



Interface & Application Design of Mobile Banking Apps

Group 10

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Abstract

This project aims to create a banking system following a user-centered design approach. After a brief analysis of the existing banking apps and users requirements, three first and one second generation prototypes were created and evaluated using various methods such as personas, heuristics and feedback from independent testers. After the whole analysis, further recommendations were made to involve the design of the second generation prototype.

Brief summary of group members' contribution

The contribution of each team member has been equal for this project and all parts of the assignment have been influenced by all the five team members. All the decisions that led to the final design of the second generation prototype derived from group discussions and collaborative work based on feedback.

Summary of contributions from each group member					
	Melisha Trout	Anastasiia Koroleva	Dimitrios Simopoulos	Roman Gaev	Vasileios Manolis
Percentage contribution	20%	20%	20%	20%	20%
Abstract	✓	✓	✓	✓	✓
Introduction & Definition of problem addressed	✓	✓	✓	✓	✓
Review of related work					
Related mobile banking app evaluation	✓				✓
Literature review	✓	✓			✓
Analysis of user's requirements		✓	✓	✓	
First generation prototype					
First generation prototype 1 design (rationale)	✓		✓		
First generation prototype 2 design (rationale)		✓		✓	
First generation prototype 3 design (rationale)					✓
First generation prototype 1 evaluation			✓	✓	
First generation prototype 2 evaluation	✓	✓			✓
First generation prototype 3 evaluation			✓	✓	

Second generation prototype					
Tool analysis			✓		✓
Second generation prototype design(rationale)	✓	✓	✓	✓	✓
Second generation prototype design		✓		✓	
Evaluation of the second generation prototype	✓	✓	✓	✓	✓
Conclusions	✓	✓	✓	✓	✓

Introduction and the objective for this study.

Mobile banking is a service offered by a financial institution that allows users to conduct a number of functions like checking their balance, transferring money between their account and make payments to existing payees. Over the years, the popularity of mobile banking application has increased. According to the British Banking Association (BBA), in 2010 86 million users were accessing their bank via a mobile device. By 2015 this figure increased to 895 million, and it was predicted that by 2020 over 2,341 million users will be accessing their bank via a mobile device. However, despite the huge popularity of mobile banking applications, many users have reported the following issues:

- Transactions do not update in real-time
- Unable to conduct payments to new payees
- No notification of upcoming payments
- No additional support to help manage the user's finances
- No customization
- The overall design and layout are not aesthetically pleasing (it's very basic!)
- Difficulties in analyzing the transaction data to pinpoint any errors.
- High-security concerns

As a result, the main objective of this study is to design a new banking application that will improve users experience, alleviate the common issues faced by users of traditional banking methods, and encourage more users to become more proactive with their financials.

Literature review

The literature review is split into two sections. The first section looks into the psychological theories into the reason why users accept or reject technology devices, and the second half will look into the current trend of mobile applications.

A great deal of research has been conducted to determine factors that influence the adoption of a specific technology. Numerous models have been developed and proposed to enhance the understanding of this issue. One model in particular is the Technology Acceptance Model (TAM), which was first proposed by Davis (1989,1993). It is a behavioural model that can help explain why a user accepts or rejects technology.

The model provides the basis of how external factors influence belief, attitude, and intention to use technology. According to the model, the user's intention to use technology is influenced directly and indirectly by the user's behavioural intentions, attitude, perceived usefulness of the system, and perceived ease of the system. The model also suggests that certain external variables can affect the user's perception of usefulness and ease of use.

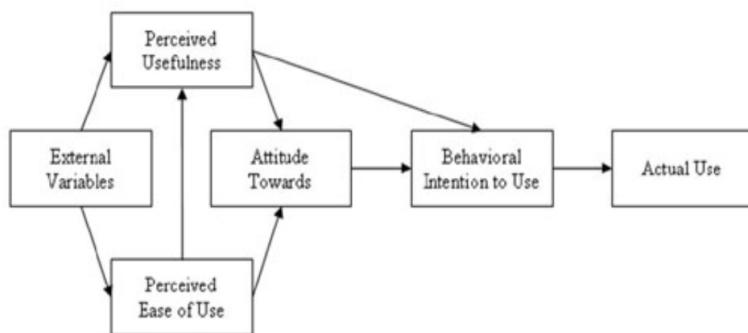


Figure 1. Original technology acceptance model (TAM)

In relation to our study, this model can help guide us during the first-generation prototype design process to ensure that the features included are developed in perspective of each category within the TAM model.

