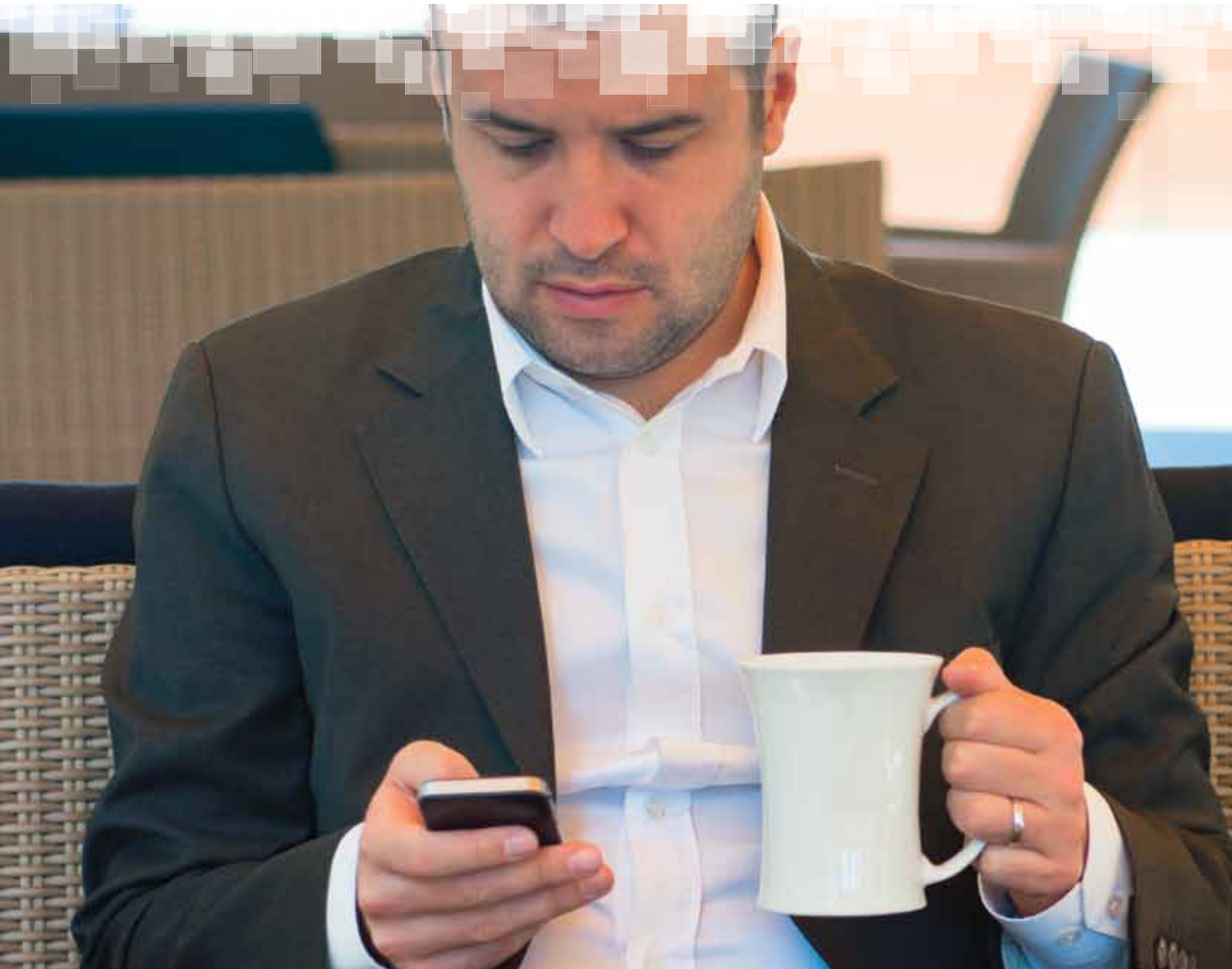
Mobile Identity

TURKCELL

Mobile Signature in Turkey

A case study of Turkcell: MobilImza

Co-authored: GSMA Mobile Identity team & Turkcell



I. Executive Summary

In 2007, Turkey was the first country to launch a mobile signature solution – Turkcell's "MobilImza" service. Since then, the solution has evolved, the number of available services has increased, and usage per subscriber has multiplied by five. Turkcell is now a reference for other operators that have launched similar mobile signature solutions (e.g. Finland, Estonia) or are planning launches (e.g. Moldova).

