Towards strategies to capture and retain mobile ticketing customers

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Abstract

INTRODUCTION: When compared to traditional ticketing systems, mobile ticketing has several advantages, allowing ubiquitous and remote access to payments, avoiding queues and replacing notes and coins. It also allows service providers to reduce their costs and achieve operational and productivity gains. However, while some cities have implemented mobile ticketing solutions on their public transport network, the adoption of such services appears to have limited success. The causes that lead to such a low rate of use of the service are still unknown.
OBJECTIVES: This paper presents an in-depth study of the reasons that lead mobile ticketing customers to adopt or abandon this type of service and establishes a series of strategies to attract and retain customers.
METHODS: It uses the city of Porto, Portugal, as an illustrative example, where a mobile ticketing solution, called Anda, was launched. Customer complaints related to 6 months of using Anda were analysed and usability tests were carried out with real customers in the context of use.
RESULTS: This analysis allowed to identify a series of factors that lead people to adopt or abandon this type of services. Then, a series of strategies were defined and identified that allow to capture and retain mobile ticketing customers during the various stages of the mobile ticketing lifecycle: user onboarding, user engagement, user retention and user reinstall. For each of the stages of this life cycle, the main concerns to be considered were also listed, a series of tactics were defined to reverse the abandonment trend and a series of KPIs were specified to measure the efficiency of the strategies.
CONCLUSION: This paper fills an important research gap in the literature, being very useful in shaping future strategies for successful mobile ticketing solutions.

1. Introduction

As the world becomes increasingly interconnected, the adoption of technology is one of the most influential factors in human progress. Immediate access to the Internet or possession of a smartphone is now taken for granted in many advanced economies. It permeates commerce, social interactions, politics, culture and everyday life [1]. In addition, while high-income economies continue to use more internet and have more high-tech devices, in recent years, there has been a tendency for emerging countries to follow and copy these behaviors. These patterns are now global, regardless of how fast they grow in each type of economy. In 2018, more than 3.5 billion people, 47% of the world's population, were connected to the mobile internet [2].

Internet access and innovative services facilitate access to modern public health services, free education services and financial services, including mobile payments. Thus, the mobile phone has become a fundamental gateway to the digital economy. The general adoption of mobile devices to

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pay for goods and services is a widespread reality [3][4][5]. Mobile payments are designed to provide users with a secure, convenient, consistent, efficient and reliable payment experience [6]. However, security and privacy issues, as well as the interaction and reliability of the service, can be some of the concerns that users share [7].

Mobile payments can be applied to various sectors, such as public transport. There, mobile payment comprises prepaid options - where mobile phones act as a wallet and ticketing itself - where passengers buy and authenticate tickets on their mobile phones. The last resort is only possible due to a service based on emerging technology called mobile ticketing.

As with mobile payment services, mobile ticketing is a process in which customers can order, pay, obtain and validate tickets only on mobile devices and without requiring a physical ticket. A mobile ticket contains a single ticket check, varying according to the technology used. While some mobile ticketing systems require validation via SMS text [8], a QR or barcode [9], others require Near Field Communication (NFC) [10]. Mobile ticketing services solutions take advantage of wireless communication and thus aim to free customers from difficult purchasing decisions, allowing easier access to other services.

The convenience of this technology makes it fully adequate to deal with the problems of urban congestion and stress in metropolitan areas. As public transport improves passenger mobility, by means that are safe and of high quality, it can be seen as the necessary solution for urban sustainability. However, the complexity of the transport networks and the lack of continuous options reduce the attractiveness of the sector. Long waiting times in the queues to purchase and validate tickets make people abandon this solution and choose to use their own vehicle. Mobile ticketing in the public transport sector can offer an innovative, ubiquitous and engaging service [11].

Although some cities have implemented mobile ticketing solutions on their public transport network, the adoption of such services appears to have limited success [12]. The causes that lead to such a low rate of use of the service are unknown. However, researchers claim that churn factors are somehow related to the acquisition phase or the user experience [13]. Others claim that usage rates are still low because mobile payments require customers to change their behavior to deeply entrenched payment habits [14].

In an attempt to understand the phenomenon, the authors [14] studied the failure of three cases of mobile payment in Switzerland: the m-Maestro project, the European initiative compliant with Visa, and mobile payments by PostFinance. PostFinance initiative, for instance, failed to provide additional value to customers and local merchants. They faced significant difficulties in finding a workable balance between interoperability and the ease of use for customers, resulting in a clumsy solution that suited the physical environment and the behaviors associated with payments at local stores. At the end of the study, the authors acknowledge that more research is needed to formulate a more complete

structure, based on the richest process data from the mobile payment diffusion trajectories.

