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Resistance of multiple stakeholders to e-health innovations: Integration of fundamental insights and guiding research paths

Shalini Talwar [a], Amandeep Dhir [b,c,d], Nazrul Islam [e,*], Puneet Kaur [d,f,h], Ahlam Almusharraf [g]

[a] S P Jain Institute of Management and Research, Mumbai, India
[b] Department of Management, School of Business & Law, University of Agder, Norway
[c] Jaipuria Institute of Management, Noida, India
[d] Optentia Research Focus Area, North-West University, Vanderbijlpark, South Africa
[e] Royal Docks School of Business and Law, University of East London, UK
[f] Department of Psychosocial Science, University of Bergen, Norway
[g] College of Business and Administration, Princess Nourah Bint Abdulrahman University, Riyadh, Saudi Arabia
[h] Jaipuria Institute of Management, Lucknow, India

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ABSTRACT

Consumer/user resistance is considered a key factor responsible for the failure of digital innovations. Yet, existing scholarship has not given it due attention while examining user responses to e-health innovations. The present study addressed this need by consolidating the existing findings to provide a platform to motivate future research. We used a systematic literature review (SLR) approach to identify and analyze the relevant literature. To execute the SLR, we first specified a stringent search protocol with specific inclusion and exclusion criteria to identify relevant studies. Thereafter, we undertook an in-depth analysis of 72 congruent studies, thus presenting a comprehensive structure of findings, gaps, and opportunities for future research. Specifically, we mapped the relevant literature to elucidate the nature and causes of resistance offered by three key constituent groups of the healthcare ecosystem—patients, healthcare organizational actors, and other stakeholders. Finally, based on the understanding acquired through our critical synthesis, we formulated a conceptual framework, classifying user resistance into micro, meso, and macro barriers which provide context to the interventions and strategies required to counter resistance and motivate adoption, continued usage, and positive recommendation intent. Being the first SLR in the area to present a multi-stakeholder perspective, our study offers fine-grained insights for hospital management, policymakers, and community leaders to develop an effective plan of action to overcome barriers that impede the diffusion of e-health innovations.

1. Introduction

E-health (or electronic health) technologies refer to various innovations that support the delivery of medical care and other healthcare services via the Internet or mobile apps. The key innovations in the healthcare space are mobile health applications (mHealth apps), web-based telemedicine services, health cloud, smart clothing systems, information technology-based assistive technology services, electronic medical record (EMR) systems, clinical decision support systems (CDSSs), RFID application in managing various forms of healthcare, and computerized physician/provider order entry (CPOE) (Barrett & Stephens, 2017; Bush et al., 2017; de Wit et al., 2019; Dubin et al., 2020).

The use of these innovations has been widely acknowledged to support diagnosis and improve the delivery of medical services. Over the years, digital technology-driven healthcare systems have become more potent, competent, fast, and beneficial in identifying illness and treatment (Kumari et al., 2018; Tanwar et al., 2020). In light of this, one would expect digitally delivered healthcare (e-health hereinafter) to become an integral part of the healthcare interface, beginning from e-consultation and ending with recovery through virtual care. However, until the beginning of 2020, this was not the case. Even in most advanced countries, e-health initiatives varying from telemedicine to CDSS have witnessed low diffusion due to resistance from multiple stakeholders, including patients, doctors, clinical staff, and hospital management. For instance, some reports note that in the United States, at the beginning of 2019, only a few healthcare systems had

* Corresponding author.
E-mail addresses: shalini.talwar@spjimr.org (S. Talwar), amandeep.dhir@uia.no (A. Dhir), nazrul.islam@uel.ac.uk (N. Islam), puneet.kaur@uib.no (P. Kaur).

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implemented virtual care (e.g., Mehrotra and Prewitt, 2019). However, things changed considerably with the surfacing of the COVID-19 crisis, particularly after the World Health Organization declared it a pandemic in March 2020 (Laato et al., 2020; Miri et al., 2020).

With a surge in infections and the consequent social distancing requirements, health systems across the globe made a massive move towards e-health technologies to provide virtual medical treatment (Webster, 2020). However, scholars have recently observed certain trends that do not bode well for plans for the long-term full-fledged shift of healthcare delivery through e-health systems. For instance, Webster (2020) noted that many doctors are still wary of e-health innovations, despite the pandemic. Others suggest that the care has already started shifting back to usual physical interactions (Mehrotra et al., 2020). This raises the question of whether the healthcare systems will relapse to their rather stiff adherence to the physical mode of consultation, treatment, and care once the pandemic recedes; or has the face of healthcare, as far as e-health is concerned, transformed forever?

The query is deceptively simple, but the answer is not easy to ascertain. The issue is not only of habit and adherence to a certain way of doing things. There are more intricacies involved. On the one hand, e-health systems offer benefits in the form of cost savings, expediency, and inclusiveness (e.g., Totten et al., 2019), but on the other hand, it is believed that these systems may not offer the quality of care that many doctors believe is possible only through physical interaction (e.g., Webster, 2020). Or is this just a matter of perception? Clearly, there is much to understand and evaluate. Indeed, with the healthcare sector as a whole being at crossroads, these aspects warrant deep contemplation and incisive insights such that the concerned stakeholders are able to strike the right balance, thereby benefitting the world through the expansion of e-health systems without compromising the quality of care.

The onus is now on academic research to shed light on varied embodiments, lineation patterns, and perceptions related to the adoption/non-adoption of e-health innovations such that the underlying dynamics, granularities, and complex nuances are better understood. We argue that to formulate a well-rounded response to the friction between the anticipated trajectory and unforeseen impediments in the way of diffusion of e-health innovations, it is essential to understand and address negative perceptions and barriers of the end-users, including doctors, patients, and hospitals. We further contend that to fully appreciate the potential inhibitors that might obstruct the diffusion of e-health innovations in times to come, it is essential to look back in the past to diagnose the factors that caused multiple stakeholders to resist these innovations before the onset of the pandemic, during the lockdown phase of the pandemic, and immediately after the lockdown restrictions were eased. In sum, there is a need to understand the consumer/user behavior of different stakeholders in the healthcare ecosystem to offer a clearer perspective on the future diffusion of e-health innovations.

A comprehensive review of the literature evolved through different phases of digitalization of healthcare, from healthcare 1.0 (1970 s), healthcare 2.0 (1991–2005), healthcare 3.0 (2006–2015) to healthcare 4.0 (since 2016) (Tanwar et al., 2020), reveals that although there is a reasonable volume of literature examining end-user perspectives, these studies have largely focused on adoption, considering non-adoption only as a by-product of the absence of adoption drivers. In comparison, studies focusing specifically on factors associated with the non-adoption of e-health innovations are limited. Since the extended literature suggests that non-adoption is not merely an outcome of the absence of factors that motivate adoption, rather it is a manifestation of consumer resistance (e.g., Talwar et al., 2020b), more research exclusively examining consumer resistance towards e-health innovations is required to guide practice better.

We suggest that to encourage future research addressing this specific requirement, there is a need to integrate the current knowledge, which is fragmented across narratives, creating theoretical confusion. In concordance, our study endeavors to synthesize the drivers of non-adoption of e-health innovations by different participants in the healthcare ecosystem. Towards this end, we propose to organize the state-of-the-art literature into meaningful clusters to structure the findings in a more relatable and reproducible way. In addition, we plan to bring forth the dilemmas, contradictions, and limitations in the existing knowledge to map future research needs. Specifically, we propose to address three research questions (**RQs**): **RQ1**. Why do multiple internal and external stakeholders resist e-health innovations across various healthcare contexts? **RQ2**. What are the methodological and conceptual deficiencies in the extant literature that deprive practice of actionable insights? **RQ3.** What are the potential research paths that can meaningfully drive the future research agenda? We propose to use the systematic literature review (SLR) approach to address these research questions. Our choice of the SLR approach is based on past recommendations that it is an effective way of reviewing and synthesizing the identified literature (Dhir, Talwar, Kaur, & Malibari, 2020; Talwar, Talwar, Kaur, & Dhir, 2020b).

The unique contributions of our study may be summed as follows: (a) It is the first SLR in the area to review studies from the perspective of all key stakeholders—patients, doctors/clinical staff, hospital management, policymakers, and community leaders. By doing so we contribute to the theoretical deepening of the research in the area where discussion on consumer resistance have been rather operational so far; (b) it underscores the need to pay closer attention to the digital transformation dilemma, which poses many challenges despite the rhetorical emphasis on transitioning completely to a digital mode wherever possible; and (c) it scores due to its timeliness by raising the issue of resistance to e-health innovation when the world is settling in the *new normal* post-easing of the severity of the COVID-19 pandemic. Decisions taken now will determine the future of healthcare delivery and preparedness for meeting future health crises.

2. Review methodology

To achieve the objective of our study and respond to the proposed research questions, we reviewed the state-of-the-art literature through a broadly accepted approach, i.e., an SLR (e.g., Christofi, Vrontis, & Cadogan, 2021; Christofi et al., 2022). An SLR is a useful review approach since it enables researchers to review and report the existing findings systematically and extensively (Kaur et al., 2021; Seth et al., 2020). The inductive reasoning approach of an SLR offers established criteria for identifying the corpus of literature to be reviewed (Chaudhary et al., 2021; Kraus et al., 2022).

Although scholars have applied different steps to conduct SLRs, there is a common thread that can be observed across most of them. Following recently published SLRs (e.g., Bresciani et al., 2021; Madanaguli et al., 2022, we executed our study through the following steps: (i) *setting the conceptual boundary of the review* to serve as the basis for identifying the keywords and databases for the literature search, (ii) d*efining the study selection protocol* through clear delineation of the inclusion and exclusion criteria, (iii) *shortlisting of congruent studies* through multiple rounds of screening, and (iv) *reporting the review* by undertaking a content analysis of the congruent studies to identify the key themes.

2.1. Setting the conceptual boundary of the review

The broad objective of our SLR is to review past studies examining resistance towards and the non-adoption of various e-health innovations envisaged to make the patient – hospital – doctor interface more information technology-driven. Accordingly, we identified the following initial set of keywords: *healthcare information technology, resistance/non-adoption, patients,* and *doctors*. Following the common practice, we searched this initial set of keywords on Google Scholar and thoroughly read the first 100 results. Based on the understanding developed from the analysis of these articles, we expanded the keywords list to 13. Thereafter, we sought the opinion of four experts (three professors and one practitioner) from information systems (IS), healthcare, and

consumer behavior backgrounds to ensure that our keyword selection is comprehensive. They recommended two more words, resulting in the final list of 15 keywords, presented in Table 1. Finally, we identified two digital databases—Scopus and the Web of Science—to search and shortlist relevant studies for inclusion in the review. The choice of these two databases is guided by the fact that these have been acknowledged to be the most comprehensive indices of academic research by recent studies (e.g., Kaur et al., 2020).

2.2. Defining the study selection protocol

Although we followed a very stringent process for the keyword selection and literature search, not all studies found through the search could be expected to be congruent with the topic at hand. Therefore, we also specified certain inclusion and exclusion criteria that could help us filter relevant studies. The criteria are presented in Table 2.

2.3. Shortlisting of congruent studies

We searched the identified keywords in the title, abstract, and author keywords using * and two Boolean operators: OR and AND. We used * with each of the keywords; OR was used within the category (keywords related to innovations, keywords related to consumer resistance, and the keywords related to end-users) and AND was used between the three categories. The search string was executed on both databases, setting the relevant time period as all years to date. Details of the document results/articles found at each stage of filtration are illustrated in Fig. 1. As exhibited in the figure, the filtration process resulted in 154 potentially congruent articles after the reading of the abstracts.

To ensure a robust selection process for shortlisting articles for the SLR, we invited four researchers from the IS, healthcare, and consumer behavior fields to further evaluate our shortlist of 154 articles for their relevance to the topic at hand. At this stage, based on a consensus decision, the four evaluators generated a list of 82 articles to be included in the review. Next, guided by an expert team of three professors and one practitioner who had helped in keyword identification, the author team analyzed the full articles to arrive at a final list of 72 articles that were considered to be congruent with the conceptual boundaries of the present SLR.