With a limited but growing number of users, Turkcell continues to identify and overcome barriers to adoption. This represents a good opportunity to study the requirements and key success factors of mobile signature solutions.

This case study begins with a summary of the Turkish ecosystem, highlighting the favourable conditions that have contributed to the creation of the Turkcell mobile signature solution. It then describes the different aspects of the solution: technical architecture, partnerships, user adoption and usage, and the business model. Finally, it examines key success factors identified by Turkcell and the GSMA Mobile Identity team; factors such as the lean subscription process, favourable local legislation and necessary partnerships with service providers that drive adoption and usage.

II. Introduction to the Turkish environment and to Turkcell

A. The Turkish environment

1. The importance of signature in administrative processes

The launch of mobile signature in Turkey was a global first. To understand why this technology emerged in Turkey in the first place, it is important to understand the role of signature in Turkey. As in all other countries, signatures are required to finalise contracts. For example, opening a bank account, even with a branchless (online) bank, requires a contract with a traditional "wet signature". Despite its simplicity, it is the most universal way to authenticate documents.

In Turkey, a signature is required for many processes, which would not require proof of acceptance in other countries. For example, it is compulsory for all companies in Turkey to collect employees' signatures when monthly payslips are distributed. This is a legal necessity specified by the country's labour laws. The same is true for holiday requests, corporate flight reservations, annual leave and a number of other daily processes.

The extensive use of signatures explains why Turkey adopted an electronic signature law early in 2004 in order to give digital signatures the same legal value as wet signatures. At that time, four Certificate Authorities were designated by the State to issue digital certificates to companies and individuals. Turkcell was able to rely on this pre-existing ecosystem for electronic signatures to launch mobile signature in 2007, even though the law needed to be adapted slightly to include mobile use cases.

2. Mobile phone penetration

Mobile phone penetration in Turkey is approximately 88%[1] which, whilst high is still lower than the regional average (99.8% in the Middle East[1]). Mobile internet has a larger reach than the regional average (43% of 3G connections), however smartphone penetration is relatively low (11% according to the latest figures[2]).

These figures suggest that the emergence of mobile signature is not due to an unusual success of mobile. It indicates that for a solution to be pervasive, it needs to be compatible with all kinds of phone, including basic devices.

3. ID cards in Turkey

ID cards are mandatory for every citizen in Turkey from birth, and are widely accepted as a secure proof of ID. This was a favourable condition for the launch of mobile signature since Certificate Authorities can refer to a single database to check the identity of individuals. But unlike many countries that have launched mobile signature (e.g. Estonia, Finland), Turkish ID cards are not electronic, and thus do not include electronic certificates.

This represented both an opportunity and a risk for the development of mobile signature. On the one hand, it meant there was room for operators to play the role of an "electronic ID" provider. But on the other hand, it meant that service providers did not see the acceptance of electronic forms of Identity as a priority.

An electronic ID card that includes an electronic certificate has been piloted since 2008 in some areas of Turkey with a national roll-out planned.

4. High popularity of internet services

Another reason to explain why Turkey was first to launch mobile signature is the sophisticated and demanding nature of Turkish customers. E-banking platforms are for example very advanced in Turkey. "Despite being a less-developed country than the UK, the level of expectations for services from banks and mobile operators is much higher in Turkey" explains a former member of the MobilImza team, now living in London. The launch of mobile signature was supported by the banks which were ready to improve customers' experiences.