On the other hand, despite recognizing that, despite the growing number of mobile payment applications, very few solutions have been successful, [15] selected some of those few successful platforms to study the success factors. The authors conclude that the success of mobile payment platforms lies in the platform's ability to balance the reach (number of participants) and the range (features and functionality) of the platform.

In the city of Porto, Portugal, a mobile ticketing application, called Anda was deployed in June 2018 [16]. An analysis of the level of use of the service allowed us to conclude that there are many customers who have never used the application, although they have downloaded it, and others who, despite having already used it, preferred to give up the application and continue to use the traditional ticketing system. This reality occurs with a series of similar mobile ticketing applications on the market and the literature fails in explaining this phenomenon.

Therefore, this paper aims to identify and analyze the customer adoption and churn factors of mobile ticketing services and to propose strategies for customer acquisition and retention. This work is based on an in-depth analysis of the case of Porto, Portugal. Half a year of complaints and usage data for Anda were analyzed. These are data on the interaction between users and customer support - made by phone, email and social networks - in addition to data on the history of using the app of those who complain. Additionally, usability tests were carried out on the Anda application, with real users in the context of use. Thus, it is possible to establish the causal relationship between all the extracted data and then to identify the reasons for the adoption and the churn factors. Based on this, the life cycle of a mobile ticket customer can be defined from customer onboarding to customer acquisition, customer retention and customer reengagement. For each of those stages, the critical success factors are identified and a set of useful strategies is set to attract and delight customers.

In the next sections the paper methodology is described, followed by the results of the analysis of complaints and user validation data. The discussion of the results is presented together with a proposal of service improvement in each of its stages. The final section presents the conclusions.

2. Methodology

This paper aims to identify customer adoption and churn factors of mobile ticketing services and define customer capture and retention strategies. It uses the city of Porto, Portugal, as an illustrative example, and follows complementary methodological approaches such as the analysis of complaints and suggestions from customers and usability tests to the application of mobile payments. Each of these approaches is detailed below, after a brief overview of public transport in the Metropolitan Area of Porto

2.1. Public Transport in the Metropolitan Area of Porto

This is the body text with no indent. This is the body text with no indent. This is the body text with no indent. Metropolitan Area of Porto (AMP) is composed of seventeen municipalities in an area of 2.040 km^2 and has a population of about 1.7 million inhabitants. The public transport system consists of three subsystems: buses, light subways and suburban trains. The three are all integrated into a multimodal public transport ticketing system, called Andante. This system was originally designed for the use of a smart card with contactless RFID technology. Passengers can load the Andante card with occasional trips or with a monthly pass, depending on the number of trips they intend to take during the month.

It is an open system, in which the passenger must validate the card at the beginning of a trip and whenever he changes vehicles, touching the travel card in the ticket reader. AMP is divided into 124 geographic travel zones and the journey fare depends on the number of zones crossed during a trip. The greater the number of zones travelled, the more expensive the ticket is. Andante is also a time-based system because passengers can change their mode of transport as many times as they want during a certain period, but when the time is up, the ticket will no longer be useful.

The complexity of the Andante system makes it more difficult for passengers to become familiar with the location of zone boundaries and to understand how the crossing system works and what type of tickets they should buy for a given trip. It is in this context that the Anda mobile application emerges, whose main purpose is to facilitate access to public transport services.

Anda is based on a check-in/be-out scheme, requiring an intentional user action when entering the vehicle (tapping the mobile phone on the ticket reader) and the alight station is automatically detected by the system, as well as intermediary stations along the trip. The mobile phone interact with BLE beacons installed in metro and train stations and inside buses, through Bluetooth connection, to locate the customer along the transport network [16]. The price to be paid by the customer is calculated through a fare optimization algorithm, which minimizes the cost for the passenger, freeing them from difficult purchasing decisions [17].

Anda was launched in June 2018, having been widely publicized in the media and accompanied by a massive communication plan. The objective was not only to disseminate the new service, but also to explain how it works. It involved news in TV channels, newspapers and social networks, placing outdoors and stands at stations, decorate vehicles, distribute flyers and informational leaflets, and having promoters presenting the service and helping customers.

