Exploring the Factors That Influence Unexpected Change of E-Customer Behaviour and Perceived Cybercrime Risk during COVID-19 in Saudi Arabia

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Abstract
Cybercrimes are the biggest threat that can influence the future of e-commerce, particularly in difficult times such as the COVID-19 pandemic. This pandemic has resulted in noticeable changes in e-customer behaviour represented in three types: spending rates, types of goods bought, and the number of purchasing times. Moreover, the percentage of cybercrime in many countries, including Saudi Arabia, has increased during the pandemic. The increase in the number of cybercrimes during the COVID-19 crisis and the changes in consumer behaviour shows that there is an urgent need to conduct research on the factors that have led to this. This study will explore the most significant factors that have an effect on the unexpected change of customer behaviour and cybercrime perceived risk during the COVID-19 pandemic in Saudi Arabia. The finding of the study will hopefully contribute to attempts in finding safer methods for shopping online during COVID-19 and similar crisis.

Key words:
COVID-19, cybercrime perceived risk, unexpected change of customer behaviour, online shopping type.
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1. Introduction

By the end of 2019, the world was experiencing an outbreak of COVID-19 that had started at Wuhan in China. Due to how quickly it became widespread, the World Health Organization (WHO) declared a global COVID-19 pandemic on 11 March 2020 [1]. Outbreaks of COVID-19 have occurred in more than 216 countries across the world [2]. This has forced many countries to implement strict strategies in order to limit the spread of the virus. The most prominent strategies that have been applied by governments are social distancing and lockdowns [3]. These means of limiting the spread of the virus have resulted in enormous economic losses due to most businesses and social activities having to be halted. However, there has been high demand for the Internet in various daily-life activities that have been interrupted by the crisis. Aspects of daily life such as learning, commerce and banking transitions are more frequently performed online than they were before the crisis. Online shopping is another aspect that has rapidly become more popular during the pandemic. Consumer behaviour in online shopping had changed by the first quarter of 2020 in many countries due to COVID-19 [4-6].

The main aim of this study is to explore the key factors that influence customer behaviour and increase the rates of perceived risk of cybercrimes during the pandemic of COVID-19 in Saudi Arabia.

The structure of this paper is as follows. Section 2 covers the background of the study, including the cybercrimes regarding security and privacy aspects of online shopping during COVID 19. Section 3 presents related work. Section 4 describes the research methodology. Section 5 demonstrates the research findings and discussion. Section 6 concludes the paper.

2. Background

2.1 Changing in E-Customer Behaviour

Research has been conducted to understand and explore the factors affecting customer behaviour during the pandemic in both developed and developing countries in order to respond to the changes in accordance with the characteristics of the different countries. For instance, [4] examined the influence of COVID-19 in accelerating changes in consumer behaviour and the adoption of online shopping in the USA market, while Neger and Uddin [5] explored the factors that have led to changes in e-customer behaviour during the pandemic in Bangladesh. Numerous changes have occurred, including in terms of spending rates, types of goods bought, and the number of purchasing times. However, the most significant change in customer behaviour is the increased number of online purchases. The growing usage of the Internet by the first quarter of 2020 resulted in a notable increase in online transitions for different aspects of daily life. For example, in the USA, the promotion of e-banking transitions increased by 73%, while the adoption of digital shopping for groceries and apparels increased by 106% [7].

Statistics shows that there has been a marked rise in the number of e-customers following the start of the pandemic; thus, the rate of purchases has also increased. Almost 55% of Saudi residents are now likely to purchase groceries online, despite only 6% doing this before the pandemic [8]. This indicates that there has been a greater revival of e-commerce and e-shopping than any that have occurred before. A recent study in New Zealand has shown that the number of online purchases has risen more than 10% after March 2020 (the peak of the pandemic in New Zealand, when the borders were shut) comparable with online purchases in the same month of 2019 before COVID-19 [6].

