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Research Article

Drivers' Perceptions of Smartphone Applications for Real-Time Route Planning and Distracted Driving Prevention

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Given the increasing importance and availability of traffic-related smartphone applications, understanding their potential use is vital, especially in developing countries. This research explores motorist perceptions of the installation and use of two smartphone applications—a distraction-prevention application and a real-time traffic information and navigation application—in Qatar, a rapidly developing country in the Arabian Gulf region. This study represents the first attempt to investigate the potential market for these types of applications in a region with a unique social and cultural environment. A questionnaire-based survey was conducted to examine the drivers' interest in using both applications, their willingness to buy the applications, and their data privacy concerns. The results indicated that the potential market for these types of smartphone applications in Qatar is high. The potential for the real-time route planning application was found to be much higher than that of the antidistraction application, especially among female drivers. A high percentage of the drivers, especially younger and local drivers, were less enthusiastic about installing and using the distracted driving prevention application. Most of the participants willing to use both smartphone applications did not have data privacy concerns, but in return for allowing the applications to access their data, they expected some reduction in travel time and a safer trip. These findings provide a direction for the development of future policies and smart solutions in this region.

1. Introduction

With the high increase in the use of smartphones and mobile applications, more drivers are taking more risks by utilizing their mobile phones while driving [1, 2]. Qatar, a wealthy and rapidly developing country, is first among Arab countries and second in the world (behind only South Korea) in terms of engagement with mobile services and applications [3]. The continuous growth in mobile phone usage in Qatar is due to its consumers' high purchasing power. This high level of mobile phone ownership contributes to the high rate of mobile phone use while driving in Qatar [4]. Over the past few decades, Qatar has had a huge increase in the number of vehicles, traffic violations, and collisions; many of these are fatal, and they aggravate congestion problems on road networks [5].

Therefore, it is necessary to find new solutions to improve driver safety and network efficiency in Qatar. Throughout the last decade, there has been an increase in the use of traffic-related smartphone applications. These types of applications have made an astonishing difference in the way information is transmitted to people, making them better informed about traffic conditions and helping them make safer, faster, and smarter use of transportation networks. Given the increasing availability of smartphone applications and the potential for this technology to improve traffic safety and efficiency in Qatar, this study aims to examine public perception of different types of smartphone traffic applications, which is timely and much-needed information.

Two types of smartphone applications were investigated. The first application aims at assisting drivers by providing a navigation system and real-time information about traffic conditions to improve motorway efficiency, and the second aims to restrict mobile phone usage while driving to improve drivers' behavior and provide a safe trip. The investigation of two applications that serve different functions was important to investigate the drivers' interest in and perspective towards two different issues: traffic safety and time-saving. This study represents the first attempt to investigate the public perception of these types of applications in this region.

2. Related Work

Smartphone applications have increasingly been utilized for different applications in transportation. In the area of navigation, different smartphone applications are available in the market to help the drivers by displaying their existing locations and directing them to their target locations using voice information in different languages, graphics, and text. Drivers can save time and fuel by using these navigation systems, especially when in an unknown area. Lee and Cheng [7] examined the navigation performance of drivers using smartphone applications and those using printed directions. They found better driving performance and increased efficiency when drivers used a smartphone application for navigation. The benefits are even more significant if the applications can provide real-time information about impending traffic conditions, which also has clear links to reducing congestion.

