

Research Article

Young Consumers' Usability Preferences for Mobile and Computer Screens for Online Shopping Activities

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The current research endeavors to investigate and contrast consumer usability preferences in the context of electronic commerce (e-commerce) and mobile commerce (m-commerce) using the theoretical framework of the theory of planned behavior (TPB). In order to distinguish the variations in usability preferences between e-commerce and m-commerce, a survey consisting of 37 items was administered to a sample of 213 young Chinese respondents. The survey is aimed at gathering information pertaining to the usability aspects of these two online shopping platforms. The findings of this research indicate that consumer preferences for m-commerce and e-commerce are contingent on the specific context of online shopping. The results suggest that individuals tend to prefer one medium over the other based on the specific situation or task at hand. This information is valuable for professionals in the fields of marketing, branding, and distribution as it can inform the development of effective strategies for optimizing online presence and revenue. Specifically, knowledge of consumer preferences can assist in the creation of appropriate communication, branding, and distribution strategies tailored to the specific contexts in which consumers are likely to engage in e-commerce and m-commerce.

1. Introduction

The current digital landscape of online marketing and retailing is characterized by the emergence of two primary mediums or channels for conducting online shopping and related activities: e-commerce and m-commerce. e-commerce refers to the use of traditional computer-based websites to engage in online shopping activities [1], while m-commerce refers to the use of mobile devices, particularly smartphones, for the same purpose [2]. It is crucial for professionals in the field to understand the unique advantages and importance of each medium in order to design an effective online marketing strategy.

Knowing what is relevant to users is essential in creating a more compelling e-commerce and m-commerce experience, which can potentially boost profits [3, 4]. Furthermore,

understanding the distinctions between e-commerce and m-commerce is critical for professionals in the field in order to design effective strategies that take into account the unique characteristics of each medium [5, 6], such as varying levels of convenience, accessibility, and user experience.

The field of online retailing has evolved to encompass two distinct channels: e-commerce and m-commerce [7]. Each of these channels has its own unique advantages and disadvantages. e-commerce, as defined by Turban et al. [8], refers to the conduct of monetary transactions using the Internet and a desktop or laptop computer. Within the context of this study, e-commerce may be considered to encompass consumer shopping-related activities conducted via the web using a desktop or laptop computer.

In contrast, the definition of m-commerce has been the subject of some debate in recent literature. Chopdar and

Balakrishnan [9] define m-commerce as the conduct of transactions using a wireless device and data network, in which monetary value or money is exchanged for goods, services, or information. However, Tiwari et al. [10] argue that the definition of m-commerce should not be limited to monetary transactions, as it also encompasses other mobile commerce activities such as downloading apps, playing mobile games, viewing pictures and videos, and receiving mobile advertising.

The broad definition of m-commerce adopted in this study is as follows: any transaction involving the transfer of ownership or right to use goods and services that is initiated and/or completed by using mobile devices to access wireless networks through mobile devices [10]. This definition encompasses a wide range of activities, including not only monetary transactions but also activities such as downloading apps, playing mobile games, and viewing pictures and videos [11]. This broad definition is chosen to capture the full range of m-commerce activities that may be relevant to this study.

The present study further investigates the choice of online shopping through the application of the theory of planned behavior (TPB). The TPB, an extension of the theory of reasoned action, posits that an individual's behavior is a function of their intention to engage in that behavior. This intention is influenced by the individual's attitudes towards the behavior, subjective norms, and perceived behavioral control [12]. In the context of this study, the TPB can be used to understand how young consumers' attitudes and beliefs about mobile and computer screens for online shopping activities influence their intentions and behaviors related to using these devices for shopping.

However, it is important to note that the original TPB variables may not fully capture the main beliefs that influence consumers' preferences for online shopping methods, such as e-commerce or m-commerce. Therefore, the current study is aimed at investigating how the original TPB variables can be adapted to better capture the specific context of online shopping methods. This will provide a deeper understanding of the factors that influence young consumers' preferences for different online shopping methods [13] and ultimately help in providing more effective strategies for online retailers to attract and retain customers.

The current research is focused on determining the place of each medium in terms of user preference in online shopping experience with the application of TPB. This goal stems from the debate surrounding mobile commerce and whether it can replace traditional e-commerce in online shopping or if it can only be used as a supplement. The task of determining the place of each medium is achieved through the use of predetermined factors for the comparison of e-commerce and m-commerce [14]. By authenticating a set of predetermined comparison factors between the two mediums, this study will assist researchers and managers in future research and design matters, specifically in the development of interface design guidelines for e-commerce and m-commerce.

This study is aimed at contributing to the understanding of how m-commerce and e-commerce differ in terms of user preference and how these differences can be used to inform

design and marketing strategies. By identifying the specific factors where these two mediums differ, this study will provide a valuable resource for researchers, managers, and designers seeking to optimize the user experience for mobile- and computer-based online shopping. In this study, two objectives have been specified to investigate the usability aspects of m-commerce and e-commerce and to determine if one medium is superior to the other in certain factors. The first objective is to identify the major usability aspects where m-commerce and e-commerce contrast and to determine the superiority (if any) of one medium over the other for these factors. The underlying research question related to this objective is as follows: RQ1: Do m-commerce and e-commerce differ from each other in some consumer/product-related aspects and how? The answer to this research question would provide valuable insights for product design and marketing communication planning and guide researchers and practitioners in linking design elements of devices to human preferences.