2.2 Cybercrimes and Privacy Security Issues

The significant increase in cybercrimes (mostly related to security and privacy issues) is an important sign associated with increased usage of the Internet and higher rates of online shopping. It shows that the rate of perceived risk may increase following the COVID-19 pandemic. According to ABC News [9], there have been approximately 24,000 reported cases of personal information being stolen by scammers in Australia during 2020. Compared to 2019, the proportion of scams has increased by up to 55% [9]. The Saudi ministry of commerce has received roughly 100,000 reports against online stores after the pandemic began, with the concerns of most customers being related to delivery issues. During this same time, the Saudi Ministry of Commerce has also blocked three international e-stores and five domestic stores on social media for selling fraudulent goods to consumers [10].

Therefore, exploring the main factors affecting the online shopping during COVID -19 in Saudi Arabia, in relation to unexpected changes in customer behaviour and the increased rate of perceived risk of cybercrimes, is a key requirement for finding appropriate solutions for dealing with global cybercrime problems in times such as this.

3. Related work

Previous studies in the field of online shopping are used as a basis in order to determine the factors that should be examined in this study. For example, the relationships between behavioural intuition, trust, the technology acceptance model (TAM) factors, privacy and security were explored by Roca, García [11]. It was found that trust and the TAM factors are the most important for success in online shopping, while privacy was found to not play a significant role concerning behavioural intention. In addition, the study also verified that a better, more secure system can increase e-vendors' usage intentions. It is therefore interesting to study the relations between these factors again under the context of higher demand for

online shopping during the COVID-19 pandemic and with a focus on Saudi consumers instead.

Another example of the factors being tested is a study that was conducted by Chang, Fu [12]. Their study showed how the interactions between some unified theory of acceptance and use of technology (UTAUT) factors and innovation diffusion theory (IDT) factors, as well as perceived risk and familiarity, affect purchase intentions in the context of online shopping. The study obtained significant results, the most important in relation to the current study being that perceived risk negatively affects purchase intention. Examining the relation between risk and purchase intention in the context of the pandemic may contribute to achieving the research aim of this paper.

Slade, Dwivedi [13] have also tested the relations between perceived risk, trust, behavioural intention and UTAUT factors to determine how they affect consumers' intentions of not adopting remote mobile payments (RMPs) in the UK. Although the main aim of their research was concerned with RMPs, it was also indirectly related to online shopping, with their study being based on the significant correlation between the continued growth of mobile commerce (MC) and the success of RMPs. Within the context of the current study, it will be interesting to test these factors with others to determine how they are affecting online shopping in Saudi Arabia during the pandemic. Therefore, this study determines six factors in the context of online shopping to be tested and discussed in the following subsections.

3.1 UTAUT factors

The TAM has become the base theory for many studies focused on the acceptance of information technology (IT) systems such as e-shopping. Davis [14] proposed the TAM to explain the acceptance of IT by individuals. This model is based on two main factors: perceived usefulness (PU) and perceived ease of use (PEOU).

Venkatesh, Morris [15] combined the TAM with seven more theories in order to introduce the UTAUT model, which is more suitable for understanding customer behaviour regarding acceptance and usage of technology when performing financial transitions via electronic tools. The UTAUT model unifies the most famous technology usage theories: the TAM, theory of reasoned action (TRA), innovation diffusion theory (IDT), theory of planned behaviour (TPB), decomposed theory of planned behaviour (DTPB), model of PC utilisation (MPCU), the motivational model (MM) of computers in the workplace and social cognitive theory (SCT) of computer utilisation.

The UTAUT aims to study four aspects: performance expectancy, effort expectancy, social influence and facilitating conditions. Following the creation of this unified model, research has turned towards exploring

different factors affecting the main UTAUT factors, particularly in the context of mobile apps. For example, Slade, Dwivedi [13] investigated how the UTAUT factors, innovativeness and perceived risk interact and affect behavioural intention, while Chang, Fu [12] studied factors such as virtual community building and website performance expectancy to identify their impact on behavioural intention.