3. Data Analysis: Coding

We analyzed the contents of the selected studies to understand and determine how the existing scholarship has evaluated resistance to e-health innovations from the point of view of different actors that constitute the complex healthcare sector. Given the scope of our review, we followed recent studies (e.g., Christofi, Pereira, et al., 2021) to analyze the shortlisted studies through a multistep qualitative coding approach. To begin with, we extracted the basic descriptive details of each study, including the author names, year of publication, product examined, country, theoretical framework, data collection approach/sample size, and method of data analysis. Curation of descriptive details not only revealed the research profile of the short-listed literature but also served as basis for identifying methodological gaps.

Thereafter, we analyzed the content of each study to distil the findings and discussions related to the sources of resistance. Herein, each author coded the data independently. We used MAXQDA to perform the analysis and coding process as it offers a versatile environment for this purpose. To ensure inter-coder reliability, after each round of coding, the authors discussed the codes and resolved the dissensions and issues. Since the stated objective of our review study was to synthesize the literature from the perspective of diverse stakeholders, the key point of discussion was how the perspectives would be presented. The choices were to coagulate the clusters based on theories used, underlying disease discussed, methodology used, the geography of data collection, variables examined, and stakeholders examined. After much debate and advice from our expert panel of three professors and one practitioner who had helped in the keyword identification and study selection, the consensus decision was to present the literature by clustering it simply from each separate stakeholder perspective. The choice was primarily driven by the fact that literature organized from the perspective of the consumer behavior of each type of stakeholder separately would provide a logical and relatable context for the theoretical advancement of research in the area. As a result, the author team decided to cluster the findings from the individual perspective on the one hand and the organizational perspective on the other.

A comprehensive review of the full text of the shortlisted studies also made us realize that individual perspectives should be evaluated from the patients' point of view because the studies related to healthcare professionals had a distinct organizational slant covering stakeholders such as physicians, surgeons, nursing staff, technicians, information technology experts, administrators, and management. As a result, we identified patient resistance as one thematic cluster and organizational resistance as another thematic cluster. In addition, based on the studies that distinctly focused on a multi-stakeholder perspective by examining the resistance of a variety of internal and external stakeholders towards a given innovation, we identified a third thematic cluster, that of multi-stakeholder resistance to e-health innovations. Accordingly, the following thematic clusters, as presented in Fig. 2, were identified: (a) patients' resistance to e-health innovations, (b) organizational resistance to e-health innovations, and (c) multi-stakeholder resistance to e-health innovations. The output of the coding process is presented in Appendices I through III.

Table 1
Selected keywords.

Keywords related with innovations	Consumer resistance-related keywords	End user-related keywords
Healthcare information	Resistance	Consumer
e-health	Non-adoption	Doctor
Electronic health record		User
Health cloud		Patient
Health information technology		
Healthcare technology		
Health information management		
Medical informatics		
Telemedicine		

Table 2
Inclusion and exclusion criteria for screening the studies.

Inclusion criteria (IC)	Exclusion criteria (EC)
IC1. Articles published in peer-reviewed journal articles	EC1. Duplicate studies listed on both the databases identified through same digital object identifier (DOI)
IC2. Articles published in English	EC2. Articles published in other languages (other than English)
IC3. Articles focused on consumer resistance to digital innovations in the healthcare space	EC3. Articles on drug or any other type of resistance in medical terms
	EC4. Conference articles, review studies, student thesis papers, editorials, call for papers, magazine articles, and conceptual articles

4. Results: Thematic analysis

4.1. Patients' resistance to e-health innovations

With the advancement of information and communication technology (ICT), the healthcare sector has also seen a shift in the mode of interaction between patients and healthcare providers, leading to the concept of electronic healthcare or e-healthcare. As such, the use of the

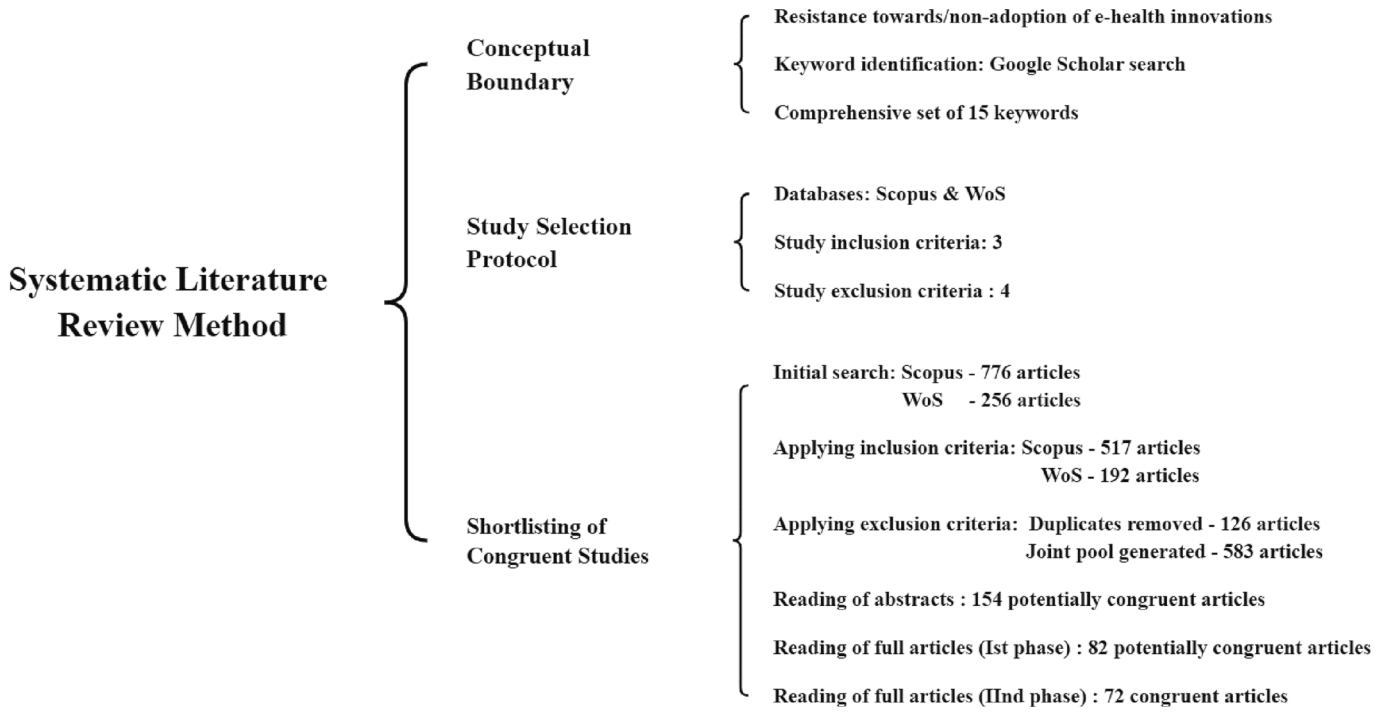

Fig. 1. SLR Method.

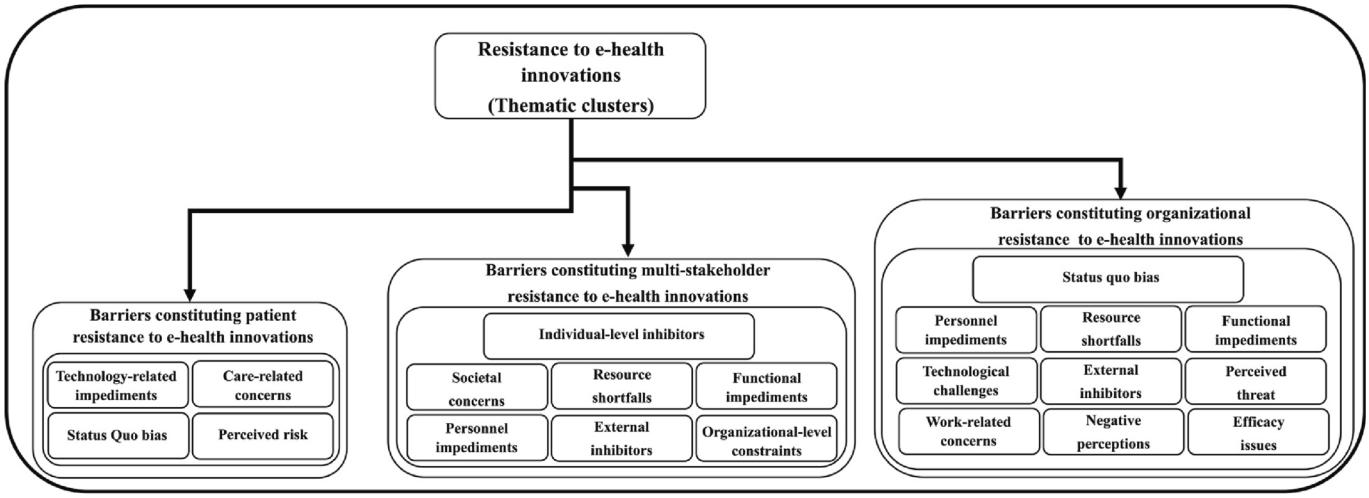

Fig. 2. Thematic Clusters.

internet and the underlying technology to provide consultations, monitor patient health, maintain patient records, and so on is called *e-health* (Bhatnagar et al., 2017). In general, scholars have considered various dimensions of patients' responses to e-health innovations. Specifically, past studies have examined patients in both developed and developing economies to diagnose the guarded and rather unenthusiastic response to e-health innovations, despite their being effective in improving access to healthcare at a reasonable cost. To this end, prior studies have employed both qualitative and quantitative research designs to collect the required data. A total of 14 studies selected for our review have examined patients' perspectives, of which 11 have used a quantitative research design, two have used a qualitative design, and one has used mixed-method design.

These studies have examined e-health interfaces such as mobile health apps (Alaiad et al., 2019), mobile health services (mHealth) (Cao et al., 2020; Deng et al., 2014; Hoque & Sorwar, 2017; Mikolasek et al., 2018), and so on, as presented in the table in Appendix I. Scholars have discussed not only the factors that have driven the adoption of these services but also the factors that cause patients to resist them. In doing so, the selected studies have used technology acceptance theories such as the unified theory of acceptance and use of technology (UTAUT; e.g., Alaiad, 2019; Hoque & Sorwar, 2017; Hsieh, 2016) and the technology acceptance theory (TAM; e.g., Cranen, 2011; Kamal et al., 2020; Tsai et al., 2019; Tsai et al., 2020;) amongst others, as presented in the table in Appendix I.

In discussing sources of resistance directly, or making an indirect reference to them, existing scholarship has identified technology anxiety, security and privacy risk, resistance to change, sunk costs, inertia, perceived value, transition costs, and uncertainty as the key factors that can impede the adoption of e-health innovations by patients (Alaiad 2019; Hoque & Sorwar, 2017; Hsieh, 2016). In addition, some studies examined and confirmed the role of socio-demographic attributes in

shaping patients' resistance towards e-health innovations. For example, Deng et al. (2014) found that resistance to change was a key dissuading factor for middle-aged patients, whereas for older users it was technology anxiety. Similarly, Cao et al. (2020) revealed that information overload and system feature overload in mHealth applications contributed to resistance of elderly patients by increasing fatigue and technostress.

In one of the limited efforts to examine barriers to e-health innovation adoption (with reference to telemedicine, specifically), Zobair et al. (2020) revealed lack of organizational effectiveness, motivation of health staff, satisfaction among patients, and trustworthiness as the key barriers. In a similar vein, Kamal et al. (2020) revealed technological anxiety, perceived risk, and resistance to technology as key barriers towards e-health innovations. Tsai et al. (2020) reported similar results in the case of a smart clothing system, revealing technology anxiety to be a key barrier.

We summarize the sources of resistance noted by each of the 14 studies to consolidate them under four broad headings: (i) technology-related impediments, (ii) care-related concerns, (iii) status quo bias, and (iv) perceived risks, as presented in Fig. 2. The technology-related impediments comprise factors such as technology anxiety, resistance to technology, lack of technical competence, lack of ability to operate equipment, low computer self-efficacy, and fears of disruption of services. The care-related concerns of patients were manifested through lack of satisfaction with the diagnosis and treatment suggested, lack of trust in organizational effectiveness, and concerns related to the lack of healthcare staff motivation. Next, status quo bias of patients was manifested through resistance to change, inertia, and transition cost. Finally, perceived risks comprised sources of resistance such as uncertainty, security, privacy, lack of trust, threat to identity, information overload, system feature overload, fatigue, and technostress.