A study investigated route choice behavior in the case of a traffic information system using revealed-preference data. The study revealed that different factors affected the decisions of the drivers, including the characteristics of the trip; the perceptions of the traffic reports reliability [8]. Another study shows that providing high-quality information has a high impact on the compliance behavior of the drivers [9]. A study investigated the impact of real-time traffic information on traveler behavior by using repeated day-to-day revealed-preference observations. It was found that the drivers who received access to real-time traffic information through their smartphone reacted to the daily variations in travel times stronger than the way they reacted in the before case (without traffic information). The results indicated that providing real-time traffic information affects driver behavior [10]

Despite the abovementioned advantages of mobile phones in the area of navigation and real-time traffic information, some activities associated with the mobile phone use can distract a driver or a pedestrian. These activities include talking, dialing, browsing, texting, hanging up a call, reaching for the phone, picking up a dropped phone, dialing, or answering the phone. These types of activities cause drivers to take their hands off the steering wheel and both drivers and pedestrians to take their eyes off of the road. These types of inattention are the primary causes of crashes. An estimated 20% to 30% of all road crashes occurred because of driver distraction [11]. Furthermore, the risk of being involved in a traffic collision is four times higher in the case of using a mobile phone while driving [12]. Even receiving a mobile phone notification without interacting with the phone was found to significantly disrupt the performance of the driver [13].

Many applications are available to restrict the mobile phone use while driving. Some applications work automatically by detecting the movement of the car, then different actions can be taken after that. For example, calls can be automatically sent to voicemail, access to the keyboard and screen can be blocked, or all notifications including alerts, texts, emails, and incoming calls can be blocked. Other applications are less sophisticated and require the driver input. In this case, the driver has to enable it every time before driving. Some applications restrict the use of mobile phones in addition to other equipment in the car. Other applications promote hands-free usage as a solution [14–20].

There are also other applications related to road safety. For speed detection, a smartphone application collects speed and location data. If the driver increases the speed near a school zone, a sound alarm will be triggered [21]. For drunk driving, a smartphone application calculates the different accelerations of the vehicle and then compares them with a typical drunk driving pattern stored on the application. If a match is confirmed, the phone will automatically alert the driver or call the police to seek help before being involved in a crash [22]. For pedestrians, a smartphone application is able to detect the approaching vehicles when pedestrians use their phones while walking using the back camera of the phone. The application alerts the pedestrian in case of anticipated conflict with an approaching vehicle [23].

In summary, no studies in the literature have investigated the willingness of drivers to install these types of applications. Furthermore, no studies were conducted throughout the Arabian Gulf region where the drivers have different culture, language, and habits. Given the increasing availability of smartphone applications and the potential for technology to improve traffic safety and efficiency in Qatar, the present study aims to examine the public perception of two different smartphone applications. The first application aims to assist drivers by improving motorway efficiency by providing real-time information on the traffic conditions, and the latter aims at restricting smartphone usage to improve the driver behavior.

3. Smartphone Traffic Applications in Transportation

3.1. Smartphone Applications for Navigation and Real-Time Route Planning. Smartphone applications have increasingly been utilized for navigation purposes. This type of applications helps drivers by displaying their existing locations and directing them to their target locations using voice information in different languages, graphics, and text. Many drivers receive driving directions using their mobile phones. Many free services currently exist to provide drivers with navigation directions, including Google Maps, Waze, and MapQuest. Paid applications include Navigon, Sygic, and MapsWithMe Pro. Drivers can also save time and fuel by using these navigation systems when in an unknown area. These systems have additional benefits, including improving driving performance. This is true even for those with small display screens. The benefits are even more significant if the applications can provide real-time information about impending traffic conditions, which also has clear links to reducing congestion. Different applications currently offer this service. For example, INRIX Traffic provides a color-coded signal of existing traffic conditions versus the typical traffic and an indication to recommend the best time to travel. It depends on users to improve its data and to provide updates to fellow users on topics such as police presence, accidents, and incorrect traffic assessments. The application is free, but users have to pay if they want to use the route planning features [24].

