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Review Article

THE ANTECEDENTS AND CONSEQUENCES OF E-HEALTH LITERACY IN THE PHARMACEUTICAL INDUSTRY: AN AGENDA FOR FUTURE RESEARCH

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ABSTRACT

As a promising area in healthcare research, electronic health (e-health) has received more research attention recently. The purpose of this paper is to develop and validate a proposed conceptual framework for digital health literacy. This conceptual framework is planned as a guide for future studies to use and validated as a foundation for quantitative studies to investigate the e-Health Literacy as perceived by citizens in Asia amid the outback of the world's high-risk pandemic crisis such as Coronavirus (Covid19). This conceptual analysis applied Technology Acceptance Model as a basis to develop the antecedents of a healthy lifestyle among the citizens of Asian countries. This conceptual paper proposed that Information quality, system quality, and service quality will affect the citizens' perceived ease of use and their perceived usefulness, which can affect their intention to use e-health and consequently results in a healthy lifestyle among the citizens. This conceptual paper submitted research hypotheses that will be a basis for future researches in Asia and if the framework is validated, recommendations will be offered to various stakeholders on how to improve a healthy lifestyle in Asia. Specifically, the proposed conceptual framework if validated will help policymakers to offer positive policies and procedures for the improvement of thriving healthcare industries in Asia.

Keywords: Healthy lifestyle, Technology Acceptance Model, Information quality, COVID-19, e-health

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INTRODUCTION

Healthcare is vital for the development of any nation both developed and developing countries. Compared to developed countries, in developing countries such as Indonesia and Malaysia because of the shortage of medical supply and the unequal expansion between the medical supply and healthcare demand, it is difficult for the citizens to obtain sufficient medical services at a high cost [1]. In addition to the shortage of medical supply, there is a high rise in mortality and morbidity of different kinds of chronic diseases [2]. Due to these situations, however, efforts have been made by various countries on how to decrease healthcare costs, enhance the diagnosis efficiency of the patient and patient treatment, and patient monitoring has happened to the focal point of the world healthcare industry [2].

As the world is presently battling the coronavirus disease which World Health Organization (WHO) declared on March 11, 2020, as a world high-risk pandemic [3]. Association of Southeast Asian Nations (ASEAN) nations, including Indonesia and Malaysia, are not exempted from COVID-19. As the fourth world's most populous country, Indonesia is forecasted to suffer significantly from coronavirus infection in contrast to countries with less population [4]. These countries reported new cases, including deaths [5]. Fig. 1 and fig. 2 reported the trend of COVID-19 cases in both Indonesia and Malaysia [6].

The advance of many diseases globally such as the COVID-19 pandemic has resulted in grave disruptions to humanity causing serious health and economic catastrophe. This particular situation provides a new avenue for digital transition in various sectors and general society at large such as e-health literacy [7]. For instance, the entire educational sector at all levels from primary schools to high institutions has developed a new digital approach for teaching from classroom lectures to online lectures [7]. In the context of healthcare, digital technology is vital as the industry responds to the pandemic via the unprecedented used of digital tools and advanced technology to improve healthcare delivery among the Asian countries to tackle acute requirements of the pandemic consequences using various technology applications [7, 8]. Therefore, the COVID-19 and similar world pandemic have demonstrated the significance of e-health services and digital applications to provide care for the citizens [7]. Various medical practitioners and patients the same now understand the full vital of using digital tools and utilize them and connect people face-to-face especially visiting hospitals now are impossible.

The COVID-19 pandemic thus may be the crucial moment for e-health across various countries especially providing an important avenue for the remote delivery healthcare in these countries. In this regard, social media is now a vital avenue of healthcare communication using various platforms including Facebook and Twitter. Using the likes of Facebook and Twitter, citizens can discuss a variety of topics crucial to healthcare staff, such as the use of personal protective equipment (PPE), measures used for self-isolation, and issues on how to control the respiratory conditions, among others. Finally, patient management issues are the most significant development as it enables citizens to apply digital tools that protect vulnerable patients from exposure and risks of going to the hospital which ultimately promotes social distances and healthcare workers protections [8]. Therefore, understanding the antecedents of a healthy lifestyle among Asian citizens is important.