The second objective is to identify valid categories of usability preferences where the two mediums differ, leading to the second research question: RQ2: What are the categories where the two mediums of online shopping differ? Testing and validating the proposed broader factors for differentiating both mediums would offer vital implications to designers and marketing managers. Overall, this study is aimed at contributing to the understanding of how m-commerce and e-commerce differ in terms of usability and how these differences can be used to inform product design and marketing strategies. By identifying the specific usability aspects where these two mediums differ, this study will provide a valuable resource for designers and marketing managers seeking to optimize the user experience for mobile- and computer-based online shopping.

2. Theory and Literature Review

The theory of planned behavior (TPB) is a psychological theory that explains the relationship between attitudes, subjective norms, perceived behavioral control, and behavior. Developed by Ajzen [15], the TPB posits that an individual's behavior is determined by their attitude towards that behavior, the subjective norm surrounding the behavior, and their perceived behavioral control over the behavior. In the context of young consumer preferences for using multiscreen devices in online shopping, the TPB can be used to understand how these factors influence their decision to shop using multiple screens [16]. Research has shown that attitudes towards using multiscreen devices in online shopping can be influenced by the perceived benefits and drawbacks of this behavior, such as convenience and ease of use [17]. Subjective norm, or the perceived social pressure to engage in the behavior, can be influenced by the opinions and behaviors of friends and family [15]. Perceived behavioral control, or the belief in one's ability to engage in the behavior, can be influenced by factors such as access to multiple devices and the availability of relevant apps and websites [15].

Overall, the TPB can be used to understand how young consumers' attitudes, subjective norms, and perceived behavioral control influence their preferences for using

multiscreen devices in online shopping [6]. This can be used to inform strategies for businesses and marketers to better appeal to this demographic and increase their engagement in multiscreen online shopping behavior [18]. TPB has been extensively employed in various research studies owing to its simplicity and applicability, particularly in the domain of information technology adoption. The primary objective of TPB is to offer comprehensive explanations and predictions for the acceptance of IT by different user groups in different organizational settings [19]. The advent of mobile devices with network capabilities in the late 1990s, such as personal digital assistants (PDAs) and mobile phones with Internet functions, has enabled the emergence of mobile commerce (m-commerce). While m-commerce encompasses various functions, a significant area of focus for businesses is the online consumer purchasing of goods and services [20].

The theory of reasoned action [21] and TPB [22] have been used to demonstrate the causality of belief-attitude-intention-behavior in explaining and predicting technology acceptance among online consumers. TPB posits that two beliefs about new technology, such as e-commerce and mobile commerce, perceived ease of use and perceived usefulness, determine an individual's attitudes towards using the technology and subsequently influence their intention to use it [23]. It is crucial for practitioners and researchers to comprehend the factors that drive consumers to choose one channel over another [24]. Previous studies have demonstrated that a multichannel retail strategy can enhance the performance of the service portfolio offered to customers, resulting in high customer satisfaction and ultimately customer loyalty [25, 26].

Therefore, it is necessary to have a deeper understanding of consumer decision-making and channel selection in order to make multichannel strategies more effective [27]. Usability has been an important issue in electronic commerce since its foundation in 1994, and it has guided the designing of shopping websites [28, 29]. However, it must be noted here that the usability of mobile e-commerce should be considered different from the general usability of mobile devices, because mobile e-commerce utilizes a set of specific functions and processes of mobile devices, such as product display, payment, and transaction procedures.

The term "availability" in this study is different from the availability of mobile devices but is related to the availability of mobile devices. Previous studies have proven that TPB is a robust and streamlined framework that can be used to understand how customers are involved in e-commerce [30], email [31], banking technology [32], online games [33], desktop video conferencing [34], telemedicine technology [35], etc. The confusion exists in differentiating e-commerce and m-commerce as two distinct marketing channels.

Ngai and Gunasekaran [36] defined m-commerce as an extension of e-commerce and further explained that m-commerce is similar to e-commerce, except that transactions are carried out in a mobile environment. Siau [37] pointed out that mobile commerce is neither synonymous with e-commerce nor just another e-commerce channel, but an extension of e-commerce. Scholars believe that the extension

of classifying m-commerce as e-commerce is too narrow because it is based only on network medium and devices [38, 39]. Unlike e-commerce, mobile commerce offers new business opportunities due to its mobility and accessibility characteristics [40]. Similarly, Haghirian et al. [41] see m-commerce as a marketing and advertisement channel easily rivaling e-commerce.

Since m-commerce is a form of retail innovation and uses mobile technology systems, while electronic shopping behavior (such as browsing and transactions) is a consumer use system, TPB provides useful basic technology for studying consumer acceptance (in the form of e-commerce or m-commerce). Research has shown that despite the robustness of TPB, there are inconsistent findings regarding the effect of ease of use on consumers' attitudes. Although some studies have found that ease of use has a positive and significant impact on consumers' attitudes towards e-commerce and/or m-commerce [42], other studies have shown insignificant relationship [35]. The main focus of this study stems from the debate concerning these two mediums of online shopping, whether they are different concerning consumer preferences and do they compete as two different marketing channels for online retailing or they are the just mere replacement of each other with no significant differences in usability preferences.