Mobile banking trend

Over the years, there has been an increasing trend of using mobile banking apps and contactless cards during. According to the BBA, in the United Kingdom, there has been a 356% increase of mobile banking apps usage between 2012 and 2017 while contactless cards usage saw a 225% increase from 2016 to 2017.

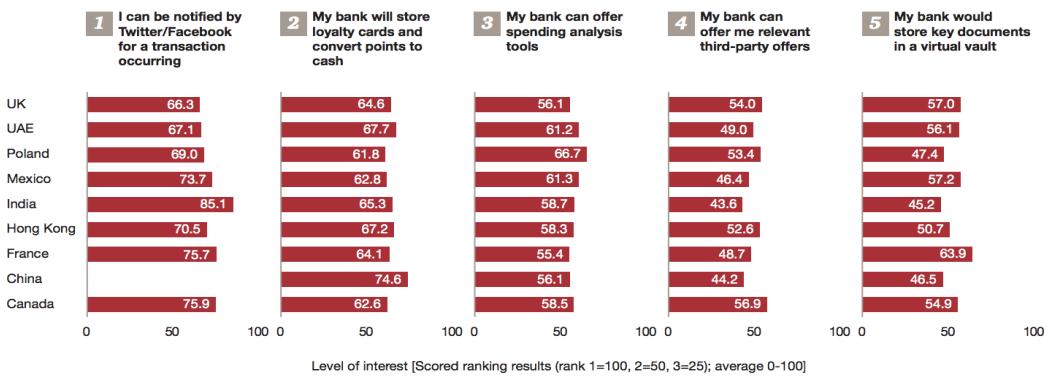
This trend has also been confirmed by Federal Reserve in the Consumers and Mobile Financial Services 2016 report where the increasing adoption of mobile banking services is highlighted. According to Federal Reserve's 2015 survey, the three most common reasons users opened mobile banking apps were about checking account balances or recent transactions (94%), transferring money between accounts (58%) and receiving mobile notifications about their bank account (56%). When it comes to mobile payments common activities include paying bills (65%) from a mobile phone and various mobile e-commerce activities such as online purchases (42%).

As mobile banking becomes a more familiar concept to more demographics, users start using mobile banking apps for more complex reasons. According to the same research, users are getting more interested in mobile investing and loaning options and services to covers these needs are expected to be added to today's limited functions of mobile banking apps. This trend was also noticed by PricewaterhouseCoopers, according to which demographics who use mobile banking are more likely to buy more banking products comparing to customers who visit physical branches.

Apart from that, in another survey conducted by PwC, the level of customers' interests in many digital services was tested. As expected, PwC saw a positive correlation between the usability of digital offerings provided by banks and the level of customer engagement. More than 60% of the tested users' sample expressed interest in features such as social media notifications for transactions, storing loyalty cards and spending analysis tools. Half of the users were also interested in receiving third-party promotional offers.

