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An Analysis of Features and Tendencies in Mobile Banking Apps

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Abstract

Mobile devices such as smartphones and tablets are being employed alongside personal computers, and even replacing them in some applications. Banks are increasingly investing on mobility, by enabling the mobile web and mobile app channels for online banking, and by providing new mobile payment services. In this paper, the services for off-branch banking offered by several Italian banks are analyzed, showing that mobile apps have surpassed the mobile web channel in completeness of the offer, due to the fact that additional capabilities of mobile devices make possible advanced features and applications. An outlook on the near future is provided, remarking that mobile marketing and mobile recommender systems can greatly take advantage of being run natively on devices, making it desirable for businesses to invest on designing mobile apps.

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Keywords: Mobile apps; Mobile banking; Mobile device services; Maturity assessment; Electronic payments.

1. Introduction

The market penetration of smart mobile devices has steadily increased in the past few years. Feature phones are being replaced with smartphones; tablets find applications both as work instruments and as part of everyday life. Compared to laptop computers, tablets offer virtually instant availability and longer battery life, in addition to being easier to carry. For these reasons, they are being deployed alongside or in replacement of laptop computers. As mobile devices become widespread, there is a growing interest on the part of businesses, including banks, toward investments in mobility. There is an expected return of investment in various forms; for example, an increase in customer fidelity, the ability to reach a greater number of potential customers or to attain a better conversion rate of prospect customers, and extra revenue obtained through a deeper analysis of customer data or the introduction of entirely new services.

In this paper, a method to analyze the services offered by a set of banks on mobile channels and evaluate the maturity of each offer is described and applied on a case study comprising fifteen Italian banks. Based on results, an outlook for the future of mobile banking services is given. In Section 2, preliminary observations on how the evolution of service suites brings added value for involved players are made, outlining the motives for investments on mobility. In Section 3, a foundation for comparison of access points to banking services is set up. Section 4 introduces a case

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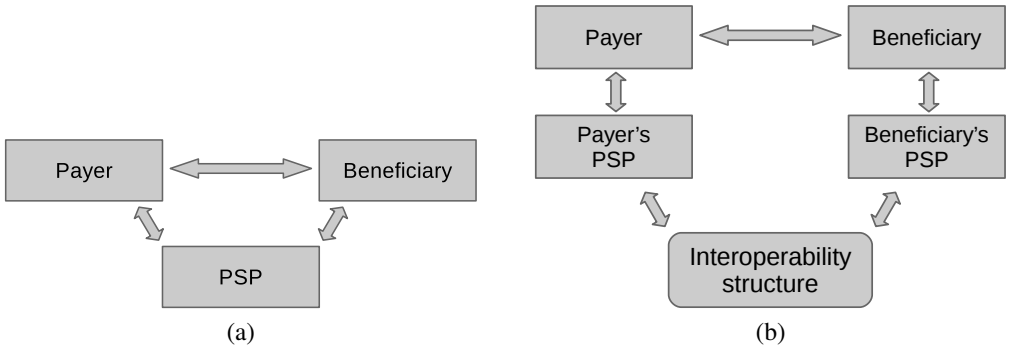

Fig. 1. Conceptual models representing the actors involved in a mobile payment transaction and the links over which communication occurs. The payer and the beneficiary may refer to the same Payment Service Provider (PSP), or each to a different one. (a) Three-corner model with a single PSP. (b) In the general case, two Payment Service Providers are present, and an interoperability structure enables transactions between them if they use incompatible payment schemes. In situations where PSPs use compatible payment schemes, the interoperability structure is not necessary, and direct communication between PSPs is possible. Source: White Paper Mobile Payments (with adaptations).

study and describes the method used to determine how complete the offer of each bank is. In Section 5, the degree of maturity of each mobile channel that makes up the offer is evaluated, and aggregate results are discussed. Lastly, in section 6, conclusions are drawn.

2. Mobility and mobile banking as business opportunities

The term 'mobility' refers to the higher degree of independence from space and time achieved in ICT processes by the employment of mobile devices. The drive behind investments toward mobility can be justified by the desirability of ubiquitousness or efficiency of business processes, or even just cost savings. Investments can be directed at increasing the mobility of the workforce, or taking advantage of an increased mobility of the customer base.

On the part of banks, this represents an advanced stage of a process started with the introduction of home banking. Costs per transaction are significantly lower outside of branch banking [1], which has made it possible for banks to charge lower fees for transactions carried out online by their customers, thus encouraging a migration of customers toward home banking. Mobile banking can be seen as a response to the needs of a number of customers as they change their habits, using their mobile devices progressively more often, at the expense of their personal computers.

