Determining the intention to use app-based medicine service in an emerging economy

Article · May 2023

DOI: 10.1080/20479700.2023.2198186

6 authors, including:

Selim Ahmed
World University of Bangladesh
64 PUBLICATIONS **1,195** CITATIONS
SEE PROFILE

Dewan Mehrab Ashrafi
East West University (Bangladesh)
26 PUBLICATIONS **190** CITATIONS
SEE PROFILE

Musfiq Mannan Choudhury
University of Dhaka
12 PUBLICATIONS **526** CITATIONS
SEE PROFILE

Muhammad Khalilur Rahman
University of Malaysia, Kelantan
145 PUBLICATIONS **2,674** CITATIONS
SEE PROFILE

International Journal of Healthcare Management

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/yjhm20

Determining the intention to use app-based medicine service in an emerging economy

Selim Ahmed, Ibrahim Alqasmi, Dewan Mehrab Ashrafi, Musfiq Mannan Choudhury, Muhammad Khalilur Rahman & Muhammad Mohiuddin

To cite this article: Selim Ahmed, Ibrahim Alqasmi, Dewan Mehrab Ashrafi, Musfiq Mannan Choudhury, Muhammad Khalilur Rahman & Muhammad Mohiuddin (2023): Determining the intention to use app-based medicine service in an emerging economy, International Journal of Healthcare Management, DOI: 10.1080/20479700.2023.2198186

To link to this article: https://doi.org/10.1080/20479700.2023.2198186

Published online: 01 May 2023.

INTERNATIONAL JOURNAL OF HEALTHCARE MANAGEMENT
https://doi.org/10.1080/20479700.2023.2198186

Taylor & Francis
Taylor & Francis Group

Determining the intention to use app-based medicine service in an emerging economy

Selim Ahmed [a], Ibrahim Alqasmi [b], Dewan Mehrab Ashrafi [c], Musfiq Mannan Choudhury [d], Muhammad Khalilur Rahman [e] and Muhammad Mohiuddin [f]

[a]World School of Business, World University of Bangladesh, Dhaka, Bangladesh; [b]Public Health School of Health Sciences, Saudi Electronic University, Riyadh, Saudi Arabia; [c]ULAB School of Business, University of Liberal Arts Bangladesh, Dhaka, Bangladesh; [d]Department of Management, University of Dhaka, Dhaka, Bangladesh; [e]Faculty of Entrepreneurship and Business, Angkasa-Umk Research Academy, Universiti Malaysia Kelantan, Pengkalan Chepa, Malaysia; [f]Department of Management, Laval University, Québec, Canada

ABSTRACT

The study investigates the customers' intention to use app-based medicine services in an emerging economy. This study explores the indirect effects of perceived usefulness, perceived ease of use, perceived security and perceived delivery with the intention to use app-based medicine services through the mediating effect of perceived trust. The present study developed a self-administered survey questionnaire to collect data from 336 respondents who were using app-based medicine services in Bangladesh. The data was collected between March 2022 and May 2022. The collected data were analysed using SmartPLS-4 to determine the reliability and validity of the constructs. The study's findings indicate that perceived usefulness, perceived ease of use, perceived security, and perceived delivery positively and significantly ($t > 1.96$; $P < 0.05$) influence the perceived trust in app-based medicine services. The research findings also indicate that perceived ease of use, perceived delivery, and perceived trust significantly ($t > 1.96$; $P < 0.05$) impact the intention to use app-based medicine services. This study highlights to explore the success factors such as consumer perceived usefulness, perceived ease of use, perceived security, and perceived delivery that can increase customers' trust to use app-based medicine services in the developing economy.

ARTICLE HISTORY
Received 14 December 2022
Accepted 29 March 2023

KEYWORDS
Intention; perceived trust; app-based medical service; emerging economy; PLS-SEM

Introduction

The COVID-19 outbreak has induced changes in an individual's feelings, cognition, consumption patterns, and social conduct. People have started to prefer using online platforms for purchasing goods and services as a way to avoid crowded settings and lower their risk of contracting COVID-19. The COVID-19 crisis has also developed dynamism in digital services throughout the country and expanded the scope of online medicine services. Recently, purchasing medicines has become increasingly digitalized, which refers to online medicine services. App-based medicine services differ from other app-based services in that they focus solely on providing medicine to patients based on their individual needs and physician-prescribed medications [1]. They provide customers with comprehensive information on the medicine they are purchasing, including its active ingredients, indications, generic names, dosage administration, side effects, precautions and warnings, storage conditions, safety guidelines, and instructions [2]. Additionally, these services are available 24/7, allowing customers to purchase medication at any time of day or night, reducing both the time and effort required to visit a pharmacy in person and the hassle of dealing with paperwork. Furthermore, app-based medicine services are designed to help patients make informed decisions about their medications and keep track of their medications, making it easier for them to adhere to their treatment plans.

App-based medicine services are increasingly being adopted in developed markets due to their convenience and cost savings. However, according to Mathrani et al. [3], many developing markets lack the digital infrastructure to offer online services and allow citizens to purchase goods and services online. In Bangladesh, one of the world's emerging economies, app-based medicine has only recently begun to gain the attention and interest of consumers, in contrast to its widespread use in developed countries [4,5]. They often face greater challenges than those in developed markets, such as a lack of access to quality healthcare and health literacy [4]. This increases the demand for app-based medicine services in emerging markets, as they can provide access to medicine without requiring an in-person visit to a local pharmacy. There is often a lack of broadband access, reliable internet connections, reliable payment

CONTACT Selim Ahmed selim.ahmed@business.wub.edu.bd World School of Business, World University of Bangladesh, Uttara, Dhaka 1230, Bangladesh

facilities, and access to reliable medical data, which can limit the effectiveness of such services in emerging markets [4,5]. In addition, medical services in emerging markets may not have the same level of quality and safety standards as those in developed markets, further increasing the need for app-based medicine services. As such, app-based medicine services are beneficial for those with limited financial resources, mobility, or difficulty accessing pharmacies due to time or location constraints. The size of the pharmaceutical market in Bangladesh is approximately $3 billion [6]. In the 2020–2021 fiscal year, Bangladesh made $169 million from the export of pharmaceutical products to 150 nations. By 2025, Bangladesh's medicine exports are projected to reach $450 million [6]. According to Statista [7], the online medicine market is expected to increase from its current level of US $59.00 m in 2022 to US$172.90 m by 2027, at an annual growth rate of 23.99%. Moreover, according to Business Inspection [8], in terms of international pharmaceutical exports, Bangladesh is ranked 71st, out of a total of 134 countries. This context provides an opportunity to examine antecedents that impact consumers' intention to use app-based medicine services in an emerging economy [4].

App-based medicine services are becoming increasingly popular among consumers due to their range of benefits and features that make managing healthcare much easier. The convenience of ordering medications from home is a major factor influencing consumer decisions to use these apps, as is the ability to compare prices from various online pharmacies in order to find the most cost-effective option [9]. Additionally, users can upload prescriptions, quickly check for the availability of medications, and receive their orders within a few days [10]. Furthermore, online pharmacy apps can help users find generic versions of medications, which are often cheaper than their brand-name counterparts [11]. Finally, they also provide patients with a record of their medical and medication history, allowing them to easily access information about past treatments via the internet-based app [12].

Despite the many advantages of app-based medicine services (e.g. quick transaction, ease of ordering, navigation through mobile apps, delivery of medicines), many consumers in developing markets still need to be convinced about using app-based medical services due to their lack of skill in using ICT systems, their fear of insecure online financial transactions, and the quality of the delivered products. Hence, there still needs to be more evidence of the determinants of customer trust that affect their intention to use app-based medical services [5], and it is pivotal to investigate which constituents foster and prevent the acceptance of app-based medical services. Consumer trust is essential for any medicine service, whether delivered through a traditional or app-based platform and this relationship between consumer trust and medicine services translates into app-based medical services in that users need to have faith that the app they are using is secure, safe, and effective in providing the medicines they are seeking [9]. App-based medicine services should focus on providing consistent, reliable customer service, up-to-date technology and security measures, transparency, quality and efficacy guarantees, detailed product information, secure payment options, and reliable shipping and delivery options in order to build consumer trust [13]. Furthermore, they should adhere to the same standards of quality, safety, and efficacy as traditional medicine services to ensure customers can make informed decisions with confidence [10].