Positive factors for emergence of mobile signature in Turkey:

- Importance of signature in administrative processes
- High mobile phone penetration
- Mandatory ID cards
- High popularity of internet services

1. Turkey penetration: operators' announcements as of 2Q12; ME penetration: Wireless Intelligence Q411
2. TomiAhonen Consulting Analysis December 2011, based on raw data from Google/Ipsos, the Netsize Guide/Informa, and TomiAhonen Almanac 2011 reported data

B. Turkcell specificities

1. Market share

Turkcell is the market leader in Turkey with a market share of 53%[3], which has been a crucial element for the launch of MobilImza, because Turkcell alone had sufficient market share and therefore customer reach to convince service providers to adopt its mobile signature service.

In most other countries where mobile signature has been launched, the State has lead the project and promoted interoperability between the different operators. Very few operators have the market position to independently lead the launch of a mobile signature service.

2. Relation to service providers

Turkcell runs a partner programme and since 2002 Turkcell has been developing new products and services with its partners and the programme now includes over 200 business partners. Turkcell also launched a programme called Turkcell LAB, targeting universities and developers. These programmes make it possible for the mobile operator to be in contact with companies and individuals with specific expertise or capabilities in order to identify new business opportunities.

Turkcell developed and maintained close relationships with the main Turkish banks. In 2003, Turkcell initiated Mobile Payment in cooperation with Yapi Kredi Bank, one of Turkey's leading banks. In 2007, an SMS-based mobile advertising programme for consumer loans was launched with AKBank. In 2008 Turkcell and Garanti Bank worked together on an NFC pilot. These pre-existing partnerships helped Turkcell gain bank support when they first launched mobile signature.

3. Focus on innovation

Innovation is one of Turkcell's corporate values. A separate entity called Turkcell Teknoloji was created in 2007 to work on the research and development of new mobile technologies, which since launch has facilitated three million hours of R&D by its 360 engineers.

In addition to programmes tailored for individual end-users, Turkcell provides products and services designed to boost productivity of its corporate subscribers. Turkcell's willingness to offer innovative services and test new technologies also helps to explain why Turkcell MobilImza was the first mobile signature solution.

3. Wireless Intelligence, Q4 2011

III. Turkcell's mobile signature service: MobilImza

A. Concept description

1. Vision and principle

The idea behind Turkcell MobilImza is to offer a remote way to complete transactions equivalent to an "original" signature on a hard copy - making it possible to sign documents and authenticate oneself via a mobile phone, in a way that is legally approved, secure, easy and convenient.

Legal compliance is ensured by the 5070 Electronic Signature Law that was passed by the Turkish government in 2007. This law gives electronic signatures the same authentication level as wet signature as long as they rely on a "qualified certificate". Qualified certificates are defined by the ETSI Standards[4] and a directive by the EU Commission[5] as certificates that are issued by an authorised Certificate Authority following face-to-face verification of both the user and government issued photographic identification.

Security is guaranteed by cryptographic systems (e.g. SHA1) and on-board key generation. The service is only made available on EAL4+ certified SIM cards which provide a high level of security.

Mobile signature services are **easy to use**, since they don't require any software installation. The certificate is activated Over-The-Air once the user has subscribed to the service. Signature requests then automatically pop-up on the user's phone each time he requests access to secure services. Once the user has entered his PIN, the signature is sent to the service provider, who checks its validity and grants access to the service.

Making electronic signature mobile also made it more convenient for users. The smartcard alternative existed when Turkcell launched MobilImza, but Turkcell desired "to spare subscribers the hassle of buying and setting up a smart card reader and carrying an extra smartcard to perform secure online transactions with qualified digital signatures"[6].