3.2. Smartphone Application for Distracted Driving Prevention. Many applications are available to reduce the mobile phone use while driving. Some applications work automatically by detecting the movement of the car. For example, Spring's Driver First application is a monthly paid smartphone application that locks phones when a car is moving faster than 10 mph, using the phone's accelerometer but not GPS to prevent battery drain. This application is targeted at parents who want to enable restrictions on their driving-age children. When using the application, calls are automatically sent to voicemail. Audio tones for email and text messages are silenced. The application also triggers autoreply messages. When the application detects that the vehicle has stopped moving for a few minutes (i.e., not at stop signs or traffic lights), all phone functions return to normal automatically. The device can be unlocked by using the exit and 911 buttons, which can override the application, but parents can choose to be notified when this occurs [25]. Another application with similar capabilities is bSafeMobile. This application identifies the driving condition and then automatically switches the device to safe mode. During this stage, access to the keyboard and screen is blocked. Furthermore, all notifications and alerts, texts, emails, and incoming calls are blocked [26].

Other applications are less sophisticated and require driver input. For example, DriveMode is a free application that helps to keep drivers' attention on the road, but the driver has to enable it every time before driving. It automatically replies to any incoming text messages; silences audio tones for texts, emails, and phone calls; and blocks web browsing and outgoing phone calls [27]. Some applications restrict the use of mobile phones in addition to other equipment in the car. For example, Cellcontrol uses Bluetooth-enabled technology in the vehicle instead of using GPS to detect vehicle movements and then apply the policy. Cellcontrol prevents distracted driving by disabling mobile phones and also mobile devices such as tablets and laptops [28]. Other applications promote hands-free usage as a solution. For example, the DriveSafely application reads to the driver the received emails and text messages and then responds automatically without the user having to touch the phone [29].

4. Methods

The present study aims to examine the public perception of two smartphone applications: iTraffic and Salamtek. The first application aims to assist drivers by real-time traffic information for route planning, and the latter aims at restricting mobile phone usage to limit distraction and improve driver behavior. Two applications were selected for the study based on their local availability, free cost, and availability in the Arabic language to ensure that users can easily understand and use them. Both applications were developed by the Qatar Mobility Innovations Center, which is a local research center that was initiated to develop and deploy different smart applications and intelligent solutions in different areas, including road safety, transportation, smart city platforms, and environment [6]. Figure 1 shows screenshots of the two smartphone applications.

4.1. iTraffic Smartphone Application. iTraffic is a real-time traffic information and navigation smartphone application. It is the first smartphone application developed in Qatar with a comprehensive traveler information system. It is available in both Arabic and English languages for free. It enables the user to monitor traffic conditions and receive real-time traffic information on Qatar's streets. A pictorial representation of the congestion rate on various streets of Qatar is included. This makes it easier to identify the fastest and/or shortest routes, depending on traffic conditions. Voice alerts for roadblocks and congested roads are also available.

4.2. Salamtek Smartphone Application. Salamtek is a smartphone application that limits the use of mobile phones while driving to reduce driver distraction. This application is available in English and Arabic languages for downloading from any country. It manages all distracting smartphone functions by eliminating all of them except the ability to receive calls from up to three contacts. The driver can also set the minimum driving speed upon which the safety measures will be activated. The application also keeps a log of all calls that have been automatically blocked, and callers are automatically notified via an autoreply message once a message is blocked.

4.3. Data Collection. The data for this study was collected using a questionnaire survey conducted at several locations such as shopping malls, universities, libraries, colleges, high schools, and sports clubs. The main questions of the questionnaire form addressed (1) whether the participants were willing to install these free smartphone applications and why, (2) would they purchase the applications if they were not free, (3) would they install the applications if these collected private data from their mobile, (4) whether the driver antidistraction application should be enforced by the government, (5) any comments, recommendations, and suggestions for the enhancement of these applications, and (6) demographic questions, including gender, age, and nationality.

