

Digital Mobile Onboarding in Switzerland – a Hands-on Experience

Nicolas Gordillo¹, Bruno Rodrigues², Christian Killer², Thomas Bocek^{1,3}, Burkhard Stiller²

²Communication Systems Group CSG, Department of Informatics IfI, University of Zürich UZH

Binzmühlestrasse 14, CH—8050 Zürich, Switzerland

¹Axelra AG, Hagenholzstrasse 83, CH—8050 Zürich, Switzerland

³OST, Eastern Switzerland University of Applied Sciences—8640 Rapperswil, Switzerland

E-mail: [nicolas.gordillo|thomas.bocek]@axelra.ch, [rodrigues|killer|stiller]@ifi.uzh.ch

Abstract—Traditional methods of acquiring commercial subscriptions, e.g., mobile communication contracts, involve a face-to-face negotiation for detailed contract options and, especially, customer identification based on passports or identity (ID) cards.

This paper reports on the experience gained of the fully digital onboarding process to acquire a new mobile subscription, in which the goal was to design and implement an application publicly available to customers of Android and iOS devices. A straightforward process on how people acquire new SIM (Subscriber Identification Module) cards and the amount of money needed to pay for the subscriptions was designed. As a result, the elimination of paperwork required, when creating a new subscription with a provider, the removal of costs for ordering a new SIM card, and the offering of flat payments without any hidden costs to compete with major service providers was reached. The architecture defined was used for the application and run in a real world use case.

I. INTRODUCTION

Digital Onboarding (DO) is a widely used marketing term describing the migration process of services traditionally performed in stores with humans directly involved to fully digital environments. This process can be beneficial for both companies and consumers, since digital tools allow customers to save time by using a more efficient, remotely accessible, and flexible service. Thus, the respective company can potentially reduce costs of maintaining a retail store [5]. Offering DO is highly relevant to attract consumers. However, DO in itself is not sufficient to engage consumers in a product or service [3]: It should also define straightforward user interfaces and a suitable User Experience (UX), highly valued by customers interests in buying a product or service. In this regard, this paper details a DO experience in Switzerland's mobile telecommunications sector, describing the underlying technical aspects of the process, its innovations, and its results.

Traditionally, acquiring a new mobile subscription in Switzerland starts by contacting a service provider and requesting one of the various plans offered. Most companies (the largest in the Swiss sector – Swisscom, Salt, Sunrise [15]) internally use web-based software tools to manage plans and subscriptions. However, the sale of subscriptions still heavily relies on manual, on-site processes, which require customers to visit a retail store. Usually, the customer initiates the

process, either calling the provider or filling in an online form on the respective Web-site. Then, the provider manually verifies the customer's identity. These manual processes are inefficient, error-prone, and require many person-to-person interactions with customers. The major challenges are related to the automation of the identity verification process replacing existing manual, paper-based work, in a way that is compliant with Swiss legislation. Henceforth, the following approach is proposed in this paper, which disrupts the traditional market by providing a service with these characteristics:

- Automatic identity verification via mobile phone in which the process of verifying the consumer's identity document can be automated using a photo and an official document.
- A new type of subscription alongside with monthly subscriptions: daily subscriptions, where users can opt-in/opt-out to pay for a prepaid subscription daily.

The respective mobile application (app) presented in this paper was developed in collaboration with a Swiss telecom provider. The app is available for iOS and Android smartphones. Additionally, this approach includes a DO process not used yet by any large companies controlling the telcom market share. Within the onboarding process, users can verify their identity, order a free SIM Card, and add a payment method to ease and speed up acquiring a new subscription plan.

The remainder of the paper is organized as follows. Section II overviews the fundamentals. While Section III describes the design and implementation of the mobile DO approach, Section IV details the evaluation. Finally, Section V summarizes the work and considers improvements.

II. THE STATE-OF-THE-ART

The distinction of mobile onboarding and its user experience borders here the evaluation of the state-of-the-art.

A. Mobile Onboarding

One of the first sectors to look into DO in Switzerland was the banking sector. In 2012, UBS released its first mobile application for Android devices enabling mobile and online access to bank accounts [6]. In 2015 UBS released the first mobile application for iOS. Since then, both platforms were constantly updated, with the latest update in January 2020. Before that, customers could only see their account details

(e.g., transactions, balance) by directly visiting the bank or accessing E-Banking via their Web browsers. Thus, a mobile application had to be developed and offered to the public at no cost to fulfill the customer need to access banking information on the go.