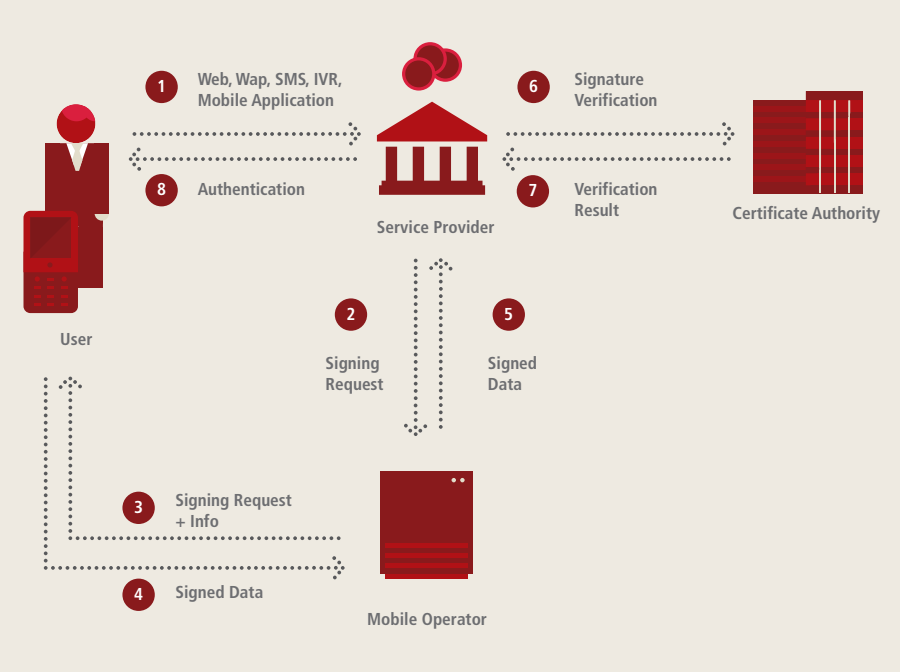
4. ETSI TS 101.456 and ETSI TS 101.862
5. Directive 1999/93/EC
6. Original launch press release (http://www.gemalto.com/php/pr_view.php?id=164)

2. How it works

The chart to the right explains how MobilImza works:

Mobile signature relies on the Wireless Public Key Infrastructure (WPKI) technology. A couple of "keys" are generated for each certificate. One is a private key, and the other is a public key. The private key is unique and stored on the SIM card. It is used to encrypt the documents sent by the user. The public key is made public by being published in a directory and can only decipher documents that have been encrypted by the associated private key. Qualified digital certificates are a means of unambiguously binding one person to a public key.

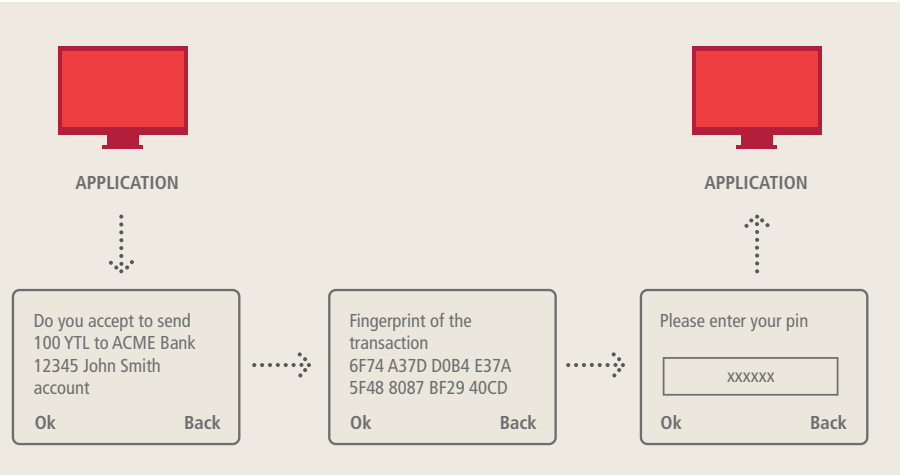
Turkcell is working with eGuven (one of the four authorised Certificate Authorities in Turkey) which is responsible for issuing and revoking the certificates.



From the user's point of view, there is a three step process:

1. Click on the "Sign" button on the application/website where you want to authenticate yourself or sign a document
2. An explanation text of the transaction and a unique fingerprint pops up on the screen of your handset
3. To sign the transaction, enter your private PIN (password)

Once approved the application is completed.



B. Technical solution

1. Original solution chosen

Mobile signature solutions only work on compatible SIM cards, that match the WPKI specifications in terms of security and capacity, and contain a SIM Toolkit application capable of performing signatures. A solution must also be implemented on the operator side to manage signature requests.