2.2. Customer complaints and suggestions analysis

In order to have a better understanding of how to capture and retain customers, it is crucial to first assess and then become fully informed about the behavior of current users. By identifying usage patterns, as well as their trend, it is easier to see the indicators of customers who are about to churn.

Customer feedback is a valuable tool to understand how the service has been communicated to current and potential users. Complaints analysis allows to understand how users perceive the application and what are their expectations and needs about it. This makes it easier to recognize the vital areas for improving communication with the customer and, therefore, improving the service as well.

Since its complete implementation, customers using the Anda application interact daily with the customer service, through several channels, such as telephone, e-mail, Facebook, Google play and physical stores. This interaction can serve several purposes, such as asking questions, reporting errors, or making suggestions for improvement [18]. The information from the various channels is collected on a single platform, to be further processed and analyzed.

The object of this study is the complaints received by the Intermodal Transports of Porto (TIP) during 6 months of using Anda - from September 2019 to February 2020. The choice of this time interval is related to the fact that it is a normal period of use, only with regular updates of the application, but without major changes that would imply a greater influx of complaints.

The analysis included three main aspects: complaints, complainants and the effects of complaints on the use of Anda. Firstly, the data on complaints includes the date on which the statements were made, the reasons for which they were made, the responsible carriers and the means of communication through which they were made. Second, with regard to claimants, information is collected about their social profile - whether they belong to a certain age group or benefit from help due to their social status - and the type of ticket they use most. Information was also collected on the distribution of claimants in the different months. Finally, to assess the impact of complaints on usage, the application's validation history data is considered. To perform a descriptive analysis of the data gathered, MS Excel and Rapid Miner Software were used.

2.3. Usability testing

Usability testing is a tool designed to determine the extent to which an interface facilitates a user's ability to complete routine tasks [19]. n this case, the main objective was to understand how intuitive the application is for new users - who have never had contact with it - and, at the same time, to identify problems in the daily interaction of regular users. The test results were expected to generate relevant and valuable suggestions to make the app clearer and accessible to everyone using public transport. It was also expected that the test would result in a list of usability problems that lead consumers to abandon this type of service.

The Anda usability tests were carried out with eight participants (according to [20], between 5 and 8 users are sufficient to achieve meaningful results). Of the chosen customers, four were regular users of Anda for over a year and four were people who had never contacted the application. Of the regular users, two people from the selected ones were users who presented complaints to the system during the period under analysis.

The test administered to users was divided into three parts. The first part consisted of a pre-test questionnaire to characterize the participants. The objective was to collect demographic information and information on the level of experience with the Andante and Anda system. The second part consisted of asking users to perform 16 tasks in the application. They were asked to think and speak aloud while performing each task, in order to record their experience. During the execution of the task, the time they took to complete was measured. In the end, participants were asked to rate the task in terms of difficulty and usefulness on a scale of 1 to 4, where 1 is very easy and useless, and 4 very difficult and very useful. Choosing a scale with an even number of options has to do with avoiding neutral responses.

The third part consisted of a post-test interview with focused questions and open answers. The objective was to assess the general perception of users in relation to the application and its usability. Questions were asked about the features they liked the most and the ones they liked the least. Likewise, suggestions were made for improvements and strategies that would have an effect on the acquisition of new users. A question was also asked about the security of the app and whether they would suggest the app to someone who doesn't know it.

As the purpose of the test was to assess problems that could arise during normal use of the application, the test was carried out in context. It was carried out with each participant individually. That is, only the user and the tester were presented so that there was no external influence on the participants' behavior. For each participant, a trip was made, whose initial and final stops were chosen by them. The means of transport used was also chosen by users.

The tester was responsible for presenting the application to users, explaining the purpose of the test and how it would be performed, reading the tasks and questions on the test form, asking for permission to record audio and video, writing the responses and comments of the participants, timing the completion of each task and taking notes on the behavior observed throughout the test. In addition, in the final part of the test, the tester was responsible for interviewing each user in order to collect their opinion, highlights and insights about the application.

3. Results

This section presents the results of the analysis performed, with regard to the analysis of complaints and suggestions and to the usability tests.

3.1. Customer complaints and suggestion analysis

This section starts by presenting the data of the complaints, followed by the presentation of complainers' characterization. Finally, the conclusions resulting from the crossing of data from the history of usage of Anda app and the complaints data are presented.