UTAUT factors are included in the current study because these factors could contribute in occurring the changes in customer behaviour during COVID-19. Performance expectancy, effort expectancy, social influence and facilitating conditions may play an important role to increase the trust of purchasing e-goods and determining the best online shopping type (web or app).

3.2 Trust factor

Trust in online shopping can be defined as providing what has the e-store promised to give their customers[16][17]. Al-Debei, Akroush [18] think that trust could be a result of web quality and word of mouth. The web or app quality could be measured by the level of design quality, privacy, and security. The design of the web site or the app is an important factor that affects trust because producing an attractive enjoyable design will build more trust between e-customer and vendor.

Building the trust of customers is the most important aspect in the success of e-shopping [19]. Thus, vendors should make their customers feel confident when shopping via their e-stores by ensuring high levels of security and privacy for their websites or apps [20]. In the current study, trust should be included as a fundamental factor because it could affect customer behaviour and could be affected by cybercrime during COVID-19 pandemic.

3.3 Security and privacy factor

According to [21] issues, which are related to privacy and security, are always classified as important factors that influence e-shopping. They also state that most of e-stores request customers to save their sensitive information such as personal and payment info into the system. Therefore, they conclude that e-stores should provide a system that ensure a suitable level of privacy for the e-customers. To build a secure online shopping system (be it a website or app), essential security measures for each transition phase must be applied, such as authorisation and encryption, via suitable security tools. Moreover, online shoppers should always be aware of the different types of threats surrounding e-shopping. These can be classified into three types: denial of service (DOS), illegal access and theft and fraud [22]. According to Yazdanifard, Edres [19], finding a system for e-shopping that is fully secure against these threats becomes more challenging as time goes by

due to the Internet becoming more widely used, thus meaning more frequent cyberattacks. As the Internet has been more widely used during the pandemic than other time before, security and privacy factors should be an important component of the current study.

3.4 Online shopping type factor

The widespread of Internet usage and electronic devices encouraged the adaption of e-commerce. An e-store has become an essential feature for e-commerce [23]. An e-store can be a store web site, store app, or a social media app account. Customers may choose one of e-stores types to purchase online goods based on various criteria including enjoyable, ease of use, security, and privacy. Some studies explored what is the most popular choice for e-customers when they shop online. For example, Almarashdeh, Jaradat [24] compared shopping using web site and shopping using app method in a study that targets Saudi Arabia while Liang and Liu [25] conducted a similar study in USA. Almarashdeh, Jaradat [24] found that Saudi consumers prefer apps more than website. On the other hand, Liang and Liu [25] found that the selected sample prefer using website more than apps. However, none of both studies suggested consumer to use one method rather than the other one depending on security and privacy issues.

Another example, Okamoto, Yatsuhashi [26] conducted a study to determine the reasons behind students from a Japanese university installing shopping apps on their devices and purchasing online goods through them. The study confirmed that some young customers use apps on mobile devices to shop instead of web browsers, but it did not state the main reasons that motivate this decision. The current study could help to explain the main reason that motivate customers to choose one online shopping methods instead of others based on trust, security, and privacy factors.

In our study, adding online shopping type as a factor is important because the challenges that face online shopping during COVID-19 may affect customer behaviour and their trust level for security and privacy. Therefore, this could help customers decide which method of e-shopping is suitable regarding security and privacy.

3.5 Cybercrime Perceived risk factor

The organized cybercrime industry emerged by 2004 and has become one of the most risky global crimes [27]. According to Hunton [28], cybercrime considers as a part of digital crimes that are harm and supported by digital communications such as the Internet. The risk of this type of crimes continues increasing due to the growth of the usages of the Internet and other digital networks [28]. It is also common for cybercrimes and attacks to become more frequent and widespread during crises as severe as the COVID-19 outbreak [29].

Riek, Bohme [30] proved the existing of a negative impact of cybercrime perceived risk on the avoidance of online shopping in regular times. However, research needs to be carried out to investigate if this impact is still the same or changed during severe crises such as COVID-19.

