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Quality and Use of Mobile Applications for Transportation Service: Influence on Satisfaction

Calidad y uso de aplicaciones móviles para el servicio de transporte: influencia en la satisfacción

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ABSTRACT

The main objective of this research work was to analyze the factors that influence satisfaction and the intention to continue with the use of mobile transport applications in young university students from Guadalajara, Jalisco, Mexico. The approach was quantitative. 144 valid responses were used, and partial least squares structural equation modeling (PLS-SEM) was used to test the model. The software employing was the SmartPLS 3. The results indicate that the quality of the design, the quality of the information and the quality of the system are predictors of influence on satisfaction. Companies that offer individual passenger transport through a mobile application have increased in recent years, generating strong competition both between existing brands and with established traditional taxis. This study provides new and recent information for marketing managers and academics on application user behavior in the transportation industry.

Keywords: mobile app, public transport, satisfaction, intention to continue use.

JEL CODE**:** M31, M15

RESUMEN

El presente trabajo de investigación tuvo como principal objetivo analizar los factores que influyen en la satisfacción y la intención de continuar con el uso de aplicaciones móviles de transporte en los jóvenes universitarios de Guadalajara, Jalisco, México. El método fue cuantitativo. Se utilizaron 144 respuestas válidas y se utilizó el modelado de ecuaciones estructurales de mínimos cuadrados parciales (PLS-SEM) para probar el modelo. El software empleado fue SmartPLS 3. Los resultados indicaron que calidad de diseño, calidad de la información y calidad del sistema son predictores influyentes en la satisfacción. Las empresas que ofrecen transporte individual de pasajeros mediante una app móvil han aumentado en los últimos años generando una fuerte competencia tanto entre las marcas existentes como con los taxis tradicionales establecidos. Este estudio aporta información nueva y reciente para los directores de marketing y académicos sobre el comportamiento del usuario de apps en la industria del transporte.

Palabras clave: aplicación móvil, transporte público, satisfacción, intención de continuar el uso.

JEL CODE**:** M31, M15

INTRODUCTION

Mobile applications (apps) currently occupy an important place in daily life (Jain, Kumar & Singla, 2014), even becoming indispensable in daily activities (Soemantadiredja, Vitayala & Hermadi, 2017), and changing the ways of life of many ways (Chan *et al*., 2016). Mention an example are the applications to stay related to other people in the personal or work environment (Whatsapp, Facebook, Messenger, Zoom, Google Meet, among others), or to communicate and perform basic activities (such as remembering the time to wake up, take medicine or a meeting) or even applications that are in the form of financial services, airline reservation services, shopping, games, health applications, food and fitness and a new service in ordering taxis (Keong, 2016).

The taxi sector has recently had a phase of disruption generated by social, cultural, and economic changes through the introduction of the internet and new technologies (Akbulaev, 2020). Emerging mobile transport based on complementary or independent technological platforms that act as intermediaries between passengers and drivers, using applications appearing in countries around the world (Agyeman, Kwarteng & Zurkalnaine, 2019).

This new taxi ordering service is called Mobile Booking Taxi Application (MBTA) (Kanti, Anandya & Rahardja, 2018), where the user makes the point-to-point service request from a mobile device at any time and from anywhere (Harding, Kandlikar & Gulati, 2016; Kanti *et al*., 2018; Mohamed, Rye & Fonzone, 2020).

For example, Uber, Hailo, Curb and Lyft in the USA, Uber and Cabify in Europe and Latin America, App Chiflea in Ecuador, Easy taxi and 99 taxis in Brazil, Little and Mondo in Africa, or Grab, Go-Jek, Didache, Kuaidi Dache, Didi, Meru, Ola, and Hailing in Asia. This innovation has generated new direct competition to taxis, since in the beginning the absence of legislation to operate in this sector, previously exclusively for taxis, caused problems in public transport policies, such as monopoly or protests in different countries, especially the poorest, that they were not prepared for this (Harding *et al.,* 2016; Akimova, Arana-Landín & Heras-Saizarbitoria, 2020; Cetin & Deakin, 2017; Paronda, Regido & Napalang, 2016; Ye *et al*., 2018; Contreras & Paz, 2018; Agyeman *et al*., 2019; Mohamed *et al*., 2020; Sánchez-Torres, Correa & Gómez, 2020).