The approach taken by Revolut [12] to present their products and onboard potential customers is a well-organized process within their mobile application. The process is simple, efficient, and easy to understand. Revolut minimizes the number of interactions required by the user within the onboarding process. Most of the User Interface (UI) is straightforward, containing either one action/button or one input field that can be filled. The addressee's input fields can be filled automatically by choosing the right address when they type their address. Revolut advertises this onboarding process as "registering a new account in less than 60 seconds" [12].

Due to the rise of digital services offered today, telecom providers also present their services digitally. Also, every major provider implements a Web portal, where customers can access information regarding their current services. For instance, customers can see how much data is still available in the current plan, or access billing information directly. Salt, Sunrise, and Swisscom offer such an online portal to every customer subscribed to one of their services [16], [13], [17]. However, a displaying of these information in a mobile application has yet to be developed.

Swisscom also released a similar mobile application in 2018 called *My Swisscom* [17]. It allows customers to access current billing information, pending payments, an overview of subscriptions, and technical problem assistance. The app also offers a feature locating Swisscom retail shops near the current geo-location, including opening hours. However, it does neither offer any in-app purchases nor activation or deactivation of services options. Therefore, the need for an application that allows customers to opt-in or opt-out of subscriptions without restrictions is clear.

B. User Experience (UX) within Mobile Applications

Mobile UX boomed within 2007 and 2009 [18] mainly driven by the release of Apple's first iPhone. Research around mobile UX became a hot topic in that period. As outlined by [9], it is essential to maintain a state within the mobile application, so any progress persists. Also, users should only be asked to log in once, starting with the authentication part. It is irrelevant whether or not the mobile application is closed, left in the background, or if the mobile phone is turned off; if the application is reopened, the user should still be signed in.

[4] provides insight on the *feedback* the mobile application should provide to users when an action was completed or triggered. Upon any user input (e.g., a user clicks on a button or triggers an action) within the mobile application, there must be visual or haptic feedback sent to the user, reinforcing what they just did was processed by the mobile application. *I.e.*, the user needs to be informed about what is happening in the background and instructed on what he or she is required to do

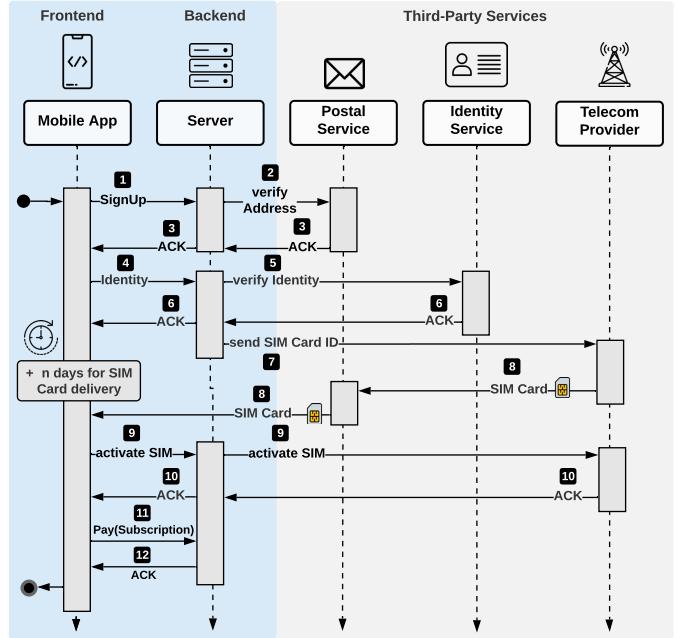


Fig. 1: Mobile Application Sequence Diagram

next. Without providing feedback to the users, they will try to click on the same button waiting for something to happen.

[8] explains the importance of reducing waiting times within a mobile application. If there is no user feedback for more than 10 s, users think something went wrong. They need to repeat the action or close the mobile application and open it again. As stated by [8], most heavy-duty tasks should be outsourced to the backend infrastructure, which communicates with the mobile application. The mobile application should display information received by the process executed on the backend. Thus, creating a good UX is a combination of different technical components, approaches, and findings.