4.2. Organizational resistance to e-health innovations

Scholars have been mindful of the resistance offered by doctors, clinical staff, and other organizational stakeholders, as evidenced from a reasonable body of extant literature examining their opposition to the adoption and use of e-health systems. For instance, Bhattacherjee and Hikmet (2007) underscored the importance of recognizing and examining user resistance to technology in the specific case of e-health innovations. Lin et al. (2012) also contented that understanding the resistance perspective is important to better diagnose technology rejection. These and other studies examining the resistance of healthcare professionals and other organizational stakeholders to e-health innovations have employed both qualitative and quantitative research designs to collect the required data. A total of 46 studies selected for our review have examined the organizational stakeholders' perspective, of which 20 have used a quantitative and 26 have used a qualitative research design.

These studies have focused on a variety of products, deploying theoretical frameworks used by scholars for examining consumer behavior in different contexts. Some of the predominant aspects of these studies include the following: (a) recognition of the fact that resistance to e-health innovations varies with the type of professionals/organizational stakeholders under discussion, such as physicians versus nurses (e.g., Barrett, 2017); (b) the importance of considering both pre- and post-implementation challenges and engagement, especially since less-engaged groups may develop resistance. Such groups are more likely to use unsanctioned workarounds if they perceive the given system to be inadequate (e.g., Bagot et al., 2020; Cresswell et al., 2017); (c) the importance of workarounds that may lower resistance to change (e.g., Barrett & Stephens, 2017); (d) the role of resistance in lowering adoption-related factors such as perceived usefulness (e.g., Beglaryan et al., 2017); (e) the difference in user versus non-user perceptions of barriers and related solutions from an administrative perspective (e.g., Zandieh et al., 2008); and (f) acceptance of the fact that despite its acknowledged potential to improve the quality of healthcare, health information technology has diffused quite slowly since its introduction in the 1980s (Grabenbauer et al., 2011).

Within these broad boundaries, the e-health products/services examined include electronic health records (e.g., Al-Rayes et al., 2019; Grabenbauer et al., 2011; Heath & Porter, 2019; Hossain et al. 2019; Ngafeeson & Manga, 2021), clinical decision support systems (e.g., Fossum et al., 2011; Litvin et al., 2012; Zakane et al., 2014), etc., presented in the table in Appendix II. The key theories utilized by these studies are the acceptance/adoption theories, such as the technology acceptance model (e.g., Al-Rayes et al., 2019; Bezboruah et al., 2014; Segrelles-Calvo et al., 2017), the unified theory of acceptance and use of technology (e.g., Bush et al., 2017; Hossain et al., 2019), and so on, as presented in the table in Appendix II. In addition to the acceptance perspective, some scholars have provided insights about change management and personnel issues related to the use of e-health innovations by a wide range of professionals, such as physicians, surgeons, technicians, ancillary staff, nurses, physiotherapists, administrators, and other organizational stakeholders (Barrett & Stephens, 2017; Bush et al., 2017; Kelly et al., 2017; Lapointe & Rivard, 2005; Segrelles-Calvo et al., 2017). To this end, they used theories such as the theory of interpersonal influence and leadership (Ilie & Turel, 2020) and so on, as presented in the table in Appendix II. A limited number of studies have utilized resistance theories and perspectives, such as the psychological reactance theory (Ngafeeson & Manga, 2021), status quo bias (Hsieh, 2015; Hsieh & Lin, 2020) and the theory of innovation resistance (de Wit et al., 2019) to specifically focus on the barriers that drive resistance of healthcare professionals and other organizational stakeholders towards the use of e-health innovations.

Using these theoretical frameworks, the reviewed studies revealed resistance to change brought by the introduction of e-health innovations to be a key driver of resistance towards a given innovation (Al-Rayes et al., 2019; Bhattacherjee & Hikmet, 2007; Barrett & Stephens, 2017; Dubin et al., 2020; McAlearney et al., 2013). Such resistance could be related to changes in workflow and organizational impediments or control concerns (Grabenbauer et al., 2011; Kelly et al.,2017; Litvin et al., 2012; Stronge et al., 2008). Workflow issues may arise if the innovation is not integrated within the existing workflow, requiring the concerned professional to spend additional time to get the work done or increasing the documentation requirement, resulting in productivity losses (McAlearney et al., 2013; Ser et al., 2014; Yu et al., 2013).

Institutional politics may also impede the diffusion and use of these innovations (Ackerman et al., 2012). In addition, institutional pressures, the unsystematic process followed by management for technology adoption, information asymmetry, and issues in communication can also cause resistance (e.g., Bezboruah et al., 2014).

Over and above this, many studies have noted the impact of technical complexities and technical capabilities on resistance towards the use of e-health innovations (Aboelmaged & Hashem, 2018; de Wit et al., 2019; Segrelles-Calvo et al., 2017), which can lead to aggravation due to lack of training (Hossain et al., 2019; Ser et al., 2014). Anxiety among healthcare staff about delivering proper patient care with a new technology, which is driven by self-doubt about their own technical competence, skills, and knowledge, also acts as dissuading factor (Jindal et al., 2018; Taylor et al., 2015).

Overall, the extant findings have reinforced the barriers associated with innovation implementation in general, such as the need for technical support, worries related to technology, perceived threat, perceived risk, cost barriers, user resistance, culture, and the disruption of work routines that have been discussed by the reviewed studies (e.g., Bush et al., 2017; Caffery et al., 2017; Cocosila & Archer, 2016; Hsieh, 2015; Lin et al., 2012; Varsi et al.,2015), as presented in Appendix II.

We summarize the sources of resistance noted by each of these 46 studies to consolidate them under 10 broad headings: (i) personnel impediments, (ii) resource shortfalls, (iii) functional impediments, (iv) technological challenges, (v) external inhibitors, (vi) perceived threats,

(vii) work-related concerns, (viii) negative perceptions, (ix) efficacy issues, and (x) status quo bias, as presented in Fig. 2.

4.3. Multi-stakeholder perspectives on resistance to e-health innovations

The diffusion of e-health innovations has been challenging because the resistance to their adoption and subsequent use comes from multiple stakeholders at the same time. This implies that every innovation that comes up as an alternative for digitalizing a process or interface encounters barriers from patients, healthcare professionals, administrators, and management concurrently. Thus, resistance is actually a complex outcome of multiple inhibitors perceived by varied stakeholders in the same temporal context. Some scholars, albeit few, have recognized this fact and investigated resistance to a given e-health innovation from the perspective of multiple stakeholders such as patients, physicians, IT staff, nursing staff, consultants, pharmacists, social workers, administration staff, hospital directors, and so on. These studies have employed both qualitative and quantitative research designs to collect the required data. A total of 12 studies selected for our review have examined multi-stakeholder perspectives, of which two used a quantitative research design, nine used a qualitative research design, and one used a mixed-method design. The key findings in this regard are that the level of resistance varies with stakeholder type (e.g., Alajlani & Clarke, 2013; Safi et al.,2018; Wang et al., 2015) as well as with the demographic profile of the respondent (e.g., Alajlani & Clarke, 2013; Poss-Doering et al., 2018; Weitzman et al., 2009).

These broad findings are based on the examination of resistance offered to innovations such as electronic health records (Poss-Doering et al., 2018; Takian et al., 2012), electronic patient-reported outcome mobile application and portal systems (Hans et al., 2018), etc. as presented in Appendix III. The reviewed studies have drawn upon different theoretical frameworks to provide insights about factors that drive the resistance of the internal and external stakeholders to e-health innovations. The key theories utilized are the healthcare information systems evaluation Framework (Wang et al., 2015) and the technology acceptance model (Safi et al., 2018; Wang et al., 2015), amongst others, as presented in as presented in Appendix III.

Examining resistance from a multi-stakeholder perspective enabled the past studies to identify varied dimensions of such resistance such as societal, interpersonal, and individual. Some of the key drivers include integrity, prioritizing health information technology to advance healthcare and policy issues, discomfort and unwillingness of providers to share power and information, lack of technological literacy and low self-efficacy to use the innovation, less commitment to collaborative work, organizational complexity, and lack of conducive organizational culture (Serrano et al., 2020; Weitzman et al., 2009).

As observed in the case of the individual as well as the organizational perspective, the lack of technological skills and knowledge at both patient and organizational levels has continued to manifest during the past decade (Campling et al., 2017; Cijvat et al.,2021; Takian et al., 2012; Weitzman et al., 2009). Furthermore, different stakeholders tend to have different levels of concerns related to privacy protection, with fear of misuse being highest in doctors (Wang et al., 2015). The financial aspect has also been underscored as a reason behind resistance to e-health innovations (Alajlani & Clarke, 2013; Campling et al., 2017; Poss-Doering et al., 2018; Serrano et al., 2020). In addition, data safety and security serve as barriers that drive the resistance of multiple stakeholders to accept/adopt/use e-health innovations (Alrahbi et al., 2022; Poss-Doering et al., 2018; Wang et al., 2015). Cost and usability are also important considerations for organizational stakeholders, along with concern for patient care (Alrahbi et al., 2022; Choi et al., 2019).

Organizational level issues such as power-sharing, management control, disruption in workflow, liability concerns, and impact on the relationship with patients are also seen as key sources of resistance offered by professionals to e-health innovations (Hans et al., 2018; Safi et al., 2018; Takian et al., 2012; Weitzman et al., 2009). In fact, of the key stakeholders, including policy-making officials, healthcare professionals, patients, and industrialists, healthcare professionals emerged as the most resistant group (Choi et al., 2019), with stakeholders responsible for governance and policy-making identifying the highest number of barriers (Serrano et al., 2020).

In sum, as presented in Appendix III, technological concerns, financial aspects, and organizational issues are the key sources of resistance to e-health innovations when seen from a multi-stakeholder perspective. We further organized these barriers under seven broad categories to present an aggregate view of multi-stakeholder resistance, as presented in Fig. 2. The key categories are (i) societal concerns, (ii) resource shortfalls, (iii) functional impediments, (iv) personnel impediments, (v) external inhibitors, (vi) organizational-level constraints, and (vii) individual-level inhibitors.

5. Discussion

After establishing the exigency of advancing research on the resistance to e-health innovations, we sought to address three research questions (RQs). To respond to **RQ1**, we analyzed the short-listed studies to develop a comprehensive set of drivers of resistance from the perspective of three user groups: patients, organizational actors, and multiple internal and external stakeholders. The results are discussed in detail in the preceding text and are also presented through Fig. 2 and Appendices I through III. Overall, it is rather surprising that the studies published a decade back as well as those more recently have noted technology-related, training-related, and usability-related issues among the key reasons behind the resistance of healthcare professionals and other organizational stakeholders towards e-health innovations (Hoonakker et al., 2013; Ser et al., 2014; Stronge et al. 2008). The fact that, even after more than a decade, not much progress has been made to address the technology-related issues points to the need for more intensive efforts to overcome resistance. Offering a solution, the existing scholarship in the area argues that the resistance manifested by healthcare professionals and other organizational stakeholders in the form of distrust, inertia, reactance, and so on (Ngafeeson & Manga, 2021) can be countered by organizations by honestly communicating the anticipated obstacles and associated benefits during the initial implementation phase of these innovations (Barrett, 2017) and using workarounds to reduce resistance to change (Barrett & Stephens, 2017). At the same time, scholars caution against using interpersonal influence tactics judiciously since, in some cases, they may actually end up unintentionally increasing resistance (Ilie & Turel, 2020). Succinctly, research in this area needs to expand in volume and mature in coverage to make agenda-setting contributions to practice.

To respond to **RQ2**, we critically analyzed the short-listed studies to identify methodological and conceptual deficiencies in the extant literature that deprive practice of actionable insights. To begin with, in the case of all three resistant perspectives—patient, organizational stakeholder, and multi-stakeholder—there is a similar kind of methodological shallowness and linearity-spanning limitations in methods of data collection, geographies sampled, and data analysis methods applied. There are three key gaps in this regard.

(i) *Methods of data collection*: If we consider the total sample of 72 studies, then there is an appreciable balance between the quantitative and qualitative insights available on resistance to e-health innovations. However, if we consider the individual thematic clusters, then in the case of the patients' perspective, of the 14 congruent studies selected for our review, 11 have used a quantitative research design, two have used a qualitative design, and one has used a mixed-method design, indicating not only very limited but also skewed findings. In contrast, in the case of multi-stakeholder perspective, of 12 congruent studies reviewed, only two have used a quantitative approach, with nine offering qualitative insights and one using a mixed-method design, again indicating a narrow and skewed literature base, but on the opposite side in this case. Admittedly, there is a balance in available insights with regard to studies

examining the organizational perspective (46 studies of which 20 have used a quantitative and 26 have used a qualitative research design).