In various parts of the world, the individual public passenger service (taxis) had been presenting problems related to asymmetries of information and coordination between client and driver, as it was not known precisely where to take a taxi, service hours, and driver reliability, safety, cleanliness and vehicle quality, knowledge of the city by the driver and the

price to pay for the service offered, among others, reflecting on uncomfortable trips for the consumer (Balachandran & Bin, 2017).

To address these problems, different work schemes and their regulation have been adopted with varying degrees of success, implementing the MTBAs to provide better quality services to passengers and entirely in tune with market changes (Hamzah *et al.,* 2018; Weng *et al*., 2017) being proposed for their applicability in taxis in many countries (Ge *et al*., 2020; Nguyen-Phuoc *et al.,* 2020; Wang *et al.,* 2016; Ye *et al*., 2018; Zhang, Honnappa & Ukkusuri, 2020).

The advantages it provides is that by using the MTBAs users keep always informed about the time, price, route, and driver data of the vehicle (Weng *et al*., 2017). Users can fix the departure and destination location by GPS or by typing the location that drivers can easily reach (Chan *et al*., 2016).

This type of application motivates the user to change their habit of using private transport to public transport (Kanti *et al*., 2018). In the literature, some research can be found on the factors that influence the intention to use, consumer satisfaction, quality of service, loyalty, among other aspects regarding public or private transport in different countries of the world, such as in Indonesia (Sumaedi, Bakti & Yarmen, 2012); South Africa (Govender, 2014); United States (Rayle, 2014; Hong & Zhang, 2017); Vietnam (Khuong & Dai, 2016); and Malaysia (Balachandran & Bin, 2017), however, it can be identified by the recentness of the subject, that there is still a significant gap in the literature regarding the taxi industry, the use of apps in this sector and the consumer. Considering the foregoing, the purpose of this document is to identify what factors affect satisfaction and the intention to continue using the apps of the so-called transportation network companies or ERT.

MOBILE APPLICATIONS IN INDIVIDUAL PUBLIC TRANSPORT

Based on the development of smartphone technologies and global positioning systems, various companies have emerged dedicated to mediating the agreement between users and providers of individual public transport services through downloadable applications on mobile devices, which makes, on the one hand, the user demands point-to-point transport services and, on the other hand, a group of private drivers offers the service by using the same application and their vehicles.

These companies "are called Transport Network Companies or ERT" (Federal Commission of Economic Competition, 2015: 2). According to the Mexican Institute of Transportation (IMT, 2007), the transportation service is classified as private and public, subdividing the

latter into "collective public transportation and individual public transportation (point-to-point taxi and route or subject to itinerary)" (Federal Commission for Economic Competition, 2015: 1). Within the individual public transport of passengers, the traditional taxi, ridesharing and ERT can be identified.

> *"Traditional taxis are subject to specific regulation of passenger transport and imply the provision of public service in exchange for a regulated charge. Ridesharing consists of sharing a car without an economic transaction involved and, it usually occurs between people who know each other. ERTs use technological platforms to communicate passengers with independent drivers" (Federal Commission of Economic Competition, 2015: 2).*

ERTs have taken two different forms:

- Complementary platforms are those that connect consumers of point-to-point transport services with taxi drivers registered in the public service modality. In Mexico, an example of these systems is Easytaxi and Yaxi.

- Independent platforms, which are those that through an application connect drivers who offer private services to consumers. Examples of these platforms are Uber and Cabify (Federal Commission for Economic Competition, 2015: 2-3).

According to the Global Mobile Consumer Survey (GMCS) 2017 Mexico chapter, on average there are 14 applications installed on most mobile devices, and that in terms of payments shows that paying for a taxi (54%) is the most performed activity by users using smartphones.

According to Statista (2019), it is observed that the number of users of mobility apps in the world to request a driver service (taxi, uber, cabify), rent a car or bicycle for short trips or share vehicles is considerable. Of the 43,034 respondents from 52 countries, China, Russia, Spain, and the US occupy the first positions (51%, 38%, 35% and 35%, respectively), followed by Brazil (33%), the United Kingdom (30 %), France (26%), India (23%), Italy (21%) and Germany (20%).