The data collection process involved three phases. The first phase included selecting the participants. The participation in this study was voluntary and anonymous and was limited to people who were at or above 18 years old, had a valid driving license, and owned a smartphone at the time of the interview. To ensure randomization, the trained interviewers approached every 10th person entering, explained the importance of the questionnaire, and asked them if they met the criteria and if they were willing to do the survey. In the second phase, the participants who agreed to participate were

Figure 1: Screenshots of iTraffic (top) and Salamtek (bottom) [6].

shown (via a demonstration) how to operate the applications. A group of interviewers was trained to present a demo of the two applications. The interviewers showed the demo of the first smartphone application, explained its advantages, and answered any questions the participants had. These steps were repeated for the second application. In the third phase, the participants were provided with the questionnaire form. The interviewers explained the form to each participant in person. The participants were asked to complete the form by hand and return them then and there. The participants were allowed to ask any questions during the process if any parts of the form were not clear. The minimum sample size required for the study was calculated as follows:

$$SS = Z^2 * \frac{p(1-p)}{C^2} \quad (1)$$

where

SS = sample size,

Z = Z-value,

p = percentage of population picking a choice expressed as a decimal,

C = confidence interval expressed as decimal.

Assuming a 95% confidence level (Z=1.96) and 5% confidence interval (C=0.05), the minimum sample size was found to be 385. In this study, 450 survey forms were handed out to the participants. All 450 forms were returned. Only 421 forms were considered complete and used for the analysis. The other forms had a high percentage of missing responses and were not used during the analysis.

Table 1: Characteristics of the participants.

Gender	Frequency	Percentage
Male	266	63.2%
Female	155	36.8%
Age		
18-25	197	46.8%
26-50	178	42.3%
51 or more	46	10.9%
Nationality		
Qatari	128	30.4%
Non-Qatari Arab	247	58.7%
Other	46	10.9%
Total	421	100.0%

The distribution of data collected is given in Table 1. The characteristics of the participants were generally representative of the characteristics of the population in Qatar; however, there were some differences. Male respondents were the majority with 63.2%, (females 36.8%). This ratio reflects the imbalanced gender population in Qatar (which is 75.5% male and 24.5% female) [30]. As the sample selected were for drivers who own and use smartphones; the percentage of participants older than 50 was low (10.9%). The rest of the respondents were less than 25, 46.8%, and 26-50, 42.3%. The sample consisted of Qatari nationals (30.4%) and non-Qatari Arabs (58.7%) and other nationalities (10.9%). It should be noted that only 14.3% of the general population are Qataris [31]. Consideration of driver nationality was important due to the cultural diversity across the country. The oversampling of the female and Qatari participants in this study was necessary to ensure that there are enough members of these two subgroups within the population so that more reliable estimates can be reported for both groups.

4.4. Logistic Regression. Logistic regression was utilized for the analysis throughout this study. This type of analysis is one of the most useful assessment methods to determine which factors influence the outcome response of participants, given that it intrinsically adjusts each factor considered for the presence of the other factors. As shown in Table 2, the response variable (install application) is binary with two levels: 0 for not installing and 1 for installing. Three independent variables were used in the analysis. These variables include the driver age (18–25=1, 26–50=2, and 51 or older=3), driver nationality (1=Qatari, 2=non-Qatari Arab, 3=other), and driver gender (1=male and 2=female). In the used model, the probability (P1) of installing application Y1 [32] is as follows:

$$Y1 = logit\,(P1) = \ln\left(\frac{P1}{1-P1}\right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_j x_j \quad (2)$$

where

Y1: latent variable for install application,

x_j: value of j^{th} independent variable,

β_j: corresponding coefficient for the j^{th} independent variable.

The comparison between the referred group can be indicated by the odds ratio, which is given by

$$OR = \exp\left(\beta_j\right) \quad (3)$$

An odds ratio that is greater than 1 indicates that the condition to install the application is more likely to occur in the first group, and vice versa.