Within these broad design-based limitations, the methodology used lacks variety, with most quantitative studies employing a paper and/or web-based, self-reported, single-wave, questionnaire survey for empirical data collection. In comparison, very few studies have employed an experimental design or collected data in multiple waves. In the case of qualitative design, most studies have used focus groups and semi-structured interview approaches. In comparison, other qualitative approaches, such as open-ended written essays, observation studies, diary studies, and so on have hardly been employed. Since the data collected and analyzed forms an important part of robust research, there is a need to address these gaps by expanding the repertoire of methodological tools used by researchers.

(ii) *Geographies sampled*: Most of the studies reviewed from all three perspectives have either focused on an Asian country such as China, Taiwan, Bangladesh, and Pakistan, or on the United States, with some studies examining advanced economies in Europe. As a result, the literature presents skewed findings with limited generalizability. The focus on the US is particularly intriguing, given that, anecdotally, technology resistance has been considered to be a characteristic of emerging and under-developed countries. The reason behind the narrow geographical focus could perhaps be that the US has been at the forefront in introducing e-health innovations, thereby providing suitable field conditions for the studies to take place. Regardless, this serves as an indication that future researchers need to focus on different geographies with an unbiased preconceived notion about technology resistance being rooted only in the level of development.

(iii) *Data analysis methods applied*: As mentioned above, the reviewed studies have used both qualitative and quantitative data to respond to their identified research questions. The collected quantitative data has been analyzed largely using common data analysis methods such as hierarchical regression analysis, covariance-based structural equation modelling, and variance-based structural equation modelling, amongst others mentioned in Appendices I through III. These are popular yet common methods of data analysis that do not provide advanced insights. This severely limits the width and depth of findings at the disposal of researchers and practitioners endeavoring to develop models and strategies to overcome resistance to innovations. In comparison, the studies based on qualitative data collection have analyzed the data using a variety of methods such as content analysis, narrative analysis, framework analysis, grounded theory approach, and interpretive phenomenological analysis. The preceding discussion indicates that there exists much scope for increasing the methodological width of the literature in the area.

In terms of gaps from a conceptual perspective, we observe that in the case of all three resistant groups—patients, organizational stakeholders, and multi-stakeholders—existing scholarship has adhered to a rather narrow conceptualization by examining a limited set of e-health innovations, employing commonly used acceptance theories and focusing on a comparatively narrow set of respondents in terms of both variety and number. The key gaps in this regard are as follows:

(i) *The limited set of e-health innovations examined*: A limited variety of innovations have been examined, with most studies focusing on a clinical decision support systems (four), computerized physician/provider order entry systems (three), electronic health/medical records (18), telehealth /telemedicine (15), and mHealth interventions/services/apps (seven). Unless the understanding of the drivers of resistance to a wider variety of innovations is clear, it will be difficult for academic research to offer viable strategies for the commercial success of these innovations in a way that the community also benefits.

(ii) *The limited set of user groups/activities examined*: A close look at the reviewed literature as presented in Appendices I through III and in comparison to the extensive universe of patients, providers, clinicians, IT staff, administrators, and types of healthcare set-ups reveals that what has been examined is really the tip of the iceberg. Thus, the existing literature is considerably constrained and limited in providing the real picture of resistance as it exists on the ground.

(iii) *Limited theoretical frameworks utilized*: As evident from the preceding discussion and Appendices I through III, the existing scholarship has shown a predominant tendency to use acceptance/adoption theories like TAM, UTAUT, and TPB to examine the resistance offered to e-health innovation. Since prior literature has clearly established that the drivers of adoption are quite distinct from those of resistance, the use of the acceptance lens perhaps weakens the robustness of the resistance-related insights offered by these studies.

(iv) *The limited scope of inquiry*: The extant literature has examined a variety of variables; however, resistance has been investigated by most of these studies as an afterthought rather than as a key point of focus. Due to this, the understanding of finer aspects of resistance to e-health innovations in terms of its type (i.e., postponement, opposition, or rejection) or form of its manifestation (active or passive) has been quite deficient so far.

We responded to **RQ3** by putting forth tangible recommendations for setting a future research agenda. Herein, we have formulated a conceptual framework and proposed potential research questions grounded in the framework to provide future researchers a comprehensive frame of reference. The framework and the potential research questions are discussed in detail below.

6. Conceptual framework

Building upon the theoretical insights obtained from our literature review, we propose a conceptual framework. The proposed framework embodies a comprehensive view of resistance of multiple stakeholders towards the adoption and continued usage of e-health innovations. The proposed framework goes beyond mere mapping of drivers of resistance to highlight various nudges and interventions that can be leveraged to overcome resistance, thereby increasing adoption, post-adoption usage, and recommendation intent. In sum, our framework rests on the tripod of (i) barriers and user resistance, (ii) consequents, and (iii) nudges and interventions, as presented in Fig. 3.

6.1. Framework constituents

(i) *Barriers and user resistance:* We have categorized the barriers under three levels—micro, meso, and macro—as per user groups. The mapping of levels to user groups provides a rational context for presenting commensurate and relevant interventions. We have categorized barriers at these three levels by drawing upon Chandler and Vargo's (2011) conceptualization, which was extended by Beirão et al. (2017) to examine the healthcare service ecosystem. Accordingly, the barriers/sources of resistance at these three levels are discussed below.

Micro-level barriers are drivers of resistance of individual actors represented by patients. We identified barriers under this category on the basis of an understanding evolved from our review of congruent studies, as discussed under thematic analysis and presented in Appendices I and III. For the ease and clarity of presentation, we have classified these barriers under three broad headings: (a) resistance to change, (b) resistance to use, and (c) perceived risk.

Resistance to change captures patients' tendency to avoid e-health innovations due to inertia, concerns about transition costs both in terms of learning effort and monetary expense, comfort with existing practices, inaccurate perceptions about the efficacy of these innovations, and care-related concerns. Succinctly, resistance to change represents patients' status quo bias. In comparison, resistance to use represents a set of micro-level barriers that arise from patients' technology anxiety, limited computer self-efficacy, and concerns about fatigue and technostress due to information and system feature overloads. In essence, these factors capture the dark side of technology use and self-doubt about using it efficaciously. Finally, perceived risk, representing the third broad set of micro-level barriers, encapsulates resistance arising from patients' perception of threat to identity, privacy concerns, data security worries,

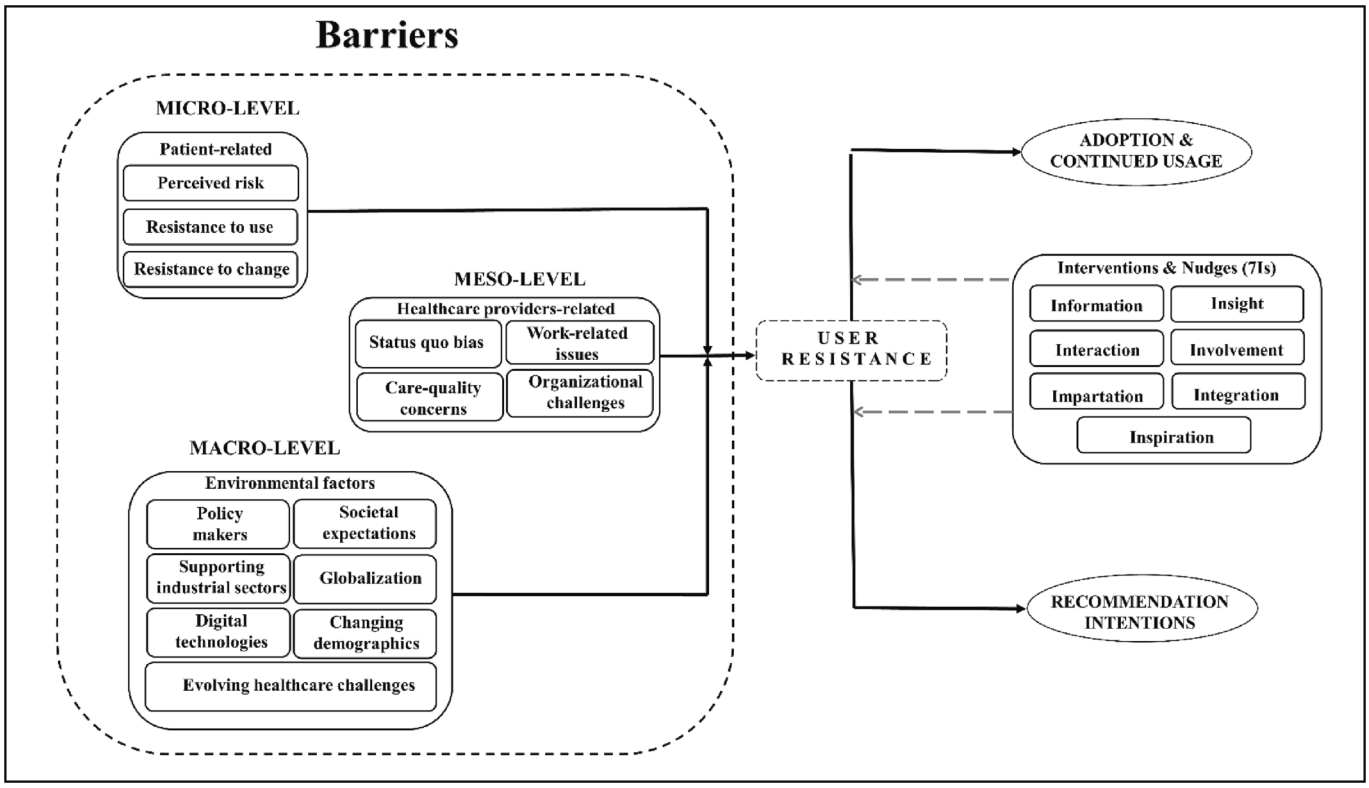

Fig. 3. Conceptual Framework.

and lack of trust.

Meso-level barriers are drivers of resistance of organizational actors such as healthcare professionals, technicians, administrative staff, and management. We shortlisted barriers under this category by consolidating our understanding derived from the reviewed studies, as discussed in the thematic analysis and presented in Appendices II and III. To put forth a structured and reproducible map, we have classified the *meso*-level barriers under four broad headings: (a) status quo bias, (b) work-related issues, (c) care-quality concerns, and (d) organizational challenges.

Status quo bias represents a set of barriers perceived/manifested by the healthcare providers at an individual level, but in the workplace setting. These barriers include preconceived notions against the said innovation, task-fit issues, low involvement in implementation, perceived helplessness, low perceived value of change, differences in personal innovativeness, and stress on account of change.

Next, work-related issues that may cause resistance from organizational actors encompass a set of factors that includes increased workload, time commitments, changes in workflow, higher documentation burdens, role ambiguity, fear of legal and medical liability, and reduction in autonomy. In the case of care-quality concerns, the *meso*-level barriers mainly manifest on account of worries related to assessing patient suitability, impact of the system on patients' anxiety, dehumanization of the patient-provider relationship, commercial exploitation of patients, too much standardization of the medical decision-making process, inability to provide the desired patient care, fear of self-medication or treatment leading to patient isolation, misfit of new technology with logic of care, and lack of clarity about operational and practical aspects of patient care and management.

Coming to organizational challenges, the resistance of healthcare providers may manifest due to lack of training, limited clinical knowledge, low engagement levels of staff, decreased productivity, lack of required routines, communication problems, unplanned and ineffective implementation, limited resources leading to infrastructural shortages, technology usability challenges, design and software barriers, issues in integration with other IT systems, fears associated with system efficacy or performance risk, and doubts about the clinical and cost effectiveness of the system.

Macro-level barriers are drivers of resistance coming from the milieu in which the healthcare sector operates. These barriers can arise on account of (a) policy makers, (b) societal concerns, (c) supporting industrial sectors, (d) globalization, (e) the nature of digital technologies, (f) changing demographics, and (g) evolving healthcare challenges. In other words, the politico-administrative actors, national orientation, socio-demographic profile of the population, regulatory expectations, level of economic development, technological ability and know-how, technology transfer and support systems, and tertiary support of related industrial sectors can all play an important role in driving resistance towards e-health innovations.