III. TECHNICAL REQUIREMENTS AND STEPS

The main requirements for this approach include (i) achieving a good UX based on state-of-the-art research and (ii) implementing the solution in accordance with Swiss law [14]:

- **Single Code Base:** The mobile application must be available for both Android and iOS devices, but has to originate from an identical code base ("Code Re-use").
- **Fully Digitized:** Every step of onboarding must be digitalized and executed within the mobile application.
- **User Authentication:** Anonymous users are not allowed. Users must sign up by email or by using a Single-Sign On (SSO) solution provided by social media.
- **Language Support:** The mobile application must support all four official languages of Switzerland.
- **Good UX:** The mobile application must follow UX guidelines in support of an intuitive, simple interaction.

While these requirements had to be fitted without any exception into the digital on-boarding workflow (*cf.* Figure 2) to meet legal, business, and marketing constraints, the sequence diagram in Figure 1 presents a simplified view between system

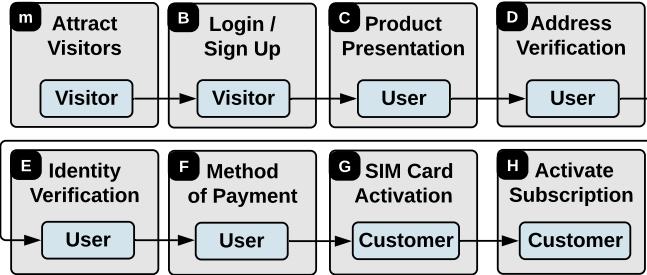


Fig. 2: Overview of the Onboarding Steps

components in the frontend, backend, and third-party services in the system implemented for the registration process, identity verification, selection of payment method, activation of SIM card (detailed in Figure 2). In this regard, the most relevant steps in relation to verifying the user's identity and billing management are based on traditional services (Onfido [10] for identity provisioning and Killbill [7] for billing).

A. Attract Visitors

Requirements have to be met and implemented for a simplified and easy-to-understand UX [18]. At first, it is essential always to render a straightforward screen. Users must understand (*i*) what is expected of them and (*ii*) which information is being communicated. The design avoids large amounts of information or texts that do not offer crucial benefits. The design performed reduced the flow of screens and transition feedback from every navigation step within the application, resulting in a highly attractive application.

B. Login/Sign-up

Every user has to be signed and logged in to use the application. Thus, the backend implemented SSO to allow users to create an account using a social media provider, like Google, Facebook, or Apple. Additionally, users can also create an account with a combination of email and password.

C. Solution Presentation

Available subscriptions are presented in the form of cards, as suggested in [11]. The front of the card displays crucial facts about daily subscriptions, and the reverse displays information about the monthly subscription. The card has to be "flippable," which means using a gesture, users can see the back or front of the card without any obstacles or difficulties. Following marketing recommendations, the reverse of the card is shown first to the users. This causes the users to see the monthly subscription and might persuade them to purchase that type of subscription instead of a daily one.

D. Address Verification

A user needs a postal address linked to the account due to legal purposes. In this step, users can decide to order a new SIM Card to the address provided. The respective information (*e.g.*, name and address) is sent to an address verification Application Programming Interface (API) provided by the

Swiss Postal Service and depending on the response, the user will be able to move forward within the mobile application, as well in accordance to the Federal Council article 20 [14] stating the need for a valid Swiss postal address attached to the user's account.

E. Identity Verification

To launch a telecommunications service within Switzerland, it is mandatory to include an identity verification within the software system. Thus, an identity verification is a required step within the mobile application's on-boarding process. To reach a valid and legal identity verification, users can identify themselves using their passport or ID card, if they live within Switzerland or the European Union. Additionally, users need to take a picture of their face to prove who they are. The process consists of sending a copy of the passport to the service provider or personally visiting one of their retail stores. By implementing the identity verification as a service within the mobile application, it is now possible to bypass the manual verification done in the non-digital process.

F. Payment Method

Users require a valid payment method within their accounts, to which a third-party service is used to validate credit card information typed in by the user. Furthermore, a flip animation is implemented within the credit card view to keep the same look-and-feel within the screens (*cf.* Figure 3). Datatrans is the service that creates a check against the most common credit card brands [2]. If Datatrans validates the users' payment method, it is possible to be sure that amounts can be charged to that payment method at any time. To keep users within the application and keep the flow of the onboarding process, the only option is to use native libraries provided by Datatrans and integrate them into the mobile application.