As customers visit bank branches less often, personal interactions between customers and employees do not happen as frequently as in the past. However, personal knowledge of customers had been a useful 'hidden asset' for banks. Part of the bank employee's work was indeed to learn to know the customers and put this knowledge to good use: bank tellers could be more successful at recommending investments to those customers, whose needs and inclinations they better understood; branch managers relied on experience and a good understanding of the situation and perspectives of an entrepeneur when approving loans. To compensate for the decreased knowledge of customers, banks have developed an increasing drive to analyze data pertaining to each customer, in order to gather a comparable degree of knowledge of their habits and needs. As the number of transactions grows, it becomes possible to tap into transaction histories to extrapolate patterns and other information, useful to improve or establish mobile marketing services [2].

This serves as a reason for banks to push customers toward use of their mobile payment services. By allowing ubiquitous access to payment services, banks increase their knowledge of customer habits, in addition to tapping into a new form of revenue, as payment services are offered in ways that were not possible before. Note that, consistently with the definition of mobile payments [3], ubiquitousness does not strictly require the use of mobile Internet connectivity; remote mobile payments may happen by accessing the Internet through wi-fi capabilities of a mobile device, and the use of NFC technology for proximity payments still constitutes a form of ubiquitous access to a mobile service.

The ecosystem for mobile payments and mobile commerce involves several stakeholders, ranging from banks and merchants to mobile network operators (MNO) and mobile operating system makers, and potentially including other kinds of players. This ecosystem, as well as the modifications in revenue streams due to the added value introduced by

novel mobile services, can be analyzed with a proper theoretical framework[4], which makes a distinction between roles (e.g. payment service provider, mobile marketing service provider) and the actors that cover the functions associated with one or more of them (e.g. a bank, a MNO).

The revenue streams associated with a single instance of mobile payment can be represented by a fairly simple reference model, which resembles the one representing communication channels (see Figure 1): transaction fees are charged, and participation in the payment scheme can be monetized. As advanced data analysis and mobile marketing are introduced, they introduce a source of revenue for new roles, which can be filled out by existing players (such as banks and MNOs) or by separate entities, as the complexity of the domain and the availability of data from multiple sources have paved the way for data analytics being offered as a service to banks[5].

User data and transaction histories can be analyzed to discover new information, with goals such as:

- Short-term, everyday decision making: banks can employ data mining techniques to identify risky borrowers;
- Strategic planning: for example, to perform customer segmentation and tailor offers of new services[6];
- Deployment of services to customers: for example, in form of a recommender system.

Concerning the last class of applications, recommender systems are engines that attempt to predict items or services that the user may be interested in, based on analysis of data pertaining to items to recommend, user features and past transactions[7]. These systems are commonly employed by major e-commerce sites, where they are used to suggest items to customers, typically based on past purchases, by studying the similarity of users or items, or by other techniques. For the e-commerce firm, this serves the purpose of increasing customer loyalty, and also constitutes a useful function for end users, as it allows them to find items of interest which may be difficult to find otherwise[8].

There are also examples of recommender systems deployed by banks. These can exploit the knowledge of confidential and financial data of each customer (such as average monthly expenses) to improve on existing models for a recommender system. Financial data proves to be useful even when anonymized[9]; this may be crucial to enable the handling of data by third parties, in cases where analytics are offered as a service to banks, as seen above, and for the application of these systems in countries with strict regulations on data handling – for example, privacy laws may require that users give explicit consent for their data to be shared with third parties for marketing purposes.

Context-awareness is a crucial feature for mobile recommender systems; at any given time, a person using a mobile device, as opposed to a desktop or laptop computer, is more likely to be interested in recommendations useful in their particular situation, rather than generic ones to be saved for a later time. A widely accepted definition of context is the following: "Context is any information that can be used to characterise the situation of an entity. An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves"[10]. This broad definition encompasses basic information such as time (of day and/or year) and location, as well as less common attributes, such as the user's velocity, which can be used to infer whether a user is walking or riding a vehicle. It has been suggested that a mobile app may access the user's calendar stored on the device, to be used as context information to provide recommendations[11]. Context is most important as an input to a recommendation engine, but some context information can also be collected at the time of transactions[2].

The considerations thus far suggest that a possible way to increase the potential revenue of a business process is to gain access to real-time data available on the user's mobile device. This motivates the growth of investments on mobile apps, rather than on platforms based on mobile web, in many fields of activity.