The complaints

During the period under review, the total number of complaints received by Anda app is 1223. Of these, only 68% (832 complaints) were submitted by different users, which means that 32% of users completed at least more than once. So far, most of these records (95.5%) are resolved and closed, but those that are still open require action by third parties - for example, external technical teams.

The problems that can arise in the use of Anda are several and can be categorized by the reasons that caused them. The main reasons are related to the validation of the trip, login and registration in the app, the correct filling of the trips, the consultation of personal data, the associated tariff and the disregard of intermediate stops. Fig. 1 shows the distribution of the main reasons for complaints. In addition, there are other reasons that can lead to a complaint - beacons, payment methods, questions, enrollment, data changes, suggestions for improvement, inspection and account deletion - but the total number of records for these reasons is not relevant to considered in this study.
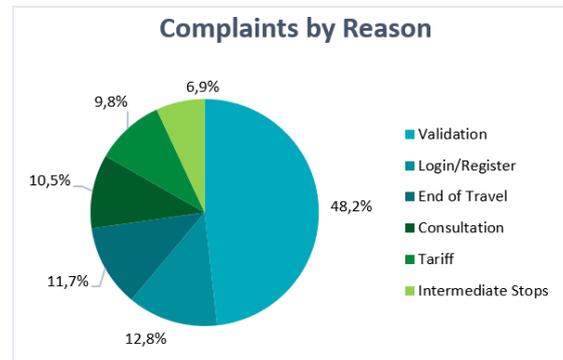

Figure 1. Distribution of complaints by reason

Porto's Intermodal Transport consists of 19 public transport operators and Anda can be used in all of them. In addition, it is important to mention that 76.3% of complaints are not related to the trip itself and to the operators, but to issues related to the application or billing. Complaints to carriers are 23.7% of the total.

Anda's complaints can be submitted by the most diverse means of communication, but two of them stand out for their great use: the application's crash report (64%) and email (32.5%). Among the rest are links (3%), the official Facebook page (0.4%) and the Google Play Store (0.2%).

The complainers

The total number of Anda users from September 2019 to February 2020 is 5759 and 14% of them are complainers of the service. Usage data allows us to know that, on average, about 3,103 people use the app to travel on Porto's transport services per month. Likewise, it is known that about 203
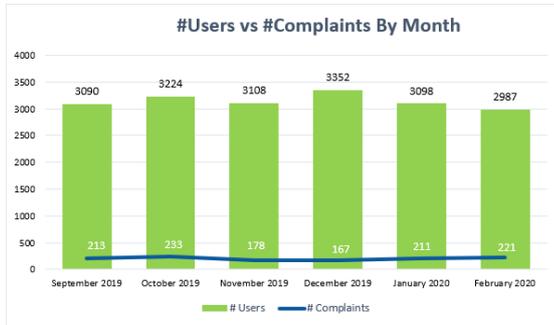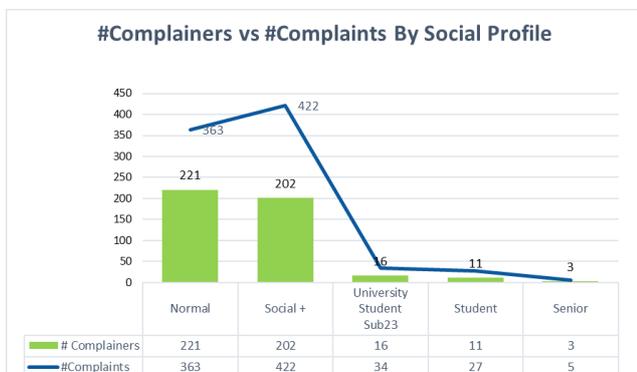

Figure 1. Number of users vs. number of complaints, per month

complaints are filed per month. In Fig.2. it appears that, over the period studied, the relationship between the number of users and the total number of complaints received remained practically constant.

Based on the validation data, it is known what types of tickets were purchased by the claimants. Most people who complain purchase single tickets (69.9%), that is, for occasional trips. In addition, TIP groups users by social profile according to their age group or social status. By analyzing these data, it can be seen that the majority of complainants belong to the "Normal" social profile (49.1%) - which means that they are adults who do not benefit from any type of discount. Among the remaining profiles are people who have lower rates (Social +) (44.9%), university students (3.6%), students under 18 (6.4%), and seniors over 65 (0.7%).