The existing literature investigated the role of success factors that influence customers' perceived trust towards their intention to use app-based medical services. In line with this, the concept of the Technology Accepted Model [14] and the Theory of Planned Behaviour [15] are extensively used as theoretical lenses. Moreover, it is still being determined whether perceived delivery as a constituent of TAM in app-based medical services influences users' trust and adoption intention. However, existing studies have ignored to focus on the impact of perceived delivery in generating users' intention through perceived trust [16,17]. Additionally, more attention should be given to critical factors that reflect customers' trust and its impact on their intention to use app-based medical services. Furthermore, prior studies have ignored to scrutinize the mediating role of perceived trust in app-based medical services [18–20]. Therefore, a research gap exists which needs to be addressed and validated. Consequently, this study seeks to fill the gap by answering two critical and essential research questions: (1) Do perceived usefulness, ease of use, security, and delivery influence users' trust and intention to adopt app-based medical services? (2) Does perceived trust mediates the relationship of perceived usefulness, ease of use, security, and delivery with users' adoption intention of app-based medical services?

The answers to these issues are crucial for maintaining app-based medical services' profitability, development, and long-term viability, which connects two separate groups: buyers and sellers. Marketers and policymakers can use such information to understand their customers' spending patterns better, and it has the potential to provide marketers with valuable, meaningful and practical insights into consumer behaviour. This study adds to the existing body of literature by shedding light on how users perceive app-based medical services and advances the current knowledge in various ways. Firstly, existing studies have focused on various constituents of TAM,

including perceived ease of use, perceived usefulness, perceived security etc., on users' perceived trust and behavioural intentions. This study contributes by incorporating perceived delivery as a novel constituent of TAM in determining users' perceived trust and behavioural intention in adopting app-based medicine services. Secondly, limited studies have focused on users' perception of trust in predicting users' intention to use app-based medical services [10,13]. Hence, this study adds to the theoretical depth by highlighting the role of users' trust in predicting users' behavioural intention to adopt app-based medical services. Thirdly, this study advances the existing body of literature exploring the role of trust as a mediating variable between perceived ease of use, perceived usefulness, perceived security, perceived delivery and users' behavioural intention to adopt app-based medical services. Furthermore, this study's empirical findings contribute by demonstrating how the insights might help new market entrants to establish pertinent marketing strategies to enhance their market share. Finally, this study proposes a conceptual model and explores the consumers' predecessors and their intention to use app-based medical services.

Theoretical background: Social exchange theory and Technology Acceptance Model (TAM)

The main theoretical foundation of this study is social exchange theory, which was used to investigate the interaction between variables for using app-based medical services. The foundation of social exchange theory is the idea that monetary and non-monetary incentives stimulates and drives social interactions [21]. In this study, the contextualization of social exchange theory suggests that customers are expected to have positive attitudes and actions towards the app-based medicine services in exchange for the benefits they receive [22]. According to Homans [23], a user's behaviour changes in response to shifts in the value exchanged when using app-based medical services, where the user's contributions may be seen as costs and the service's returns as gains. There are inherent responsibilities in social exchange, where one party (e.g. app-based medical service providers) does something beneficial (e.g. providing superior services) for another with the expectation of receiving something in return (e.g. customer loyalty) in the future [24]. Henceforth, app-based medical services and their users' associations stand on the idea of reciprocity, which is a central tenet of social exchange theory. The concept of reciprocity refers to an instantaneous return of favours. Prior literature also defines reciprocity as the provision of benefits for the other in exchange for similar favours or allowances to be obtained in the future [25]. Therefore, instead of being limited to a single transaction, customer-medicine service reciprocity may develop from a series of accumulated perceived service benefits. Therefore, the purpose of this study is to examine how consumers weigh the benefit and cost of app-based medicine services, with positive and negative values representing the factors that are likely to contribute to the quality of their relationships with such services in light of the social exchange theory.

We also incorporated the Technology Acceptance Model (TAM) in this study, first suggested by Davis [26], which is a commonly used framework for understanding people's responses to novel technologies. A consumer's perspective towards novel technology is predicted to be mostly shaped by their perceptions of its usefulness and ease of use [27]. In this study, how simple and convenient the technology (app-based medical services) is regarded to be by the consumer is termed as the ease of use [28]. On the other hand, perceived usefulness refers to the degree to which the integration of technology is believed to be advantageous and effective [29]. According to TAM, an individual's behavioural intention is positively impacted by perceived usefulness and ease of use [26]. Moreover, in prior literature, scholars have extended the TAM model and incorporated perceived security into the model. For instance, a study conducted by Patel and Patel [30] in the context of internet banking in India included perceived security as a pivotal antecedent impacting their behavioural intention. In this study, we aim to examine the how perceived ease of use, perceived usefulness, perceived security and perceived delivery impacts consumers' behavioural intention to use app-based medicine services through the mediated impact of perceived trust. Therefore, TAM was also included as an underpinning theory to explore the interactions amongst the variables that determines consumers' intention to use app-based medicine services.

Literature review

Perceived usefulness

The concept of 'Perceived Usefulness' has been explained by Davis [26] as 'users' perceptions of the expected benefits of using an Information System'. Regarding the online technological aspect, 'usefulness' indicates using any given technology to conduct or perform a specific task [31]. Perceived usefulness is considered the user's belief that using any given online technology will help achieve the goal of the users [32]. Generally, this concept is related to the performance of any given information technology usage [27]. Within an online environment, perceived usefulness points-outs the extent to which a user believes that buying in an online platform will provide greater access to

helpful information and a swift purchase experience. It can also be explained as consumers' perceived belief about an information technology that will enhance their value [33]. From the perspective of online commerce, perceived usefulness has been a significant determinant of consumer trust and intention to use services [34]. Ventre and Kolbe [35] evidenced that perceived usefulness is significantly connected with Mexican users' trust and intention to shop online. Furthermore, TJ et al. [13] found that the perceived usefulness of e-pharmacies positively impacts Indian consumers online purchase intention. Thus, it is proposed that,

Hypothesis 1(H1): Perceived usefulness positively impacts perceived trust in app-based medicine services

Hypothesis 2 (H2): Perceived usefulness has a positive influence on the intention to use app-based medical services

Perceived ease of use

The concept of 'Perceived Ease of Use' is explained as the faith and reliance of the technology users, which indicates that the given technology seems relatively easy and smooth for usage purposes that require less effort to use [36]. Davis [26] defined perceived ease of use as 'the degree to which a person believes that using a particular system would be free of effort' (p. 320). Perceived ease of use generally reflects the degree to which the usage of the technological system is uncomplicated from the user's perspective to use it without putting much effort [37]. In the context of the online platform, perceived ease of use indicates the extent of consumers' belief about using the internet with minimal effort [38]. In the context of the online viewpoint, trouble-free and painless usability of any given mobile app or website has significantly developed trust in the user's mind [13]. Also, according to Ma [9], better usability and workability of any given website have influenced users' trust and intention to use. In their research, Srivastava and Raina [19] found that perceived ease of use significantly influences users' trust and intention to use health-related app-based mobile services in Indian context. Hence, it is assumed that if online purchasing becomes less complicated and more user-friendly for consumers to navigate, it will enhance consumers' trustworthiness and intention to use app-based medicine services. Thus, it is proposed that,

Hypothesis 3 (H3): Perceived ease of use positively influence perceived trust in app-based medical services

Hypothesis 4 (H4): Perceived ease-of-use has a direct impact on intention to use app-based medical services

Perceived security

Perceived security has been one of the burning concerns for online consumers or users engaged in the online platform's buying process through internet connectivity [39]. The notion of 'Perceived Security' can be described as the perceived feelings of online consumers that their private information will not be disclosed to other parties at the moment of the online purchase phase [40]. Generally perceived security refers to the perception of online users that the internet-based online transaction is safe and secure, maintaining users' personal and financial information intact and secret [41]. A higher level of perceived security will make customers more trusted that all online transactions will be performed safely and securely [42]. A higher level of security has been considered to offer an assurance that consumers' private information, such as name, location, and financial card code, will not be disclosed to others for any unlawful purposes [43]. Research suggests that perceived security has been interrelated with customers' trust and intention to use products or services [44]. Hence, if consumers feel that the online transaction is safe and secure when purchasing products on app-based medicine services, there will be a positive development of trust and intention in their minds. Thus, it is proposed that,

Hypothesis 5 (H5): Perceived security has a direct relationship with perceived trust in app-based medicine services

Hypothesis 6 (H6): Perceived security positively influences intention to use app-based medicine services

Perceived delivery

In the online purchasing environment, home delivery has become a common practice provided by online shop owners [45]. It has also been a reason why people like to shop online because it seems convenient and saves them time [46]. It has also been a source of preference for online purchasing as it seems convenient for consumers by saving valuable time [46]. Delivery efficiency has become a significant factor in online purchasing [47]. Within an online commerce atmosphere, delivery time indicates the time between the placement of online order and the delivery of the product within promised time [48]. Timely delivery has been considered one of the crucial aspects of the e-commerce environment [49]. The timely delivery also affects the trust, intention to use and value perception of online consumers [17,50]. Saha et al. [51] indicated that dependable and on-time delivery would satisfy customers and boost their intention about online purchasing. Since customers are seen to have issues with delays in the promised delivery

timing [52], henceforth, it can be assumed that the ability to deliver products in due time will lead to building positive trust and intention among potential consumers who purchase medicines by using mobile apps. Thus, it is proposed that,

Hypothesis 7 (H7): Perceived delivery has a positive effect on perceived trust in app-based medicine services

Hypothesis 8 (H8): Perceived delivery has a direct impact on the intention to use app-based medicine services

Perceived trust and intention to use

Trust has been viewed as a critical element in developing a relationship with others [53]. Perceived trust can be considered as an emotional state that influences one to trust other/s depending on the good behaviour of others. According to Bisdikian et al. [54], trust can be illustrated as 'the willingness of one party (trustor) to depend or rely on the actions of another party (trustee)'. Trust can be described as the consumers' dependency on an online website or a market app through which their needs are fulfilled [55]. Perceived trust can also be explained as a psychological state that stimulates one party to believe in another, developed on trusted behavioural performance [56]. Trust can be perceived as a prerequisite to facilitating adoption and usage concerning the mobile commerce market [57].