G. SIM Card Activation

The SIM card's activation can only be completed, once the customer receives a SIM Card from the service provider. The SIM Card has to be scanned or the 20 digits number has to be manually inserted into the application to receive a phone number. The phone number will be linked to the user's account and will be able to receive calls. At this point, the phone number cannot perform calls, and it does not have any connection to the Internet until a subscription is bought later.

H. Activate Subscription

In the last step the activation of the subscription happens with a daily or a monthly plan. To keep the same look-and-feel within the entire onboarding process, this step also consists of presenting the front and reverse of the card with each subscription's information. However, the user can already decide to purchase one of the subscription plans. These will be billed either daily or every month.

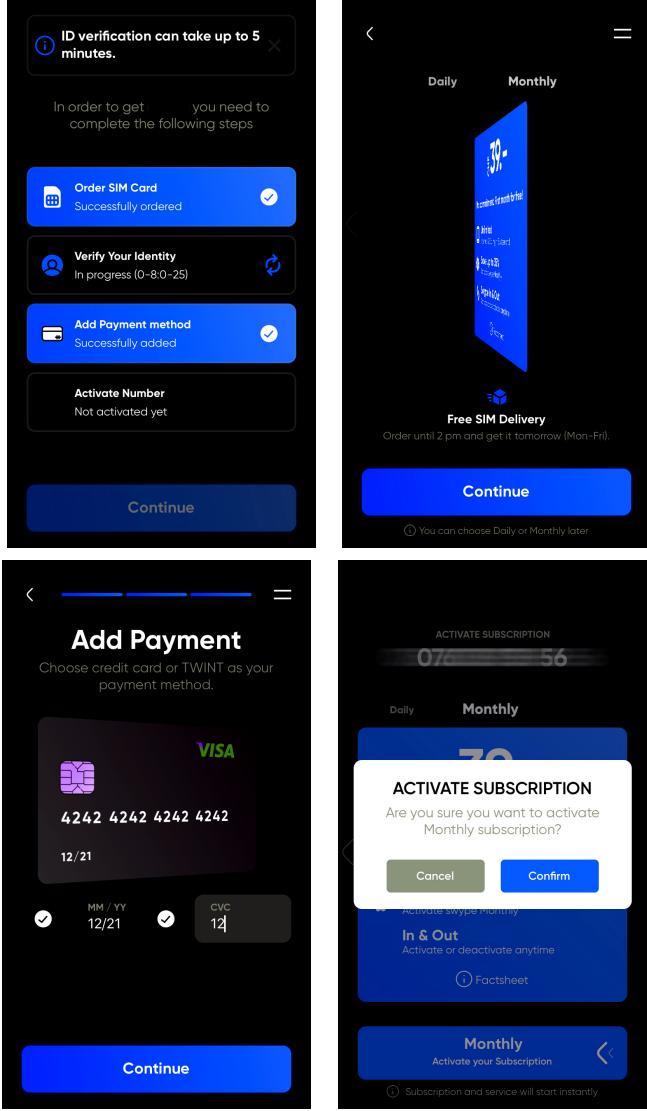


Fig. 3: Top-left: Verify ID. Top-right: Daily and Monthly Plans. Bottom-left: Payment Method. Bottom-right: Activate Subscription

IV. ANALYSIS

The evaluation focuses on the prototype built to show the digital transformation of the entire process of receiving a new mobile subscription in Switzerland. Statistics from the prototype are presented and results from a questionnaire concerning their user acceptance. The mobile application was developed targeting both Android and iOS operating systems. The first version was released on December 10, 2019. It is available for free to every person with a mobile phone running an Android or iOS operating system. The release included a connection to Firebase [19] (real-time data of active users, installs and audiences for each platform), which is a service offered by Google, capable of recording data from the mobile application in both Android and iOS operating systems.

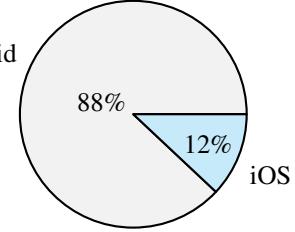


Fig. 4: iOS and Android Distribution in Number of Downloads

A. App Store Statistics

The mobile application was downloaded at a total of 21,037 times (December 2019 to February 2020). From this group, 32,700 were recorded sessions (*i.e.*, one session equals one time the mobile application is opened). From this group 88% are Android users and 12% are iOS users (*cf.* Figure 4).