E-health is also known as health information technology or telemedicine is defined as "the use of information and communication technology (ICT) for health" [9]. In this study for consistency purposes, e-health is used throughout the paper. In other words, e-health is defined as the "delivery and management of health information for and by healthcare providers, receivers and policy-makers through the Internet and telecommunications using computers, PDAs, mobile phones and other digital devices" [10]. In this paper, e-health refers to the delivery and management of information related to health by the patients through the internet using PDAs, phones, computers, and other related devices.

E-health service is important because of the following reasons: firstly, it provides healthcare services from a distance which separates various participants [11]. Secondly, E-health can decrease the possible inefficiencies in healthcare provision. Thirdly, E-health has the potential of reducing patients' waiting time and travel time. Fourthly, E-health can augment access of specialist doctors to rural patients. Fifthly, e-health has the possibility of empowering patients to comprehend their sickness, partake in health treatments among others [11]. Despite the significance of E-health, its adoption is a

serious challenge, particularly in developing economies such as Malaysia and Indonesia. Besides, literature reported low patients' involvement can hinder the achievement of the desire goal and objectives of the e-health services [12]. Although many studies investigated the citizens' adoption of e-health services, however large volume of these studies concentrates on physicians' perspectives and limited studies consider patients' perspectives given patients play an important part in the success of any e-health programs. Hence, this paper is expected to contribute to understanding how patients adopt e-health services in Asia. A recent study further found that digital health-care tends to provide valuable medical-related information than traditional approaches. However, the scholars expressed fear of unreliable information that might be electronically made available to patients without adequate confirmations [13]. Similarly, it was established that patients in rural areas tend to trust physicians more than pharmacists in embracing medical information [14]. Therefore, e-health-care will tremendously attract more patients if it is effectively implemented.

Distant communications and video conferencing of patients with doctors through e-health [11], can offer superior, flexible, and rural healthcare support to citizens of developing countries including Malaysia and Indonesia [11]. The e-health's prime aim is to develop care services to the geographically deprived and poor categories of the society by providing them with quality healthcare at a lower cost and with superior convenience [11]. Although e-health has received high attention worldwide, literature reported lagging rate implementation and patients' adoption rate [8]. This study develops on possible antecedents that elicit patients' prospects to adopt e-health in Asia, specifically, Malaysia and Indonesia. The paper was drawing on the TAM and provide a comprehensive literature review of the antecedents of a healthy lifestyle. Although various models were tested in various studies, the external factors and mediators of e-health services should be investigated concurrently. Moreover, this paper provides a full conceptual framework for citizens' e-health services study to quantitatively analyze the model in Asian countries. Fig. 4 provides the Conceptual Framework of the study.