On the other hand, the intention to use can be defined as the user's willingness to use a particular product or service in future [58]. Lindh et al. [59] argued that it has been essential for international retailers to create trust and intention among prospective online consumers before their purchase decision. The study by Kumar et al. [60] exhibited that trust has a significant connection with the continuance intention of Indian M-wallet users. Customers' perceived trust regarding an internet-based transaction is salient, which can offer an essential role in the development of the online system [61]. Yuliati et al. [62] studied online bike-sharing services in Indonesia. They found that online trust has a powerful influence on the service usage of the online bike-sharing system. Likewise, Dhagarra et al. [63] also found trust as a significant factor in predicting Indian patients' intention to use technology-based healthcare services. Several authors opined that trust could be influenced by the customers' perceived usefulness, perceived ease of use, perceived security and perceived delivery [64]. The result findings of the study conducted by Asti et al. [65] indicate that online trust is crucial in driving customers' repurchase intention to use an electronic grocery store. Kosim and Legowo's [58] research also indicated that perceived trust strongly affected customers' intention to use mobile banking services. Hence, the following hypotheses are proposed (Figure 1):

Hypothesis 9 (H9): Perceived trust positively correlates with the intention to use app-based medicine services.

Hypothesis 10a (H10a): perceived trust mediates the relationship between perceived usefulness and intention to use app-based medicine services

Hypothesis 10b (H10b): perceived trust mediates the relationship between perceived ease of use and intention to use app-based medicine services

Hypothesis 10c (H10c): perceived trust mediates the relationship between perceived security and intention to use app-based medicine services

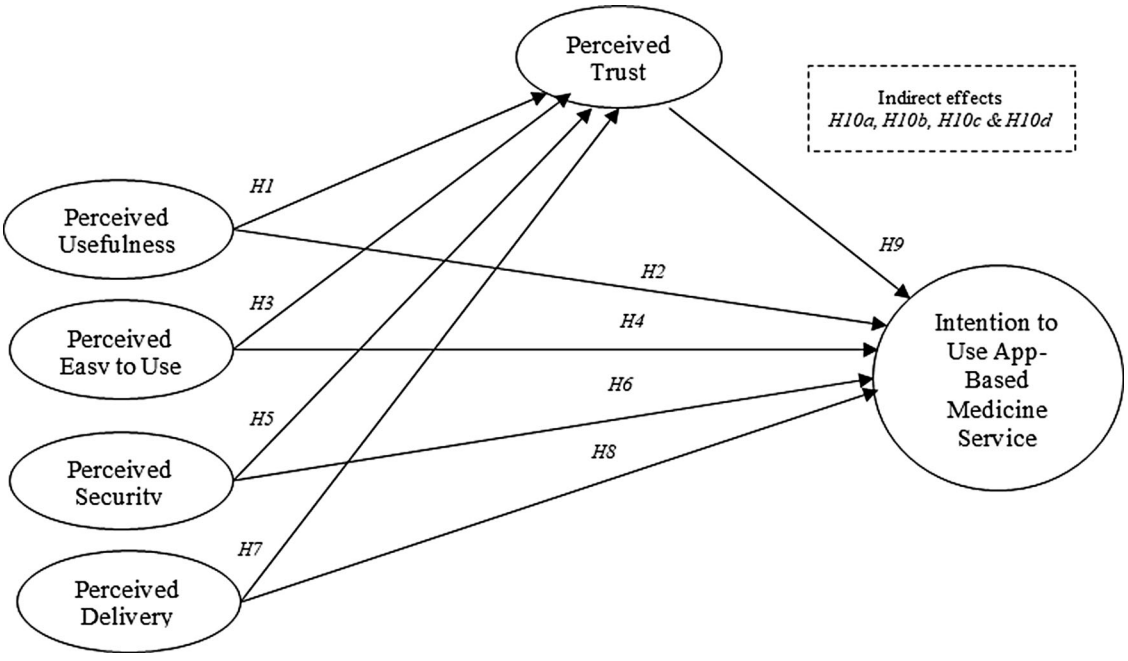

Figure 1. Research framework with hypotheses.

Hypothesis 10d (H10d): perceived trust mediates the relationship between perceived delivery and intention to use app-based medicine services

Methodology

The present study applied a quantitative research approach to evaluate the customers' intention to use app-based medicine services in Bangladesh. The Purposive Sampling technique has been used to determine the direct effect of app-based medicine services on perceived trust and indirect effects with perceived usefulness, perceived ease of use, perceived security, and perceived delivery. The reasons for using the Purposive Sampling technique are it can match the aims and objectives of the research, it helps save time and money for data collection, it increases the depth of understanding of the aims of the study, it helps to obtain trustworthiness data and results, it can use to select everyone of the population to collect data, and it has an opportunity to create generalization from the collected data [66]. The respondents were selected who had experienced using app-based medicine services in Bangladesh for the last three years.

The self-administered survey questionnaire was used to collect data from the respondents. In the survey questionnaire, we used 27 items to measure six research variables (see the Appendix). The first research variable is perceived usefulness which consists of five items:

(i) App-based medicine service gives greater control;
(ii) App-based medicine service improves the quality of decision-making;
(iii) App-based medicine service is a more effective way to use service;
(iv) App-based medicine service makes it easy to find what we need; and
(v) App-based medicine service makes it easy to get service anywhere.

The above items were adapted from Ho and Chen [67], Natarajan et al. [68], and Singh and Sinha [56].

The second research variable is perceived ease of use that pertains to four items:

(i) App-based medicine service is easier;
(ii) It is ease of use app-based medicine service;
(iii) Interactions during app-based medicine service are clear & understandable; and
(iv) (iv) App-based medicine service enables to get on to it quickly.

The above four items are adapted from Kumar et al. [60] and Natarajan et al. [68].

The third research variable is perceived security which consists of five items:

(i) App-based medicine service protects information about personal services;
(ii) App-based medicine service does not share personal information with other parties;
(iii) App-based medicine service protects information about the credit card;
(iv) App-based medicine service has adequate security features; and
(v) Risk associated with app-based transactions is low.

These above items are adapted from Oghuma et al. [69] and Kumar et al. [60].

The fourth research variable is perceived delivery which pertains to four items:

(i) App-based medicine service has a careful delivery system;
(ii) App-based medicine service has a tracking system to see the progress of the delivering items;
(iii) Online delivery person use mask and hand gloves to deliver the items; and
(iv) App-based deliver the items on time.

These above four items are self-developed.

The fifth research variable is perceived trust, which contains five items:

(i) App-based medicine service is dependable;
(ii) App-based medicine service is reliable;
(iii) Feels safe in transactions with app-based medicine service;
(iv) Believes app-based medicine service providers are ethical; and
(v) App-based medicine service has a strong sense of integrity.

These above five items are adapted from Kumar et al. [60] and Singh and Sinha [56].

The sixth research variable is the intention to use app-based medicine service, which consist of four items:

(i) Recommend others to use app-based medicine service;
(ii) Intention to use more app-based medicine service in future;
(iii) Try to use the app-based medicine service whenever need to make a purchase; and
(iv) As long as the present service continues will not switch app-based medicine service.

These above four items are adapted from Gupta et al. [70] and Singh and Sinha [56].

All research variables are measured by using five points Likert scales (5 = strongly agree, 4 = agree, 3 = neutral, disagree, 2 = disagree, 1 = strongly).