A few companies (called Mobile Signature Service Providers or MSSPs), such as Methics and Valimo offer this suite of services for operators to deliver mobile signature. For the first few years, Turkcell chose Valimo as their MSSP. Valimo is now a part of the SIM vendor Gemalto. There are many advantages to choosing a turnkey solution like Valimo mobile ID, including reduced time-to-market and technical support.

2. Development of Turkcell's own technology

In 2010, Turkcell Technology developed its own MSSP solution. The main driver for this decision was that mobile signature solutions have to be regularly adapted when legislation changes, or when a service provider requires a customisation of the system. By developing their own MSSP solution, Turkcell has greater flexibility to update their own technology to match changing requirements. In addition, there were also a number of operational cost and performance benefits.

The MSSP developed by Turkcell Technology is called mSign and is now commercialised to other operators.

The choice between developing a solution or choosing a vendor's depends on the specificities of the market, namely:

- The time available to launch the solution
- The ability for the operator to develop a solution internally
- The ability of the turnkey solution to match local regulations
- The compatibility of the solution with standards chosen at a national level to ensure interoperability

3. Subscription process

The mobile signature subscription process needs to be very secure since the whole service relies on the trust that service providers put in the initial user identification. However, this process can also be a barrier to adoption if it becomes too long and complicated.

Turkcell's registration process for MobilImza includes three identity checks:

1. A physical check of the person and his/her ID at a Turkcell store or bank branch
2. A comparison of the captured ID with the national ID database
3. A call to the user to ask further questions to confirm the identity

This process requires the user to visit a Turkcell shop or Bank branch to show his or her ID, sign the contract and upgrade to a compatible, 128K SIM card. Originally, the registration process took up to five days, mainly because of postal delays as completed forms needed to be sent to the certificate authority.

Turkcell improved this process by introducing a "pre-registration" process. If the user performs this pre-registration, the subscription process is much faster. During the pre-application process, the subscriber's details are captured (national ID number, name, date of birth…) together with the MSISDN number (phone number) for which the mobile signature service is to be activated. This can be done on partner banks' websites, via the customer care centre or via an SMS message. But the subscriber still needs to visit a point of sale, and the process typically last 3-4 days.

The service then needs to be activated by the user:

- A mobile signature pop-up menu appears on the subscriber's mobile phone. The menu prompts the subscriber for the activation code.
- The subscriber defines his/her 6 digit signature and approves it by re-entering.
- The mobile signature becomes active. The subscriber is informed via SMS once his mobile signature becomes usable (his certificate has been published by the Certificate Authority).

C. Service provider adoption

1. Initial support of service providers

It is often the case that service providers are reticent about adopting mobile signature solutions if there is not a large installed base of users, and users are not enthusiastic about services that are not backed by multiple service providers. This leads to a stand-off that can often threaten the commercial success of mobile signature services.

Initially, Turkcell's project was supported by the five main Turkish banks, which together pushed for the government to adapt the electronic signature law. This collaboration helped drive adoption since banks offered customers pre-registration at their branches, and then sent the forms to Turkcell. The banks also promoted the use of mobile signature through marketing campaigns.

The service was launched in February 2007 with the 5 main banks. Ten months later, 23 services were available including enhanced e-banking services by 12 different banks.

In 2008, banks declared that mobile signature was the best and most secure authentication method. Other companies started to use it in their workflows.

Financial services remained the real key driver for adoption. In 2007, 84% of all mobile signatures were used for financial purposes[7], however further use cases include:

- Online application for loans
- Online opening of a bank account
- Stock trading on Istanbul Stock Exchange
- PDF and email signing
- E-procurement
- Online bidding

2. Additional service providers joining at a later stage

In 2009, the government started to use m-signature in its login process to an eGovernment services portal. Other public services were added in the following months.

More services were gradually added to the initial list. The number of available services has grown to 66. New services have been added such as secure access to medical records by doctors, secure VPN remote access for businesses, and local tax declaration. A list of use cases is available in the appendix section of this document.