Figure 4: Appetite for innovative digital services

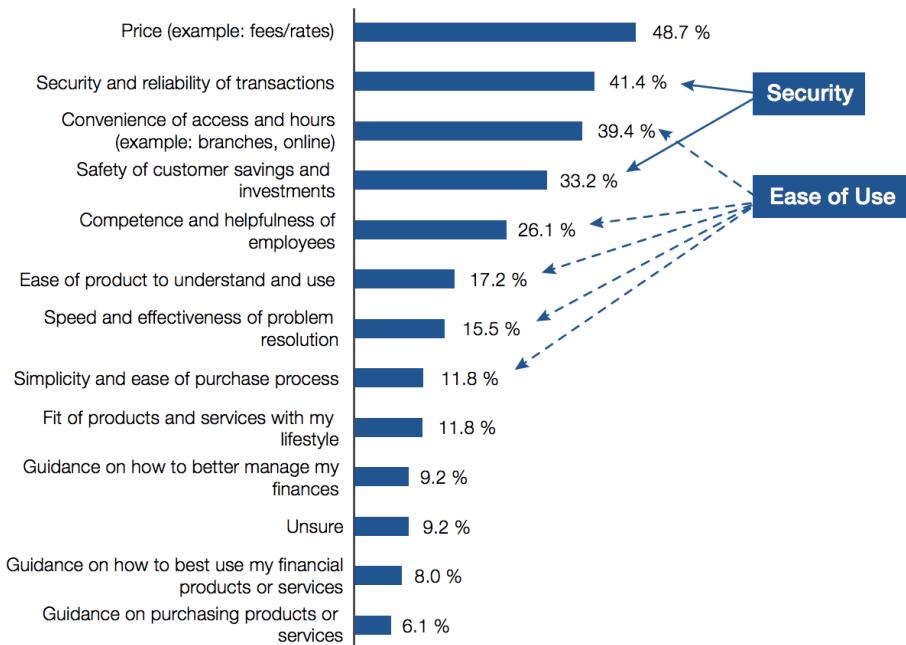
'Which of the following would you be willing to pay for, please rank your top 3?'



Source: PwC Digital Tipping Point Survey 2011

In another research, VASCO Data Security identified the top needs that consumers listed for banking. After a reasonable pricing for banking services, the top seven needs that customers expressed were related to the security and user-friendliness of the services. Mobile can effectively address all these three categories as it can lower the cost of services as less physical branches will be needed and at the same time offer easy to use and secure systems by integrating advanced cyber security techniques such as two-step verification.

What do customers want?



[1] https://info.bai.org/Vasco_BAI_Banking_Strategies_Webinar_120914_Archive.html

Review of related work

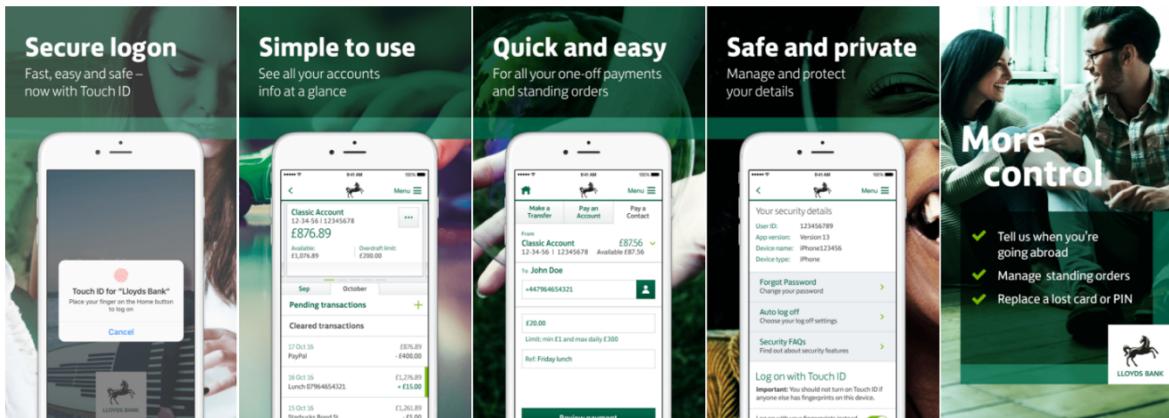
To build a compelling user experience, 8 key mobile apps were analysed. For our analysis, the Financial Technology or FinTech apps, as they are commonly referred to, were categorised into three major categories:

- Apps offered by traditional financial institutions (e.g. Barclays, Lloyds, Santander)
- Apps focusing only on payment services (e.g. Android Pay, Apple Pay, PayPal)
- Apps developed by start-ups that may have or may have not a full banking license (e.g. N26, Monzo)

Traditional Banks

Name: Lloyds Bank Mobile Banking

Released: October 2011



Lloyds Description: “When it’s hard to find time to do those small but important things, our Mobile Banking app is there to help. It can do everything you’d expect, maybe even more. It’s fast, convenient and more secure than ever, with built-in security technology to keep your banking details safe and private.”