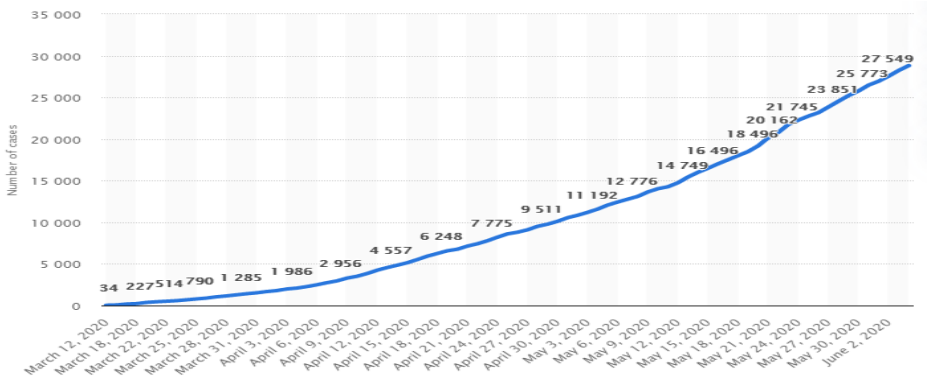

Fig. 1: Total number COVID-19 in Indonesia

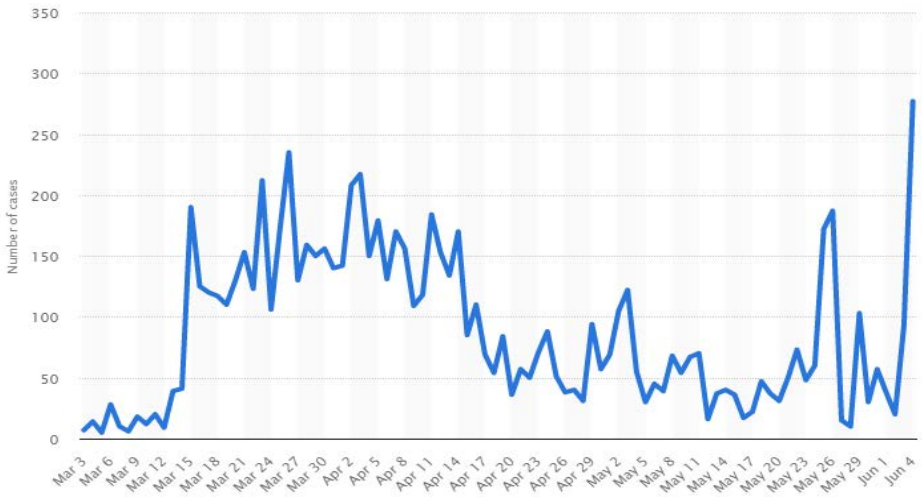

Fig. 2: Total number of daily COVID-19 cases in Malaysia from march to may 2020 [6]

Health literacy and digital health literacy

E-Health and digital literacy have received a lot of attention as a subfield in medical informatics using information technology applications and tools in the healthcare industry [15]. E-Health is defined as the "health services and information delivered or enhanced through the Internet and related technologies" [16]. Using e-health services, patients can manage their illness, communicate with healthcare providers, including peers using social networks, and promoting healthy lifestyles, among others. It was further found that the virtual health-care system avails both the patients and medical practitioners the opportunity of expediting medical-related services tracking within a limited time and also offers the aged ones the option of choosing home treatment [15, 17] defined health literacy as any challenge individual faces included in finding, using, understanding, and evaluating health information and services. Therefore, e-Health literacy or Digital Health Literacy refers to "the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving health problems"[18]. In other words, digital literacy refers to individuals "being able to make use of technologies to participate in and contribute to modern social, cultural, political

and economic life" [19]. Digital literacy consists of the patients' ability to make use of the information systems and similar supporting infrastructure. For instance, patients' ability, knowledge, and skills of entering/typing information using a keyboard or the skill on how to use a mouse.

Skills related to e-Health literacy will enable the patients and empower them to involve in healthcare decision making [18] which will improve patients' health outcomes including quality healthcare [20]. Prior empirical studies have recognized that e-Health literacy is significantly and positively related with patients' health behaviors, knowledge and patients ability to participate in health screening, using mobile technology to accomplish healthcare objectives and goals, research related to healthcare, seeking medical advice among others [21-24].

Patients low of e-Health literacy skills are expected to experience difficulties in getting consistent e-Health information [22]. Various studies have reported that patients with insufficient e-Health literacy skills are likely not to use e-health services, especially people with cardio-vascular illness [25]. Prior researches have recognized that digital literacy levels affect patients' engagement with information technology. On the other hand, lack of computer knowledge and related skills with low computer understanding have been identified to influence patients' attitudes towards e-health and be one of the major barricades for patients adopting e-health services [25]. Therefore, given the rising utilization of information technology in healthcare, it is significant for patients to be digitally literate [18].

