic principles of assistive systems, based on the DIN 92419", *Ergonomics*, Vol. 66 No. 6, pp. 1-28, doi: 10.1080/00140139.2022.2127920.

Yee-Loong Chong, A., Liu, M.J., Luo, J. and Keng-Boon, O. (2015), "Predicting RFID adoption in healthcare supply chain from the perspectives of users", *International Journal of Production Economics*, Vol. 159, pp. 66-75, doi: 10.1016/j.ijpe.2014.09.034.

Yousaf, A., Mishra, A. and Gupta, A. (2021), "'From technology adoption to consumption': effect of pre-adoption expectations from fitness applications on usage satisfaction, continual usage, and health satisfaction", *Journal of Retailing and Consumer Services*, Vol. 62, 102655, doi: 10.1016/j.jretconser.2021.102655.

Zhao, Y., Ni, Q. and Zhou, R. (2018), "What factors influence the mobile health service adoption? A meta-analysis and the moderating role of age", *International Journal of Information Management*, Vol. 43, pp. 342-350, doi: 10.1016/j.ijinfomgt.2017.08.006.

Zhou, T., Lu, Y. and Wang, B. (2010), "Integrating TTF and UTAUT to explain mobile banking user adoption", *Computers in Human Behavior*, Vol. 26 No. 4, pp. 760-767, doi: 10.1016/j.chb.2010.01.013.

Corresponding author
Nicola Cobelli can be contacted at: nicola.cobelli@univr.it