Therefore, it is crucial to detect cybersecurity risks and threats in relation to online shopping during the pandemic by adding this factor to our study.

3.6 Unexpected change of customer behaviour factor

E-customer behaviour change unexpectedly due to COVID-19 [4-6]. The changes in e-customer behaviour include spending rates, types of goods bought, and the number of purchasing times. Therefore, studying the change of customer behaviour factor will help to investigate the influence on the increasing of cybercrime risks during the crisis of the pandemic of COVID-19.

4. Research methodology

The study uses a survey method and has targeted participants who: are aged 18–60, live in Saudi Arabia, can use the Internet and are able to utilise at least one online payment method to shop online). University students and staff are the best population for the sample as all of the aforementioned characteristics apply to them. Thus, the sample size is selected of the university with the largest number of students and staff members in Saudi Arabia Umm Al-Qura University (UQU), which is in the western region of Saudi Arabia.

This study applies descriptive and inferential statistics analysis to the collected data using SPSS software. A digital questionnaire was used in this study to collect the data. Questions were about the experience of e-customers with online shopping during COVID-19 pandemic in Saudi Arabia and how that affected their online shopping behaviour. The structure of the questionnaire consisted of 27 questions that represent the values of study factors. The measures of the study factors were set using a five-point Likert scale (1= strongly disagree, 2= disagree, 3=neutral, 4= agree, 5= strongly agree) except for the negative questions, their values were reversed before conducting the analysis.

The total of received responds is 432 only 360 were valid for factors descriptive analysis.

5. Finding and Discussions Conclusion

Table 1 summarises the result of the responders' demographic characteristic. It is clear from the table that most of the participants are young between the age (18-24) years old, almost 50% of the participants. Also, the male participants are (71.5 %), almost two times and half more than the females. The participants have different level of

education, but almost 55% of them have a bachelor's degree. It is also notable that more students participated in our study than those who are employed. The highest group of the participants are those who receive less than 1000 S.R as monthly income; this should be expected since most of the participants are student and the students at the Saudi public university are receiving a monthly income 1000 S.R or less.

Table 1: Demographic data

Demographic Characteristics	Percentage
Age	
18 – 24	215 (49.8%)
25 – 30	56 (13.0%)
31 – 35	46 (10.6%)
36 – 40	58 (13.4%)
41 – 45	34 (7.9%)
46 - 50	12 (2.8%)
51 – 60	8 (1.9%)
>60	3 (.7%)
Gender	
Male	309 (71.5%)
Female	123 (28.5%)
Education level	
High school or equivalent	92 (21.3%)
Bachelors	236 (54.6%)
Masters	56 (13.0%)
PhD	30 (6.9%)
Other	18 (4.2%)
Employment	
Student	243 (56.3%)
Employed	189 (43.8%)
Monthly Income	
less than 1,000 SR	186 (43.1%)
1,000 – less than 3,000 SR	55 (12.7%)
3,000 – less than 5,000 SR	30 (6.9%)
5,000 –less than 10,000 SR	49 (11.3%)
10,000 SR or more	112 (25.9%)
Online shopping experience	
Yes	400 (92.6%)
No	32 (7.4%)
Online shopping experience during COVID-19	
Yes	367 (85.0%)
No	33 (7.6%)
Constrained to purchase online during COVID-19	
Yes	280 (64.8%)
No	87 (20.1%)

The majority of the participants (92.6%) have experience of online shopping. While (85.0%) of them have experience of online shopping during COVID-19, about 65% were constrained to purchase online during COVID-19. Thus, a high proportion of the study sample have necessity to shop online during COVID-19.