Although Mexico is not among the ten countries with the most users of this type of application, it has taken significant steps in this industry. According to The Competitive Intelligence Unit (CIU) (January 20, 2020), transportation platforms have increased their preference among consumers over traditional alternatives. In 2019, 59.6 million (71%) of Internet users in Mexico made payments through an app or website. Of this percentage, 16.2% corresponds to transport applications, only below the payment of audiovisual content platform services (22.1%) and the sale of electronic products (17.8%). Within the transport service, the five leading players are Uber (80%), Cabify (14%), DiDi (4%), Easy Taxi (1%) and Beat (1%).

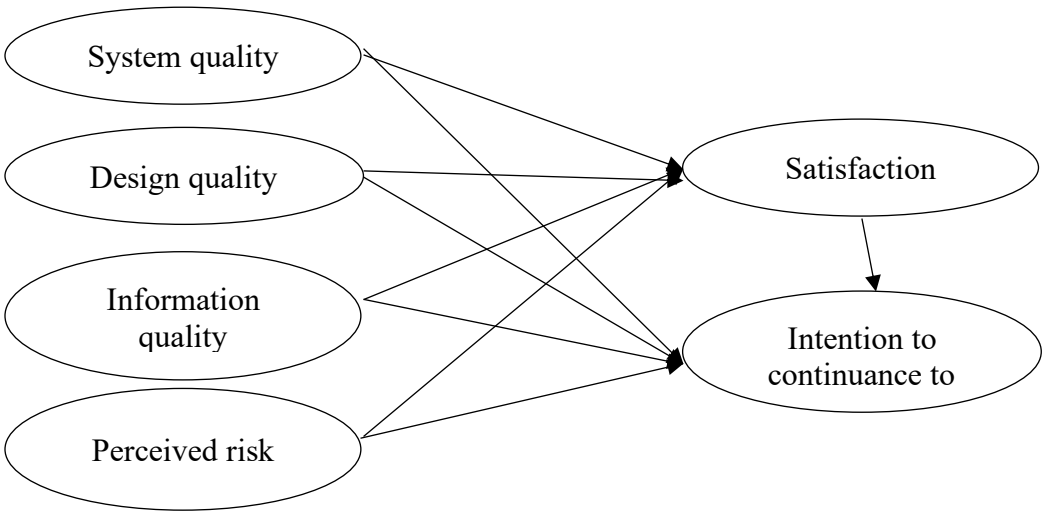
It is important to mention that its growth in the market will depend on the standards of service quality, reputation and price level perceived by users in its horizontal comparison and compared to traditional substitutes. In the same way, the increase in payment options and greater security in the provision of the service.

THEORETICAL MODEL AND DEVELOPMENT OF HYPOTHESES

Mobile commerce is one of the areas most favored by companies that have known how to adapt. According to Rojas (2019), applications give the consumer the impression that the service is tailor-made for them, which encourages brand identification. In this way, the company can carry out the user by the hand throughout the purchase process, facilitate the transaction and the knowledge or exploration of the product or service offered in a close and immediate language.

The information systems (IS) success model of DeLone and McLean (2003) explains the impact of IS at the individual and organizational level (Lee & Chung, 2009) and was the one that was taken as the basis for the development of the model research of this work. However, our research focused solely on the individual level of the constructs: quality of the system, quality of the information and the quality of the interface design and its consequent impact on the intention of use and customer satisfaction (Figure 1).

Figure 1. Theoretical model



Source: own elaboration.

Considering that behavioral intentions can be seen as the signals that are shown if the client continues to use the services of a company or changes to a different provider (Zeithaml *et al.,* 1988). Therefore, through a better understanding of passenger participation, more appropriate marketing strategies can be developed and adapted to services (Lai & Chen, 2011).

System quality

DeLone and McLean (1992) introduced the concept of system quality defining it as the quality manifested in the general performance of a system and measured by the perceptions of individuals (DeLone & McLean, 2003). Kleijnen and others (2004) defined it as degree to wich individuals perceive that the system is satisfying, in terms of transfer speed and reliability (cited in Kumar & Ravindran, 2012).

It is logical to think that when consumers perceive a quality system it positively affects satisfaction (DeLone & McLean, 2003; Wang, 2008; Justitia, Semiati & Ramadhini, 2019) and therefore the intention to continue using the system, in this case, the application (Li, 2013; Yang *et al*., 2020).

H1: System quality has a positive and significant impact on satisfaction.

H2: System quality has a positive and significant impact on the intention to continue using the app.

Information quality

Ding and Straub (2008) define information quality as "the ability to provide information to benefit users in terms of accuracy, completeness and up-to-date" (Kumar & Ravindran, 2012).