3. A frame of reference for app functionality

To assess the state of mobile banking, it is important to make a proper distinction among different access points to the services. Each access point that provides a different kind of user interface is defined as a channel. Thus, a desktop-optimized web site and a mobile-optimized web site constitute separate channels, as does each different app released for each operating system for mobile devices. If the apps made available for smartphones and tablets on the same family of operating systems are notably different (for example, if an app for the iPad has significant improvements, compared to its counterpart for the iPhone), they are also considered two distinct channels.

The present study is focused on a comparison of the availability of functions on mobile channels. To assist in identifying these functions, it is useful to categorize them according to their effect, and according to their presence on desktop-oriented channels. Three categories can be identified with respect to the purpose and effect of functions:

- "State-changing" functions, which have an effect on an account balance: for example, ordering money transfers and making investments;
- "Private view" functions, providing a view of information intended to remain confidential: for example, checking one's balance and recent transactions;
- "Customized view" functions, providing a view of public information, and taking advantage of user identification or user context to display relevant information in a prominent position: for example, reading news, viewing stock charts and market indices (displaying a user selection of news categories, stocks the user owns, etc.), or finding ATMs (the closest to the user's current position can be displayed first).

The classification based on a comparison with services on the desktop channel is threefold, as well. Categories correspond to three stages of an ideal path of introduction of mobile services:

1. "Mirror" stage: mobile services simply replicate the existing functionality of desktop web-based services;
2. "Enhance" stage: existing services are improved or made simpler to use by the features of mobile devices;
3. "Extend" stage: new services are introduced, which were impossible or inconvenient without mobile devices.

In real-world applications, the introduction of mobile services does not necessarily happen according to a linear process; for example, the introduction of a new service may happen earlier than the enhancement of a previously existing one. However, the definitions given above can be useful to plan a transition to mobile services, or to evaluate the stage of completion of an ongoing transition. For instance, with respect to previously laid out plans, a provider of services may have completed 80% of the "Mirror" stage, 50% of the "Enhance" stage and 30% of the "Extend" stage, in a given time frame. This evaluation can be conducted separately for each device type and operating system.

In a comparison of the offer of different banks, it is possible to refer to stages to categorize functions. Most functions that make up a common mobile banking experience are also found on the desktop channel: each can be considered part of the "Enhance" stage if it is significantly improved in at least one mobile channel by taking advantage of a feature of mobile devices (e.g. accessing the user's location by GPS), or of the "Mirror" stage otherwise. Functions not made available through desktop web banking are considered part of the "Extend" stage.

4. Case study

A total of 15 banks operating in Italy were selected for analysis, including the twelve largest Italian banks by total assets according to year 2012 data from relbanks.com. Two of the banks under analysis are online banks, i.e. banks that provide financial services only through web and mobile channels, having no traditional branch offices. Information was gathered between April and May 2014.

4.1. Breakdown of functions in the offer

Every considered bank offers services through:

- a web site optimized for desktop browsers (desktop web);
- a web site optimized for mobile browsers (mobile web);
- a native app for at least one mobile operating system.

Information about functions implemented in mobile web sites and mobile apps for the major mobile operating systems (Google Android, Apple iOS, Microsoft Windows Phone, BlackBerry) was collected by visiting the official app stores, from which the apps are available, and the web site of each bank. The analysis of data and the comparison with the functionality offered on the desktop web channel provide insight into the amount of investment of resources

into mobility by banks, with respect to the actualization of a complete solution for mobile access to their services and the advertising of said solution to end users.

A selection of functions implemented on online banking suites on various channels is reported in Table 1. The "Purpose" and "Stage" columns provide the categorization with respect to the points of view described in Section 3.

Table 1. Functions found in online banking suites

Function	**Purpose**	**Stage**
Perform a money transfer; top up a SIM card or a prepaid card; transfer funds between own accounts	State-changing	Mirror
Perform and manage investments	State-changing	Mirror
Check balance and recent transactions for an account or card	Private view	Mirror
View investment history	Private view	Mirror
View aggregate account and investments situation, view loan situation	Private view	Mirror
Read finance news, market indices and currency exchange rates	Customized view	Mirror
Check the stock market	Customized view	Mirror
Pay bills on a postal or bank payment slip	State-changing	Enhance
Find nearest bank branch or ATM	Customized view	Enhance
Management of savings	State-changing	Extend
Proximity payment (NFC-enabled POS, QR-code)	State-changing	Extend

In the remainder of this section, functions found to be in the "Enhance" and "Extend" stages in this case study are described briefly, in order to provide an outlook on mobile banking as an evolution of online banking.

4.2. Functions taking advantage of mobile device features

In this analysis, two functions were found to be in the "Enhance" stage: processing postal payment slips and finding bank branches and ATMs.