Major Features:

- | | |
|---|--|
| <ul style="list-style-type: none">- Log in with a 3-character combination- Check balances, transactions and pending payments- Make transfers and payments home and abroad | <ul style="list-style-type: none">- Apply for loans, savings, cards and more- Report lost or stolen cards and order replacements- Inform bank if the user plans to go abroad- Reset Internet Banking password |
|---|--|

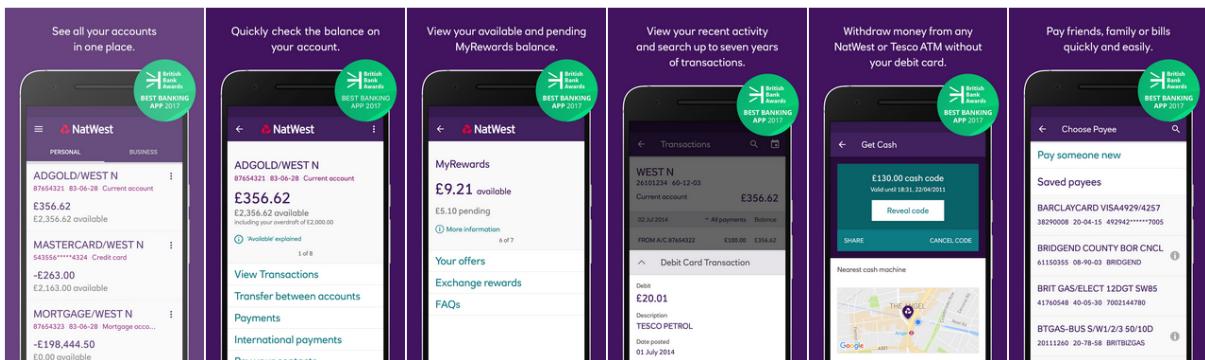
<ul style="list-style-type: none"> - Make payments to loan or credit card bill - Promotional every day offers 	<ul style="list-style-type: none"> - Update the phone number & email
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STRENGTHS	WEAKNESSES
<ol style="list-style-type: none"> 1. High level of security 2. Understandable interface by older users 3. Supports more than one account 4. Log in with a 3-character combination instead of a password 5. Offers ATM finder 	<ol style="list-style-type: none"> 1. Push notifications do not always work 2. Too many information and options in the Home screen lead to a confusing UI 3. The available balance is not updated in real time 4. Not attractive graphic elements 5. Tries to replicate Lloyd's website instead of creating a native mobile experience 6. Too many redirects to the website 7. Difficult to transfer funds to a contact

Overview: Lloyds offers a conservative mobile app to the users as it tries to appeal to its large customer range with a single product. After testing the app, we discovered that older users with limited experience using apps found it understandable, however, younger users quickly expressed their dislike for its “dull and overloaded” UI.

Name: Natwest

Released: iOS: October, 2009, Android: March, 2012.



Natwest: “Named ‘Best Banking App 2017’ by the British Banking Awards,

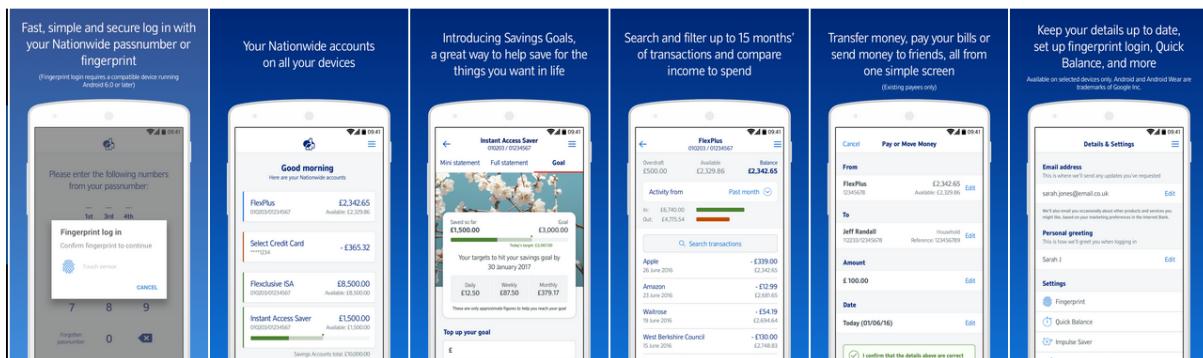
Major features:

<ul style="list-style-type: none"> -Fingerprint login -View your customer number -Transfer money between your NatWest accounts -Apply for credit card, loan, overdraft or saving account -Manage Direct Debits and standing orders 	<ul style="list-style-type: none"> -Transfer up to £250 to any UK account. -Make bill payments -Pay your contacts via Paym service -Get cash at any Natwest or Tesco cash machine when you don't have your debit card -Find nearest cash machines or local branch -Applicable for use by blind and partially sighted customers
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STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • Able to get cash out from NatWest cash machines without the need of using your card. This is ideal especially when a user may have lost or misplaced their card and needs to withdraw some money from their account 	<ul style="list-style-type: none"> • It is less secure than using the online banking. • The current balance doesn't update in real-time • No notifications to inform you if you have gone over your credit limit

Summary: Overall the Natwest applications allows the user to perform basic functions like viewing transactions, making payments to existing payees and apply for additional services. Although the application was named the 'Best banking app in 2017'

Name: Nationwide



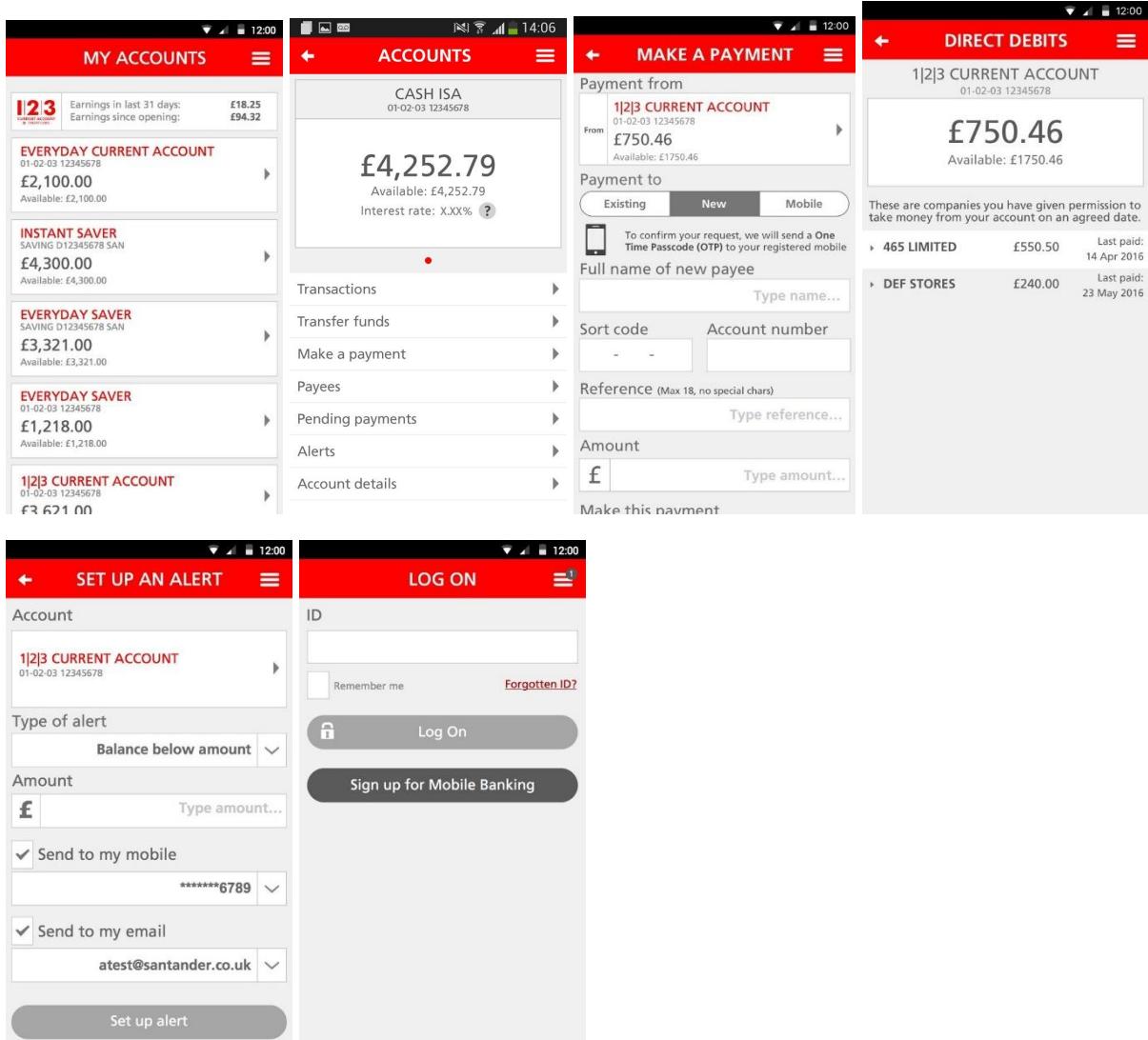
Released: Nov 14, 2012 (both iOS and android)