3. Methodology

3.1. The Electronic Commerce Comparison Survey. A 37-item survey has been designed to explore differences in usability preferences between two mediums of online shopping. The items have been developed following the previous literature and subjective judgment of important issues in the most recent online shopping environment. Some items and scales have been adapted from a similar past study conducted by Ozok and Wei [2]. However, the items have been modified from the previous version, and also, many new items have been added to ensure the appropriateness of the survey for the recent m-commerce and e-commerce phenomena. To explicitly compare and explore attributes of both mediums, a polarized Likert scale was designed, with each end of the scale representing the strong superiority of m-commerce regarding each question and the other end representing the clear prominence of e-commerce. Likert scales are known to be a good and reliable instrument for comparison-based studies on the web [43] and deemed suitable for investigations similar to the current study [44]. The scale includes better m-commerce options, better e-commerce options, equal m-commerce, and better e-commerce. The option of "e-commerce much better" consisted of a score of 1, and "m-commerce much better" occupied a score of 5, whereas the score of 3 showed both of the media being about equal regarding the particular question.

Concerning comparison factors, there were a total of eight main categories, and one was divided into two subcategories; hence, a total of nine factors were included in the survey for comparison of the two media. In addition, the survey also includes demographic questions, including age, gender, and frequency of online shopping, how often they

use mobile devices and computers for online shopping, and which devices they usually use for online shopping. The nine comparison factors consist of a total of 37 questions with a Likert scale, aiming to quantitatively determine the differences in user questions between the two media. These categories included human factors, interface feature factor, product research-related factors, product-related factors, online review related, the marketplace, sharing content, and service-related factors. The human factor consisted of two subcategories, and the first one was human factor-miscellaneous which mostly included items related to convenience and single items for enjoyment and habit. The second human factor category represented items related to autonomy/control in shopping. Of the 37 questions in total, 21 and 34 are the similar questions used to calculate Cronbach's alpha internal reliability quotient. The reliability of Cronbach's alpha coefficient for these items is 0.89. This number indicates that the survey has sufficient internal reliability. As Cronbach (1990) reported, surveys with a coefficient of 0.70 or higher have acceptable internal reliability.

The factors as mentioned above and their respective items with wording are given in Table 1. Only one item out of two duplicate items with wordings *having communication with the seller* was included in preceding all analyses to avoid confusion.

3.2. Sample Profile. The participants included 219 graduate and undergraduate students. The majority of the respondents were between 16 and 26 years of age (age mean = 21.4 and variance = 2.60). They were students of various departments at a large university located in Harbin city of China. The survey has been performed much recently in the spring of 2017. This group of respondents was selected because college students are known to have the likelihood of being familiar with m-commerce and e-commerce [45], and others reported that the college students can be considered as representing the online shoppers overall. Initially, 216 participants were included in the survey, but six responses were removed because of the incomplete (i.e., less than 30% answers) and unnatural answers (same answers for all questions). Finally, 213 responses have been used for further analysis out of which 69% were male and 29% were female, whereas five respondents did not specify their gender.

4. Results

4.1. Descriptive Analysis. First, Table 1 indicates that the mean values of all the 36 items (one out of two Cronbach alpha items were excluded) were calculated followed by the ANOVA to determine the consumers' usability preferences regarding online shopping using m-commerce and e-commerce. Table 1 lists the mean of all 36 items in the survey. High scores indicate the advantages of mobile commerce, and low scores indicate the advantages of e-commerce for specific items. ANOVA was performed on these 36 items to find whether the mean value of each item in the 3.0 score was significantly different. For each item, compare the response with the overall average of 3.0. In this

case, the respondents will not respond to the superiority of each medium. Table 2 shows the results of the ANOVA. It should be noted that if the mean value of a particular item is significantly higher or lower than the mean value of 3.0, this indicates that one form of medium is better than the other.

It was interesting to note that m-commerce has been preferred in all cases of the human factor-miscellaneous category with mean value 3.30 for "joyful and pleasant shopping experience" and a maximum 4.05 for "shopping at any time and location." All the items on this factor remained significant at 0.001 level as shown in Table 3 for the respective items 1, 2, 8, 24, 27, 28, 37, 32, and 37. It should be noted here that this factor mostly consisted of items related to convenience, and these results imply that users prefer mobile devices for a convenient shopping experience. Only one item "having interactive features helping me in navigating" within interface factor was significantly different from the indifference mean value of 3.0 (mean = 3.43, Std.Dev. = 1.254, $F = 20.995$, P value < 0.05), whereas the other items in this category remain insignificant with mean values near indifference value 3.0.