Table 2 shows the mean, standard deviation, and the percentage of agreement level for each construct of the study six factors. From table (II), the result analysis of customer trust level of online shopping during COVID-19 shows that: the majority of responders (48.3 % agree) with 3.59 as mean score, feel confident while shopping online during COVID-19 because they trust the level of security and privacy of e- stores. Therefore, the most significant factors that influence Saudi customer trust level during COVID-19 are the high level of security and privacy in e-stores. The minority of responders (26.7%) with mean

score (2.61) have neutral attitude toward the trust level of shopping online during COVID-19 in regard to facing cybercrimes, such as identity theft, fraud, personal or banking info stealing while they shop online. Therefore, the risks of cybercrime have no effect on trust level for most e-customers while shopping online during COVID-19. This indicates that many e-shoppers may not have sufficient awareness of cybercrime risks, which calls for the need to find better solutions to increase awareness and spread knowledge among e-customers.

Analysing the factor of "Security and privacy level of online shopping during COVID-19 in Saudi Arabia" as shown in table 2 reveals the following results: the highest mean score of e-customers is 3.94 where (58.3 %) of them agree that e-stores apply an adequate level of privacy and security, such as sending an email or text message to confirm the transition, during COVID-19. The second highest mean score of e-customers is 2.61 where (45.6%) of them have not experienced any security issues, such as hacking attack, and viruses, that lead to harmful damage in their computers or devices after visiting or shopping online during COVID-19. However, about 13% of responders agreed and totally agreed that they have experienced security issues that lead to harmful damage in their computers or devices after visiting or shopping online during COVID-19. We also analysed the security and privacy factor for e-shoppers from reputable and fake e-stores. Whereas the mean score of the e-shoppers from the fake e-stores who did not encounter security and privacy problems is (1.91), the popular ones were (1.85). However, the mean of those who encountered problems while shopping from reputable e-stores is (10.6 %) and (12.2 %) from fake e-stores, which are relatively high.

Online shopping type during COVID-19 in Saudi Arabia, as table 2 illustrates, shows that the mean of e-shoppers, who prefer to shop online using the store apps rather than using the store web site during COVID-19 because it provides better security and privacy for them, is 3.53. On the other hand, the mean of e-shoppers, who have neutral attitude toward using the store web site rather than using the store apps during COVID-19, is 2.91. Thus, most of the responders think that e-shopping using store app is provide more security and privacy for them while shopping online during COVID-19.

The result of analysing cybercrimes rate during COVID-19 in Saudi Arabia shows that: the mean score of e-customers, who have not experienced cybercrimes such as (identity theft, fraud, personal or banking info stealing) during COVID-19 while shopping online using store website and store app, are (2.00) and (2.08) respectively. However, the total percentage of e-customers who agree and strongly agree that they have experienced cybercrimes while shopping using store website is (12.5%) and (13.3%) for shopping using store app. Although these percentages are considered as a high rate of cybercrimes in Saudi

Arabia during COVID-19, the mean score of responders (3.10) has neutral level of agreement on the increasing rate of cybercrimes during the pandemic. That again indicates low awareness level of the risk of cybercrimes among e-customers during the pandemic.

It is clear, from the result of analysing unexpected change of customer behaviour during COVID-19 in Saudi Arabia in table 2, that the most significant change of customer behaviour is the increased number of purchase online goods during COVID-19, where the score of mean is 3.73. The next significant changes of customer behaviour are purchasing new types of goods for the first time from online stores during COVID-19 (mean score is 3.43) and the increased in spending rate for buying online goods during COVID-19 (mean score is 3.42). In addition, the mean score (2.47) represents the responders who adopted online shopping before COVID-19 but almost 25.8% of the responders adopted shopping online for the first time during COVID-19. Therefore, the percentage of shopping online has increased among Saudi's citizens during COVID-19.

UTAUT factors analysis in table 2 shows that the most significant factor of UTAUT is the improving of online shopping performance during COVID-19 because it has the highest mean score (3.75). This is followed by: (1) facilitating conditions with the second highest mean score (3.71), (2) spending less effort while shopping online with the third mean score (3.64), and finally (3) the social influence with the mean score (3.48). Therefore, it is clear that all the four UTAUT factors have a significant effect on changing e-customers behaviour during COVID-19 in Saudi Arabia.