The survey questionnaire was created via Google Forms then the link to the questionnaire was sent to the targeted respondents through email, Whatsapp, and messenger. We distributed 500 survey questionnaires to the respondents and received 387 responses. The data was collected between March 2022 and May 2022. Out of these responses (387 respondents), we received 336 valid responses (i.e. 67.2% response rate) from the self-employed, lecturers, government employees, professionals, executives, students, and others. Out of these respondents, most of the respondents were male (54.2%) and married (69%).

After collecting data, we preliminary analysed the data screening process, outliers, and normality to ensure that the data were free from possible statistical errors. To evaluate the research constructs' internal consistency, reliability, and validity, we tested construct validity, convergent validity, and discriminant validity using the SmartPLS-4. We have used the same software to test the research hypotheses.

Results

Analysis of measurement model

The present study analysed the measurement model before the test of the structural equation modelling. The measured model was evaluated to identify the constructs' reliability, internal consistency, and validity [71]. To determine the internal consistency and reliability, the value of Cronbach's alpha, composite reliability (CR), and rho_A must be 0.70 and above [72]. The measurement model results indicate that Cronbach's alpha, CR, and rho_A values of the six variables are more significant than 0.7, which meets the reliability and internal consistency [73].

The present study also evaluated the measurement model to determine the validity of the constructs. Construct validity, convergent validity, and discriminant validity were tested to examine the validity of six constructs. The outer loading and AVE (average variance extracted) values were used to evaluate the construct and convergent validity of the measurement model. According to Hair et al. [72], when any construct outer loading is 0.7 or above and the AVE value is 0.5 or higher. Therefore, it meets the requirements of construct validity and convergent validity. The measurement model results illustrate that all constructs' outer loadings and AVE values were above 0.7 and 0.5, respectively. Table 1 illustrates the internal consistency, reliability, and validity (construct & convergent validity).

Besides the construct and convergent validity, the present study also performed the discriminant validity for the measurement model by examining the Fornell-Larcker criterion, Cross Loadings, and Heterotrait-Monotrait Ratio (HTMT). To analyse the discriminant validity, the construct indicators should be the highest loading compared to other constructs within its underlying latent construct involved in the PLS-SEM [72]. The results of the measurement model indicate that the Fornell-Larcker criterion, Cross Loadings, and Heterotrait-Monotrait Ratio (HTMT) values of the constructs are more significant loadings compared to other constructs within their respective underlying

Table 1. Construct validity of the measurement model.

Variable	Item	Outer loading	Cronbach alpha	rho_A	Composite reliability	AVE
Perceived Usefulness	PU1	0.820	0.864	0.871	0.902	0.647
	PU2	0.814				
	PU3	0.783				
	PU4	0.833				
	PU5	0.769				
Perceived Easy to Use	PE1	0.777	0.834	0.849	0.888	0.665
	PE2	0.812				
	PE3	0.819				
	PE4	0.855				
Perceived Security	PS1	0.797	0.871	0.873	0.906	0.660
	PS2	0.845				
	PS3	0.813				
	PS4	0.813				
	PS5	0.793				
Perceived Delivery	PD1	0.754	0.812	0.825	0.877	0.642
	PD2	0.853				
	PD3	0.731				
	PD4	0.859				
Perceived Trust	PT1	0.804	0.870	0.874	0.906	0.659
	PT2	0.807				
	PT3	0.728				
	PT4	0.865				
	PT5	0.848				
Intention to use app-based medicine service	IUA1	0.868	0.884	0.894	0.920	0.742
	IUA2	0.887				
	IUA3	0.841				
	1UA4	0.850				

Table 2. Results of Fornell-Larcker criterion.

Variable	Intention to use app-based medicine service	Perceived delivery	Perceived easy to use	Perceived security	Perceived trust	Perceived usefulness
Intention to use app-based medicine service	0.861	–				
Perceived Delivery	0.679	0.801	–			
Perceived Easy to Use	0.659	0.651	0.816	–		
Perceived Security	0.609	0.704	0.642	0.812	–	
Perceived Trust	0.708	0.757	0.670	0.721	0.812	–
Perceived Usefulness	0.580	0.563	0.599	0.577	0.617	0.804

constructs which are involved in the Structural Model (see Tables 2–4). As a result, the discriminant validity of the measurement model is acceptable.

The present study used the Variance Inflation Factor (VIF) to determine the collinearity issues and tested the outer weights to measure the significance and relevance of the indicators. The results indicate that the highest VIF value is 2.521, which is lower than the cut-off value of 3.3 [72]. Thus, there is no issue with collinearity in this study. On the other hand, the Bootstrapping option indicates the outer weights of the constructs' items. Based on the output of Bootstrapping, it was observed that the outer weights of all six variables' items were significant at a 5% level ($t > 1.96$). The results of outer weight suggest that all variables' indicators are relatively essential and contribute to creating the constructs (see Table 5).

Analysis of structural equation modelling

After analysing the measurement model and confirming the constructs' reliability, internal consistency, and validity, this study examined the hypothesized structural model using Partial Least Square (PLS) method. The reason for using the PLS approach is that it can determine the direct and indirect relationships of many endogenous and exogenous variables simultaneously. In addition, this approach can be applied for hypothesis testing when the sample size is small and data have some issues with a normal distribution [73]. The Bootstrapping method was used to determine the significance of path coefficients for the PLS-SEM analysis. The Bootstrapping option indicates the results of a significant level of the coefficients.

The findings of SEM tests are illustrated in Figure 2, Tables 6–8. The results of SEM analysis indicates that perceived trust has significant relationship with perceived usefulness ($\beta = 0.155$, $t = 3.467$, P-value = 0.001), perceived ease of use ($\beta = 0.162$, $t = 2.652$, P-value = 0.008), perceived security ($\beta = 0.259$, $t = 3.603$, P-value = 0.000) and perceived delivery ($\beta = 0.383$, $t = 5.727$, P-value = 0.000). The SEM results also indicate that intention to use app-based medicine service has significant relationship with perceived ease of use ($\beta = 0.230$, $t = 3.475$, P-value = 0.001), perceived delivery ($\beta = 0.220$, $t = 2.923$, P-value = 0.004) and perceived trust ($\beta = 0.293$, $t = 3.776$, P-value = 0.000).

Table 3. Cross loadings.

Variable	Item	Intention to use app-based medicine service	Perceived delivery	Perceived easy to use	Perceived security	Perceived trust	Perceived usefulness
Intention to use app-based medicine service	IUA1	0.874	0.592	0.579	0.570	0.682	0.539
	IUA2	0.885	0.673	0.610	0.579	0.658	0.564
	IUA3	0.842	0.522	0.528	0.444	0.547	0.362
	IUA4	0.844	0.531	0.551	0.489	0.533	0.485
Perceived delivery	PD1	0.467	0.756	0.450	0.669	0.534	0.402
	PD2	0.553	0.857	0.541	0.606	0.658	0.566
	PD3	0.541	0.723	0.538	0.419	0.548	0.323
	PD4	0.604	0.860	0.555	0.571	0.672	0.488
Perceived easy to use	PE1	0.467	0.442	0.767	0.477	0.401	0.424
	PE2	0.536	0.544	0.810	0.508	0.533	0.524
	PE3	0.551	0.563	0.824	0.524	0.599	0.440
	PE4	0.584	0.558	0.859	0.580	0.621	0.539
Perceived security	PS1	0.554	0.600	0.705	0.798	0.659	0.538
	PS2	0.478	0.566	0.469	0.845	0.555	0.453
	PS3	0.487	0.588	0.486	0.812	0.582	0.491
	PS4	0.484	0.585	0.443	0.810	0.530	0.438
	PS5	0.462	0.519	0.473	0.796	0.586	0.400
Perceived trust	PT1	0.531	0.647	0.522	0.544	0.804	0.566
	PT2	0.580	0.596	0.514	0.607	0.807	0.463
	PT3	0.528	0.551	0.581	0.518	0.728	0.335
	PT4	0.616	0.627	0.572	0.618	0.865	0.545
	PT5	0.618	0.650	0.549	0.636	0.848	0.579
Perceived usefulness	PU1	0.412	0.462	0.432	0.469	0.555	0.834
	PU2	0.411	0.444	0.448	0.442	0.504	0.825
	PU3	0.613	0.517	0.565	0.514	0.534	0.767
	PU4	0.418	0.414	0.460	0.456	0.474	0.834
	PU5	0.441	0.411	0.483	0.421	0.386	0.759

Table 4. Results of Heterotrait-Monotrait ratio (HTMT).