All the items in product research-related factor were found inclined towards e-commerce, and the item with maximum mean score was searching for products and product-related information online (mean = 2.69, Std.Dev. = 1.131, $F = 20.658$, P value < 0.05) and lowest mean score for comparing various products in a category (mean = 2.39, Std.Dev. = 1.117, $F = 19.955$, P value < 0.05) and watching online advertisements related to products and services (mean = 2.39, Std.Dev. = 1.006, $F = 27.626$, P value < 0.001). Hence, the users like their computers more for doing some research about their anticipated purchase probably because of the larger screen size and easy browsing. Concerning product-related questions, a similar trend was observed since all the items were significant towards e-commerce. The lowest mean was recorded for shopping for high involvement and complex products (mean = 2.14, Std.Dev. = 1.029, $F = 40.525$, P value < 0.001). It is interesting to note that all the items were strongly tilted towards e-commerce and significant at 0.001 level. However, since the survey did not include all product-related features, so the findings should be considered within specific contexts of the items.

Respondents were remained indifferent on two out of four items in service-related factor, whereas the remaining two items showed preferences for m-commerce. The highest mean was reported for having communication with sellers (mean = 3.37, Std.Dev. = 1.093, $F = 15.752$, P value < 0.001). The items personalizing my needs, saving my preferences, and offering me services based on these preferences significantly showed a tendency for m-commerce at 0.05 level. Getting postpurchase service after buying the product (mean = 2.86, Std.Dev. = 1.075, $F = 2.826$, P value > 0.05) and safety in providing credit card numbers and other personal information (mean = 2.86, Std.Dev. = 1.129, $F = 2.053$, P value > 0.05) remained indifferent pointing out that both mediums have equal usability for shoppers in this regard.

TABLE 1: Proposed factors and their item means.

Category	Items	Mean
Human factor-miscellaneous	1. For shopping conveniently overall.	3.55
	2. Shopping at any time and location.	4.05
	8. Shopping with ease of use.	3.92
	24. Convenience in making payments online.	3.97
	28. Speedy shopping consuming less time.	4.09
	37. Conveniently searching for local businesses and suppliers in the nearby areas.	3.48
Interface factors	32. Joyful and pleasant shopping experience.	3.30
	27. For habitual/routine shopping.	3.93
	3. Having interactive features helping me in navigating.	3.43
Product research	4. Shopping with a visually appealing interface.	2.78
	5. Shopping with a convenient screen.	2.83
	6. Shopping with a convenient input interface.	3.17
	7. Searching for products and product-related information online.	2.69
	9. Comparing various products in a category.	2.39
	16. Seeing pictures of products to shop for.	2.62
Product related	17. Seeing animations/videos of products to shop for.	2.49
	33. Watching online advertisements related to products and services.	2.39
	36. Getting information related to brands and vendors.	2.43
	10. Shopping for expensive products.	2.32
	11. Shopping for high involvement and complex products.	2.14
	12. Shopping for customized products and services on the Internet.	2.27
Service related	13. Shopping for a large variety of products.	2.30
	14. Shopping from international vendors/retailers.	2.51
	15. Getting postpurchase service after buying the product.	2.86
Marketplaces	21. Having communication with sellers.	3.37
	23. Safety in providing credit card numbers and other personal information.	2.86
	26. Personalizing my needs, saving my preferences, and offering me services based on these preferences.	3.24
Online reviews	22. Shopping from online marketplaces like Taobao.	3.18
	25. Participating in online auctions.	2.77
Sharing content	18. Checking customer reviews and ratings for the desired products.	2.93
	19. Writing reviews regarding your purchased product.	3.19
Autonomy	20. Sharing content related to products and brands.	3.17
	35. Sharing your shopping experience with your friends and family.	3.65
	29. Shopping with greater autonomy.	3.02
	30. Having better control over shopping activities.	2.98
	31. Being able to do other activities when shopping online.	2.53

Regarding shopping through marketplaces, the respondents considered m-commerce and e-commerce as equal since the mean for both items used for this factor was not significantly different from the indifference value of 3. Out of the two items measuring online review-related factor, only one, writing reviews regarding your purchased product (mean = 3.19, Std.Dev. = 1.073, $F = 5.146$, P value < 0.05), exhibited the significant preference for m-commerce. The other item, checking customer reviews and ratings for the desired products, was insignificant. The sharing content factor was also measured through two questions, and one of them,

sharing your shopping experience with your friends and family, showed the preference for m-commerce. On the other hand, no medium was preferred over the other for sharing content related to products and brands. As mentioned earlier, the human factor was divided into two subcategories of miscellaneous and autonomy/control related because of the fundamental difference in the logic of questions used for both categories. The findings were in agreement with this differentiation since, contrary to the miscellaneous human factor, respondents preferred e-commerce for one out of three items and remained indifferent for the other two.

TABLE 2: ANOVA.