The multiple regression analysis provided the most important results. First, gender has a significant effect on the security/privacy level of e-stores during COVID-19 in Saudi Arabia, and the factors of age, education level, employment and monthly do not. Second, employment has a significant effect on online shopping type during COVID-19 in Saudi Arabia, but age, gender, education level and monthly income do not. Third, the independent variables age, gender, education level, employment and monthly income have no significant effects on the dependent study factors (trust, unexpected customer behaviour, cybercrime risk and UTAUT factors).

Table 3 summarises the regression model and shows the correlation between security/privacy as the dependant factor and the demographic data as independent factors. The value of the correlation coefficient (R = 0.196) indicates that there is a possible positive relationship between the security/privacy level of e-stores during

Table 2: Descriptive Statistics and Frequency Percentage

Factor	N	Mean	Std. Deviat-ion	Agreement level percentage				
				Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Consumer trust level of online shopping during COVID-19 in Saudi Arabia **TR1** I feel confident while shopping online during COVID-19 because I trust the level of security and privacy of e-stores	360	3.59	.934	3.6%	7.8%	27.5%	48.3%	12.8%
TR2 I trust the quality of the products and that they match the site descriptions when I shop online during COVID-19	360	3.19	.852	2.5%	17.5%	41.4%	35.3%	3.3%
TR3 I trust that I will receive the products at the estimated delivery time during COVID-19	360	2.87	1.033	8.9%	31.1%	26.9%	30.3%	2.8%
TR4 If there is any delivery delay, the store will let me know	360	3.12	1.120	8.1%	25.8%	19.2%	39.7%	7.2%
TR5 I trust using and saving my personal and banking info in the e-store site or app when shopping online during COVID-19	360	3.03	1.103	10.6%	21.7%	28.6%	33.1%	6.1%
TR6 I do not trust shopping online during COVID-19 because I am afraid of cybercrimes (e.g. identity theft, fraud and stolen personal/banking info) while I shop	360	2.61	1.009	11.4%	40.6%	26.7%	18.3%	3.1%
Security-privacy level of online shopping during COVID-19 in Saudi Arabia SP1 **E-stores apply an adequate level of privacy and security (e.g. sending an email or text message to confirm the transition) during COVID-19**	360	3.94	.826	2.5%	2.2%	15.3%	58.3%	21.7%
SP2 I experience one or more security issues (e.g. hacking attacks/viruses) that harm my computer/device after visiting or shopping online during COVID-19	360	2.08	1.008	30.6%	45.6%	10.8%	11.4%	1.7%
SP3 I have experienced shopping online from a fake store that resulted in me being a victim of one or more cybercrimes (e.g. identity theft, fraud and stolen personal/banking info) during COVID-19	360	1.91	1.042	42.5%	38.6%	6.7%	10.0%	2.2%
SP4 I have experienced shopping online from a famous store that resulted in me being a victim of one or more cybercrimes (e.g. identity theft, fraud and stolen personal/banking info) during COVID-19	360	1.85	.984	43.1%	41.1%	5.3%	8.9%	1.7%
Online shopping type during COVID-19 in Saudi Arabia **ST1** I prefer to shop online using store apps rather than websites during COVID-19 because they provide me with better security and privacy	360	3.53	.976	3.6%	8.6%	35.0%	37.2%	15.6%
ST2 I prefer to shop online using store websites rather than apps during COVID-19 because they provide me with better security and privacy	360	2.91	1.075	11.7%	21.1%	38.9%	21.7%	6.7%
ST3 Both methods of online shopping provide the same level of security and privacy during COVID-19, and I have no preference	360	3.44	.999	3.3%	14.4%	30.6%	38.6%	13.1%
Cybercrimes rate during COVID-19 in Saudi Arabia **CR1** I experienced one or more cybercrimes (e.g. identity theft, fraud and stolen personal/banking info) during COVID-19 while I was shopping online using a store website	360	2.00	1.037	37.2%	40.0%	10.3%	10.6%	1.9%
CR2 I experienced one or more cybercrimes (e.g. identity theft, fraud and stolen personal/banking info) during COVID-19 while I was shopping online using a store app	360	2.08	1.109	35.6%	38.9%	12.2%	8.9%	4.4%
CR3 I experienced cybercrimes (e.g. identity theft, fraud and stolen personal/banking info) during COVID-19 while I was shopping online using both methods with no preference during COVID-19	360	2.01	1.025	35.8%	40.3%	13.1%	8.3%	2.5%
CR4 I think that the rate of cybercrimes has increased during COVID-19	360	3.10	1.095	8.9%	17.8%	38.6%	23.9%	10.8%
Unexpected change of customer behaviour during COVID-19 in Saudi Arabia UCB1 **I adopted online shopping for the first time during COVID-19**	360	2.47	1.185	22.2%	38.9%	13.1%	21.1%	4.7%
UCB2 The number of times I purchase online goods has increased during COVID-19	360	3.73	1.076	4.4%	11.9%	12.8%	48.3%	22.5%
UCB4 I purchased some goods for the first time from online stores during COVID-19	360	3.43	1.157	6.9%	16.9%	18.6%	40.8%	16.7%
UCB5 I do not prefer to purchase new types of goods that I never try to buy online before during COVID-19, and I always prefer to purchase the same types of goods	360	3.10	.985	3.9%	25.0%	35.6%	28.3%	7.2%
UCB6 My spending rate for buying online goods has increased during COVID-19	360	3.42	1.156	6.1%	18.1%	21.4%	36.4%	18.1%
UTAUT factors UF1 I believe that my online shopping performance has improved during COVID-19	360	3.75	.964	2.8%	8.3%	20.3%	48.3%	20.3%
UF2 I spend less effort while shopping online during COVID-19	360	3.64	1.094	4.2%	13.6%	18.6%	41.7%	21.9%
UF3 Community interest in e-shopping (relatives or friends) has encouraged me to adopt it during COVID-19	360	3.48	.984	3.3%	13.1%	28.6%	42.2%	12.8%
UF4 I was willing to try shopping online, its new facilities and features during COVID-19	360	3.71	.935	2.2%	7.5%	26.4%	44.7%	19.2%