Variable	Intention to use app-based medicine service	Perceived Delivery	Perceived Easy to Use	Perceived Security	Perceived Trust	Perceived Usefulness
Intention to use app-based medicine service						
Perceived Delivery	0.793					
Perceived Easy to Use	0.760	0.784				
Perceived Security	0.685	0.840	0.740			
Perceived Trust	0.800	0.898	0.777	0.823		
Perceived Usefulness	0.645	0.659	0.696	0.655	0.699	

However, perceived usefulness ($\beta = 0.124$, $t = 1.931$, P-value = 0.054) and perceived security ($\beta = 0.023$, $t = 0.340$, P-value = 0.734) do not have significant impact on intention to use app-based medicine service.

Based on the above coefficient results, it can be concluded that perceived usefulness, perceived ease of use, perceived security and perceived delivery have direct and significant impacts on the perceived trust in app-based medicine service. Similarly, perceived ease of use, perceived delivery and perceived trust have positive and significant relationships with the intention to use app-based medicine service. As results, hypothesis 1, 3, 4, 7, 8 and 9 (H1, H3, H4, H5, H7, H8 & H9) are supported at 5% ($P < 0.05$) significant level (see Table 7). Though perceived usefulness and perceived security significantly influence perceived trust, they do not have a direct and significant relationship with the intention to use app-based medicine service. Thus, hypothesis 2 and 6 (H2 & H6) are not supported at 5% ($P < 0.05$) significant level (see Table 6).

Table 7 elaborates on the indirect relationships of the coefficient paths. Based on the results of PLS-SEM it was observed that perceived trust fully mediates on the relationship between perceived usefulness and intention to use app-based medicine service ($\beta = 0.045$, $t = 2.378$, P-value = 0.018), perceived security and intention to use app-based medicine service ($\beta = 0.076$, $t = 2.893$, P-value = 0.004). On the other hand, the perceived trust partially mediates on the relationship between perceived ease of use and intention to use app-based medicine service ($\beta = 0.067$, $t = 2.680$, P-value = 0.007), perceived delivery and intention to use app-based medicine service ($\beta = 0.112$, $t = 3.337$, P-value = 0.001). Hence, it can be remarked Hypotheses 10a, 10b, 10c and 10b (H10a, H10b, H10c & H10d) are supported at 5% ($P < 0.05$) significant level.

In addition, the PLS-SEM results indicate that the coefficient paths model was compatible with the data [74]. The PLS-SEM results reveal that perceived trust is explained by perceived usefulness, ease of use, perceived security, and perceived delivery at 68%. On the other hand, the intention to use app-based medicine service is explained by the perceived trust at 59.5%. This study also examined the endogenous variables' predictive relevance and effect size (perceived trust and intention to use app-based medicine service) using Stone–Geisser's Q^2 value. Based on the outputs, it was observed that the research model is predictive relevant (see Table 8).

Table 5. Variance inflation factor (VIF) and weights for formative measures.

Variable	Item	VIF	Outer weight
Intention to use app-based medicine service	IUA1	2.309	0.327
	IUA2	2.521	0.315
	IUA3	2.198	0.262
	IUA4	2.264	0.255
Perceived delivery	PD1	1.559	0.227
	PD2	2.073	0.302
	PD3	1.414	0.339
	PD4	2.065	0.352
Perceived easy to use	PE1	1.708	0.227
	PE2	1.786	0.302
	PE3	1.756	0.339
	PE4	1.985	0.352
Perceived security	PS1	1.829	0.279
	PS2	2.330	0.235
	PS3	2.235	0.246
	PS4	2.196	0.224
	PS5	1.882	0.248
Perceived trust	PT1	1.959	0.240
	PT2	1.949	0.244
	PT3	1.573	0.222
	PT4	2.484	0.260
	PT5	2.269	0.264
Perceived usefulness	PU1	2.124	0.281
	PU2	2.193	0.255
	PU3	1.640	0.270
	PU4	2.224	0.240
	PU5	1.826	0.195

Discussion

The present study investigates how customers' trust impacts intention to use app-based medicine services in Bangladesh. This study examined the relationships between perceived usefulness, perceived ease of use, perceived security, and perceived delivery with perceived trust and intention to use app-based medicine services. The research findings indicate that perceived usefulness, perceived ease of use, perceived security, and perceived delivery positively influence perceived trust in using app-based medicine services. Previous research findings [13,35,75] indicate that perceived usefulness, perceived ease of use, perceived security, and perceived delivery have a significant impact on perceived trust in different service areas. This study also examined the relationship between intention to use app-based medicine services with perceived

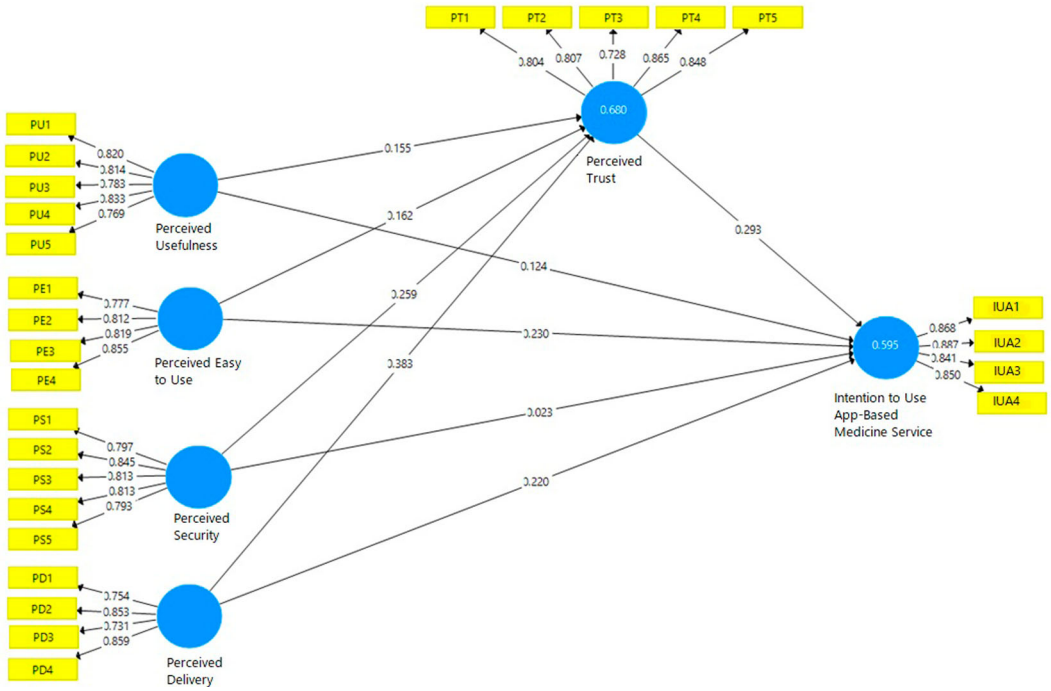

Figure 2. Output of PLS-SEM.

Table 6. Hypothesized path coefficients.

	Hypothesized path coefficient relationships	Coefficient (β)	Standard deviation	*t*-value	*P*-value	Remarks
H1	Perceived Usefulness → Perceived Trust	0.155	0.045	3.467	0.001	Supported
H2	Perceived Usefulness → Intention to use app-based medicine service	0.124	0.064	1.931	0.054	Not Supported
H3	Perceived easy to use → Perceived Trust	0.162	0.061	2.652	0.008	Supported
H4	Perceived easy to use → Intention to use app-based medicine service	0.230	0.066	3.475	0.001	Supported
H5	Perceived Security → Perceived Trust	0.259	0.072	3.603	0.000	Supported
H6	Perceived Security → Intention to use app-based medicine service	0.023	0.068	0.340	0.734	Not Supported
H7	Perceived Delivery → Perceived Trust	0.383	0.067	5.727	0.000	Supported
H8	Perceived Delivery → Intention to use app-based medicine service	0.220	0.075	2.923	0.004	Supported
H9	Perceived Trust → Intention to use app-based medicine service	0.293	0.078	3.776	0.000	Supported

Table 7. Results of specific indirect effects.

Hypothesis	Specific indirect effects	Coefficient (β)	STDV	*t*-value	*P*-value	Support
H10a	PU → PT → IUAMS	0.045	0.019	2.378	0.018	Full
H10b	PEU → PT → IUAMS	0.067	0.025	2.680	0.007	Partial
H10c	PS → PT → IUAMS	0.076	0.026	2.893	0.004	Full
H10d	PD → PT → IUAMS	0.112	0.034	3.337	0.001	Partial

Notes: PU = Perceived Usefulness, PE U = Perceived Easy to Use, PS = Perceived Security, PT = Perceived Trust, IUAMS = Intention to use app-based medicine service.

usefulness, perceived ease of use, perceived security, perceived delivery, and perceived trust in Bangladesh. The research findings revealed that perceived ease of use, perceived delivery, and perceived trust significantly influence the intention to use app-based medicine services.