The distribution of users by social profile also allows knowing that the users who most complain are the "Normal" and "Social +". Also, Fig. 3 shows that in all groups, the number of complaints is higher than the number of complainers, which, once again, reaffirms that there are users complaining more than once.


Figure 2. Number of complainer vs number of complaints, by social profile.

The effects of the complaints

Finally, to understand the effect of complaints on the use of Anda, it is necessary to cross the data of both – complaints and validations. By knowing the complainers, it is noticeable their influence on the use of the application. Likewise, it is interesting to find out whether the use-complaint relationship is uni or bilateral.

When categorizing by type of users, as seen in Fig. 4a, it is possible to see that 78.7% of the complainers are people who use the app to make trips. However, 17.6% of app users complained without ever having used it - 9.9% complained before using it and 7.7% complained without ever having used it. In addition, 3.7% of complainers submit their statement at the time of their first trip. To deepen this
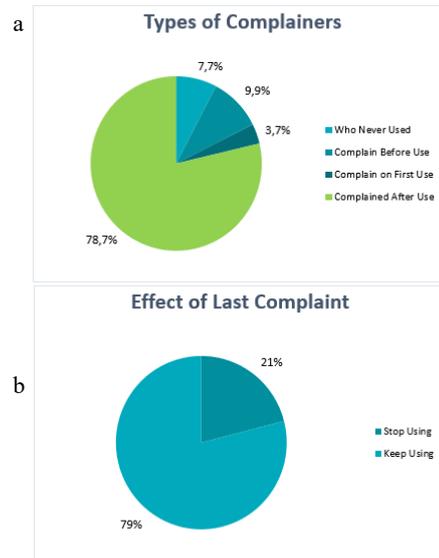
Figure 4. a. Types of complainers; **b.** Effect of the last complaint

connection, it was also assessed the use of the app on trips after the last complaint. In Fig. 4b it can be seen that the majority (79%) continued to use Anda, but 21% did not do it again.

3.2. Usability testing

In carrying out the usability test, four people who use Anda on their usual trips - regular users - and four people who had never been in contact with the app - first-time users were selected. The choice of participants took into account some aspects that were relevant to be analyzed. Demographically, people of both genders and all age groups were selected in order to get in what sense the existing problems can result from generational differences.

Participants with different degrees of knowledge of the Intermodal Andante system were also chosen. On the one hand, participants were selected who usually know and use this transport network and, on the other hand, participants who use public transport but with less regularity. All regular

users chosen are customers who have been using the app for at least a year.

Another aspect that was considered in the choice of the test participants concerns the complaints made to the application, during the period under analysis - September 2019 to February 2020. From the regular users, some were chosen who presented complaints in that period and others who did not.

The demographic information of the participants, as well as their level of knowledge of Andante, and the complaints presented to Anda are detailed in Table 1 and Table 2 respectively.

Table 1. Test Participants demographics

| | First-Time Users | | Regular Users | | | |
| | | | Complainers | | Non-Complainers | |
Age	F	M	F	M	F	M
18-29	2	1	0	0	0	1
30-44	0	0	1	0	0	0
45-59	1	0	0	1	0	0
60 or +	0	0	0	0	1	0

Table 2. Test Participants knowledge of Andante system

	First-Time Users	Regular Users
Inexistent	0	0
Little	1	0
Reasonable	1	0
Good	1	1
Very Good	1	3

Through the performance of usability tests, the perception of a significant difference in the behaviour of regular users and first-time users was clear (see Fig. 6 and Fig. 7). While the experts are very comfortable navigating the app and accessing the various screens available, consumers who had never been in contact with Anda felt6060 more lost and insecure during the test. Behind this problem is the lack of guidance for users in the first interaction with the app. The need for a feature or screen that explains how to use the app makes the entire user experience based on a long and time-consuming trial and error approach.

The technical problems arising from the interaction with the app – be it the long activation time of payment methods, the inability to end the trip immediately, the difficulty in understanding whether the password has been changed, among other - are concerns that must be addressed. The greater the number of usability problems that users encounter, the greater their dissatisfaction with the app will become and consequently, the greater the likelihood that they will churn the service.

The fact that users feel that sending a crash report will not be effective is also a problem that must be avoided. Complaints to the service aim to understand the problems that arise during the use of Anda so that they can be resolved.