5. Results

5.1. Installing versus Not Installing. A central question was asked to the participants to explore their willingness to install the two studied smartphone applications. As shown in Figure 2, 321 (76.2%) participants liked the iTraffic application, and they were willing to install it. The remaining 100 participants mentioned that they are not willing to install the application. Most of this group (46%) mentioned that it is not needed because they know the streets well in the city in terms of traffic conditions during the day. The rest of the participants mentioned that they would not install it to avoid distraction (28%), due to data privacy concerns (22%), or other reasons such as difficulties to position the phone inside the vehicle (4%). Non-Qatari Arabs and others showed more willingness to install the applications than Qataris. Also, female participants were more willing to install the application than male participants. Table 3 lists the model estimation and the odds ratio for the independent variables. Based on the effect model, the binary logistic regression model identified significant factors directly associated with installing the two applications. In order to take the Bonferroni correction into consideration, a critical value was calculated by dividing the familywise error rate by the number of tests. For iTraffic, the model showed that the odds of the non-Qatari Arab drivers to install iTraffic were 2.41 times of the odds for Qatari drivers. The model also showed that the odds of the female drivers to install iTraffic were 1.88 times of the odds for male drivers.

5.2. Installation of Salamtek. Two-hundred and forty-one (221) participants (52.5%) were willing to install the Salamtek application as indicated in Figure 2. The remaining 200 participants indicated that they are not willing to install the application because it is not needed (73.5%). This group of participants mentioned they want to keep using their phone while driving, and they do not see a problem with it. The rest of the participants mentioned that they would not install it due to privacy concerns (23%) or other reasons such as must use my phone for work purposes (3.5%). Some participants mentioned that the application was not important, or necessary as most of them were aware of the danger of mobile use while driving. Also, blocking the incoming calls except for three VIP numbers, made a few participants concerned they might miss an emergency call from an unknown person or situation.

Elder participants (participants with an age greater than 50) were more willing to install this application. Fewer

Table 2: Variable coding and definitions.

Variable	Description
Dependent Variable	
Install Application	Not Installing:0, Installing:1
Independent Variable	
Gender	Male∗:1, Female:2
Age Group	18-25∗:0, 26-50:1, 51 or more:2
Nationality	Qatari∗:1, Non-Qatari Arab:2, Others:3

∗Reference group for binary logistic analysis.