Coming to specific details, the barriers attributable to policy makers include regulatory enforcement to implement a system, policy confusion, and the general lack of a supportive environment. Next, societal concerns that hinder the unobstructed diffusion of these innovation span a variety of data, integrity, compensation, information, and societal-awareness barriers. Lack of support from tertiary industrial sectors, vendor-related issues, coordination problems, complex supply routes, and other external factors also act to inhibit the adoption and continued usage of these innovations. In addition, the lowering of sovereign boundaries, the fast-paced transition and transformation of digital technologies, aging populations—particularly in lower- and middle-income group countries where healthcare affordability and reach are a challenge—and the rising complexities of healthcare systems also act, covertly but quite detrimentally, as barriers.

(ii) *Consequents*: We propose adoption, continued usage, and recommendation intentions as the three outcome variables of interest, implying that, ultimately, future research should examine how the user resistance towards e-health innovations can be countered to increase adoption and to ensure continued usage. To elaborate, from the perspective of individual patients, the key consequents could be their willingness to consult, continue treatment, and receive care virtually

when required, as well as comply with all information sharing and safety requirements that can support the frictionless use of e-health technologies. In the case of the organizational actors, adoption and continued usage would imply sincere implementation of the e-health technologies for delivering healthcare, committing adequate resources, and avoiding unfaithful workarounds that may reduce the efficacy of the implemented systems. From the perspective of macro actors such as regulators and policy makers, this would imply the formulation of clear policy guidelines and the creation of a conducive environment for the expedient yet voluntary adoption of these technologies by the concerned user groups.

In addition to proposing adoption and continued usage as outcome variables of interest, we have also included recommendation intentions in our framework, since word of mouth and its effect on users' adoption behavior is well-documented in the consumer behavior literature (Talwar, Dhir, et al., 2020; Talwar, Dhir et al., 2021).

(iii) *Nudges and interventions*: The role of nudges and interventions in inducing individuals to act in a societally or environmentally desirable way is well-established in the literature (Dhir et al., 2020). In addition, prior literature on resistance to digital innovations, in general, has also discussed how interventions in the form of information and guidance (Talwar et al., 2020b) can lower resistance. Furthermore, the idea that resistance from key stakeholders can be overcome through well-defined strategies is also consistent with the seminal work of Ram and Sheth (1989) in which several marketing strategies were discussed to overcome customer resistance to innovations.

In the present context, we propose seven *Is* to represent different kinds of interventions and nudges that can be used to counter resistance of different user groups. For instance, *information* shared through mass media promotion may work well to reduce the patients' resistance. Similarly, *insights* shared through workshops, seminars, and reading material may help healthcare professionals know more about the available innovations and their usefulness. At the same time, continuous engagement and communication may work well for organizational actors to handle their anxieties and concerns in the pre-implementation stage. Continued *interaction* with the external stakeholders, such as regulators, suppliers, and societal representatives, can also serve as a nudge and intervention for ensuring that the macro-level barriers are mitigated. Also, *involvement* in the decision making and seeking feedback from user groups may serve to lower their resistance before it escalates into complete rejection. From the organizational perspective, training diligently, integrating the workflow and routines of healthcare professionals and staff, and motivating them through additional compensation and recognition can also nudge them in the right direction to use the system faithfully and efficaciously. Bringing it all together, we suggest that more such nudges and interventions should be designed and implemented through an approach similar to planned social change driven by reinforcement, inducement, rationalization, and confrontation, as discussed by Sheth and Frazier (1982).

6.2. Potential research questions

(i) Barriers and user resistance.

PRQ1: Why do patients and organizational actors resist comparatively new e-health innovations such as cloud computing, the epidemic prevention cloud, assistive and welfare technologies, and web-based self-management tools for critical care more than the older, more routine innovations?

PRQ2: How is patients' resistance to e-health innovations correlated with the nature of their illness (critical/non-critical), the existence of comorbidities, and the extent of treatment required?

PRQ3: How is the resistance of organizational actors different in the case of large hospitals with an established legacy as compared to smaller nursing homes that may be more agile in successfully implementing the innovations but constrained by resource availability?

PRQ4: How does the resistance of multiple stakeholders differ in different cultural contexts, such as Confucian-based versus individualistic?

PRQ5: How is the manifestation of resistance of multiple stakeholders different in developed versus developing economies?

(ii) Consequents.

PRQ6: How have pandemic-induced anxieties affected the resistance of multiple stakeholders towards the continued use of remote medical consulting and care?

PRQ7: Which barriers can slow down or obstruct completely the adoption of emerging (industry 4.0) technologies-driven healthcare innovations such as robotic surgery, smarter pacemakers, smart wearables, and so on?

PRQ8: What are the differences between the resistance of early-adopters and late-adopters that drive postponement/opposition/rejection of e-health innovations?

PRQ9: How does resistance associated with the size, type, ownership status, and age of healthcare set-ups impact the adoption and continued usage of e-health innovations from both clinical as well as administrative standpoints?

(iii) Nudges and interventions.

PRQ10: What are the potential interventions that can be effectively used for mitigating pre-and post-implementation resistance towards e-health innovations?

PRQ11: How can the bottlenecks and obstructions associated with supply-side drivers of resistance be overcome to reduce the external barriers to adoption of e-health innovations?

PRQ12: How can policy measures be used as a positive nudge to mitigate the resistance of different stakeholder groups?

PRQ13: How can social and peer influence be leveraged through recommendations and word of mouth to mitigate the resistance of multiple stakeholders?

7. Implications, Limitations, and future research

7.1. Theoretical implications

Our study contributes to the accumulated literature on resistance to e-health innovations in the following three ways. First, our review builds upon and addresses the limitations of the prior reviews on the topic by offering a broader and deeper view of resistance to e-health innovations that incorporates the perspectives of all key stakeholders, covering varied geographies and a variety of e-health innovations. An examination of prior reviews reveals their narrow scope in terms of the coverage of stakeholders, innovations, and geographies. For instance, Almathami et al. (2020) reviewed congruent studies to identify the barriers and facilitators that impede or stimulate the adoption of healthcare home consultation systems, and Niazkhani et al. (2020) identified various barriers that hinder the adoption of electronic personal health records by patients, caregivers, and providers. Similarly, Kumar et al. (2020) examined the pertinent corpus of studies published in information system journals and conferences to present a consolidated view of resistance to healthcare information technology focusing on the interactions of people, practice, and technology. Adding to the growing volume of review literature, Al-Samarraie et al. (2020) analyzed relevant studies to reveal insufficient progress made in the diffusion of telemedicine in Middle Eastern countries, identifying many key challenges such as financial, cultural, and regulatory. Relatively older studies have also shown a similar narrow inclination toward reviewing studies on resistance by remaining confined in terms of publications, user groups, or innovations. For example, Davidson et al. (2018) reviewed the evolution of healthcare research in information system journals since 2004, offering a descriptive narrative of the accumulated findings through three clusters: health information technology adoption and diffusion, physician resistance to health information technology use, and the impact of health information technology on healthcare outcomes, and Kruse et al. (2018) mapped the barriers inhibiting the adoption of telemedicine across the world by reviewing the existing research. In a similar vein,

Kruse et al. (2015) conducted an SLR to uncover the drivers of resistance of patients and providers to patient portals, and Lluch (2011) reviewed studies on healthcare professionals' organizational barriers to health information technologies. The review offered a single perspective and categorized the barriers into five categories from the organizational viewpoint. In another noteworthy review, Boonstra and Broekhuis (2010) synthesized studies specifically examining physicians' barriers toward the adoption of electronic medical records. In comparison, the broad coverage of our study provides an integrated view of resistance of different end-users towards e-health innovations, presenting a single point of reference for researchers.

Second, our study lucidly categorizes the resistance literature under three clear perspectives based on user groups: (a) patients, (b) organizations (an umbrella term for physicians, nurses, administrators, technicians, and hospital directors) and (c) multiple other internal and external stakeholders. Such categorization helps synthesize the literature in a more relatable and understandable manner, making it a useful reference for future research and ongoing practice. Our theoretical contribution is further concretized by two key aspects of our study: (i) we have presented a clear narrative of the underlying products, theories, methodologies, and barriers for each user cluster (see Appendices I through III), and (ii) we have specifically summarized the sources of resistance discussed/revealed by each study, offering a comprehensive narrative to balance the literature that has so far majorly focused on adoption, referring to resistance almost as an afterthought. Such summarization is quite valuable, especially in the cases where barriers are not immediately apparent.

Finally, our explicit delineation of methodological and conceptual underpinnings of resistance serves as a coherent basis for suggesting well-defined PRQs for the academic community to work on. By doing so, we bring forth potential areas of research that could not only enrich the insights specific to resistance towards e-health innovations but also contribute to the richness of the methodological literature in general. To make our contribution even more tangible, we have formulated a conceptual framework that brings together potential research paths, serving as a ready reference for researchers keen to advance the academic understanding of the resistance of multiple stakeholders, manifested through rationally experienced or irrationally perceived barriers. Succinctly, our proposed framework comprising barriers classified into micro-, meso-, and macro-categories can help theorists and practitioners evolve more contextual strategies. At the same time, our detailed presentation of methodology-related gaps can provide future researchers with valuable inputs on how to determine a suitable research design and plan better theory-based conceptualizations. For instance, our study suggests that future researchers should consciously draw upon the resistance-related theories such as innovation resistance theory (IRT; Ram & Sheth, 1989) and status quo bias theory (SQB; Samuelson & Zeckhauser, 1988) to formulate models theorizing and testing more resistance-related variables, rather than explaining resistance as the absence of adoption drivers. Recent studies have deployed these theories effectively to explain consumer resistance in different contexts (e.g., Khalil et al., 2023).

7.2. Practical implications

Our study offers three key contributions for practice: First, our study reveals that resistance to e-health innovations is not confined to patients or doctors alone, rather multiple internal and external stakeholders who can play a vital role in supporting the adoption of these innovations also have reservations about their efficacy, utility, and implementability (Campling et al., 2017; Choi et al., 2019; Takian et al., 2012). By uncovering such finer dimensions, we bring out the complexity of the issue and provide useful inputs for formulating effective strategies and interventions to overcome such resistance.

Second, we highlight the fact that despite the potential of these innovations to deliver healthcare more efficiently and, ultimately, cost-effectively, there exist several organizational impediments such as power, control, autonomy, workflow, and productivity (Hans et al., 2018; Safi et al., 2018; Takian et al., 2012) that may create frictions in the adoption of e-health innovations. By doing so, we underscore the fact that the adoption of these innovations is not just an operational or a technical decision, rather it is a broader decision, with intangible aspects playing an equally important role. Observing this, we suggest that the organizations adopting these innovations should onboard their human resources department fully to properly plan and execute the implementation as a well-visualized change management process.

Finally, by revealing that the resistance of the implementing organization may come from administrative challenges such as the skill level of staff, training requirements, additional compensation expectations, etc. (Dubin et al., 2020; Plumb et al., 2017; Taylor et al., 2015), as well as from the clinical features that affect the quality of care (Alrahbi et al., 2022; Zwaanswijk et al., 2011), we provide action-oriented inputs to the manufacturers and marketers. To elaborate, we suggest that ease of use should be emphasized continually, and all innovations should be accompanied by proper demo support and self-help videos that can be referred to as and when required. To address the quality-of-care concerns, the manufacturers and marketers of e-health innovations should have a systematic approach to capture reviews, feedback, and testimonials of different user groups to serve two specific purposes: (i) provide inputs for subsequent product improvements, and (ii) reassure potential users about the effectiveness of the concerned innovation.

7.3. Limitations and future work

Our study offers a comprehensive, first-of-its-kind review of the state-of-the-art literature on resistance to e-health innovations, yet it has certain limitations that need to be acknowledged. First, although we followed recent studies (e.g., Christofi, Pereira, et al., 2021; Vrontis et al., 2022) to execute a robust and systematic search and review of congruent studies, there might be certain keywords or studies that we have missed due to our inclusion and exclusion criteria. Second, we limited our search to only two digital databases, Scopus and the Web of Science, which could have led us to miss some relevant studies indexed in other databases. However, the two databases are known for their extensive indexing, assuring us that there is unlikely to be any grave omission. Third, apart from the methodological limitations, there is also a possibility of human error in shortlisting and/or synthesizing the reviewed studies, which could have affected the reported analysis. However, the author team tried its best to limit such errors by undertaking independent coding at each stage and comparing the output.

Future researchers can take our review study forward by (a) searching additional databases to include studies that may have been inadvertently excluded by us, (b) conducting a *meta*-analysis of the studies to provide deeper insights into the underlying literature, and (c) undertaking a bibliometric analysis of the literature in the area to generate a detailed research profile to help future researchers.