Information is one of the important aspects for the client when making the decision to use and pay for a service. In matters of mobile apps, it is not the exception, and it could be said that the quality of the information presented acquires major importance. Having sufficient information guides consumers to make better decisions and allows them to accept and continue using a product or service (Lee & Chung, 2009; Sripalawat *et al.,* 2011; Li, 2013; Justitia, Semiati & Ramadhini, 2019; Yang *et al.,* 2020) more easily.

Information is essential in any innovation diffusion process (Cruz *et al.,* 2010) and plays a crucial role in reducing consumer resistance (Jun & Cai, 2001; Rogers, 2003; Cruz *et al.,* 2010; Kwame, 2013).

H3: Information quality has a positive and significant impact on satisfaction.

H4: Information quality has a positive and significant impact on the intention to continue using the app.

Design quality

The quality of the design of the transport mobile app is another important aspect to consider (Bharati & Chaudhury, 2004). Some authors associate this characteristic as the device barrier, inappropriate device (Cruz *et al.,* 2010; Sripalawat *et al.,* 2011), design (Lee & Chung, 2009; Poey & Arffin, 2015) or interface design (Yu & Fang, 2009). In the mobile context, it can be defined as "the relative importance in the attributes of the services (screen size, keyboard, location, response time" (Laukkanen, 2007; Yang, 2009). A bad interface design can negatively influence your satisfaction and use (Lee & Chung, 2009; Olubusola, 2015; Yang *et al.,* 2020).

H5: Design quality has a positive and significant impact on satisfaction.

H6: Design quality has a positive and significant impact on the intention to continue using the app.

Perceived risk

The perceived risk was evaluated as an uncertainty about the possible negative effect of the use of products or services (Srivastava & Sharma, 2011) or also the degree of uncertainty of the consumer regarding the result of a purchase decision (Keong, 2016). The perceived risk plays an important role in the use or purchase online since it is related to the perceptions of the users (Currás-Pérez *et al*., 2013). In this context it is defined as the "uncertainty about the result of the use of innovation" (Ram & Sheth 1989; Miyazaki & Fernandez, 2001; Gerrard & Cunningham, 2003; Cruz *et al*., 2010).

Research on technology adoption provides evidence that an individual's perception of risk is important when considering the acquisition of a new technology or service (Laforet & Li 2005; Yang, 2005; Im *et al*., 2007; Sohail & Al-Jabri, 2014; Kanti *et al*., 2018).

In the context of mobile apps, the perception of risk is even more important due to the threat of privacy and security concerns (Luarn & Lin 2005; Reid & Levy, 2008; Olubusola, 2015). For example, fear of losing confidential information (Kuisma *et al*., 2007), hackers who can access your bank account by making unauthorized charges (Poon, 2008), or fear to the loss or theft of a mobile device with stored data (Coursaris *et al*., 2003; Kwame, 2013).

Therefore, the perception of risk affects both satisfaction and the intention to continue using an app (Wang *et al*., 2018, Lim *et al*., 2018; Kanti *et al*., 2018; Razi *et al*., 2019).

H7: Perceived risk is negatively associated with satisfaction.

H8: Perceived risk is negatively associated with consumers' intention to continuance to use apps.

Satisfaction

Satisfaction can be defined as the consumer's feeling that the consumption of a product delivers results against a standard of pleasure or displeasure. This definition mirrors on one side, satisfactions cognitive nature, i.e., comparison between expectations and performance while on the other side, it mirrors on the afective nature which is the related pleasure feeling (Moliner *et al*., 2007 cited in Olubusola, 2015: 2).

Mobile consumer user satisfaction (MCUS) can be defined as

> *"a summary affective response of varying intensity that follows mobile commerce activities and is stimulated by several focal aspects, such as information quality, system quality, and service quality"* (Wang & Liao, 2007: 384*).*

The more satisfied the users are, then the higher the probability that the users will continue to use the current application (Wang, 2008; Oghuma *et al.,* 2016; Kanti *et al.,* 2018). At the same time, the results of several studies on satisfaction and intention to continue are positively accepted (Lai & Chen, 2011; Lee & Kwon, 2011; Kanti *et al.,* 2018) including public transport services (Joewono & Kubota, 2007; Nathanail, 2008; Lai & Chen, 2011; Wang & Liao, 2007; Li & Liu, 2014; Weng *et al*., 2017; Kanti *et al*. 2018).