Postal payment slips are a common payment method in Italy for fines and utility bills (for which direct debit is also a common choice). Traditionally, these slips could be taken to a post office to perform a cash or debit card payment. Nowadays, in addition to this payment option, it is possible to pay through web banking services, by filling in a form with the details of the bill. It is common for payment slips to have a QR-code printed on them, which can be scanned with the camera found on a smartphone or a tablet, to input bill details quickly and enable payment through the mobile banking app. This shows that the same function is made simpler to use on a native mobile app.

Similarly, the feature to find bank branches and ATMs is enhanced in a pretty straightforward way by allowing the user to take advantage of the geolocation features on the mobile device, thus avoiding manual input when the user intends to perform a search on current location.

4.3. New functions in mobile banking

The capabilities of mobile devices far surpass those required for home banking via a desktop computer. Apps designed specifically for smartphones or tablets make possible new ways to manage one's finances, and allow banks to offer a wider range of services. For the purposes of this study, every function that is made available through an app on a mobile device, and not through desktop web banking, is considered part of the "Extend" stage, regardless of whether it would be possible to implement the same function on a desktop web banking suite. More precisely, certain functions are related to services that can only be offered with the use of specific features found in mobile devices; other functions are possible on desktop web, but only truly convenient by reason of the ubiquity of mobile devices. Two functions were found to provide a relevant example for each case: mobile payments and savings management.

Although mobile payments have been a topic of interest for over ten years, adoption has been slow or minimal, except in Japan and South Korea[12]. This has been explained mostly with the lack of an emerging standard[13]. In the United States, different services are being introduced and competing to become a de facto standard; in the European Union, public consultations among stakeholders were held under the guidance of the European Payments Council, in

an attempt to define standards. As a first result, a White Paper on mobile payments[14] was published in 2012, followed by other documents.

Early adoption of NFC for mobile payments has been slow in other markets where its introduction has been attempted, like in Malaysia[15]; nonetheless, NFC-based solutions carry several advantages over technologies like SMS-based and SIP-based payment schemes[13]. This is driving European banks toward introduction of NFC-based solutions for mobile payments, both at consumer and merchant side (with the introduction of mobile Point-Of-Sale devices). Concerning the offer of services by Italian banks, at this stage, while contactless credit and debit cards are becoming commonplace and support for NFC-enabled smartphones is planned, a form of mobile payment based on QR-codes is already supported, albeit not yet common. Merchants and local administrations can request payments by displaying QR-codes on a screen, which can be found in a relevant location (a store or an office) or on a personal computer connected to a web site. Users of specific mobile banking apps can scan the code to initiate a payment process, which involves charging a credit or debit card associated with the app.

One of the banks under consideration has introduced a mobile app for savings management, to be installed in addition to the regular mobile banking app. This extra app provides the user with a simple way to move amounts of money from their regular bank account to a special personal fund. The user can set goals for the total balance of this fund, and lastly use it to make a purchase of goods or services. The intended result is a virtual money box, which lets the user keep track of their savings on a daily basis, accumulating money in the fund by accessing the app at any occasion when they save money on their expenses. An option is offered to allow other people to add money to the user's savings – for example, between family members, to help one another reach goals, without disclosing the balance of the main bank account or providing the ability to use another person's funds.

The same functionality could be made available on a web application or even a desktop application, but implementing it on a mobile app allows ubiquitous access, which is supposed to contribute significantly to its adoption. In fact, without ubiquitous access, a user could even be limited to checking one's balance to accumulate savings at the end of the day, with a negative impact on the perceived usefulness of the application.

5. Assessing mobile app maturity

This section describes a method to evaluate the maturity of mobile banking services. Although the main focus will be held on discussing the results obtained for this case study, the method is designed to find application in other sets of banks, so long as a fair degree of homogeneity exists (e.g. banks operating in a single country or within the EU).

As a first step, a score was assigned to each function made available by at least two banks, depending on their importance. Since the goal is to assess the maturity of mobile apps with respect to a consolidated set of services, functions implemented by a single bank were not considered. These scores and criteria of importance were used:

- 5 points to each essential function, the lack of which would be perceived as a serious shortcoming;
- 3 points to each important function, expected to be useful for a majority of the user base;
- 2 points to each function that, while not essential, would be particularly useful in a mobile context;
- 1 point to each function of minor importance, as well as to features that simplify access to a service, i.e. the lack of which would cause a difficulty, but not an impossibility to access a specific service.

The assignments used for the present study are reported in Table 2. Studies performed in different situations may require adjustments. If available, the knowledge of usage statistics can provide an additional criterion to assign scores.