When customers feel that their statements will not be analysed and that their opinion is not relevant to the service, they can abandon the app.
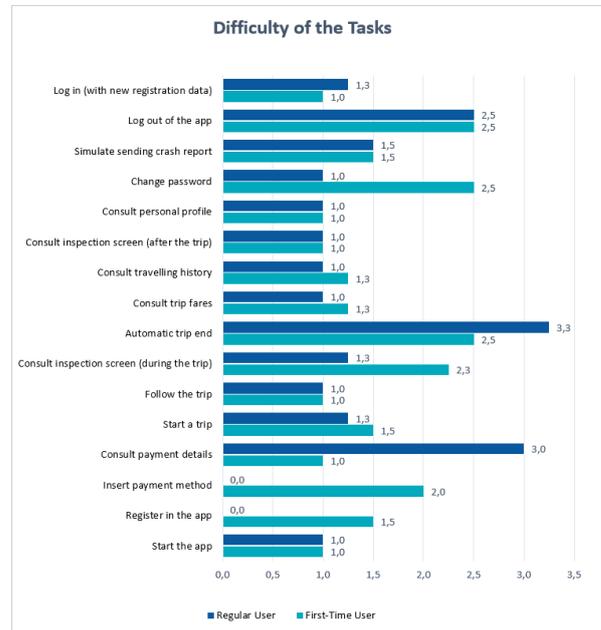

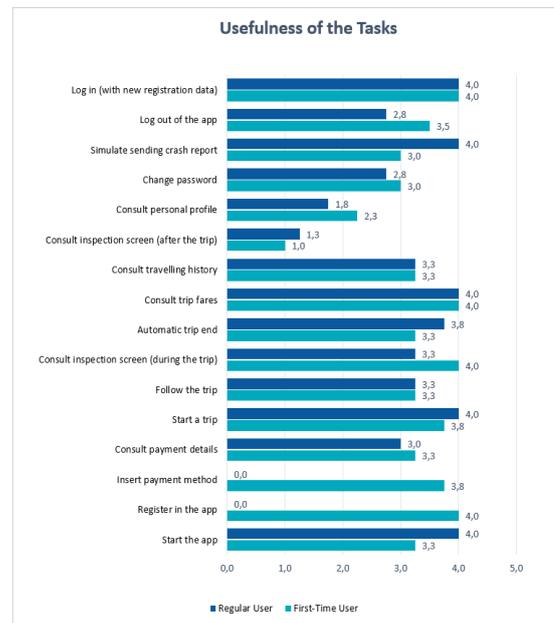**Figure 5.** Perceived difficulty of tasks performed

Figure 6. Perceived usefulness of tasks performed

Finally, in addition to the problems already mentioned, users said that the lack of exposure to the app is the main cause of little use of Anda. Regular users have reported that they generally need to present and explain to others who travel with them that it is possible to travel on TIP through a mobile ticket application. In this sense, they consider that the realization of advertising campaigns directed to different types of users - students, families, the elderly, etc. - it would be an asset.

4. Discussion

The analysis of the complaints and usability tests opens the ground for several reflections and sets the path for the future development of the mobile ticketing services. In this sense, customer adoption and churn factors regarding mobile ticketing services are identified, as well as customer capture and retention strategies.

4.1. Customer adoption and churn factors

The analysis of complaints and usability tests made it possible to identify the factors that lead public transport customers to use mobile ticketing applications and the reasons that motivate the churn, which are presented below.

Adoption factors

Accessibility of the mobile applications:
Not only being able to travel, but also paying for a trip using just a smartphone, is seen as a major trend in the future. Users consider it an advantage not to need the smartcard to travel and, instead, to be able to buy the ticket, validate it and even present it for inspection on the mobile phone.

Flexibility of the mobile applications:
The fact that these applications are compatible with different transport operators and make it possible to travel on different means of transport - be it buses, subways, trains, among other - just using the mobile phone is extremely useful.

Ubiquity of the service:
Not having to go to a store or vending machines to purchase tickets is one of the main benefits of using these apps. Being able to avoid the queues to buy tickets is extremely convenient for users.

Sustainability of the service:
The fact that these applications are environmentally friendly and, unlike traditional travel methods, do not require physical cards - paper or plastic - is also a reason why users choose these applications.

Churn factors

Bad First-Time User Experience:
The first contact with the application is essential. If at first users feel that the service provided does not meet their expectations, they will stop using it.

Recurrence of Usability and Technical Problems:
There are problems with mobile apps. However, if these problems have become recurring and have not been resolved in a timely manner, this is a reason for users to stop using the application.