8. Conclusion

Our study rests on the premise that despite being widely acknowledged for supporting efficient and effective delivery of medical services, e-health innovations have not become an integral part of the healthcare system. Even in most advanced countries, a variety of e-health initiatives have received lukewarm response. Such disengagement and lack of acceptance is depriving the healthcare system from delivering cost-effective and inclusive medical care. Given the criticality of the issue, the factors contributing to limited adoption of e-health innovations cannot be ignored. Taking cognizance of need, our study examines the reasons behind low diffusion of e-health innovations. We contribute to the literature by curating and critically synthesizing the barriers that comprise resistance of three key stakeholder groups – patients, doctors and clinical staff, and hospital management towards e-health

innovations, and suggest potential research questions that need to be addressed.

CRediT authorship contribution statement

Shalini Talwar: Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Amandeep Dhir:** Writing – review & editing, Supervision, Resources, Methodology, Conceptualization. **Nazrul Islam:** Writing – review & editing, Validation, Supervision, Methodology, Conceptualization. **Puneet Kaur:** Writing – review & editing, Visualization, Validation, Methodology, Conceptualization. **Ahlam Almusharraf:** Writing – review & editing, Supervision, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix I:. Patients' resistance to e-health innovations

Study	Product	Country	Theoretical framework	Data collection method/ Sample size	Data analysis approach	Sources of resistance*
Harrefors et al. (2010)	Information technology-based assistive technology services	Sweden		Semi-structuredinterviews supported by written vignettes [12 healthy couples, aged over 70 years]	Content analysis	(a) Linked with care needs and abilities(b) Fear of these services when completely dependent on care(c) Mistrust when illness is severe and family support is less
Cranen et al. (2011)	Web-based telemedicine service	The Netherlands	Technology Acceptance Model	Experiment & questionnaire [10 Control group / 20 experimental group participants (Mean age of 43.3; 50 % male)]	(a) Analysis of covariance(b) Post hoc tests(c) Paired t-tests	No prior experience with the system can cause patients to have inaccurate perceptions that may hinder adoption
Sanders et al. (2012)	Tele-health and telecare	The United Kingdom		(a) Semi-structured interviews [22 people (mean age of 71 years, 66.64 % male)(b) Observational visits	Content analysis	(a) Need to have technical competence and ability to operate equipment(b) Threat to identity, independence, and self-care (c) Fears of disruption to services
Deng et al. (2014)	Mobile health service	China	(a) Value Attitude Behavior Model(b) Theory of Planned Behavior	Questionnaire survey [218 middle-aged respondents in age group 40–59 years, 36.7% male; 206 old-aged respondents in age group 60 years and more, 43.7% male]	Covariance-based Structural equation modelling	(a) Resistance to change(b) Technology anxiety
Hsieh (2016)	Health cloud	Taiwan	(a) Dual factor perspective (b) Unified Theory of Acceptance and Use of Technology(c) Status Quo Bias	Field survey[681 respondents, aged between 21 and 70 years, 49.63% male]	Covariance-based structural equation modelling	(a) Sunk costs(b) Inertia(c) Transition costs(d) Uncertainty
Bhatnagar et al. (2017)	Medical Teleconferencing	The United States	–	Web-enabled survey [140 respondents, 19 to more than 70 years in age; 58 % male]	Variance-based structural equation modelling	(a) Computer self-efficacy (b) Resistance to use
Hoque 2017	Mobile health services	Bangladesh	Unified Theory of Acceptance and Use of Technology	Face-to-face structured questionnaire survey [300 respondents, 60 years and above in age, 66% male]	Variance-based structural equation modelling	(a) Technology anxiety(b) Resistance to change
Mikolasek et al. (2018)	Mobile health app	Switzerland	Reach, Effectiveness, Adoption, Implementation, andMaintenance framework	(a) Paper-based questionnaire [100 respondents, mean age of 53.24, 26 % male](b) Semi-structured interviews [8 respondents, mean age of 50.70 years, 1 male]	(a) Kaplan-Meier analyses with log-rank tests(b) Cox proportional hazards regression	Resistance to change
Alaiad et al. (2019)	Mobile health services	Jordan	(a) Unified Theory of Acceptance and Use of Technology(b) Dual-factor model(c) Health Belief Model	Online and paper survey [280 respondents, 18 to more than 50 years in age; 57 % male]	Variance-based structural equation modelling	(a) Security and privacy risks(b) Resistance to change
Tsai et al. (2019)	Tele-health	Taiwan	(a) TechnologyAcceptance Model(b) Innovation Diffusion Theory(c) Status Quo Bias	Survey [281 respondents over 40 years old, 40.93 % male]	Covariance-based structural equation modelling	(a) Technology anxiety(b) Transition costs
Cao et al. (2020)	Mobile health services	China	Stimulus-Organism-Response framework	Online survey [317 respondents, 60 years old and above, 41.9 % male]	Variance-based structural equation modelling	(a) Information overload(b) System feature overload(c) Fatigue(d) Technostress
Kamal et al. (2020)	Telemedicine	Pakistan	Technology Acceptance Model	Face-to-face survey [226 respondents, 20–50 years in age, 64.6% male]	Variance-based structural equation modelling	(a) Technological anxiety (b) Perceived risk(c) Resistance to technology

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(*continued*)

Study	Product	Country	Theoretical framework	Data collection method/ Sample size	Data analysis approach	Sources of resistance*
Tsai et al. (2020)	Smart clothing system	Taiwan	Technology Acceptance Model	Questionnaire survey [81 respondents, 50 to more than 90 years in age, 53% male]	Variance-based structural equation modelling	Technology anxiety
Zobair et al. (2020)	Telemedicine	Bangladesh		492 (18 to more than 50 years in age, 41.9 % male)	Variance-based structural equation modelling	(a) Lack of organizational effectiveness(b) Lack of health staff motivation(c) Lack of patient satisfaction (d) Lack of trustworthiness

Appendix II. Organizational resistance to e-health innovations

Study	Product	Country	Theoretical framework	Data collection method /Sample size	Data analysis approach	Sources of resistance*
Lapointe and Rivard (2006)	Computer information system	Canada		(a) Observations(b) Documentation(c) Interviews[15 physicians, 14 nurses, and 14 system implementers]	(a) Content analysis(b) Within-case and cross-caseanalysis	(a) Change in the object of resistance as resistance unfolds(b) The extent and severity of manifested resistance varies during the implementation phase to the extent that it may lead to rejection of the innovation being implemented
Bhattacherjee and Hikmet (2007)	Computerized physician order entry system	The United States	Cenfetelli's Dual-Factor Model of IT Usage	Paper-based and electronic survey [129 practicing physicians]	Variance-based structural equation modelling	(a) Resistance to change(b) Perceived threat
Stronge et al. (2008)	Telemedicine (teledermatology)	The United States		Structured telephonic interviews [18 current or former users: six primary care managers, six consult managers, and six dermatologists]	(a) Qualitative coding(b) Chi-square test	(a) *Organizational impediments*- lack of training- increase in workload- communication problems- lack of telemedicine awareness- internal organizational issues- differences in reported impediments between the examined user groups(b) *Technology impediments*- usability challenges- general technical issues- limitations of technology- slow pace of consult process(c) *User impediments*- negative preconceived notions about the innovation- resistance to change- anxiety related to technology use about using the technology- differences in reported impediments between the

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Study	Product	Country	Theoretical framework	Data collection method /Sample size	Data analysis approach	Sources of resistance*
						examined user groups(d) *Patient-related impediments*- dissatisfaction- patients' resistance to change- decreased quality of patient care
Zandieh et al. (2008)	Electronichealth records	The United States		Semi-structured interviews [11 practice managers and 12 medical directors from of an academic ambulatorycare network]	Content analysis	(a) IT issues(b) High practitioner resistance(c) Decreased productivity(d) Patient privacy issues(e) Differences in approach of paper-based and EHR-based leaders to overcome resistance
Fossum et al. (2011)	Clinical decision support systems	Norway		(a) Group interviews [25 nursing personnel](b) Cognitive walkthrough observations [Five nursing personnel](c) Usability evaluation questionnaire [Five nursing personnel]		(a) *Organizational barriers*- lack of training- information about implementation not disseminated properly- lack of equipment and computer stations- lack of clinical knowledge among personnel- lack of required routines (b) *Individual barriers*- low involvement in implementation process,- lack of skills to use computer- preferences for verbal mode of exchanging information- lack of motivation to use patient care plans- resistance to use computers, especially among older nursing personnel(c) *Task-fit barrier*(d) *Design and software barriers*- issues with integration of the digital systems as barriers to CDSS implementation- issues related to the design of graphical user interface- system quite cumbersome and frustrating to use
Grabenbauer and Skinner et al. (2011)	Electronic health record	The United States		Focus group sessions with average of five participants [20 physicians]	Method of constant comparison	(a) Physician frustration with ease of use and non-intuitive interface(b) System not suitably designed to support physician workflows,

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Study	Product	Country	Theoretical framework	Data collection method /Sample size	Data analysis approach	Sources of resistance*
						affecting patient care(c)Time consuming and tedious data searches(d) Issues related to team communication
Grabenbauer et al.(2011)	Electronic health record	The United States		Focus group sessions with average of seven participants [74 participants in all, comprising four stakeholder groups of 38 academic practitioners, 14 private practitioners, 12 university administrators, and 10 hospital administrators]	Content analysis	(a) Differences in resistance of private versus academic physicians, where the former were more concerned about the learn curve required to use the innovations (b) Limited functionality of the system(c) Possibility of adverse effect on patient care
Zwaanswijk et al. (2011)	Electronic information exchange	The Netherlands		Non-directive interview technique [17 stakeholders]	Content analysis	(a) Confidentiality and security of information(b) Reliability and quality of patient data
Ackerman et al. (2012)	Diagnostic computer kiosks	The United States	Actor Network Theory	(a) Observations(b) Semi-structured interviews [31staff members and researchers]	(a) Iterative coding of data to identify and interpret themes(b) Individual-site as well as cross-site comparison	(a) Difficulties associated with different patient populations(b) Institutional policies(c) Complex and pragmatic aspects associated with different locations/ sites
Lin et al. (2012)	Electronic medical record	Taiwan	TechnologyAcceptance Model	Field survey [115 attending physicians]	Covariance-based Structural equation modelling	(a) Perceived inequity(b) Perceived threat
Litvin et al. (2012)	Clinical decision support system	The United States		(a) System-based audit and feedback(b) Practice site visits(c) Semi-structured group interviews with providers and staff at each practice as well as project liaisons(d) Review of performance and training, [39 providers in nine practices]	Content analysis	(a) *Provider barriers*- comfort with existing practices- lack of faith in efficacy and effectiveness of the system in assisting decision-making(b) *Patient barriers*- inconvenient to use for all patients- limited functionality that hinders patient education at the point of care(c) *Technical barriers*- issues with computers/ network that interfere with system use- unplanned location of supporting equipment- non-intuitive system leading to training requirements(d) *Organizational barriers*- disruption

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Study	Product	Country	Theoretical framework	Data collection method /Sample size	Data analysis approach	Sources of resistance*
						in workflow at the practice
Hoonakker et al. (2013)	Computerized providerorder entry	The United States		Repeated cross-sectional survey with two open ended questions in two waves [Nurses, physicians, nurse practitioners, and physician assistants with 177 responses in the first wave and 220 in the second]	(a) General linear mixed model (b) Wilcoxon ranking order test of items(c) Thematic analysis	*Usability issues*- system design- complexity- excess information- user-unfriendliness- difficulties in communication- problems in locating specific information
McAlearney et al. (2013)	Electronic health record	The United States		(a) Key informant interviews [45 physicians and organizational representatives including executives, managers, IT professionals and nurses] (b) Focus groups [six comprising 37 physicians]	Analytic processcombining both inductive and deductive approach	(a) *Provider-level personal barriers*- changes in work patterns- lack of skills for using computer(b) *Provider-level system-related barriers*- reduced productivity- demand for customization- issues with documenting detailed information(c) *Organization-level personal barriers*- general resistance to change- issues with sharing data- it support perceived to be deficient(d) *Organization-level system-related barriers*- possibility of system failure/ downtime- system limitations such slowness- challenges in handling system updates
Yu et al. (2013)	Electronic health records	Australia	DeLone and McLean Information Systems Success Model	Longitudinal data collected through semi-structured interviews [110 care staff members]	Content analysis	(a) Challenges in entering and retrieving data(b) Resistance to use the system(c) More complex information management requirements(d) Worries related to access(e) Higher documentation burden(f) Reduced communication flow(g) Managing space-related challenges(h) Difficulties in delivering desired patient care
Ser et al. (2014)	Electronic health records	The United Kingdom		Semi-structuredinterview [33 staff members at mentalhealth hospitals]	Thematic analysis	(a) *Operational barriers*- perceptions about lack of integration of the new system with the existing workflow(b) *Cultural barriers*- related to shift