The final score for each channel is the sum of points associated to each function not available on that channel. Channels with a lower final score can be considered to provide more complete solutions for the access to financial services. The reason for choosing this approach was that the attribution of points represents a penalty, given when a strong indication exists that a feature is not implemented.

It must be observed that not every bank offers every channel; in some cases, it was not possible to calculate a score for a channel, e.g. when a bank advertises the availability of the channel but does not publish any detailed information concerning which functions are actually implemented.

Lastly, total scores are divided into three ranges representing different degrees of maturity and investment. To place emphasis on the comparative nature of the analysis, thresholds were chosen such that high and middle maturity classes

Table 2. List of functions by score contribution

Value	Type	Examples
5 points	Essential	Check balance and recent transactions for an account or card; money transfer; top up a SIM card or a prepaid card
3 points	Important	Transfer funds between own accounts; pay bills on a postal or bank payment slip; check the stock market, perform and manage investments
2 points	Secondary	View aggregate account and investments situation; view investment history; view loan situation; find nearest branch or ATM; report stolen card
1 point	Minor	Read finance news, market indices and currency exchange rates
1 point	Ease of use	Quick selection of payment beneficiaries; access to tech support line; quote watchlist

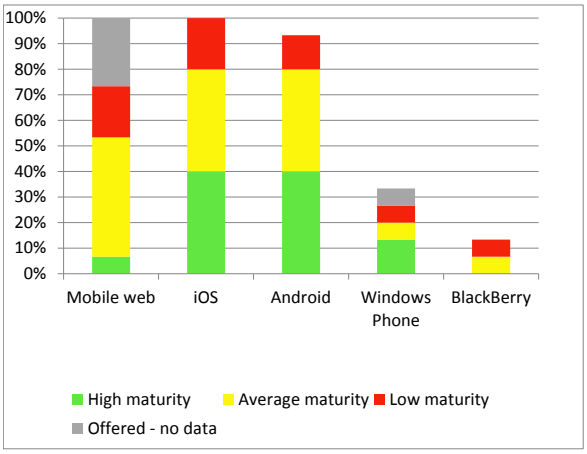

Fig. 2. Evaluation of maturity of channels to access mobile financial services, aggregated by mobile operating system. The leftmost bar refers to the mobile web channel, the other bars refer to native apps.

were as close as possible to having the same cardinality. The high maturity class includes scores from 0 to 14 points; the middle maturity class comprises scores from 15 to 28 points; a score of 29 points or more denotes low maturity.

Results grouped by operating system are shown in Figure 2. It is notable that Apple iOS is supported by every bank in the study, and Android is supported by all but one. Support for Windows Phone is provided by about one third of banks, whereas BlackBerry support is currently very uncommon and never scores at the top of our scale. Banks invest in the two main platforms – iPhone and Android smartphones – virtually with the same degree of interest; banks that support both platform have similar scores on these two platform. As the main business area for the BlackBerry platform is gradually shifting from consumer-oriented smartphones toward integrated enterprise solutions, it is to be expected that banking apps intended for consumer use do not become mainstream on this platform. The Windows Phone OS, on the other hand, has a potential for support by a larger number of banks in the future.

The mobile web channel is offered by every bank, and is also intended to provide service to customers running unsupported operating systems. Functionality may not be on a par with native apps; only one bank under exam achieves a top score on the mobile web channel. Most future innovation can also be expected to happen on native apps, as access to device features on a mobile web application has to be mediated through browser APIs, resulting in the possibility of incomplete support, a higher degree of market fragmentation, and higher development costs.

6. Conclusions

In online and mobile banking, services are offered in ways that differ according to the access points. Differences range from optimizations of the user interface to extra services offered exclusively through a mobile app. This paper describes a method to assess and compare the maturity and completeness of the offer through each channel, and

applies the method in a case study involving a number of Italian banks. Results of analysis show that mobile apps have surpassed the corresponding mobile-optimized web applications as far as maturity of the platform is concerned.

The possibility to exploit capabilities of mobile devices motivates the greater amount of investments in mobile apps, compared to the mobile web platform. A further motive is the possibility to gain access to data available from mobile devices and benefit from the analysis of data, for purposes such as improving mobile marketing and employing recommender systems. Therefore, it is likely for the gap between mobile web and apps to expand even further.

The method to analyze the state of mobile apps described in this paper can be adapted to different kinds of study. In particular, the categorization by stage is not specific to banking apps, and can be applied to assess advancements in multi- and omni-channel service suites, in m-commerce and other fields where mobile devices play an important role.

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