Description: "Stay in control of your finances at your convenience with our handy Mobile Banking app. To get started, all you need are your existing Internet Bank details. If you're not already registered, it won't take long - you can do this via our website."

Major features	
<ul style="list-style-type: none">• Fingerprint login• View the last 15 months activity on your current, credit card, and savings accounts.• Able to send money to existing and new payee now or in the future• View and cancel regular payments/Direct Debits.	<ul style="list-style-type: none">• See your balance without the need to log in• Create saving goals• Customise your account by managing your overdraft, set up notifications, and set up text alerts and paperless settings.• Visualisation - view your monthly spending habits

STRENGTHS	WEAKNESSES
<p>-The ability to view up to 15 months of statements</p> <p>-Managed overdrafts via app.</p> <p>-Set up new saving goals and create impulse savings which takes money from your current account and transfer to one of your saving account. This can be done without having to log in to the app.</p>	<p>- Anyone can view the user's balance via Quick Balance, which displays how much money a user has in their account.</p> <p>- not being able to create a new payee to make payments</p>

Name: Santander



Released: 2002

Description: "Wherever life takes you, stay in control of your accounts 24/7 with our Mobile Banking App. Manage your current accounts, savings accounts and credit cards securely and easily, anywhere you can connect to the internet. Simply log on with your existing Online Banking details. If you don't have any login details, just download the app to sign up. "

Major features

- | | |
|--|---|
| <ul style="list-style-type: none"> • See up to 4 years of transactions • Set up new payees and make payments | <ul style="list-style-type: none"> • Use mobile-to-mobile payments (Paym) to send payments |
|--|---|

<ul style="list-style-type: none"> Setup, view, amend and cancel standing orders (only available on iPhones) 	<ul style="list-style-type: none"> Set up alerts for when your balance goes over or drops below a certain amount Find your nearest Branch Sign up for mobile banking
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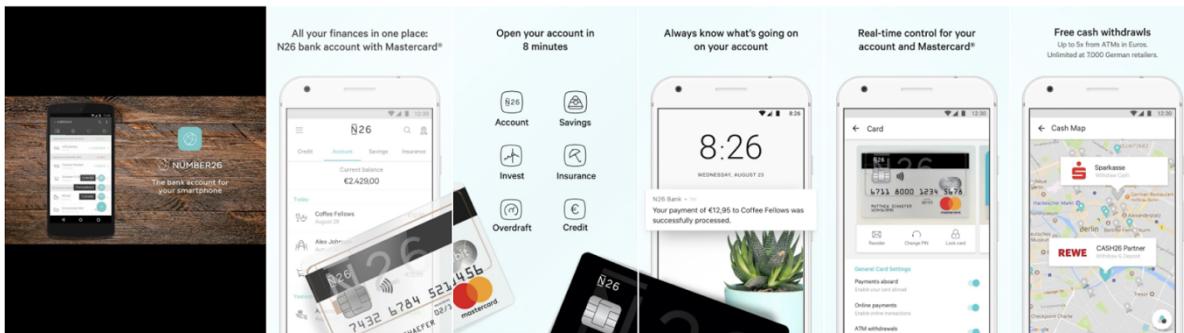
STRENGTHS	WEAKNESSES
<p>-The user can set up an alert to warn them if their balance goes below a certain amount.</p> <p>-The user can set up a weekly SMS notification to alert them the incomings, outcomings and the current balance of their account.</p>	<p>-The design is not appealing.</p> <p>-There is no fingerprint login, the user must remember their login credentials from their online banking, which entails three set of different passcodes.</p> <p>-The app tries to mimic the design from the online banking, which is not ideal for a mobile application</p> <p>- The user is not able to update their personal information via the app.</p> <p>-There is no budgeting tool.</p> <p>-No feature to tell Santander that you are planning on going abroad.</p> <p>-The Santander app shows transactions coming in and going out but does not give you a running total of your balance.</p>