The mobile signature value proposition varies between different user segments:

- **Banking & financial institutions**: to access and to perform transactions securely
- **Public sector including government organisations, municipalities**: to minimise loss of time, to reduce the number of physical documents, and serve citizens remotely and more efficiently
- **Merchants, Dealers, Sellers, Resellers**: to use e-payments, e-commerce, m-commerce, mobile payment, mobile money transfer
- **Large companies**: for their internal workflows or document management

7. Source: Turkcell

Mobile signature is not restricted to online services, and can also be used in the physical world. For example MobilImza makes it possible to withdraw money from ATMs without a bank card.

3. Signature as a platform for innovative services

As mobile signature has become more popular, some businesses have started to develop solutions to make the most of this new technology as an enabler for consumer services.

For example, a Turkish door lock manufacturer has developed a new kind of SIM-embedded lock that can be locked or unlocked with a mobile phone[8]. Another example is a parking meter system: individuals can now pay parking fees via mobile thanks to mobile signature.

D. User adoption

1. Initial take-up

The number of transactions conducted quickly increased in the months following the launch. This increase was encouraging, particularly since under the initial pricing model, each signature cost as much as an SMS.

Over the years, the number of subscribers kept increasing, as well as the average number of signatures sent by users.

Nonetheless the mobile signature service remained a "niche" product when compared to the number of Turkcell subscribers.

2. Take-up limitation

The take-up of mobile digital signature has remained low compared to the total user base so far, and lower than in smaller countries like Lithuania.

Turkcell believes two primary factors explain this limitation: the lack of compatible services and the subscription process.

- Due to the limited number of subscribers, service providers are not always eager to integrate mobile signature in their processes. And because of the limited number of available services, people hesitate to subscribe to Mobile Signature.
- The current subscription process represents a barrier to adoption: it requires customers to physically be at the point of sale to prove their identity and sign many documents. Also people are reluctant to change their SIM cards.

Additionally, pricing could be a barrier to wider adoption. The monthly cost of MobilImza is US$2.74 (5 Turkish Liras) which represents more than a quarter of the estimated average revenue per user in Turkey (US$10.84[9]). As such, this proposition is of greater appeal to a specific sub-segment of the customer base - high-value customers. It would be difficult to lower this price as the unit cost for the operator is high. Issuing a digital certificate is a costly process. The price paid by Turkcell remains confidential, but the public price for a certificate on a smart card is currently around $89[10] in Turkey, which gives an idea of the cost range.

3. Usage

Although subscriber numbers remain comparatively low in absolute terms, annual growth is encouragingly high, running at over 80% per annum. Users are steadily realising the benefits of the mobile digital signature service, and once subscribed to it, appear to be very satisfied.

8. KaleKilit press release : http://www.kalekilit.com.tr/kapinizi-cep-telefonunuzdan-acip-kitleyin_3_68
9. Wireless Intelligence Q4 2011
10. $47 for the certificate + $20 for the smartcard + $22 for the identity checks source: eGuven

E. Economics

Business model

The initial business model for Turkcell MobilImza was a pay-per-use model. The service was free to subscribe to, and users had to pay a fee each time they used the signature service. The idea was that the cost of the certificate would be covered after a certain number of transactions, and then profit would be generated by extra usage. But this model relied on consistent levels of usage from subscribers. However a significant proportion of non-active users made this model unsustainable.

Therefore this business model was replaced by two complementary approaches:

- Monthly subscription: subscribers pay 5 Turkish Liras for an unlimited number of signatures
- Price per signature: service providers pay a small fee per transaction. Public enterprises and educational institutions are not required to pay this fee, because of their public service orientation. It is anticipated that service providers who actively promote mobile digital signature will also enjoy a waiver of this fee.

Turkcell suggests that because the fixed costs are high, profitability is relatively low, but expects an improvement in its operating margin due to improving scale economies as the user base grows.

IV. Key Success Factors

A. Identified success factors

1. Partnerships at launch

Due to the double-sided nature of the market, it was important for Turkcell to have strong partners at launch, especially because the government was not initially a participant in the programme.

Receiving early support from leading banks helped drive initial adoption of the service and has had a sustained impact on mobile signature.