Similarly, Dhagarra et al.'s [63], Ventre and Kolbe [35], and Srivastava and Raina's [19] study found that perceived ease of use, perceived delivery and perceived trust have positive and significant impacts on intention to use technology in service businesses. However, perceived usefulness and security have a little direct and significant relationship with the intention to use app-based medicine services. However, they significantly indirectly influence the intention to use app-based medicine services in Bangladesh.

The present study also investigates the mediating effects of perceived trust on the relationships of perceived usefulness, perceived ease of use, perceived security, and perceived delivery intending to use app-based medicine services. Based on the research findings, it was observed that perceived trust fully mediates the relationships between perceived usefulness and perceived security intending to use app-based medicine services. Furthermore, perceived trust also partially mediated the relationships between

Table 8. Values of R square and predictive relevance.

Variable	R^2	Adjusted R^2	Predictive relevance (Q^2)
Perceived trust	0.680	0.677	0.445
Intention to use app-based medicine service	0.595	0.589	0.363

perceived ease of use and perceived delivery to use app-based medicine services. One of the reasons behind this finding may be attributed to the reason that the delivery personnel might have used face-masks, gloves, and proper sanitization while delivering the products, which may reduce the infection caused by respiratory droplets [76], leading to higher trust levels among consumers. However, customers may still perceive a contagion risk since the virus could be transmitted through asymptomatic delivery personnel. Hence, the app-based medicine service providers needs to make sure that a minimum safety distance of 6 feet is mandatory to make the customers feel safer [77]. In addition, many service providers, for instance, offer 'contactless payment' and 'doorstep delivery' options, which means that clients do not even have to touch the products upon receiving those [78], which acted as a precursor to the development of consumers' security as well as trust on app-based medicine services.

Furthermore, delivery staff of app-based medicine services informed and advised clients to sterilize the goods before using them because the virus may survive on the delivered object for several hours to several days [79], which ultimately reduced users' anxiety and fostered their feeling of security in app-based medicine services. According to Asti et al. [65] and Kosim and Legowo [58], perceived trust can strongly influence customers' intention to use online services by enhancing the customers' perception of usefulness, ease of use, security, and delivery system. Furthermore, Lindh et al. [59] stated that app-based medicine services must focus on perceived trust to create a solid intention to use their services. Nevertheless, this research findings can be insightful and an eye-opener for app-based medicine service providers to foster their businesses by focusing on developing a positive trust perception in the consumer's mind, which would lead to forming a positive intention to use their app-based medicine services. This is a significant factor for developing markets with an institutional void in online retailing. Therefore, organizations can get closer to customers using app-based medicine services if they can augment their perceived trust.

Implications

The study has significant theoretical and practical contributions. Theoretically, the earlier literature on app-based medicine services from the consumers' perceived psychological factors has generally emphasized usefulness, ease of use, and security, while ignoring the potential impact of customer-perceived delivery predicting perceived trust towards app-based medicine services. Perceived delivery timely and directly can, beyond cognition, increase customer trust towards intention to use app-based medicine services. Besides, perceived usefulness, ease of use and security are also individuals' most crucial psychological factors that may increase customer trust and influence their intention to use app-based medicine services. Moreover, this study pays to consolidate the use of the theory of consumers' perceived usefulness, ease of use, security, and delivery to explain app-based medicine services, indicating new findings that assist in enlightening the mediational role of trust in predicting customers' intention to use app-based medicine services.

The findings indicate that the uncertainty of the COVID-19 pandemic was one of the reasons that forced medical stores to adopt new service delivery channels and ensure consumers' safety and security. Despite the relatively low level of consumers' trust in the online delivery channel in Bangladesh, this new channel can be made popular and trustworthy by improving measures that can ensure the safety and security of the transaction both for the delivery and quality of delivered products. App-based medicine services need to ensure customers' perceived service delivery, security, ease of use, and usefulness of online purchasing, which led the industry to go through the years, during and after the epidemic of COVID-19. In this regard, this study suggests useful and practical implications. Medicine companies must ensure customers' perceived security that they are providing digital technologies in services for social distancing and reducing the outbreak of the COVID-19 pandemic. When digital technology is a powerful strategy for the medicine service industry, it may pose some challenges, such as loss of employment and high costs for service delivery. Although adopting app-based medicine services will provide extra costs for the business owners, the findings of this study indicate the crucial role of app-based medicine services in attracting customers. The results reveal that customers' trust in online retailing services can effectively reduce customers' health risks. Thus, the medicine industry needs to facilitate effective app-based medicine services to reduce disease transmission to potential consumers.

Conclusion

The present study's findings indicate that perceived usefulness, perceived ease of use, perceived security, and perceived delivery positively and significantly influence the perceived trust in app-based medicine services. The research findings also indicate that perceived ease of use, perceived delivery, and perceived trust significantly impact the intention to use app-based medicine

services. Though the present research illustrates interesting findings, it has several limitations. One of the limitations of this paper is to draw samples only from a single city and a single country: Dhaka city, Bangladesh. Hence, the current paper's sample characteristics might only be indicative of some consumers from developing countries, which impacts the generalizability of this paper's research findings. Future research might consider participants from various nations and locations within the same nation to document cross-national and regional differences in the consumers' perceived trust and intention level regarding app-based medical services. The current study has adopted the PLS-SEM method, a quantitative approach, to test the study model. Future studies may adopt a mixed-method approach (qualitative and quantitative measures) for more robust study findings. Furthermore, future research may include several new variables into the current study model, such as contagion risk, the user is IT competency, online delivery infrastructures and knowledge, electronic word of mouth, service quality, and online reviews to understand their influence on perceived trust and intention to use app-based medicine services.

Notes on contributors

Dr. Selim Ahmed is an Associate Professor and head of business school, World University of Bangladesh. He received his PhD in Business Administration from International Islamic University Malaysia. Dr. Ahmed has published many articles in the peer reviewed journals such as *International Journal of Lean Six Sigma*, *TQM Journal*, *Reviews on Environmental Health*, *International Journal of Healthcare Management, International Journal of Quality and Service Sciences, Humanomics, International Journal of Health Care Quality Assurance, International Journal of Business and Systems Research*, and others. His research area includes quality management, lean six sigma, service management, quality improvement process, healthcare management, etc.

Dr. Ibrahim Alqasmi is an Assistant Professor at Public Health School of Health Sciences, Saudi Electronic University, Riyadh, Saudi Arabia. He received his Master's and PhD in Healthcare Management from the University of Salford, UK. His research areas are healthcare management, public healthcare, patient safety, quality improvement and others.

Dewan Mehrab Ashrafi is a senior lecturer at ULAB School of Business, University of Liberal Arts Bangladesh. Previously he worked at School of Business Administration, East Delta University as an Assistant Professor. He did Master's in International Management and Consumer Psychology from Rhine-Waal University, Germany. His research areas are consumer behaviour, business management, service management, digital marketing and others.

Dr. Musfiq Mannan Choudhury is a Professor of Business, Marketing, and Information Systems in the Department of Management at the University of Dhaka. He has worked previously in the University of Southampton on different projects of digital marketing. While working there, he was also included in the prototype building of the Boeing 737 max Rolls Royce Engine. Dr. Choudhury has around six (6) MPhil/PhD students enrolled with him. He has published 21 research papers in top-ranking journals. In terms of innovation, he has developed an ERP which can streamline processes in higher education making institutes run effectively and smoothly.

Dr. Muhammad Khalilur Rahman currently works at Universiti Malaysia Kelantan (UMK). He did his PhD in Marketing from University of Malaya, Malaysia. He has a wide interest in service management research, which includes supply chain management, operation management, tourism management, environmental management, marketing, service quality, brand equity, entrepreneurship, and green consumption behaviours.

Dr. Muhammad Mohiuddin is an Associate Professor of International Business at Department of Management, Laval University. He is the Associate Editor, Transnational Corporations Review. His research interests focus on emerging markets and sustainable offshore outsourcing. He published more than 40 peer reviewed articles and won étudiant-chercheur étoile (STAR-Researcher) Award (FQRSC), 'Best paper awards' ASAC 2018, ASAC 2014, ASAC 2012 and AGBA, 2013 and Hon'ble Mention Award in AIB-NE, 2013. He was also awarded the CIRRELT, FQRSC, SSHRC, ISESCO, Dean's Research award (2015), Teaching Award (2016) and Service Award (2018) and President (Vice Chancellor's) Research Award 2019.

Disclosure statement

No potential conflict of interest was reported by the author (s).

Funding

The author(s) reported there is no funding associated with the work featured in this article.