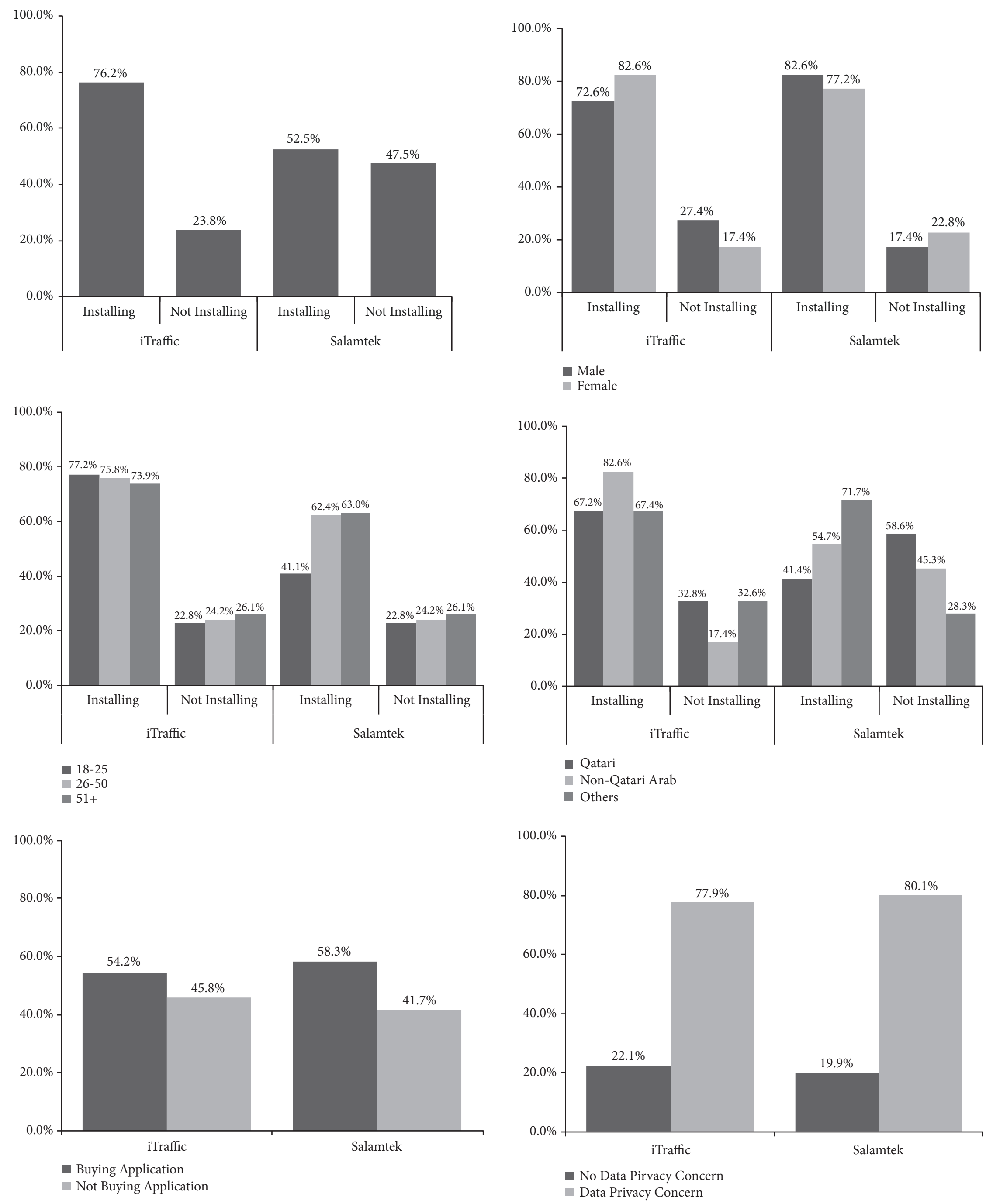

Figure 2

Table 3: Drivers' choice of installing/not installing iTraffic and logistic model results.

iTraffic	Total	Gender		Age			Nationality		
		Male	Female	18-25	26-50	51+	Qatari	Non-Qatari Arab	Others
Installing	321	193	128	152	135	34	86	204	31
Not Installing	100	73	27	45	43	12	42	43	15
% Installing	76.2%	72.6%	82.6%	77.2%	75.8%	73.9%	67.2%	82.6%	67.4%

Variable	B	S.E.	Wald	df	Sig.	Odds Ratio Exp(B)	95% C.I. for EXP(B) Lower	95% C.I. for EXP(B) Upper
Gender [Female vs Male]*	0.631	0.257	6.014	1	0.014	1.880	1.135	3.113
Age [26-50] vs [18-25]	0.027	0.259	0.011	1	0.918	1.027	.618	1.707
Age [51 or more] vs [18-25]	-0.171	0.389	0.193	1	0.660	.843	0.393	1.806
Nationality [Non-Qatari Arab vs Qatari]*	0.878	0.255	11.835	1	0.001	2.406	1.459	3.967
Nationality [Others vs Non-Qatari Arab]	0.016	0.383	0.002	1	0.967	1.016	0.479	2.153
Constant	0.494	0.241	4.212	1	0.040	1.639		

* refers to significance at 5 percent level.

Table 4: Drivers' choice of installing/not installing Salamtek and logistic model results.

Salamtek	Total	Gender		Age			Nationality		
		Male	Female	18-25	26-50	51+	Qatari	Non-Qatari Arab	Others
Installing	221	137	84	81	111	29	53	135	33
Not Installing	200	129	71	116	67	17	75	112	13
% Installing	52.5%	51.5%	54.2%	41.1%	62.4%	63.0%	41.4%	54.7%	71.7%