Lack of response to customer feedback:

Following the usability problems that may arise, if users submit complaints to the service and, therefore, do not obtain a favourable response or resolution, it is possible that they will stop using the application.

Depreciation of Customer Value:
Customers of mobile ticket applications like to feel that using these applications has some advantage over traditional methods. When mobile ticketing customers feel that the application does not benefit them from traditional ticket customers, the first ones will stop using it.

Negative Influence of Lost Customers:
Customers may abandon the service for a variety of reasons. If the reasons for abandonment have to do with the bad user experience, these lost users can communicate a wrong image of the application to current and potential customers, causing them to abandon the service as well.

The Lack of advertising campaigns:
The lack of knowledge about the existence of mobile ticketing applications is another problem that must be addressed. The discriminatory factor for people who use this type of app in public transport compared to the majority who use traditional tickets is worrying. Social pressure can lead users to abandon the service. The lack of mass and targeted advertising campaigns is at the root of the lack of consumer awareness.

4.2. Customer capture and retention strategy

After studying the effect of comparing the results of the analysis of complaints and usability tests, as well as the main factors of adoption and abandonment of mobile ticketing applications, it is essential to define a strategy to capture, acquire and retain new clients.

In this sense, four fundamental stages were identified in the process of using this type of applications: user onboarding, user engagement, user retention and user reinstall. For each stage of the life cycle, the main aspects to be considered are identified - according to the results obtained - and a series of tactics are established to increase the value of the service for customers. The different segments of users, as well as the appropriate channels to reach them, are also considered in the proposal presented.

User Onboarding

The data referring to users who complain without having ever used the app are indicators that their first interactions with the service are not meeting their expectations. For technical or usability reasons, some users do not initially find the type of experience they were looking for and give up on the application before actually using it.

To counter this trend, Table 3 lists a number of tactics that can be put into practice. Regardless of the user segment, the application should present a welcome message on first use, encourage users to sign up emphasizing the benefits of the

service and display a brief demonstration of the application and its main features.

Table 3. Strategy to improve user onboarding for different types of user segments.

User Segment	Tactics	Channels
Installed but not registered	• Welcome users on the app and introduce the main features of the app. • Encourage the register in the first 24 hours. • Incentivize registration with rewards on the app (cashback, ticket discount).	• In-app Notifications • Push Notifications
Registered but not activated	• Welcome app users after the register. Incentivize them to complete the payment information. • Stimulate users to make their first travel using the app, with rewards (cashback, ticket discount).	• In-app Notifications • Push Notifications • SMS • Email • Reminders
Registered and activated	• Encourage greater use of the app with rewards (cashback, ticket discount).	• In-app Notifications • Push Notifications • SMS • Email • Reminders

User engagement

Once familiar with the service, users need to be converted and start using it consistently and frequently. The data collected shows that 9.9% of the complainants are people who complained before traveling with the app. In addition, 3.7% are users who complained shortly after using the app for the first time. If these values are not taken into account and if these users are not motivated to give the service a new chance, it is very likely that they will churn it.

At this stage of the cycle, the service should encourage the consumer to perform actions on the app - be it filling out payment information or taking a trip - stimulating the commitment already established. Notifications with special offers are also useful to promote constant use and encourage repeated interactions - for example, trips of the same type or with similar routes. Table 4 shows the different strategies to be targeted at different users at the engagement stage.

Table 4. Strategy to improve user engagement for different types of user segments.

User Segment	Tactics	Channels
Onboarded but non-converted	• Urge users to make their first travel using the app – push different use cases at different times. • Create custom campaigns offering rewards for first users (cashback or travel discount).	• In-app Notifications • Push Notifications
First-time converted	• Confirm completion of first travel. Thank the choice of service, up to 5 min after it finishes. • Encourage users to keep using the app.	• Push Notifications • SMS • Email
Repeat converted	• Encourage continuous use through targeted personalized campaigns based on usage patterns. • Promote different services with rewards (cashback or travel discount).	• In-app Notifications • Push Notifications • SMS • Email
Users not completing actions (abandonment)	• Notify users 1 hour and 24 hours after they abandon a task.	• Push Notifications • SMS • Email • Reminders
No activity	• Remind users that have no activity in the app in the last 30 days.	• Push Notifications • SMS • Email

User retention

Mobile ticketing applications services tend to have difficulty retaining users. A consistent and constant customer base is the main basis for the sustainable growth of any service.