ORCID

Selim Ahmed http://orcid.org/0000-0002-0361-6797
Ibrahim Alqasmi http://orcid.org/0000-0001-9258-9630
Dewan Mehrab Ashrafi http://orcid.org/0000-0001-9746-9654
Musfiq Mannan Choudhury http://orcid.org/0000-0003-0917-3744
Muhammad Khalilur Rahman http://orcid.org/0000-0001-9057-9121
Muhammad Mohiuddin http://orcid.org/0000-0003-2009-027X

References

[1] Fang F, Zhou Y, Ying S, et al. A study of the ping an health app based on user reviews with sentiment analysis. Int J Environ Res Public Health. 2023;20 (2):1591.
[2] Hillis A, Germain J, Whitfield M, et al. Internet sourcing and unsafe use of controlled drugs (opioids, sedatives and GABA drugs) in the UK: an in depth case study of consumer dynamics during COVID-19. emerging trends in drugs. Addict Health. 2023;3:100049.

[3] Mathrani A, Sarvesh T, Umer R. Digital divide framework: online learning in developing countries during the COVID-19 lockdown. globalisation. Societies Educ. 2022;20(5):625–640.
[4] Chowdhury LAM, Rana T, Azim MI. Intellectual capital efficiency and organisational performance: in the context of the pharmaceutical industry in Bangladesh. J Intellect Capital. 2019;20(6):784–806.
[5] Neger M, Uddin B. Factors affecting consumers' internet shopping behavior during the COVID-19 pandemic: evidence from Bangladesh. Chinese Bus Rev. 2020;19(3):91–104.
[6] International Trade Administration. Bangladesh - healthcare and pharmaceuticals. 2022. [cited November 14, 2022]. Available from: https://www.trade.gov/country-commercial-guides/bangladesh-healthcare-and-pharmaceuticals.
[7] Statista. EHealth - Worldwide | Statista Market Forecast. 2022. [cited November 14, 2022]. Available from: https://www.statista.com/outlook/dmo/digital-health/ehealth/worldwide
[8] Business Inspection. Pharmaceutical industry of Bangladesh: prospects and future challenges. 2022. [cited November 14, 2022]. Available from: https://businessinspection.com.bd/pharmaceutical-industry-of-bangladesh.
[9] Ma L. Understanding non-adopters' intention to use internet pharmacy: revisiting the roles of trustworthiness, perceived risk and consumer traits. J Eng Tech Manage. 2021;59:101613.
[10] Sabbir MM, Islam M, Das S. Understanding the determinants of online pharmacy adoption: a two-staged SEM-neural network analysis approach. J Sci Technol Policy Manag. 2021;12(4):666–687.
[11] Alwon BM, Solomon G, Hussain F, et al. A detailed analysis of online pharmacy characteristics to inform safe usage by patients. Int J Clin Pharm. 2015;37:148–158.
[12] Karattuthodi MS, Thorakkattil SA, Kuzhiyil AK, et al. Implementation of virtual clinical pharmacy services by incorporating medical professionals and pharmacy students: a novel patient-oriented system to advance healthcare in India. Explor Res Clin Soc Pharm. 2022;5:100126.
[13] Varghese Assin TJ, George NA, Sivakumar P. Perceived risk and online purchase intention of E-pharmacy: examining the moderating role of online trust in the Indian context. Spec Educ. 2022;1(1):(43) 9663–9685.
[14] Lee Y, Kozar KA, Larsen KR. The technology acceptance model: past, present, and future. Commun Assoc Informat Syst. 2003;12(1):752–780.
[15] Ajzen I. The theory of planned behavior. Organ Behav Human Decis Process. 1991;50(2):179–211.
[16] Yuniarti FR, Arief H, Meydia H, et al. Online retailers' ethics and its effect on repurchase intention: the mediating role of perceived risk. Cogent Bus Manag. 2022;9(1):2051691.
[17] Uzir MUH, Al Halbusi H, Thurasamy R, et al. The effects of service quality, perceived value and trust in-home delivery service personnel on customer satisfaction: evidence from a developing country. J Retail Consum Serv. 2021;63:102721.
[18] Nayak KM, Bhatt V, Nagvadia J. Measuring impact of factors influencing to consumer buying intention with respect to online shopping. Int J Manag. 2021;12 (1):230–241.
[19] Srivastava M, Raina M. Consumers' usage and adoption of e-pharmacy in India. Inte J Pharmaceut Healthcare Market. 2020;15(2):235–250.
[20] Attar RW, Amidi A, Hajli N. The role of social presence and trust on customer loyalty. Br Food J. 2022;125(1):96–111.
[21] Wisker ZL. Examining relationship quality in e-tailing experiences: a moderated mediated model. Market Intell Plan. 2020;38(7):863–876.
[22] Chou CY, Leo WWC, Chen T. Servicing through digital interactions and well- being in virtual communities. J Serv Mark. 2021;36(2):217–231.
[23] Homans GC. Social behavior as exchange. AJS. 1958;63(6):597–606.
[24] Rousseau DM. Psychological and implied contracts in organizations. Empl Responsib Rights J. 1989;2 (2):121–139.
[25] Sin LY, Alan CB, Yau OH, et al. Relationship marketing orientation: scale development and cross-cultural validation. J Bus Res. 2005;58(2):185–194.
[26] Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q. 1989;13(3):319–340.
[27] Venkatesh V, Davis FD. A theoretical extension of the technology acceptance model: four longitudinal field studies. Manage Sci. 2000;46(2):186–204.
[28] Venkatesh V, Thong JY, Chan FK, et al. Extending the two-stage information systems continuance model: incorporating UTAUT predictors and the role of context. Inf Syst J. 2011;21(6):527–555.
[29] Ashrafi DM, Easmin R. Okay Google, good to talk to You … examining the determinants affecting users' behavioral intention for adopting voice assistants: does technology self-efficacy matter? Int J Innov Technol Manag. 2022;20(2):1–30.
[30] Patel KJ, Patel HJ. Adoption of internet banking services in Gujarat: an extension of TAM with perceived security and social influence. Int J Bank Mark. 2018;36 (1):147–169.
[31] Natarajan T, Balasubramanian SA, Kasilingam DL. Understanding the intention to use mobile shopping applications and its influence on price sensitivity. J Retail Consum Serv. 2017;37:8–22.
[32] de Luna IR, Liébana-Cabanillas F, Sánchez-Fernández J, et al. Mobile payment is not all the same: the adoption of mobile payment systems depending on the technology applied. Technol Forecast Soc Change. 2019;146:931–944.
[33] Rouibah K, Abbas H, Rouibah S. Factors affecting camera mobile phone adoption before e-shopping in the Arab world. Technol Soc. 2011;33(3-4):271–283.
[34] Lee T, Jun J. Contextual perceived value?: investigating the role of contextual marketing for customer relationship management in a mobile commerce context. Bus Process Manag J. 2007;13(6):798–814.
[35] Ventre I, Kolbe D. The impact of perceived usefulness of online reviews, trust and perceived risk on online purchase intention in emerging markets: a Mexican perspective. J Int Consum Mark. 2020;32(4):287–299.
[36] Eneizan B, Alsaad A, Alkhawaldeh A, et al. E-wom, trust, usefulness, ease of use, and online shopping via websites: the moderating role of online shopping experience. J Theor Appl Inf Technol. 2020;98 (13):2554–2565.
[37] Hajiheydari N, Ashkani M. Mobile application user behavior in the developing countries: a survey in Iran. Inf Syst. 2018;77:22–33.