Variable	B	S.E.	Wald	df	Sig.	Odds Ratio Exp(B)	95% C.I. for EXP(B) Lower	95% C.I. for EXP(B) Upper
Gender [Female vs Male]	0.167	0.210	0.628	1	0.428	1.181	0.782	1.784
Age [26-50] vs [18-25]*	0.779	0.219	12.614	1	0.000	2.180	1.418	3.351
Age [51 or more] vs [18-25]*	0.836	0.342	5.966	1	0.015	2.308	1.180	4.515
Nationality [Non-Qatari Arab vs Qatari]*	0.530	0.225	5.555	1	0.018	1.699	1.093	2.640
Nationality [Others vs Non-Qatari Arab]*	1.013	0.384	6.975	1	0.008	2.755	1.299	5.844
Constant	-0.796	0.228	12.165	1	0.000	0.451		

* refers to significance at 5 percent level.

younger participants (41.1%) were willing to install the application. A possible explanation is that young drivers are more attached to the new social media culture and not as prepared to get disconnected from their mobile phone. The other nationality participants who included drivers other than Qataris and non-Qataris Arab were more willing to install the application than other nationalities. Qataris were the least willing to install Salamtek.

Table 4 lists the model estimation and the odds ratio for the independent variables. Based on the effect model, the binary logistic regression model identified significant factors directly associated with installing Salamtek. The model showed that the odds of the non-Qatari Arab drivers to install Salamtek were 1.7 times of the odds for the Qatari driver. For other than Qataris and non-Qataris Arab drivers, the odds to install Salamtek were 2.8 times of the odds of the Qatari drivers. The model also showed that the odds of the middle-aged drivers to install Salamtek were 2.2 times of the odds for young drivers. The odds of older drivers were 2.3 times the odds of young drivers.

5.3. Buying versus Not Buying. A second central question was to examine participants' willingness to purchase the applications. Additionally, participants were also asked how much they were willing to pay for the purchase of the applications. This information can provide an indication of the importance of the applications to the participant and can also provide guidance to the developers of these types of applications. Three options were given: (i) less than 5 US dollars, (ii) 6-10 US dollars, and (iii) US 11 to 20 dollars. Approximately 54% (174 participants out of 321) were willing to buy the iTraffic application if it was not free (Figure 2). Male, middle-aged, and Qatari drivers showed more willingness to buy the iTraffic application. The results showed that 122 participants were willing to pay $5 or less, 32 participants were willing to spend $6 to $10, and 8 of them were willing to buy the application for the higher cost of 11- 20 dollars. One hundred and twenty-six (126) participants (58.3%) were willing to buy the Salamtek application out of the 221 that are going to install even if it was not free (Figure 2). Female, young and middle-aged, and Qatari drivers showed more willingness to buy the

Salamtek application. Ninety-five (95) participants (86.4%) were willing to pay $5 or less, 13 participants were willing to spend $6 to $10, and 2 of them were willing to buy the application for the higher cost of 11-20 dollars.

5.4. Data Privacy Concerns. Another question of interest was related to examining the level of concern regarding data privacy. Only participants who reported a willingness to install the application answered this question. The question highlighted that data collected would be used to improve the applications, which would reflect on providing better service for the users. Out of the 345 participants who were willing to install the iTraffic application, 250 participants (77.9%) were willing to install the application even if it collected the data such as the location and phone ID as shown in Figure 2. For Salamtek, out of the 241 of the participants who were willing to install the Salamtek application, 173 participants (80.1%) were willing to install the application even if it collected the same sort of data. The remaining participants were concerned about privacy and were against the collection of data.

5.5. Enforcement versus Motivation. A high percentage of the participants who were willing to install the Salamtek application (52%) responded that the government should enforce these types of traffic safety applications to enhance road safety when asked about their preference. The rest mentioned that there was no need for compulsory enforcement for these types of applications. One of the reasons provided was that enforcement hinders personal freedom and that using a mobile phone is an individual choice. Another reason was that enforcing the use of the application would result in buying smartphones by all drivers; that might not be a cost-effective or realistic solution.