1. For shopping conveniently overall.						
N	Mean	Variance	F	P value	N	P value
210	3.55	1.137	16.818172	<0.001	211	<0.001
2. Shopping at any time and location.						
N	Mean	Variance	F	P value	N	P value
213	4.05	1.173	20.256178	<0.001	213	<0.001
3. Having interactive features helping me in navigating.						
N	Mean	Variance	F	P value	N	P value
212	3.42	1.254260	10.995814	<0.05	213	<0.001
4. Shopping with a convenient screen.						
N	Mean	Variance	F	P value	N	P value
213	2.83	1.367708	0.674555	0.412395	213	0.412395
5. Shopping with a convenient input interface.						
N	Mean	Variance	F	P value	N	P value
213	3.17	1.214249	1.922855	0.167006	213	0.167006
6. Searching for products and product-related information online.						
N	Mean	Variance	F	P value	N	P value
213	2.69	1.131765	10.658052	<0.05	213	<0.05
7. Shopping with ease of use.						
N	Mean	Variance	F	P value	N	P value
213	2.39	1.117716	19.955366	<0.001	213	<0.001
8. Shopping for expensive products.						
N	Mean	Variance	F	P value	N	P value
212	2.32	1.057193	49.293848	<0.001	212	<0.001
9. Shopping for high involvement and complex products.						
N	Mean	Variance	F	P value	N	P value
212	2.14	1.029781	39.233777	<0.001	211	<0.001
10. Shopping for customized products and services on the Internet.						
N	Mean	Variance	F	P value	N	P value
211	2.27	1.071575	40.525161	<0.001	211	<0.001
11. Shopping for a large variety of products.						
N	Mean	Variance	F	P value	N	P value
212	2.30	1.050117	36.483503	<0.001	212	<0.001
12. Participating in online auctions.						
N	Mean	Variance	F	P value	N	P value
211	2.27	1.071575	40.525161	<0.001	211	<0.001
13. Having communication with the seller.						
N	Mean	Variance	F	P value	N	P value
212	3.37	1.093936	15.752339	<0.001	212	<0.001
14. Sharing content related to products and brands.						
N	Mean	Variance	F	P value	N	P value
213	3.17	1.155836	1.771012	0.184700	213	0.184700
15. Having communication with the seller.						
N	Mean	Variance	F	P value	N	P value
212	3.18	1.103655	3.659864	0.057105	211	0.057105
16. Shopping from online marketplaces like Taobao.						
N	Mean	Variance	F	P value	N	P value
211	3.18	1.103655	3.659864	0.057105	211	0.057105
17. Safety in providing credit card number and other personal information.						
N	Mean	Variance	F	P value	N	P value
211	2.86	1.129127	2.053367	0.153364	211	0.153364
18. Shopping from international vendors/retailers.						
N	Mean	Variance	F	P value	N	P value
210	2.51	1.160296	16.293813	<0.001	211	<0.001
19. Getting postpurchase services.						
N	Mean	Variance	F	P value	N	P value
213	2.86	1.075130	2.826874	0.094178	213	0.094178
20. Seeing pictures of products to shop for.						
N	Mean	Variance	F	P value	N	P value
212	2.62	1.103068	15.225144	<0.001	213	<0.001
21. Seeing animation/video of products to shop for.						
N	Mean	Variance	F	P value	N	P value
213	2.49	1.071147	24.906630	<0.001	213	<0.001
22. Checking customer reviews and ratings for the desired products.						
N	Mean	Variance	F	P value	N	P value
213	2.93	1.115803	0.607843	0.436475	213	0.436475
23. Writing reviews regarding your purchased product.						
N	Mean	Variance	F	P value	N	P value
213	3.19	1.073893	5.146746	<0.05	213	<0.05
24. Sharing content related to products and brands.						
N	Mean	Variance	F	P value	N	P value
213	3.17	1.155836	1.771012	0.184700	213	0.184700
25. Having communication with the seller.						
N	Mean	Variance	F	P value	N	P value
212	3.37	1.093936	15.752339	<0.001	212	<0.001
26. Shopping from online marketplaces like Taobao.						
N	Mean	Variance	F	P value	N	P value
211	3.18	1.103655	3.659864	0.057105	211	0.057105
27. Safety in providing credit card number and other personal information.						
N	Mean	Variance	F	P value	N	P value
211	2.86	1.129127	2.053367	0.153364	211	0.153364
28. Convenience in making payments online.						
N	Mean	Variance	F	P value	N	P value
212	3.97	1.041255	47.102627	<0.001	212	<0.001
29. Being able to do other activities while shopping.						
N	Mean	Variance	F	P value	N	P value
211	2.86	1.129127	2.053367	0.153364	211	0.153364

TABLE 2: Continued.