Technology acceptance model (TAM)

The Technology Acceptance Model (TAM) is one of the modern theories of application of technology in various fields, including e-health services [12; 26]. TAM is utilized to support the conceptual framework in this study. TAM has been one of the most influential models in technology research [27]. The TAM is extracted from the Theory of Reason Action (TRA) [28]. This theory is an adjustment of the TRA modified purposely for information systems to elucidate the citizens' intention or user's intention to accept or use a particular technology in various context, including e-health services [29, 26].

[28] explained the rationale of TAM as one of the vital models that explain the determinants of technology acceptance and is usually capable of explaining end-user use of technologies such as e-health services. As stated by TAM, patients' intention to use e-health can be influenced by their perceived usefulness (PU) and perceived ease of use (PEU) of the system [30]. PU is defined as "the degree to which a person believes that using a particular technology will enhance his or her performance," and PEU refers to "the degree to which a person believes that using a particular system would be free of effort" [28]. TAM is an important theory used to evaluate users' acceptance of technology and has become a significant theoretical tool for e-health research [30]. Even though an expansion of TAM has been reported as a unified theory of use and acceptance of technology few studies tested the model healthcare context. For instance, [31] established that TAM significantly predicts part of the users' acceptance of e-health. Various empirical studies on e-Health services tested TAM and the theory is suitable for the healthcare context [32, 33]. TAM is presented in fig. 3 [28].

Methodology

In this literature review, previous empirical studies were gathered; high impact articles were comprehensively searched. The well-known electronic databases, including Science Direct, SAGE, Emerald, EBSCO, Web of Science, Taylor and Francis, Scopus, and Google Scholar were used. Additionally, the search words applied for extraction of the relevant articles were "Health Literacy", "Digital Health Literacy", "COVID-19", "Technology Acceptance Model", "e-Health", "Information Quality", "System Quality", "Service Quality" "Perceived Usefulness", "Perceived Easy to Use" and "Healthy Lifestyle". This resulted in the gathering of quality articles containing these terms. The published articles over the previous decade, i.e., from 2010 to 2020 were extracted for the review. In addition to the published articles, published reports from WHO, Association of Southeast Asian Nations (ASEAN) nations, and Statista were used.

A Conceptual framework and hypotheses development

Several empirical studies have shown some concerns as regards the use of TAM with Davis' [28] main constructs to understand patients' intention towards e-health services. For this reason, in investigating user adoption of e-health services, using the intention of patients cannot be adequately clarified with few variables from the model [34]. The particular adoption of e-health services among patients in Asia can be understood using multiple organizational factors that are not captured in the TAM model. Prior studies in another context such as e-government, mobile banking adoption among others have reported the effect of a range of external factors such as Information Quality, Service Quality, and System Quality as external factors can extensively modify patients' behavior towards the adoption of e-health services. E-health services symbolize an enhanced option for healthcare in developing countries such as Malaysia and Indonesia; therefore, it is significant to incorporate additional external constructs (Information Quality, Service Quality and System Quality) into TAM model and test how these constructs can predict the perception of patients in term of their PEU and PU. Further, investigating the outcomes of e-health intention is very limited using TAM. Consequently, this paper has included the healthy lifestyle variable as an outcome variable of patients' intention to used e-health services into the model. The expanded conceptual and theoretical model is in fig. 4.