[38] Ismagilova E, Hughes L, Dwivedi YK, et al. Smart cities: advances in research—An information systems perspective. Int J Inf Manage. 2019;47:88–100.
[39] Saprikis V, Avlogiaris G, Katarachia A. A comparative study of users versus Non-users' behavioral intention towards M-banking apps' adoption. Information. 2022;13(1):30.
[40] Ashrafi DM, Alam I, Anzum M. An empirical investigation of consumers' intention for using ride-sharing applications: does perceived risk matter? Int J Innov Technol Manag. 2021;18(08):2150040.
[41] Zhang J, Luximon Y, Song Y. The role of consumers' perceived security, perceived control, interface design features, and conscientiousness in continuous use of mobile payment services. Sustainability. 2019;11 (23):1–16.
[42] Belanche D, Flavián M, Pérez-Rueda A. Mobile apps use and wom in the food delivery sector: the role of planned behavior, perceived security and customer lifestyle compatibility. Sustainability. 2020;12(10):1–21.
[43] Gracia DB, Ariño LVC, Blasco MG. The effect of culture in forming e-loyalty intentions: a cross-cultural analysis between Argentina and Spain. BRQ Bus Res Q. 2015;18(4):275–292.
[44] Harris MA, Brookshire R, Chin AG. Identifying factors influencing consumers' intent to install mobile applications. Int J Inf Manage. 2016;36(3):441–450.
[45] Salamzadeh A, Ebrahimi P, Soleimani M, et al. Grocery apps and consumer purchase behavior: application of Gaussian mixture model and multi-layer perceptron algorithm. J Risk Financ Manag. 2022;15 (10):424. DOI:10.3390/jrfm15100424.
[46] Rahman MA, Islam MA, Esha BH, et al. Consumer buying behavior towards online shopping: an empirical study on Dhaka city, Bangladesh. Cogent Bus Manag. 2018;5(1):1–22.
[47] Han W, Raab C, Belarmino A, et al. Are online meal delivery platforms part of the sharing economy? J Foodserv Bus Res. 2022;25(3):253–276.
[48] Wang K, Zhou Y, Zhang L. A workload-balancing order dispatch scheme for O2O food delivery with order splitting choice. J. Theor. Appl. Electron. Commer. Res.. 2022;17(1):295–312.
[49] Huang WH, Shen GC, Liang CL. The effect of threshold free shipping policies on online shoppers' willingness to pay for shipping. J Retail Consum Serv. 2019;48:105–112.
[50] Al-Adwan AS, Al-Debei MM, Dwivedi YK. E-commerce in high uncertainty avoidance cultures: the driving forces of repurchase and word-of-mouth intentions. Technol Soc. 2022;71:102083.
[51] Saha SK, Duarte P, Silva SC, et al. The role of online experience in the relationship between service convenience and future purchase intentions. J Internet Commer. 2022: 1–28.
[52] Chandrasekhar N, Gupta S, Nanda N. Food delivery services and customer preference: a comparative analysis. J Foodserv Bus Res. 2019;22(4):375–386.
[53] Manfredi E, Capik P. A case of trust-building in the supply chain: emerging economies perspective. Strateg Change. 2022;31(1):147–160.
[54] Bisdikian C, Gibson C, Chakraborty S, et al. Inference management, trust and obfuscation principles for quality of information in emerging pervasive environments. Pervasive Mob Comput. 2014;11:168–187.
[55] Chin AG, Harris MA, Brookshire R. A bidirectional perspective of trust and risk in determining factors that influence mobile app installation. Int J Inf Manage. 2018;39:49–59.
[56] Singh N, Sinha N. How perceived trust mediates merchant's intention to use a mobile wallet technology. J Retail Consum Serv. 2020;52:101894.
[57] Sarkar S, Chauhan S, Khare A. A meta-analysis of antecedents and consequences of trust in mobile commerce. Int J Inf Manage. 2020;50:286–301.
[58] Kosim KP, Legowo N. Factors affecting consumer intention on QR payment of mobile banking: a case study in Indonesia. J Asian Fin Econ Bus. 2021;8 (5):391–401.
[59] Lindh C, Rovira Nordman E, Melén Hånell S, et al. Digitalisation and international online sales: antecedents of purchase intent. J Int Consum Mark. 2020;32(4):324–335.
[60] Kumar A, Adlakaha A, Mukherjee K. The effect of perceived security and grievance redressal on continuance intention to use M-wallets in a developing country. Int J Bank Mark. 2018;36(7):1170–1189.
[61] Treiblmaier H, Sillaber C. The impact of blockchain on e-commerce: a framework for salient research topics. Electron Commer Res Appl. 2021;48:101054.
[62] Yuliati LN, Dradjat HA, Simanjuntak M. Online bike: role of perceived technology, perceived risk, and institution-based trust on service usage via online trust. Cogent Bus Manag. 2020;7(1):1–19.
[63] Dhagarra D, Goswami M, Kumar G. Impact of trust and privacy concerns on technology acceptance in healthcare: an Indian perspective. Int J Med Inf. 2020;141:104164.
[64] Liébana-Cabanillas F, Muñoz-Leiva F, Sánchez-Fernández J. A global approach to the analysis of user behavior in mobile payment systems in the new electronic environment. Serv Bus. 2018;12 (1):25–64.
[65] Asti WP, Handayani PW, Azzahro F. Influence of trust, perceived value, and attitude on customers' repurchase intention for E-grocery. J Food Products Market. 2021;27(3):157–171.
[66] Campbell S, Greenwood M, Prior S, et al. Purposive sampling: complex or simple? research case examples. J Res Nurs. 2020;25(8):652–661.
[67] Ho TH, Chen Y. Vietnamese consumers' intention to use online shopping: the role of trust. Int J Bus Manag. 2014;9(5):145–159.
[68] Natarajan T, Balasubramanian SA, Kasilingam DL. The moderating role of device type and age of users on the intention to use mobile shopping applications. Technol Soc. 2018;53:79–90.
[69] Oghuma AP, Libaque-Saenz CF, Wong SF, et al. An expectation-confirmation model of continuance intention to use mobile instant messaging. Telemat Inform. 2016;33(1):34–47.
[70] Gupta P, Sachan A, Kumar R. Different stages of the e-service delivery system process: belief–attitude–intention framework. Int J Retail Distrib Manage. 2020;48 (7):687–706.
[71] Hair Jr JF, Howard MC, Nitzl C. Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. J Bus Res. 2020;109:101–110.
[72] Hair J, Hollingsworth CL, Randolph AB, et al. An updated and expanded assessment of PLS-SEM in information systems research. Ind Manag Data Syst. 2017;117(3):442–458.
[73] Henseler J. Partial least squares path modeling: Quo Vadis? Qual Quant. 2018;52(1):1–8.

[74] Shiau WL, Sarstedt M, Hair JF. Internet research using partial least squares structural equation modeling (PLS-SEM). Internet Res. 2019;29(3):398–406.
[75] Ashrafi DM, Habiba W, Alam I. An assessment of the behavioural intention for using ride-sharing services: empirical evidence from a developing country. Malays J Consu Family Econ. 2020;24(1):36–62.
[76] Li J, Verteramo Chiu LJ, Gómez MI, et al. Strategies to reduce risk perception among grocery shoppers in the US: a survey study. PLoS One. 2021;16(4):e0251060.
[77] Kimball A, Hatfield KM, Arons M, et al. Asymptomatic and presymptomatic SARS-CoV-2 infections in residents of a long-term care skilled nursing facility—King County, Washington. Morb Mortal Wkly Rep. 2020;69(13):377.
[78] Kim JJ, Kim I, Hwang J. A change of perceived innovativeness for contactless food delivery services using drones after the outbreak of COVID-19. Int J Hosp Manag. 2021;93:102758.
[79] Van Doremalen N, Bushmaker T, Morris DH, et al. Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. N Engl J Med. 2020;382(16):1564–1567.

Appendix. Research instruments

Variable	Code	Items	Sources
Perceived usefulness	PU1	App-based medicine service gives greater control	Ho and Chen [66]; Natarajan et al. [67]; Singh and Sinha [56]
	PU2	App-based medicine service improves the quality of decision-making	
	PU3	App-based medicine service is a more effective way to use service	
	PU4	App-based medicine service makes it easy to find what we need	
	PU5	App-based medicine service makes it easy to get service anywhere	
Perceived easy to use	PE1	App-based medicine service is easier	Kumar et al. [60]; Natarajan et al. [68]
	PE2	It is ease of use app-based medicine service	
	PE3	Interactions during app-based medicine service are clear and understandable	
	PE4	App-based medicine service enables to get on to it quickly	
Perceived security	PS1	App-based medicine service protects information about personal services	Oghuma et al. [69]; Kumar et al. [60]
	PS2	App-based medicine service does not share personal information with other parties	
	PS3	App-based medicine service protects information about the credit card	
	PS4	App-based medicine service has adequate security features	
	PS5	Risk associated with app-based transactions is low.	
Perceived delivery	PD1	App-based medicine service has a careful delivery system	Self-developed
	PD2	App-based medicine service has a tracking system to see the progress of the delivering items	
	PD3	Online delivery person use mask and hand gloves to deliver the items	
	PD4	App-based deliver the items on time	
Perceived trust	PT1	App-based medicine service is dependable	Kumar et al. [60]; Singh and Sinha [56]
	PT2	App-based medicine service is reliable	
	PT3	Feels safe in transactions with app-based medicine service	
	PT4	Believes app-based medicine service providers are ethical	
	PT5	App-based medicine service has a strong sense of integrity	
Intention to use app-based medicine service	IUA1	Recommend others to use app-based medicine service	Gupta et al. [70]; Singh and Sinha [56]
	IUA2	Intention to use more app-based medicine service in future	
	IUA3	Try to use the app-based medicine service whenever need to make a purchase	
	1UA4	As long as the present service continues will not switch app-based medicine service	