206	2.77	1.152466	3.686532	0.056248	211	2.53	1.384523	4.908534	<0.05
13. Personalizing my needs, saving my preferences, and offering me services based on these preferences.									
<i>N</i>	Mean	Variance	<i>F</i>	<i>P</i> value	<i>N</i>	Mean	Variance	<i>F</i>	<i>P</i> value
209	3.24	1.047062	7.408592	<0.05	212	3.30	0.964484	21.685934	<0.001
14. For habitual/routine shopping.									
<i>N</i>	Mean	Variance	<i>F</i>	<i>P</i> value	<i>N</i>	Mean	Variance	<i>F</i>	<i>P</i> value
211	3.93	1.101485	21.956729	<0.001	208	2.39	1.006436	27.626633	<0.001
15. Speedy shopping consuming less time.									
<i>N</i>	Mean	Variance	<i>F</i>	<i>P</i> value	<i>N</i>	Mean	Variance	<i>F</i>	<i>P</i> value
212	4.09	1.086970	20.268397	<0.001	212	3.65	1.026127	38.791163	<0.001
16. Shopping with greater autonomy.									
<i>N</i>	Mean	Variance	<i>F</i>	<i>P</i> value	<i>N</i>	Mean	Variance	<i>F</i>	<i>P</i> value
211	3.02	1.016252	0.119789	0.729612	212	2.43	0.993046	41.309949	<0.001
17. Having better control over shopping activities.									
<i>N</i>	Mean	Variance	<i>F</i>	<i>P</i> value	<i>N</i>	Mean	Variance	<i>F</i>	<i>P</i> value
209	2.98	1.273358	0.025296	0.873785	198	3.48	1.129787	15.434529	<0.001
30. Joyful and pleasant shopping experience.									
31. Watching online advertisements related to products and services.									
32. Sharing your shopping experience with your friends and family.									
33. Getting information related to brands and vendors.									
34. Searching for local business and suppliers in the nearby areas.									

TABLE 3: Factor loadings.

Human factor (miscellaneous)		Product research factor		Marketplace related	
Indicator	Loading	Indicator	Loading	Indicator	Loading
1	.658	7	.596	22	.768
2	.762	9	.517	25	.768
8	.810	16	.732	Online review related	
24	.743	17	.758	Indicator	Loading
27	.751	33	.684	18	.889
28	.777	36	.518	19	.889
32	.462	Product-related factor		Sharing content related	
37	.416	Indicator	Loading	Indicator	Loading
Interface-related factor		10	.716	20	.807
Indicator	Loading	11	.754	35	.807
3	.624	12	.540	Human factor-autonomy	
4	.629	13	.545	Indicator	Loading
5	.676	14	.659	29	.719
6	.696	10	.716	30	.602
Service-related factor				31	.753
Indicator	Loading				
15	.506				
21	.706				
23	.417				
26	.743				

4.2. *Validation of the Proposed Factors.* The nine proposed survey segments were analyzed for validity to check if they indeed formed significant comparison factors between m-commerce and e-commerce. Interface-related factors and miscellaneous human factors were developed by consulting the previous literature related to user preferences and general interface usability domain, for instance, as stated by Plaisant and Shneiderman [46]. Service- and product-related factors were derived from m-commerce, e-business, and e-commerce literatures focusing on user preferences of electronic commerce [47]. Two analyses have been performed to determine the validity of these factors [23]. These analyses (correlation and principal component factor analyses) are detailed below.

4.3. *Correlations among Items of Each Factor.* The Pearson correlation was performed to examine interrelationships among items that were group together within the proposed nine factors. The resulted correlation matrix consisted of 36 items because the duplicated item 34 was not included in the analysis. This correlation matrix is presented in Table 4. The matrix is divided into the proposed nine categories, and correlation was only checked within questions of each factor. Each significant correlation between items is highlighted by a single star (at 0.05 level) or double stars (at 0.001 level). Except few, most of the items are significantly correlated within their determined categories and most of the indicators among same factor were significantly related at 0.001 and 0.05 alpha levels.

All the items within the first category of human factor-miscellaneous were strongly correlated since 29 out of 29

correlations were significant. Similarly, all the items relating to interface and autonomy were reported strongly correlated. The factors of marketplaces, sharing content, and online reviews consisted of only two items, so the single correlation existed between them which was found significant. These findings represent that all the items of factors mentioned above are closely knit and form successful comparison categories. However, one out of fifteen correlations in product research factor, one out of eight correlations in product-related factor, and three out of six correlations in service-related factor were found insignificant. Overall, this initial correlation analysis proved overt alliances for the proposed factor elements, although it marked some weak relationships between a few elements fitting to the same proposed factor.

4.4. *Factor Analysis for the Proposed Factors.* An exploratory factor analysis was established to test the validity of the nine factors proposed in the e-commerce comparative survey. In this process, principal component analysis was performed on each group of questions belonging to the proposed factors, resulting in 9 analyses. The proposed factor is validated in each analysis by specifying a factor, as the purpose of the analysis is to prove its validity. Despite its exploratory nature, principal component factor analysis was considered suitable in this case, since high loadings of items within the same proposed factor can exhibit evidence for the factor validity. For each of these 9 factors, the load of a single question is very close to or higher than 0.40. Among the factors related to online reviews, the highest load is 0.889 and the lowest loading being 0.416 (loading of “conveniently searching for local business and suppliers in the nearby areas” on

TABLE 4: Pearson correlations between indicators of each factor.