Table 3: Multiple regression for security/privacy factor

Dependent factor	Security and privacy				
Independent factors/ Demographic data	Age	Gender	Education Level	Employment	Monthly Income
Standardized Coefficients (Beta)	-0.001	0.111	-0.072	0.113	0.048
t	-0.011	1.999	-1.191	1.015	0.411
Sig	0.991	0.046	0.235	0.311	0.681
R 0.196a R square 0.038 F 2.792 Sig 0.017b					

Table 4: Multiple regression for online shopping type

Dependent factor	Online shopping type				
Independent factors/ Demographic data	Age	Gender	Education Level	Employment	Monthly Income
Standardized Coefficients (Beta)	−0.161	0.066	−0.098	0.283	-0.022
t	−1.922	1.178	−1.635	2.554	−0.189
Sig	0.055	0.240	0.103	0.011	0.851
R 0.201a R square 0.041 F 2.962 Sig 0.012b					

COVID-19 in Saudi Arabia and age, gender, education level, employment and monthly income. In addition, 3.8% variation (R2 = 0.38) in the security/privacy level of e-stores during COVID-19 in Saudi Arabia can be observed because of the age, gender, education level, employment, and monthly income.

The fitness of the regression model is acceptable because the variation between sample means (F-statistics = 2.792) is significant at the 5% level (P < 0.05).

Table 3 shows that, while only one independent factor gender out of five has a significant influence on the security/privacy level, the factors of age, education level,employment and monthly income do not. Gender (Beta = 0.111, t = 1.999) is significantly related to the security/privacy level of e-stores during COVID-19 in Saudi Arabia (P < 0.05).