B. System Usability Score (SUS)

To provide an overview of how usable the prototype published in December is, the System Usability Scale (SUS) [1] metric was used in the form of an online questionnaire sent to users in February 2020. This measures three aspects:

- **Effectiveness:** the ability of users to complete tasks using the system, and the quality of the output of those tasks
- **Efficiency:** the level of resources consumed in performing tasks
- **Satisfaction:** users' subjective reactions to using the system

The questionnaire was available in February 2020 (*cf.* Table I) and 92 users responded. All users were active on the mobile application and holding at least one active subscription. Each question received a SUS Score and after every question has been scored, a final score is obtained by multiplying the result with 22.5. The average of all scores will result in a number between 0 and 100, which yields insights on the application's usability is. Also, users responding the questionnaire are regular mobile service end-users and not developers. Since regular end-users typically do not know, *e.g.*, how to answer questions related directly to user interfaces or software design, related

TABLE I: SUS Questions Posed

	Question
1	How much effort needed to activate a SIM Card?
2	Duration until the SIM Card was delivered?
3	Satisfaction concerning Price and Value ratio?
4	How satisfied are you with the Mobile network coverage?
5	How satisfied are you with the speed when surfing or downloading data?
6	How satisfied are you with the voice quality?
7	How satisfied are you with the customer support during the digital on-boarding process?
8	Would you recommend the mobile application to your friends or colleagues?

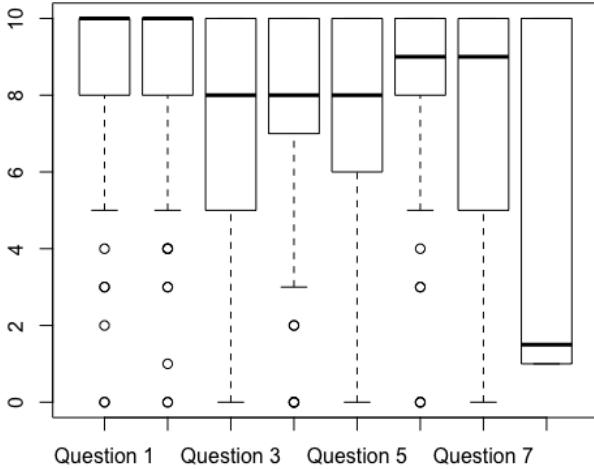


Fig. 5: Satisfaction Results for All Questions; Score 10 Represents a Very Good and a 0 a Very Bad Score

questions were designed in a broad manner. Additionally, end-users typically only see one goal, which is to use the mobile application. If such a goal is reached, it is typically considered a “good” application. Especially, if the product offered by the mobile application is not up to their standards, they will deem the mobile application as “not good enough”. In addition to these information previously mentioned, every single question within the questionnaire was optional.

Figure 5 allows for the observation that the variability and dispersion of the data gathered from every question exists. It is possible to identify how the data from these scores is spread. It is also possible to verify for each question outliers, the minimum and maximum score and where the median is. It is important to notice, for each of the responses, in which percentile the data is shown.

Question 1 do not contain outliers as the data is equally spread. The majority of users answered with a 10, meaning the mobile application was easy to use and to move forward within the digital on-boarding process. A 10 also means that they could activate the SIM Card and use it without major issues. 8 people out of 92 (equaling 8.7%) responded with a 4 or less meaning that the application will not be acceptable by every user using it, but the clear majority finds it easy to use and to understand.

Questions 2, 3, 5 and 7 presented singularities due to the initial stage of development of the prototype. For instance, the majority of users in question 2 stated that delivery times were good enough and they did not have to wait more than one day to receive the SIM Card. This information is valuable given it provides feedback on one of the physical services being used by the mobile application and their delivery rates. Users who hold a bad experience with such delivery times said that they ordered a SIM Card before the weekend or the SIM Card did not arrive and they had to order a new one.

Question 3 was intended to discover whether customers are satisfied with the current price of the subscriptions given what

is included in each subscription. The answers for this question were quite positive. More than 62% of the answers are above 5 denoting that majority of users think the prices are okay for the subscriptions they are receiving. However, they think as well that the price could be improved even more to be more competitive in the market.

Question 7 was interesting given the customer support, since it is important to a user, especially when they ran into problems. Customer support needs to be able to find solutions, provide feedback, and answer any question related to services, subscriptions, or the mobile application. Thus, users were not satisfied with the customer service and they argued it could be improved. While the majority of responses reported a good score (8-10), these scores come from users, who experienced no problems at all and did not have to contact customer support.