Human factor-miscellaneous								
	1	2	8	24	27	28	32	37
1	1							
2	.478**	1						
8	.448**	.532**	1					
24	.294**	.459**	.572**	1				
27	.423**	.420**	.536**	.503**	1			
28	.352**	.494**	.552**	.530**	.519**	1		
32	.307**	.204**	.277**	.288**	.308**	.255**	1	
37	.229**	.265**	.225**	.209**	.267**	.219**	.171*	1
Interface-related factor			Human factor-autonomy related					
	3	4	5	6		29	30	31
3	1				29	1		
4	.254**	1			30	.167*		
5	.263**	.260**	1		31	.302**	.204**	1
6	.344**	.302**	.322**	1				
Product research factor								
	7	9	16	17	33	36		
7	1							
9	.422**	1						
16	.382**	.240**	1					
17	.255**	.155*	.505**	1				
33	.230**	.183**	.342**	.450**	1			
36	.036	.152*	.193**	.364**	.343**	1		
Product-related factor			Marketplace-related factor					
	10	11	12	13	14		22	25
10	1					22	1	
11	.434**	1				25	.180**	1
13	.205**	.342**	.131	1		Sharing content-related factor		
14	.385**	.272**	.262**	.192**	1		21	35
						21	1	
						35	.302**	1
Service-related factor			Online review-related factor					
	15	21	23	26		18	19	
15	1				18	1		
21	.107	1			19	.582**	1	
23	.148*	.100	1					
26	.172*	.350**	.067	1				

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

human factor-miscellaneous factor, item 37). Generally, the loading accepted in these types of analyses is 0.40 and higher [2]. All loadings are presented in Table 3. The items with strong loadings exhibited evidence that these items belonged to their specified factors. The current analyses offered support concerning the correct placement of individual questions in their specified predetermined factors. Thus, it was concluded that the electronic commerce comparison survey was valid and appropriate for the current study. Moreover,

in conjunction with the results from the ANOVA (as indicated in Table 2), it can be ascertained that the survey met its requirements as an instrument to identify and propose usability preferences and technology issues from users' perspectives, in the comparative context of m-commerce and e-commerce.

Table 4 indicates that the Pearson correlation and principal component factor analysis (see Table 3) demonstrated evidence concerning the correct placement of individual

items in their respective factors. Thus, it has been assured that the electronic commerce comparison survey which was originally adapted from Ozok and Wei [2] is a viable instrument for the comparative analysis of m-commerce and e-commerce from users' perspective.

5. Discussion

The aim of this research is to determine the potential of m-commerce and e-commerce as primary mediums for online shopping. To achieve this goal, the study is aimed at addressing two fundamental research questions: Can m-commerce and e-commerce be used as alternative or complementary modes of shopping? And, what are the key differences between these two mediums, if any? The participants in the survey were young students under 26 years of age from various departments of a public university in China. All of the students had some level of online shopping experience for both e-commerce and m-commerce. The survey results indicate that the respondents possess a high level of understanding of usability issues and preferences for these two mediums. To determine the correlation factors used to compare the usability preferences of the two mediums, factor analysis and correlation were employed as validation methods.

Thus, nine factors or categories were identified in this research as valid measurement tools for comparing e-commerce and m-commerce. In line with the contemporary understanding that users prefer mobile devices for online shopping due to personal factors such as convenience, enjoyment, and ubiquity, this study also demonstrated that m-commerce was the preferred medium due to these human-/behavior-related issues [48]. Additionally, the participants preferred using their smartphones/tablets for habitual and routine shopping that does not require much preplanning or effort. However, autonomy has not been extensively considered as a human factor in investigating user preferences in the online shopping context; therefore, the researcher was unable to establish any set of beliefs about this factor.

The findings of this research indicate that participants either do not have a preference for a particular medium in terms of having better control over shopping activities, or they prefer e-commerce as it allows them to engage in other activities simultaneously, providing them with more freedom and control over their interactions with the devices. Managers who rely solely on web-based or computer-based platforms for online sales should consider ways to make the medium more convenient or consider moving to mobile-based sites or applications. e-commerce as a medium cannot be overlooked as participants reported feeling freer and more relaxed while using computers for online shopping-related tasks.

The participants' opinions were divided concerning the interface features of e-commerce and m-commerce. Young consumers preferred m-commerce for interactive features that aid in navigation and e-commerce for visually appealing interfaces. However, they were indifferent regarding features such as a convenient screen and convenient input interface. This finding is noteworthy as it was previously believed that

computer screens were more convenient in terms of ease of use and input interface [2]. One of the more surprising findings of this research was in regard to the product research factor, as participants preferred computers for all cases of product research-related items. This aligns with previous studies dating back to the beginning of the 21st century [39], which have consistently found that conventional PC-based e-commerce is superior to mobile commerce in many aspects. This can be attributed to the limitations of mobile device screens. Factors such as freedom in screen sizes, visual appeal, multitasking, and the ability to view clear images and videos about products were determined to be deficiencies in the mobile commerce experience and negatively impacting customers' ability to make informed purchase decisions.

Product search is a crucial stage in the purchasing process, and firms that lack a proper presentation of their products on computer-based websites may struggle to attract large consumer traffic. Furthermore, it was found that product search-related features in mobile commerce need improvement. Additionally, e-commerce was found to be more popular than mobile commerce for all product-related issues, including the purchase of expensive products, the purchase of customized products and services on the Internet, the purchase of various products, and the purchase of products from international suppliers/retailers.

Based on the findings of this research, it can be concluded that e-commerce, in the form of computer-based websites, is the preferred medium for effortful and more significant purchases. This preference is likely due to the perceived reliability, comprehensiveness, and extensiveness of computer-based platforms for high involvement and key shopping activities. However, the underlying causes of this choice decision require further investigation. Despite the advancements in technology and the availability of mobile software applications, e-shoppers still prefer to use computer screens for important and key purchases.