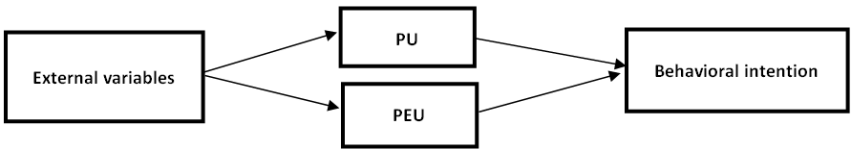

Fig. 3: Technology acceptance model [28]

Intention to use e-health (digital health)

Information quality

In the information and technology literature and user adoption of the information technology field, Information quality refers to the user perception of the accuracy, relevance, timeliness, and sufficiency of the information provided by particular systems [3]. In the context of this study, Information quality is defined as the patients' perception of the accuracy, relevance, timeliness, and sufficiency of the information provided by particular e-health systems [35]. Patients usually look for different information while using e-health services [18]. Thus, inaccurate or outdated information weakens patients' experience of that particular system and is an indication that the system is not able of providing the patients with timely and quality information, which can influence their perceived usefulness and perceived easy to use [36]. A subsequent study also emphasized the need to revitalize therapeutic inefficiencies by ensuring that high-grade drug and genuine information are made available to both the public and healthcare professionals towards promoting the perceived usefulness of e-healthcare [37]. Prior studies have equally reported the significance of information quality on perceived usefulness and perceived easy to use across the various fields of technology adoptions [35]. Similarly, various studies on users' technology adoption have found perceived usefulness and perceived ease to use are significantly

linked with information quality [36, 38, 39]. Therefore, the following hypotheses are proposed:

Proposition 1: Information quality has a positive significant effect on the perceived usefulness

Proposition 2: Information quality has a positive significant effect on the perceived easy to use

System quality

In information and technology research, system quality refers to the citizens' perception of quality and overall performance demonstrated in a particular system [40]. In this study, system quality refers to patients' perception of quality and overall performance demonstrated in a particular e-health service such as visual appeal, access speed, and navigation. Various empirical studies using technology adoption in many fields reported that users are likely to build a high degree of confidence in a particular system if they recognize the system to be qualitative, which supports the individuals to use enough time on that system [35]. In the context of this study, if the patients perceived a particular system to be of high quality, patients are expected to a build high degree of confidence in that particular system.

In the existing literature, various studies reported the significant positive relationship between system quality and users' perceived usefulness and perceived ease of use of the system [41]. Thus, the paper hypothesizes that:

Proposition 3: System quality has a significant positive effect on the perceived usefulness

Proposition 4: System quality has a positive significant effect on the perceived easy to use

Service quality

In the information and technology adoption context, service quality refers to the users' perception of the ability of a particular system to offer responsive, reliable, personalized, and assured services to the individuals' users [35]. In this study, service quality refers to the patients' perception of the ability of a system to offer responsive, reliable, personalized, and assured e-health services to them. Reliability and efficiency in the services offer the patients that the services are of high quality, which allows the patients to trust the system and use the system [35]. Earlier literature has reported service quality as a determinant of PU and PEU in the extended TAM model [38]. If the patients perceived the system as very qualitative to a certain level, patients are likely to use the system and perceived the system as easy to apply [38]. Moreover, to intensify the quality of health-care delivery, health practitioners have recently integrated Nanosuspension, a new delivery system that enhances the safety of aqueous dissolvability and bioaccessibility for peaky made soluble medicines [42]. The further study proposed that the recent introduction of the use of polymeric medicine distribution method via hydrazone connector will improve quality health-care delivery services. This is because the PH as hydrazone contains, will sensitively join medications and relief those that have already developed tumors [43]. Conversely, unreliable services can make patients avoid using the system because they may think the system is not useful to them [38]. Thus, the following hypotheses:

Proposition 5: Service quality has a positive significant effect on the perceived usefulness

Proposition 6: Service quality has a positive significant effect on the perceived easy to use

Perceived usefulness (PU) and perceived easy to use (PEU)

Drawing from TAM, intention to use e-health can be influenced by PEU and PU [30]. PU is "the degree to which a person believes that using a particular technology will enhance his or her performance," and PEU is "the degree to which a person believes that using a particular system would be free of effort" [28]. In this model, PU and PEU are expected to directly predict the patients' intention to use e-health [30]. PU and PEU are reported as main constructs in predicting users' intend to use a particular technology in various contexts [44]. The important argument here is that individuals can demonstrate high intention to use e-health if they recognize its usefulness and easy to use. Therefore, the more users perceived technology as useful and easy, the more they have the intention to use that technology, including e-health [30].