Data gathered from question 8 is considered a surprise since the majority of users (46%) responded with the lowest possible score: 1. The remainder of users are spread until up to the score of 10 (32 users). Since this question could be answered in an open-text format, users commented that this is an innovative idea, but features are still considered missing. Thus, they would not recommend a mobile application to their friends or colleagues until it is functionally “complete” in every aspect. Functions, such as the switch from an existing number to the mobile application, were reported as “missing”, including porting a number from the mobile application to another mobile operator. Additional services, such as the Electronic SIM (eSIM), are not yet available, but due to public advertisements, the impression was raised that they were. Thus, a careful interpretation of those results of question 8 show that the DO process alone cannot succeed and needs a major set of complementary services to be of practical benefit for certain users.

Lastly, the majority of answers for those questions approach a score of 10. Especially for questions 4 and 8 the median is high, reaching from 8 to 10. Thus, overall it is possible to note that every question except for question 8 had a very viable score, which provided a highly useful input toward improvements of the mobile application.

C. Lessons Learned

As with any exploratory approach, many challenges were faced during the implementation of application given the functional requirements and their outreach concerning the number of users. As feedback was received from users, bugs and errors appeared and had been fixed as quick as possible.

- **Simplicity is king:** A mobile GUI should offer as little options as possible and support only one workflow.
- **Payment methods are handled carefully:** Checking credit’s availability negatively needs to stop immediately billing for the service. In the initial stage of development, the billing service did not adequately interrupt the billing of individual customers, whose credit was not available, resulting in over-billing, when the credit was re-established.

- **Misunderstood publicity and advertisement:** A large amount of publicity and advertisement was launched within Switzerland to promote the mobile application. To attract new users, the first month was offered for free. This offer was valid, if a user would choose the monthly subscription. However, users understood that they would not have to pay for the first month, if they would choose any subscription. For example, a user contacted customer support asking why he was being charged every day for his daily subscription, if the first month should be for free. Afterwards, the publicity and advertisement had to be adjusted to clearly state that the offer is only valid on the subscription type “monthly”.
- **Efficiency in the SIM Card activation time:** Problems related to verification delay with the service provider resulted in users being onboarded without an existing phone number. Once a user held a failed SIM card activation and moved forward in the onboarding process, they would be charged daily for the active subscription in the ghost account. Thus, a new logic had to be implemented to activate the number’s endpoint. Since after 10 minutes an error would be returned to the user, and no data would be written to the database, users were blocked in the onboarding process and could not move forward.
- **Identity verification instructions:** At first, it was expected that instructions to perform an identity verification were easy to understand and nobody would have trouble with this service. However, after noticing a significant number of failed attempts, an extra screen had to be included explaining the detailed users’ steps. In most cases users had troubles taking the selfie, e.g., users would take a selfie of the passport’s or ID card’s picture or others would take pictures with glasses or objects blocking the selfie, which caused the verification to fail.

V. SUMMARY AND FURTHER IMPROVEMENTS

This paper described the experiences gained while building and deploying a novel Digital Onboarding (DO) method to achieve a fully digitized process within Switzerland. The goal to remove the paperwork required to purchase a new mobile subscription, typically taking around 1 to 3 weeks to be completed, was achieved successfully by developing and rolling out a mobile application and transforming the entire process of onboarding into a digital one. This approach now available reduced the time required onboard to approximately 5 min.

The infrastructure designed and the application developed considered major capabilities of self-scaling being capable of handling thousands of users simultaneously with an Service Level Agreement (SLA) level of 99.9% up-time/availability. The mobile application was published in December 2019 at the two significant mobile application stores: Google Play Store and Apple App Store, counting overall more than 21,000 downloads. Since then, the application has been closely monitored to gather further insights, statistics, and usage data.

Although the mobile application is already deployed and used by real users, improvements will be made in the future. For example, there is the need to transfer existing numbers to mobile virtual network operators is essential to reach another significant user quantity. This means, if a user is already a customer from another provider, the mobile application should present them with the opportunity of switching their number to the application’s network. In the future, it is expected to see mobile devices supporting Electronic SIM (eSIM) cards. At this moment, only a few iPhones series are capable of offering this feature. Once more devices will support the eSIM in the future, the mobile application should require the delivery of physical SIM Cards to the users, since eSIM-related details will become available electronically.

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