The research is aimed at determining the potential of m-commerce and e-commerce as primary mediums for online shopping by studying the preferences and usability issues of young students from a public university in China. The study employed factor analysis and correlation to compare the usability preferences of the two mediums and identified nine factors or categories as valid measurement tools. The results showed that m-commerce was the clear preference due to convenience, enjoyment, and ubiquity, but e-commerce was preferred for activities that required more autonomy and freedom. The findings also revealed that e-commerce is superior to m-commerce in many aspects, particularly in product research, purchase of expensive products, and purchase of customized products and services. However, m-commerce is favored in terms of customer service and personalization. It is also interesting to note that there is no explicit distinction between e-commerce and m-commerce when it comes to safety issues. The study suggests that managers should consider how to make e-commerce more convenient or move to mobile-based sites or applications. It also implies that further research is needed to investigate the

underlying causes of such choice decisions. Based on the findings of this research, it can be concluded that there are variations in user preferences when it comes to e-commerce and m-commerce.

While m-commerce is favored for certain activities such as personalizing needs and offering services based on user preferences, e-commerce is considered to be better for effortful and more important purchases [49]. Furthermore, the study confirms the robustness of the TPB and suggests that consumer preferences can predict their attitude towards online shopping. However, it is worth noting that there is no significant difference in shopping from online marketplaces such as Taobao [50]. Nevertheless, these findings indicate that further research is necessary to understand the underlying causes of these choice decisions.

The findings of this research indicate that the categories used for comparing the two mediums of e-commerce and m-commerce are potentially accurate, as the corresponding items were found to be related and exhibited similar preferences. Future researchers may adopt these factors for testing users' usability preferences in a comparative context. However, it should be noted that technology is rapidly changing and evolving, and as such, the online shopping environment may change in the future. It is also worth noting that the target population of this study was youth consumers, who are often at the forefront of technology adoption and are frequent users of mobile devices. Despite this, the traditional e-commerce channel still holds a significant position and cannot be entirely replaced by the modern medium of m-commerce. While there are instances in which e-commerce and m-commerce may serve as alternative mediums, they are truly alternatives in terms of factors such as convenience, product research, key product-related issues, and some interface features [51]. Overall, out of the thirty-six predetermined indicators used in the study, e-commerce was favored for fourteen items, m-commerce was chosen for thirteen items, and no significant preference was recorded for the remaining nine items.

6. Conclusion

This study is aimed at conducting a comparative analysis of e-commerce and m-commerce by using an electronic commerce comparison survey with university students as participants. The research identified and validated nine comparison factors, namely, human factor-miscellaneous, human factor-autonomy, product research, product related, interface features, service related, online review related, marketplace related, and sharing content related. A total of 36 items were used for comparison, out of which 14 received preference for e-commerce and 13 were favored for m-commerce, whereas respondents remained indifferent about the remaining nine factors. e-commerce was fully preferred for the product research factor and the product-related factor, while it was partially favored for marketplaces and autonomy. m-commerce was completely favored for the human factor-miscellaneous and partly for the interface factor, online reviews, and service-related factor.

The limitations of this study include the fact that it surveyed young Chinese students and the convenient sampling process hinders the promotion of survey results to older online consumers. The sample size of this study was small, and it was not enough to study which specific e-shopping mode would affect the choices of young online consumers. Therefore, future researchers should use large sample sizes to verify these research results. Furthermore, although the authors confirmed the validity of the face and discriminant validity of the variables of interest, there may be a high correlation between the error variance of the e-shopping modes (i.e., e-commerce and/or m-commerce) and the confounding effect between these measures. Future research needs to use different product categories or other online/offline modes of shopping to replicate the research to improve the generality of the research model.

In addition, research on the potential dynamic interaction between e-shopping media (e.g., e-commerce and mobile commerce) and TPB beliefs broadens the scope of researchers' understanding and encourages e-retailers to have a deeper understanding of TPB in the context of consumers and can formulate marketing strategies to enhance consumers' e-shopping preferences. Furthermore, consumers who browse but do not buy online may represent a unique segment of future online buyers; therefore, it may be useful to investigate the browser's e-shopping preferences because they may differ from online buyers. A further limitation of this investigation is that the sample was solely sourced from individuals under the age of 26 and from China; therefore, the results may differ when research is conducted with different age groups or geographical regions.

Data Availability

The data will be made available upon reasonable request from scientists and/or interested parties.

Conflicts of Interest

The authors have no conflict of interest related to this manuscript.

Authors' Contributions

All authors who have contributed equally to the conception and design of the study, as well as to the data collection and analysis processes. S.K, Khan, N.A Khan, and O. Egorova were responsible for developing the research framework, conducting a thorough theoretical and literature review, and performing data analysis. On the other hand, Quratlain and M Akhtar were instrumental in overseeing the development of the data collection tool, finalizing the research items, and organizing and cleaning the collected data. Additionally, N. Zia provided invaluable support in the data analysis and revision of the manuscript.

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