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Study	Product	Country	Theoretical framework	Data collection method /Sample size	Data analysis approach	Sources of resistance*
						from traditional to digital way of working, bringing forth the low IT skill level of staff(c) *Organizational barriers*- lack of appropriate training required to transition to the new system- limited resources leading to infrastructural shortages- challenges in effectively communicating the benefits to ensure staff buy-in(d) *Technical barriers*- related to the ability of the local infrastructure to support new-fangled IT systems
Zakane et al. (2014)	Computerized clinical decision support system	Burkina Faso, Africa		Semi-structured interviews [45 informants]	(a) Descriptive statistics(b) Manifest content analysis	(a) Fear that the new system would increase workload and worktime(b) Concern that the system is complex, necessitating steep learning curve and handholding to implement fully
Bezboruah et al. (2014)	Health information technology	The United States	Technology Acceptance Model	(a) In-depth semi-structured interviews of management at selected nursing homes [42 respondents](b) Direct observation of staff behavior	Content analysis	(a) The decision to use a given innovation is driven by actual or perceived regulatory requirement rather than a felt need(b) Limited or no information about or consideration of the involved costs and benefits of implementing a given innovation (c) Lack of knowledge about the available innovations(d) Deficient communication to various internal stakeholders about the benefits and costs of e-health innovations(e) Implementation of the selected system is faulty, trial-and-error, rather than well thought, evidence-based process and plan
Hsieh (2015)	Cloud computing technology	Taiwan	(a) Theory of Planned Behavior(b) Status Quo Bias	Field survey [209 healthcare professionals]	Variance-based Structural equation modelling	(a)Regret avoidance(b) Inertia(c) Perceived value(d) Switching costs(e) Perceived threat

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Study	Product	Country	Theoretical framework	Data collection method /Sample size	Data analysis approach	Sources of resistance*
Taylor et al. (2015)	Tele-health	The United Kingdom		Semi-structured interviews [84 nursing and otherfrontline staff; and 21 managers and key stakeholders]	Framework analysis	(a) Uncertainty about assessing patient suitability (b) Challenges in assessing the impact of system on patients' anxiety(c) Doubts about using innovative technology to deliver care(d) Apprehensions of staff about their technical skills(e) Perceptions of staff perceptions that the system will lead to higher workload(f) Concerns about how the system would affect staff roles and responsibilities(g) Difficulties in obtaining and sharing useful data about patients with relevant personnel (h) Doubts about the clinical and cost effectiveness of the system(i) Limits on customization to meet specific requirement(j) Unplanned and ineffective implementation increasing staff resistance(h) Lack of clarity about operational and practical aspects of patient care and management(i) All stakeholders do not share the same vision and view about the use and commitment to e-health innovations
Varsi et al. (2015)	e-health intervention	Norway		Individual interviews [six nurses and three physiciansin management positions]	Content analysis based on deductive directedapproach	(a) Contextual factors such as lack of time, required organizational changes, issues with integration with other IT systems(b) Frontline physicians' resistance to the use(c) Tendency of physicians to adhere to old habits and resist new technology
Barrett and Stephens (2017)	Electronichealth records	The United States	(a) Social Influence Model(b) Diffusion of Innovations Theory	Paper-pen survey [345 physicians, nurses, technicians, and administrators]	(a) Structuralequation modelling (b) Multiple regression	Resistance to change

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Study	Product	Country	Theoretical framework	Data collection method /Sample size	Data analysis approach	Sources of resistance*
Cocosila and Archer (2016)	Electronic medical record	Canada	Decomposed Theory of Planned Behavior	Cross-sectional survey [119 physicians from medical practices or clinics]	Variance-based structuralequation modelling	(a) Perceived overall risk(b) Fears associated with system efficacy or the performance risk (c) Doubts about suitable justification/actual need of the system or the psychological risk (d) Fear of legal liability privacy risk(e) Concern about time commitment required for implementing the system or the time risk
Beglaryan (2017)	Electronichealth records	Armenia	Tripolar Model of Technology Acceptance	Cross-sectional paper-based survey [multi-stage cluster sampling of 233 physicians]	Exploratory structural equation modeling (ESEM) with weightedleast squares estimator for categorical indicators	(a) Group level clinical concerns (b) Effect on job performance(c) Effort required use the system(d) Personal innovativeness(e) Effect on patient-provider relationship(f) Resistance to change
Barrett (2017)	Electronic health record system	The United States	Job Characteristics Model	Paper-based survey [345 employees in one healthcare organization]	(a) Analysis of variance(b) Hierarchical regression analysis	(a) Physicians' resistance higher than other professionals including nurses(b) Both physicians and nurses perceive innovative systems as cumbersome technology that is threatening for their work-related perceptions(c) Factors such as experience influence employees' perception of change, which affects their resistance
Bush et al. (2017)	Structured data entry systems	The United States	Unified Theory of Acceptance and Use ofTechnology	Paper-based questionnaire [25 physicians and pediatric surgeons]	(a) Chi-square test(b) Independent sample t-tests(c) Analysis of variance	(a) Increased workload and effort required to use the system(b) Differences in response of physicians versus surgeons to the system
Caffery et al. (2017)	Tele-orthopedics	Australia		Structured interviews [four orthopedic surgeons and five allied health or administrative staff]	Participant responses were entered in a chart and reported narratively	(a) Staff or executive resistance to the system(b) Scope for miscommunication (c) Cost barriers(d) Financial constraints in employing

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Study	Product	Country	Theoretical framework	Data collection method /Sample size	Data analysis approach	Sources of resistance*
						additional staff(e) Medical liability and privacy issuesf) Belief that video consultations were less efficient than equivalent face-to-face interactions
Cresswell et al. (2017)	Computerizedphysician order entry and clinicaldecision support systems	The United Kingdom		(a) Semi-structured interviews [173](b) Non-participant observations (Chandler and Vargo, 2011) (c) Collection of 17documents	(a) Thematic analysis(b) cross-case comparisons	(a) The groups that are less engaged tend to develop resistance and use unsanctioned workarounds if they perceive the system to be inadequate(b) Such resistance and workarounds vary with profession and specialty(c) Lack of engagement with systems may persist in senior staff and specialties if the system cannot be re-designed(d) Persistence of resistance longer in some groups such as nurses
Kelly et al. (2017)	Electronic health record portals	The United States		Pre (Totten et al., 2019)- and six-months post (Mikolasek et al., 2018) implementation cross-sectional survey of nurses, physicians, andancillary staff	(a) Chi-square test(b) Mann-Whitney test(c) Kruskall Wallis test	(a) Staff not very optimistic about the effect of system on their workflow (b) Concern about time required and increase in workload(c) Perceptions about usage related challenges
Plumb et al. (2017)	Information and communication technology for ward rounds	Australia	The theory of Institutional Logics	Semi-structured interviews [48 ICU intensivists, registrars and residents]	Analysis of transcripts using a combination of deductive and inductive thematic analysis	(a) Misfit of new technology with logic of care(b) Issues with equipment availability and set-up(c) Software not being user-friendly(d) Lack of aptitude and skills to use technology (e) Worries about back-up support in the event of system failure(f) Systems may not be able to cope with the complexity of the medical decision-making process
Segrelles-Calvo et al. (2017)	Telemedicine	Spain	TechnologyAcceptance Model	Web-based survey [349 pulmonologists, thoracic surgeons, residents, nurse, physiotherapists, and others]	(a) Descriptive statistics(b) Contingency tables(c) Student *t*-test(d) McNemar's test	(a) Technical problems of the system(b) Technical abilities of the professionals
Aboelmaged and Hashem (2018)	RFID adoption in managing healthcare operations	United ArabEmirates	Technology, Organization and Environmental Factors	Online survey [311 managers, technicians, physicians and nurses]	Covariance-based structural equation modelling	(a) Technical complexity(b) Environmental uncertainty

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Study	Product	Country	Theoretical framework	Data collection method /Sample size	Data analysis approach	Sources of resistance*
Jindal et al. (2018)	mHealthintervention	India		(a) Semi-structured interviews [eight physicians, six nurses, three counsellors, four pharmacists, and six lab technicians](b) Pilot-testing of the intervention to assess its usability and to identify the barriers.For evaluation:- Interviews were conducted [five physicians and five nurses]- weekly observation visits were undertaken- Data on central server was analyzed	Development and implementation of an intervention as per the Medical Research Council framework and its pilot testing.The key process indicators monitored were:- number of new patients registered-follow-up rate- proper assessment- medication adherence	(a) Application-related barriers such as duplicate registrations and issues with forms and formats(b) Knowledge and skills of nurses in handling devices and patients with co-morbidities(c) Health-system barriers such as lack of training, staff issues, and resistance to follow the recommended patient workflow
Al-Rayes et al. (2019)	Electronic health record systems	Saudi Arabia	TechnologyAcceptance Model	Cross-sectional paper survey [213 physicians]	(a) Chi-square test (b) independent t-tests	(a) Resistance to change different for user versus nonuser group
de Wit et al. (2019)	Web-basedself-management tools in cancer care	The Netherlands	Theory Of Innovation Resistance	Web-based cross-sectional survey [239 registered nurses]	(a) Confirmatory factor analysis (b) Structural equation modelling to test the full model via a hierarchicalapproach	(a) *Passive resistance due to-* complexity- lack of value- role ambiguity,(b) *Active resistance due to-* complexity- lack of value- social pressure from peers (c) Both passive and active resistance are driven by functional and psychological drivers, whose strength depends on expertise, managerial support, and governmental influence
Heath and Porter (2019)	Electronic health record	The United States	Boveyand Hede model	Semi-structured interviews [28 physicians]	Manual content analysis	(a) Disruption brought by the introduction of the new technology in daily practice(b) Change in workflows(c) Issues related to functionality of the system(d) Additional time commitment to learn and implement the new system(e) Concerns related to adverse impact on patient care(f) Negative emotions towards the new system leading to stress on account of change, insecurity, or mistrust
Hossain et al. (2019)	Electronic health record	Bangladesh	The Unified Theory of Acceptance and Use of Technology	Cross-sectionalsurvey [249 physicianswith different specializations]	(a) Variance-based structural equation modelling(b) One-way ANOVA	(a) Lack of training (b) Limited number of computers(c) Low level of computer usage ability(d) Low speed of computers

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Study	Product	Country	Theoretical framework	Data collection method /Sample size	Data analysis approach	Sources of resistance*
Baudin et al. (2020)	Welfare technologies	Sweden		Web-based cross-sectional survey [393 professionals working on municipal elder care: 29 information technology staff78 chief medical nurse28 chief rehabilitation office103 occupational therapist/ physiotherapist51 specialist dementia nurse and others (manager/electronic health strategist)]	Chi square test	(a) Gender and age differences in disposition to use technology(b) Negative perception about efforts of their organizations to optimize the use of technology(c) Negative reaction to the new technology that brings about changes in society or increases the workload of professionals
Dubin et al. (2020)	Telemedicine	Global		Web-based, cross-sectional survey [620 urologists from 58 different countries and six continents]	(a) A single-factor analysis of variance(b) Chi-square test	(a) Lack of technological skills and understanding in patients(b) Lack of access of patients to the relevant technology(c) Concerns about reimbursement
Hsieh and Lin (2020)	Epidemic prevention cloud	Taiwan	(a) Task-Technology Fit (b) Status Quo Bias	Survey [116 infection control professionals with epidemic prevention cloud usage experience]	Variance-based structural equation modelling	(a) Uncertainty costs(b) Low perceived value of the change
Østervang et al. (2019)	Relatives' participationthrough virtual presence during patient rounds	Denmark		(a) Two focus group interviews [nine healthcare professionals](b) Eight short open interviews [physicians, nurses, and staff from management](c) Field observations of healthcare professionals [15 days, 75 h]	Interpretativephenomenological analysis	(a) Time(b) Culture (c) Change in flow of daily work
Alohali et al. (2020)	Health information technology	Middle East		Semi-structuredinterviews [15 physicians and 15 nurses]		(a) Both passive and active resistance manifested(b) Skepticism about the efficacy of the system to improve the delivery of care or reduce the work pressure of professionals(c) Perceived threat measured through dissatisfaction and perception about reduction in autonomy
Bagot et al. (2020)	Telemedicine	Australia	Implementation Framework and a Behavior Change Taxonomy	Semi-structured interviews [25 clinicians conducted once after six-month pilot and then after 12-month implementation period]. Although the study reported only two longitudinal post-implementationinterviews, results were compared with a priorpre-implementation findings	Inductive and deductive analysis of data throughdescriptive thematic analysis	(a) Similar new and ongoing barriers identified, along with additional post-implementation barriers(b) Infrequent use of system(c) Competing demands and continued resistance of certain individuals (d) Differences between early and late adopters