H9: Satisfaction has a positive and significant impact on intention to continue using the transportation application.

METHODOLOGY

The present investigation used the quantitative approach. The main method of data collection was surveyed. The items of the questionnaire were adapted and modified from scales previously developed and validated with the appropriate coding for the conditions of young Mexican users. Each item was measured on a 5-point Likert scale with responses ranging from "totally agree" to "totally disagree". The unit of analysis was the undergraduate student, user of private transport applications of the University Center for Economic-Administrative Sciences (CUCEA) of the University of Guadalajara. Previous experience was necessary to be able to evaluate satisfaction and intention to continue using this type of app. The sampling

technique was random, with a size of 202 participants from the various educational programs. Of this number of applied surveys, once the data had been tabulated and reviewed, 144 good surveys remained (corresponding to 71.28%), eliminating the missing or null data. Partial least squares structural equation modeling (PLS-SEM) was used to test the model. The software employing was the SmartPLS 3.

RESULTS

First, the profile of the participants was obtained. Table 1 presents the results of gender the participants, age, monthly income, when was the last time they used a ride hailing app, how long they have been using this kind of app, what is the application you use the most, frequency of use, used and brand of the device.

Table 2 presents the results of the reliability and validity test. All measures meet the quality criteria: factor loadings are greater than 0.7, average variance extracted is greater than 0.5, and composite reliability is greater than 0.7. Furthermore, all constructs showed sufficient levels of discriminant validity according to the heterotrait-monotrait (HTMT) criterion (Hair et al., 2017).

The results of the inner model are provided in Table 3. Precisely, we report the path coefficients (and their significance), the R2 values and some further quality criteria, such as the effect sizes (f2), the Q2 values based on the blindfolding procedure, and variance inflation factors (VIF) (which are below the threshold).

Design quality (0.282, p = 0.010), information quality (0.283, p = 0.014), and system quality (0.192, p = 0.019), are positively and significantly related to Satisfaction. Therefore, Hypotheses 1, 3 and 5 are supported, respectively. Previous studies (Justitia et al. 2019 and Olubusola 2015) tested these hypotheses.

On the other hand, hypotheses 2, 4, 7, 8, 9 are rejected. Because in the case of perceived risk with satisfaction, the path coefficient did not show an inverse relationship between the variables. That is, to higher perceived risk, the satisfaction is lower, in addition to the fact that the p value was not significant. Like the result obtained from perceived risk and the intention to continue using the app.

The rest of the hypotheses related to the intention to continue using the app (system quality, information quality, design quality and satisfaction) were rejected because the p-value was not significant.

Table 1. User characteristics

Variable	*Frequency*	*Percentage*
Gender		
Man	57	39,6
Woman	87	60,4
Age		
Less than 20 years	39	27,1
Between 21 and 30 years	103	71,5
More than 31 years	2	1,4
Monthly income		
Less than $ 2000	47	32,6
From $ 2001 to $ 3000	31	21,5
From $ 3001 to $ 4000	21	14,6
From $ 4001 to more	45	31,3
When was the last time you used the mobile applications to request a transportation service?		
Today	12	8,3
1 - 7 days ago	71	49,3
1 - 2 weeks ago	23	16,0
3 - 4 weeks ago	21	14,6
2 - 3 months ago	15	10,4
3 - 4 months ago	2	1,4
What was the application you used?		
Uber	138	95,8
Cabify	3	2,1
Easy taxi	2	1,4
City driver	1	,7
Since when you have used the private transport applications?		
Less than a month	8	5,6
1 to 6 months	46	31,9
7 to 12 months	37	25,7
More than a year	53	36,8
How often do you use it?		
Everyday	3	2,1
Two or three days a week	25	17,4
Weekends	63	43,8
Other	53	36,8
What is your form of payment?		
Cash	61	42,4
Card	69	47,9
Both	14	9,7
What type of mobile device do you use most frequently to access the private transport application?		
Smartphone	141	97,9
Tablet	1	,7
iPod touch	2	1,4
Who is the manufacturer of the device?		
Apple	44	30,6
HTC	4	2,8
Motorola	18	12,5
Samsung	38	26,4
LG	9	6,3
Nokia	2	1,4
Sony Ericson	1	,7
Other	28	19,4

Source: own elaboration.