2. Business model

As the attractiveness of the mobile signature service can be modest in the period immediately following launch - due to limited service provider participation - it can be accordingly difficult to persuade consumers to pay for the service. Clearly, to be sustainable, revenues need to be sufficient to cover development costs, investment in digital certificates, customer acquisition costs and any other attributable opex. The approach adopted by Turkcell helped to minimise these issues, by employing both a flat monthly fee for subscribers and a per-transaction fee for service providers.

3. Distribution / subscription process

According to Turkcell, the service subscription process represents 93% of customers complaints related to mobile signature and this process has been identified as a key barrier to adoption. As such, improvements to the subscription process became a priority for Turkcell.

A new subscription process is currently being tested, which would allow customers to subscribe without having to go to a point of sale (provided he is equipped with a compatible SIM card), and would only take a few hours to be completed. It would use the credentials already captured by the bank. Turkcell is partnering with Garanti Bank on this, and believe this improvement will be key to driving adoption rates.

B. Potential additional success factors according to Turkcell

1. SIM dissemination

One of the barriers to adoption is the replacement of the SIM, for two reasons:

- It makes it necessary for customers to go to a point of sale
- It may contain information that users don't want to lose (e.g. address book)

In some countries where mobile signature has been launched (like Finland) operators made the WPKI 128K SIM a standard a few years before the service was launched. It made adoption much easier, but represented a high cost.

128K SIM cards are distributed de facto to all of Turkcell's business customers but this does not address the whole consumer base.

Key Success factors:

- Key partnerships at launch
- Pricing to stimulate usage
- Simple subscription process
- WPKI SIM card pre-dissemination
- Interoperability with other operators
- B-to-B-to-C business model
- Cooperation with the state on signature regulation

2. Interoperability

Another element that could lead to further penetration is interoperability with other mobile signature solutions. It is quite clear to every operator that mobile signatures would be more successful if all operators agreed on interoperability at a national level: service providers would be incentivised to use the service, and customer awareness would be higher. Turkcell welcomes the launch of mobile signature services by Avea, one of their competitors in the Turkish market.

In Finland and Moldova, the solutions offered by the different operators are interoperable, and higher adoption rates are expected.

3. B2B Business model

Turkcell is working on an additional business model for 2013. The idea is to make mobile signature free for individuals, and have the price paid by service providers who benefit from the service. Banks for example benefit from mobile signatures as their customers can apply for financial products more easily. They also don't have to distribute and manage authentication tokens. Garanti Bank already offers MobilImza to its most valuable customers, and is currently negotiating with Turkcell to extend this to more customers.

4. State regulation

The Electronic Signature Law #5070 which defines the principle of electronic signature in Turkey made it possible for Turkcell to launch MobilImza very early. Now new regulation is likely to benefit mobile signature: "E-Tebligat" and the "New Turkish Code of Commerce" encourage people to use electronic signature solutions and companies to move to "paperless offices" starting from mid-2012. This law even makes use of electronic signature obligatory in some cases: agreements that require an attached signature under the Law of Obligations will require an e-signature if they are made in electronic format.

Appendix:

List of Mobilimza use cases available today:

- Sign documents such as PDF files and email (live)
- Secure online log-in and transactions (live)
- Secure e-Commerce purchases
- Sign corporate transactions (live)
- ATM withdrawals without an ATM card (live)
- Remotely access health records (live)
- Conveniently access corporate networks (VPN) (live)
- Secure mobile contactless (NFC) payment account registration
- Top-up mobile wallets and other mobile applications
- E-Government: For usage on the e-government portal following are the use cases:
  - Entrance to the e-government portal (live)
  - Information query: (live)
  - Payment
  - Application for licenses / examinations / permissions etc.: military, birth certificate, change of address, application for a state job (live)
- E-Municipality: The mobile signature is used in the municipalities' web sites for other means such as housing / environmental tax payments, applications for opening a trading entity (such as a restaurant, doctor's office, etc.), application for marriage (live).
- Tax payment and declarations: Motor vehicle, corporate, income taxes can also be declared / queried and paid using the mobile signature as a means of authentication to the "Revenue Administration" (live).

mobileidentity@gsm.org
www.gsma.com/mobileidentity/

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