6. Discussion and Conclusions

A questionnaire-based survey was conducted with 421 participants to understand their perceptions towards two different types of traffic-related smartphone applications: a driver antidistraction application and a real-time traffic information and navigation application. The results indicated that 321 (76.2%) participants were willing to install the real-time traffic application; female drivers (82.6%) were especially interested in this application. Furthermore, 188 (54.2%) participants were willing to buy the application in the future. Most of the participants willing to install the application (77.9%) were open to sharing their personal data to improve the performance of the application. The remaining participants willing to install the application (22.1%) were concerned about the security and privacy of their personal details.

On the other hand, 221 (52.5%) participants were willing to install the driver antidistraction application. This application was not popular among young and Qatari drivers. More than half this group (58.3%) were willing to buy the application, and 80.1% of this group were willing to use the application even if it collected personal data. In summary, the potential market for the real-time traffic application was higher than that of the antidistraction application. In general, the participants willing to use the applications did not have privacy concerns, but in return for sharing their personal data, they expected some reduction in travel time and a safer trip.

These results can provide guidance for safety campaigns and awareness programs that focus on motivating drivers to make smart travel choices. Changing drivers' methods of selecting specific routes to be based on real-time information can substantially improve the performance of the transportation network and reduce costs and vehicle emissions. Similarly, promoting the use of distraction-prevention smartphone applications through awareness programs, especially among young drivers, can have significant safety benefits for all road users; solutions such as driver education and stricter punishments or fines for mobile phone use while driving are not enough.

These results are useful for policymakers and government agencies and can be used to appropriately promote these types of smartphone applications in Qatar. Although this study was conducted in Qatar, the findings can be applied throughout the Arabian Gulf region, which includes Kuwait, the United Arab Emirates, Oman, and Saudi Arabia. These countries share similar social and cultural environments.

6.1. Applications of the Findings. In conclusion, there is a potential market for these types of smartphone applications in Qatar. Once they become popular, these applications could provide important benefits for drivers and transportation networks. Drivers can benefit from efficient route planning and travel information, which can reduce their travel time and fuel consumption costs. This, in turn, can reduce travel times, costs, and vehicle emissions for the entire road transportation network. In addition, distraction-prevention applications can improve driver safety by preventing mobile phone distractions, which could significantly reduce the incidences of distracted driving and consequently the number of road collisions.

There are also many other possibilities for public agencies to effectively benefit from these applications. These applications could be used to collect traffic data and information, such as vehicle speeds and counts. However, before utilizing these applications for data collection, their accuracy must be evaluated, and data obtained from these applications must be compared with real-life data obtained from trusted sources. Such comparisons will also assist developers in calibrating and validating their applications. These applications can also be used to conduct before and after studies to evaluate the impact of different traffic-related policies.

There is also potential for these applications to provide real-time traffic information for incidents and congestion. This information can be used by public agencies to make rapid decisions and to provide information to drivers via dynamic message signs, for example. It can also be used by public transportation agencies to provide real-time arrival and departure information.

6.2. Limitations and Future Studies. Although the objectives of the study were achieved, there were a few limitations. The participants did not actually experience the applications under real driving conditions; therefore, they had limited experience to guide their responses. In addition, the study only investigated the potential market for these types of applications without investigating how the applications may influence driver behavior in the future. Therefore, follow-up studies are necessary to find the actual number of installations. In addition, postinstallation preference studies are needed to measure user perceptions and preferences, as well as gaps between the number of installations and frequency of use. Several studies have shown that only a limited number of installed applications are being frequently used. Finally, there is a need to measure the impact of these types of applications on driver behavior to discover whether drivers make changes to their commutes based on the information provided by these applications and to reveal the degree to which they rely on the applications.

Data Availability

The survey data used to support the findings of this study are available from the corresponding author upon request.

Disclosure

The statements made herein are solely the responsibility of the author.

Conflicts of Interest

The author declares that there are no conflicts of interest regarding the publication of this paper. The survey data used to support the findings of this study are available from the corresponding author upon request.

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