Table 2. Measures

Construct (Source)	Items	Loading	AVE	Composite reliability	HTMT- (BcA-) confidence interval includes 1
Design quality	X1_1	0.822	0.668	0.910	No
	X1_2	0.849			
	X1_3	0.852			
	X1_4	0.776			
	X1_5	0.786			
Information quality	X2_1	0.846	0.680	0.914	No
	X2_2	0.809			
	X2_3	0.847			
	X2_4	0.831			
	X2_5	0.789			
Perceived risk	X3_1	0.796	0.621	0.868	No
	X3_2	0.827			
	X3_3	0.795			
	X3_4	0.733			
Satisfaction	X4_1	0.902	0.811	0.895	No
	X4_2	0.898			
System quality	X5_1	0.811	0.670	0.890	No
	X5_2	0.733			
	X5_3	0.848			
	X5_4	0.876			
Intention to continuance to use	X6_1	0.885	0.692	0.870	No
	X6_2	0.873			
	X6_3	0.729			

Source: own elaboration.

Similarly, R2 represents the amount of variance in a dependent construct that is explained by all the antecedent constructs associated with it and whose values range between zero and one, the higher the level of precision in the prediction. It is the measure of the predictive value of the model and therefore the predictive power of the sample (Hair *et al*., 2017). According to Hair and others (2011), and Henseler and others (2009) in marketing, R2 values of 0.75 are considered important, 0.50 moderate and 0.25 weak (Hair *et al.,* 2017).

The results of R2 for satisfaction are explained 45% by quality of the system, quality of the information, quality of the design and perceived risk. According to the thresholds established in the literature, it can be considered moderate values.

But in the case of intention to continue using the app, R2 turned out to be low, 29.7%, which partly coincides with the fact that the predictive power of the sample for this variable is low, since all the hypotheses associated with the intention were rejected.

Table 3. PLS-SEM analysis

Relationship	Path coefficient	*p*-value	VIF	f^2	HTMT- (BcA-) confidence interval includes 1	BcA bootstrap 95% CI
System quality → Satisfaction	0.192**	0.019	1.599	0.042	No	[0.029;0.352]
Information quality → Satisfaction	0.283**	0.014	2.289	0.063	No	[0.040;0.497]
Design quality → Satisfaction	0.282***	0.010	1.977	0.073	No	[0.071;0.503]
Perceived risk → Satisfaction	0.037	0.668	1.402	0.002	Si	[-0.124;0.213]
System quality → Intention to continuance to use	0.116	0.200	1.666	0.012	Si	[-0.057;0.298]
Information quality → Intention to continuance to use	-0.038	0.751	2.434	0.001	Si	[-0.268;0.206]
Design quality → Intention to continuance to use	0.235**	0.047	2.122	0.037	Si	[-0.006;0.459]
Perceived risk → Intention to continuance to use	0.247**	0.025	1.405	0.062	No	[0.018;0.453]
Satisfaction → Intention to continuance to use	0.137	0.247	1.817	0.015	Si	[-0.099;0.361]
R^2 *(Satisfaction)*	0.450					
R^2 *(Intention to continuance to use)*	0.297					
Q^2 *(Satisfaction)*	0.316					
Q^2 *(Intention to continuance to use)*	0.185					

Source: own elaboration.

CONCLUSIONS

In conclusion, it can be mentioned that it is important for companies to be at the forefront of technology since apps are an excellent tool or strategy, from the point of view observed, to welcome the market, position themselves and facilitate the purchase processes between the company and the customers.

With mobile devices, companies can adopt a business mobility strategy, saving costs, gaining flexibility and being able to optimize processes due to obtaining customer information in real-time and improving corporate communications. Similarly, using mobile marketing, the interaction between the company and its customers is promoted, facilitates the dissemination of offers and promotions, encourages purchases, improves customer loyalty, and favors the image of the brand. All this was influencing the future of business around the world.

Given this, the transport network companies are here to stay and satisfy the needs of the consumer regarding individual public transport, emphasizing that a better knowledge of the user will lead to improving the service offered and with it the loyalty, continuity of use and promotion of Word of mouth from the user, reflecting in higher sales and therefore profits for companies.

As recommendations and future lines of research, it is necessary to expand and refine the sample to be able to evaluate the predictive power of the model with greater certainty, as well as to review the database in detail to identify possible errors that influenced the behavior of the results.

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