In the existing literature using TAM, empirical studies have utilized and reported the important TAM in the users' acceptance of information technology, such as e-Health [32, 45, 46]. For instance, [47] use the TAM and examine the older citizens' adoption of e-Health in Sweden. Their finding demonstrated that PU and PEU are the major antecedents of older people's intentions to use e-Health in that context. In a similar context, [48] applied TAM in a study to investigate patients' adoption of e-Health; the finding of this study revealed PU and PEU are the major antecedents of older people's intentions to use e-Health. In the context of citizens use e-government portals, [49] reported a higher degree of PU and PEU is significantly linked to use of e-government portals in Jordan. Given the above-reviewed literature the following hypotheses are formulated:

Proposition 7: Perceived usefulness has a positive significant effect on the intention to use e-health

Proposition 8: Perceived easy to use has a positive significant effect on the intention to use e-health

Healthy lifestyle

A healthy lifestyle is defined as the patients' changes in health conduct following the constant use of e-health [50]. For instance, a healthy lifestyle comprises exercising, controlling diet, modifying bedtime habits, controlling weight, and regular eating of fruits and vegetables among others [50]. The surfacing of e-health technologies provides extremely reachable and low-cost information to encourage healthy habits among patients [51]. Since many countries have developed numerous e-health intervention programs to aid citizens to avoid unhealthy behavior such as smoking and intervention programs to monitor and treat various pandemic such as COVID 19. It is expected in this study that patients' intentions to use e-health can result in a healthy lifestyle among the patients. For example, [52] submitted the link between users' intention to use e-health and healthy lifestyle among young adults in Australia. Likewise, [53] submitted the link between users' intention to use e-health and a healthy lifestyle [50] opined that a healthy lifestyle is an important concern of e-health adopters and concluded that people who are persistent and intend to use e-health services are more expected to experience a healthy lifestyle, as health habits necessitate sustained e-health use. Because of the above-reviewed literature, the following hypothesis is formulated:

Proposition 9: Intention to use e-health has a positive significant effect on the healthy lifestyle

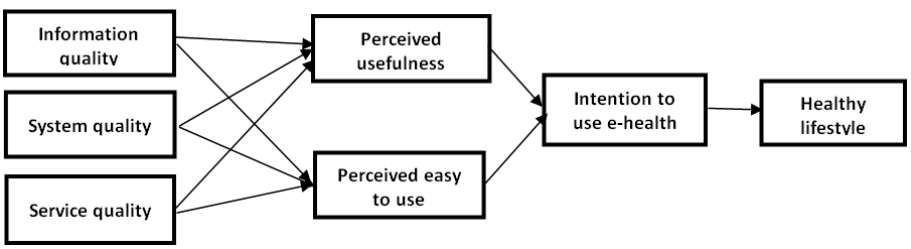

Fig. 4: Conceptual framework

CONCLUSION

Healthcare is an emerging and reputable industry in improving the economic system in the developing countries especially Malaysia and Indonesia [54],[55]. As a promising area in healthcare research, e-health has received more research attention recently. This paper developed and proposed a conceptual framework for digital health literacy. This conceptual framework is planned as a guide for future studies to use and validate as a foundation for quantitative studies to investigate the e-Health Literacy as perceived by patients in Asia amid the outbreak of the world's high-risk pandemic crisis such as Coronavirus (Covid19). Drawing on Technology Acceptance Model, the antecedents of a healthy lifestyle among the citizens of Asian countries were reviewed and research hypotheses were offered. It is recommended that more Asian values such as entrepreneurial skills acquisition [56], [57] and cultural diversity [58] can be moderating variables to advance the conceptual framework theoretically. Finally, recommendations are proffered to various stakeholders on how to improve a healthy lifestyle in Asia.

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INTERESTS

Declared none

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