At this stage, the data on the number of complaints and the number of claimants for each social profile are noteworthy. While in the "Normal" profile the number of complaints per claimant is approximately 3/2, in the rest the values increase by approximately two times. This information can become relevant as users dissatisfied with the service tend not only to abandon it, but to negatively influence potential new users. The more complaints a person sends, the greater their dissatisfaction with the service and the greater the likelihood of canceling it.

To optimize retention, users can be motivated to repeat the same interactions with the app in exchange for discounts on regular travel or reimbursement of the amount to be paid at the end of each month. Careful and attentive analysis must be carried out to control the retention rates of current and potential users, as well as personalized promotional campaigns and reminder of available offers. Table 5 shows some tactics to be implemented.

Table 5. Strategy to improve user retention for different types of user segments.

User Segment	Tactics	Channels
Engaged but not loyal (hibernating)	• Communicate with the user and understand what's their perception of the app. Send messages to obtain an assessment of the service. • Send customized campaigns with "We miss you" messages.	• In-app Notifications • Push Notifications • Email
Engaged and loyal	• Ensure app rating and reviews. • Reward loyalty with travel discounts or cashback.	• In-app Notifications • Push Notifications • Email

User reinstall

The reasons for uninstalling a mobile application can be of the most varied types, from problems with interaction with the interface, inefficiency of features, low performance or disastrous user experience.

At this stage, it is important to consider the data relating to the effect of the last complaint. In other words, 21% of claimants have stopped using Anda since the last complaint. This aspect means that the reasons that motivated the complaint or the resolution obtained in the complaint became the reason for discontinuing the use of the app. Thus, the likelihood of uninstalling the application increases the more time that has passed since the last time it was used.

To recover inactive or discontinued customers, conducting an analysis of user behavior, as well as requesting feedback from former customers, can be useful to understand the points of friction between them and the application and possibly eliminate them. To recover lost users, targeted promotional offers can be put into action. Table 6 presents some strategies to be used.

4. Conclusion

The success of mobile ticketing applications depends a lot on the service provider's ability to attract and retain customers. This article presents an in-depth study of the reasons that lead mobile ticketing customers to adopt or abandon this type of service and establishes a series of strategies to attract and retain customers.

Table 6. Strategy to improve user reinstall for different types of user segments.

User Segment	Tactics	Channels
Converted but disengaged	• Run customized campaigns with the latest offers. • Update users' preferences. Suggestion on discounts based on new preferred routes. • Send reminding messages about the advantages of the service.	• Email
Churned	• Run personalized email survey seeking feedback to understand the reasons for app uninstall. • Run "We miss you" or "Check what your missing" campaigns, highlighting new promotions and cashback offers. • Run "We're just a click away" campaigns, following the suspension policy between 43rd to 50th days after uninstalling the app.	• Email
Re-acquired	• Run personalizes "Welcome back" campaigns, highlighting new promotions and cashback offers.	• In-app Notifications • Email

This study uses the city of Porto, Portugal, as an illustrative example. In June 2018, a mobile ticketing application called Anda was launched to the market. This application allows passengers to pay for the use of public transport in the Metropolitan Area of Porto, without the need to know the fares in force or use physical cards. Despite its ease of use, it appears that its use falls short of expectations, which is the case with many services of this kind around the world.

Thus, customer complaints related to 6 months of using Anda were analyzed and usability tests were carried out with real customers in the context of use. This analysis allowed to identify a series of factors that lead people to adopt this type of services such as the accessibility and flexibility of mobile applications and the ubiquity and sustainability of the service. On the other hand, factors that underlie customer churn were identified, such as having a bad first-time user experience, recurrence of usability and technical problems, lack of response to customer feedback, depreciation of customer value, negative influence the lost customers and lack of advertising campaigns.

Taking into account these factors, a series of strategies were defined and identified that allow to capture and retain mobile ticketing customers, during the various stages of the process of using mobile ticketing applications: user onboarding, user engagement, user retention and user reinstall. For each of the stages of this life cycle, the main concerns to be considered were also listed, a series of tactics were defined to reverse the abandonment trend and a series of KPIs were specified to measure the efficiency of the strategies.

From the point of view of future work, the methodology used and the results generated open the door to a series of other investigations. Applying this method to mobile ticketing applications in other cities or deepening the applicability of the strategy of attracting and retaining customers in a real context makes it possible to carry out other scientific work relevant to the areas of design and service management.

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