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Study	Product	Country	Theoretical framework	Data collection method /Sample size	Data analysis approach	Sources of resistance*
Ilie and Turel (2020)	Electronic medical record	The United States	(a) Theory of Interpersonal Influence and Leadership(b) Adaptive Structuration Theory	Paper-based cum online survey [156 physicians and 286 nurses]	Covariance-based structural equation modelling	(a) system assessment of system and its usefulness that may lead to unfaithful use(b) certain influence tactics can inadvertently increase resistance
Ngafeeson and Manga (2021)	Electronic health record	The United States	The Psychological Reactance Theory	Cross-sectional survey [206 physicians, physician assistants, nurse practitioners, and registered nurses]	Variance-based structural equation modelling	(a) Perceived helplessness over process(b) Perceived dissatisfaction with outcomes
Sarradon-Eck et al. (2021)	Mobile health (mHealth) apps	France		(a) Semi-structured face-to-face interviews [20 general practitioners in private practice](b) Two focus groups [seven and nine general practitioners in private practice respectively]	Content analysis	(a) Potential risks for patients associated with use of technology such as addiction, radiation, issues in relationships, and cognitive changes (b) Potential risks for patients arising from the possibility that the system may not provide relevant, factual or evidence-based information(c) Potential risks for patients related to data privacy and security(d) Concerns related to delivering desired patient care(e) Fear of self-medication or treatment leading to patient isolation, higher anxiety or false sense of getting treatment, as required(f) Too much standardization of the medical decision-making process(g) These systems can increase social inequalities in health, since their use may be linked with income level, digital skills, and/or language proficiency(h) Increased workload and time commitment for the provider(i) Fears about medical liability(j) Fear of dehumanization of patient-provider relationship(k) Worries about commercial exploitation of patients

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Study	Product	Country	Theoretical framework	Data collection method /Sample size	Data analysis approach	Sources of resistance*
Wang et al. (2021)	Telepsychotherapy	China & The United States		On-line survey [164 China American Psychoanalytic Alliance (CAPA) practitioners and 165 US psychoanalytic practitioners (matched for age)]	Comparison of survey results collected from the Chinese and the US sample	The resistance to use teletherapy after the onset of COVID-19 pandemic is high in US psychoanalytic practitioners as compared to the CAPA practitioners who have been trained in and actually delivered treatment online since 2006

Appendix III. Multi-stakeholder perspective on resistance to e-health innovations

Study	Product	Country	Theoretical framework	Data collection method /Sample size	Data analysis approach	Sources of resistance*
Weitzman et al. (2009)	Health information systems (Personally controlled health records)	The United States		(a) Focus groups(b) Semi-structured individual interviews, interviews(c) Content review of email communications[20 administrators, clinicians, and institutional stakeholders; 52 community members and 250 subjects who participated in the full demonstration]	Thematic analysis	(a) *Societal level factors*- poorly defined locus of responsibility related to information accuracy and integrity- institutionally prioritizing health information technology to advance healthcare- liability risks,- impact on workflow- vendor-related concerns- no clear policy guidelines- no unique patient identifiers(b) *Interpersonal level factors*- resistance of providers to give patients access- time constraint- concerns about provider/patient roles- issue related to power sharing(c) *Individual level factors*- low technological knowledge- low self-efficacy especially of older users- uncertainty- issues related integrity, hesitation, and distrust
Takian et al. (2012)	Electronic health records	The United Kingdom	Sociotechnical Changing	(a) 48 in-depth interviews with a variety of internal and external stakeholders(b) 26 h of on-site observations (c) 65 sets of relevant documents	Inductive and deductive analysis	(a) Challenging, cumbersome to implement(b) Time-consuming, bureaucratic, and obstructive(c) Limited scope of customization if regulatorily imposed(d) Technological skills and knowledge of users(e) Inadequate training of users(f) Resistance to cultural and work environment changes
Alajlani & Clarke (2013)	Telemedicine	Jordan and Syria		(a) Questionnaire survey [50 respondents in each country between 25 and 65 years in age] (b) Face-to-face semi-structuredinterviews of 45 professional participants [22 in Jordan and 23 in Syria]	Thematic analysis	(a) Resistance from both doctors and patients, as well as from both the public and private sectors(b) Lack of infrastructure(c) Lack of technological knowledge and

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Study	Product	Country	Theoretical framework	Data collection method /Sample size	Data analysis approach	Sources of resistance*
						technology-related training(d) Lack of funding(e) Fear about consequences(f) Cultural factors more prominent than technical factors
Wang et al. (2015)	Inter-hospital electronic patient records exchange system	Taiwan	(a) Healthcare Information Systems EvaluationFramework(b) Technology Acceptance Model	Cross-sectional survey [155physicians, 28 medical record staff, and 196 patients]	(a) Exploratory factor analysis(b) Multivariate general linear model	(a) Privacy violation(b) Fear of misinterpreting the content(c) Security of data(d) Escalation of workload (e) Fear of misuse of innovation
Campling et al. (2017)	Tele-healthcare devices	The United Kingdom		(a) Focus groups [27 individuals above the age of 60(b) Telephonic semi-structured interviews [27 key supply chain players]	Thematic analysis	(a) Unawareness of the variety of devices and their usefulness(b) Lack of familiarity with terminology(c) High costs and complex supply routes (d) Lack of professionals' expertise in device usage
Safi et al. (2018)	New medical technologies in healthcare settings	Germany	(a) Technology Acceptance Model(b) Unified Technology Acceptance and Use of Technology Model(c) Theory of Technical Innovation Diffusion	Qualitativemethodology based on exploratory design. The target group included patients' medical institutions and medical professionals	Content analysis	(a) Differences in individual opinions(b) Interference in professionals' ability to make independent diagnoses of disease(c) Interference in professionals' relationships with their patients(d) Seen as a tool for management control
Hans et al. (2018)	Electronic patient-reported outcomes(ePRO) mobile application and portal system	Canada		(a) Focus groups(b) Training sessions(c) Issue tracker reports [Primary care providers (six) and their patients (12) who used the ePRO mobile application and portal]	Thematic analysis	(a) Liability concerns(b) Increased documentation requirements(c) Higher provider anxiety related to disruption of interaction with the patient(d) Increased patient engagement demands (e) Adherence of providers to with existing workflows rather than adapting to the changes required by the innovation
Choi et al. (2019)	Telemedicine	South Korea		Delphi study[50 government policy-making officials, physicians, industrialists,and patients participated in the first round, 36 in the second round, and 30 in the third round, with 60% respondents completing all three rounds]	Descriptive analysis	(a) Lack of proper medical services delivery system (b) Fear of disruption in patient care schedules
Alrahbi et al. (2022)	Health information technology	United Arab Emirates	Stakeholder Theory	Survey of 148 stakeholders [patients, health-care providers, citizens and foresight experts]	(a) Exploratory factor analysis(b) Confirmatory factor analysis	(a) Lack of proper communication and mistakes(b) Interoperability of system(c) Difficulty in using the technology(d) Data safety and security (e) Cost, usability and effectiveness of the technology(f) Compatibility between new and old technology and maintenance of technology(g) Challenge to invest in and learn technologies changing at a fast pace(h) Concerns regarding balance in costs and time(i) Lack of awareness about

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Study	Product	Country	Theoretical framework	Data collection method /Sample size	Data analysis approach	Sources of resistance*
						features and benefits(j) Challenges in providing quality care
Poss-Doering et al. (2018)	Personal electronic health records	Germany		(a) Posttrial Semi-structured interviews with 11 patients and three physicians(b) Study-specific patient questionnaire and researcher's notes	(a) Content analysis in MAXQDA Analytics (b) Descriptive analysis of participantcharacteristics	(a) Worries about financing and use of functionally pared down versions(b) Technical challenges in usage(c) Concerns about data privacy(b) Resistance from older patients and professionals
Serrano et al. (2020)	Telemedicine	Spain	(a) Stakeholder Theory(b) Lluch's Model	Case study method based on literature review, observation and 33 interviews across 19 different types ofstakeholders	Content analysis	(a) Low funding and investment(b) Fragmented system with many actors, posing alignment and coordination problem(c) Less commitment to collaborative work(d) Organizational complexity(e) Resistance to change in healthcare professionals (f) Low integration with pre-existing information systems(g) Low data integrity(h) The technology is still nascent with limited commercial options(i) Technology-related barriers are high in healthcare professionals (j) Extra time devotion by health professionals without additional compensation(k) Lack of conducive organizational culture (l) Low awareness about the potential use of this technology
Cijvat et al. (2021)	Patient-accessible electronic health records	The Netherlands & Sweden		14 semi-structured interviews with 16 key informants from both countries	The consolidatedframework for implementation research was used to guidecontent analysis	(a) Resistance from healthcare professionals (b) Technical barriers

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Shalini Talwar is an Associate Professor at S P Jain Institute of Management & Research (SPJIMR), Mumbai, India. She has an MBA and PhD in Management Studies with over 26 years of experience in industry and academia. Her research in diverse areas such as behavioral finance, corporate finance, digitalization and mobility, sustainability, and consumer behavior appears in Technovation, Journal of Business Research, International Journal of Hospitality Management, Technological Forecasting & Social Change, Journal of Sustainable Tourism, Psychology and Marketing, Business Strategy and Environment, and IEEE Transactions on Engineering Management among others.

Amandeep Dhir is a Professor of Research Methods at the University of Agder, Norway. He is also a visiting professor at the Norwegian School of Hotel Management, University of Stavanger, Norway. His research appears in the Journal of Business Ethics, Human Relations, Tourism Management, Asia Pacific Journal of Management, Journal of Sustainable Tourism, International Marketing Review, Psychology and Marketing, Technology Forecasting and Social Change, Journal of Business Research, Technovation, Business Strategy and Environment, IEEE Transactions on Engineering Management, Computers in Human behavior, Computers in Industry, International Journal of Hospitality Management, Information Technology & People among others.

Nazrul Islam is Chair Professor of Business & Director of Research Degrees, and Associate Director for UEL Centre of FinTech at Royal Docks School of Business and Law, University of East London, UK. He holds a PhD in innovation management. His research interest focuses on interdisciplinary fields: the management of technology; technological transformation; the emergence and growth of disruptive technology-based innovation; Industry 5.0, and SMEs business sustainability. His research was published in the leading international journals, and he has complemented his peer reviewed journal efforts with three books. Prof Islam's research received international awards including the 'Brad Hosler Award for Outstanding Paper' from USA; and the 'Pratt & Whitney Canada Best Paper Award' from Canada. Prof Islam serves on the board of directors for Business and Applied Sciences Academy of North America, USA. He is an Associate Editor for *Technological Forecasting & Social Change*, Department Editor for *IEEE Transactions on Engineering Management*, and Editor-in-Chief of *International Journal of Technology Intelligence and Planning*.

Puneet Kaur is an Associate Professor in Work and Organization Psychology at the University of Bergen, Norway. Her research appears in the Human Relations, Journal of Business Ethics, Journal of Sustainable Tourism, Technology Forecasting and Social Change, Journal of Business Research, Business Strategy and Environment, IEEE Transactions on Engineering Management, Computers in Human Behaviour, among others .

Ahlam Almusharraf is an Assistant Professor at Princess Nourah Bint Abdulrahman University, College of Business and Administration, Riyadh, Saudi Arabia. She has a PhD in Business Administration with concentration in Information Systems. Her research interest is on topics related to AI, IS applications, social media, e-commerce and ICT.