Table 4 summarises the regression model and shows the correlation between the dependent factor 'online shopping type factor' and the independent factors demographic data. The value of the correlation coefficient (R = 0.201) indicates that there is a possible positive relationship between online shopping type during COVID-19 in Saudi Arabia and e-customer age, gender, education level, employment and monthly income. In addition, only 4.1% variation (R2= 0.041) can be observed because of the age, gender, education level, employment, and monthly income.

The fitness of the regression model is acceptable because the variation between sample means (F-statistics = 2.962) is significant at the 5% level (P < 0.05) with 5 and 350 degrees of freedom.

Table 4 shows that, while only one independent variables 'employment' out of five significantly influences online shopping type during COVID-19 in Saudi Arabia, the factors of age, gender, education level and monthly income do not. Employment (Beta = 0.283, t = 2.554) is significantly related to the online shopping type during COVID-19 in Saudi Arabia at P < 0.05.

The T-tests also provided important results. First, the security/privacy level of e-stores during COVID-19 in Saudi Arabia made significant differences between the mean values of the female and male groups, where the mean of the former 2.58 is higher than that of the latter 2.39. Second, online shopping type during COVID-19 in Saudi Arabia made significant differences between the mean values of the employee and student groups, where the mean of the former 3.36 is higher than that of the latter 3.23.

Table 5 shows the statistics of gender groups (male, female) for the security and privacy factor: size, mean and standard deviation. Indeed, the mean of the female group is 2.58, which is slightly higher than the mean of the male group 2.39.

Moreover, table 5 reveals the T-test results, which confirm that significant differences exist between the means of the two groups. The equality-of-variance test assumed equal variances because the significant level of F 0.044 > 0.05. The t-value 2.752 is significant because it is smaller than 0.05.

Table 6 shows the employment groups (student, employee) statistics for online shopping type: size, mean and standard deviation. The mean of the employee group is 3.36, which is slightly higher than the mean of the student group 3.23.

Table 5: T-test for security/privacy among males and females

	N	Mean	Std Deviation	t	F	Sig
Male	245	2.39	0.618	2.75	0.04	0.83
Female	112	2.58	0.622			

Table 6 also reveals the T-test results, which confirm that significant differences exist between the mean values of the student and employee groups. The equality-of-variance test assumed that there are no equal variances because the significance level of F is less than 0.05. Therefore, the t-value ⁻2.298 is significant as it is smaller than 0.05.

Table 6: T-test for online shopping type among students and employees

	N	Mean	Std Deviation	t	F	Sig
Student	182	3.23	0.578	2.29	3.92	0.05
Employee	174	3.36	0.497			

6. Conclusion

E-commerce faces many challenges under the difficult conditions the world is facing during the COVID-19 pandemic, especially the challenges of understanding e-consumer behaviour. E-customer shopping behaviour was changed significantly during the pandemic and the risk of cybercrime has also increased significantly during this time due to unclear factors. This study sheds light on studying and exploring the factors that impact the change in e-consumer behaviour and increase the perceived risk of cybercrime during Covid-19, specifically in Saudi Arabia. A descriptive and inferential analysis has been applied on six factors commonly reviewed in the literature in relation to e-shopping: trust factor, security and privacy factor, online shopping type factor, cybercrime risk factor, unexpected change of customer behaviour, and UTAUT factors. The most important outcomes indicate that the security and privacy levels of e-stores are crucial. However, many e-customers have been shopping online during COVID-19 more than usual, ignoring the risk of cybercrimes. Thus, this paper shows that e-customers need to be more aware about the risk of cybercrime during hard times such as COVID-19.

Overall, gender had a significant effect on e-store security/privacy during COVID-19 in Saudi Arabia (the mean of the female group is higher than that of the male group), and employment had a significant effect on online shopping type (the mean of the employee group is higher than that of the student group). Finally, this study could contribute to add valuable ideas for the field of online shopping during other difficult times similar to COVID-19 in the future.

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