FinTech Mobile Banking Start-ups

Name: N26

Released: February 2015

Users: More than 500.000



N26's Description: "When it's hard to find time to do those small but important things, our Mobile Banking app is there to help. It can do everything you'd expect, maybe even more. It's fast, convenient and more secure than ever, with built-in security technology to keep your banking details safe and private."

Major Features:

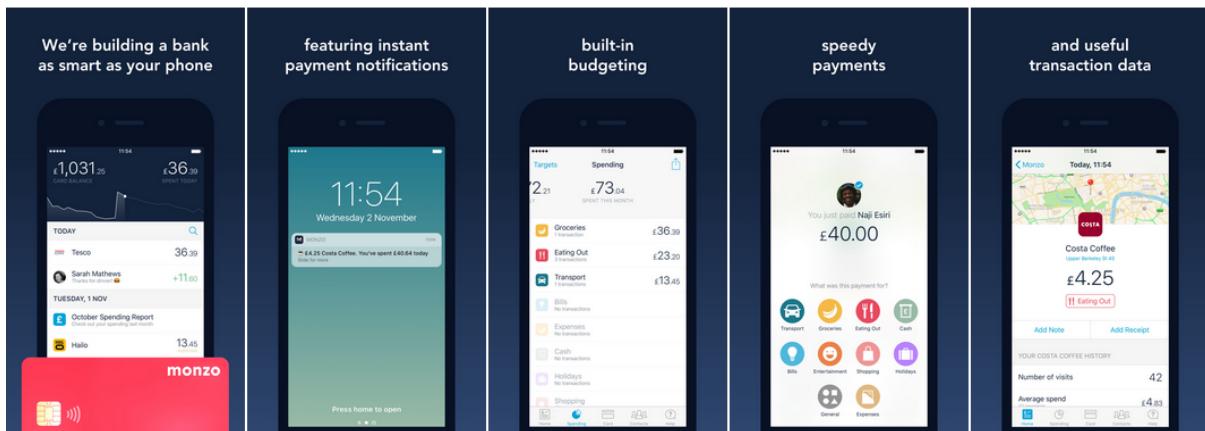
- Money Beam for instant cash transfers
- Paperless personal credit loan between €1.000 and €25.000
- TransferWise — international money transfers into 19 different currencies
- Real-Time account activity push notifications
- In-app card control to lock or reorder your card
- Personal bank account with personal IBAN

- Only in select markets:
- Overdraft, personal credit and investment products
 - N26 Invest — long-term investment tool
 - N26 Savings — fixed term savings account
 - N26 Insurance — digital insurance dashboard
 - N26 Black — premium account
 - N26 Business — account for freelancers

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> 1. User experience and design of high quality 2. It is fast, allows users to create an account from their phones in less than 8 minutes 3. Strong partnerships with innovative start-ups such as TransferWise, Auxmoney 4. User experience of high quality 5. Automatic spending categorization 6. One of the few that offers personal IBAN 	<ul style="list-style-type: none"> 1. Does not have the large customer base like larger banks 2. Security issues have shaken users' trust 3. High dependence on third-party tools for various services including hosting 4. Not providing the same services in all the markets

Overview: N26 was one of the first mobile banking start-ups that acquired a full banking license. From all the reviewed related work, N26 has the highest design quality. Its UI is elegant and simple offering a seamless user experience both in terms of usability and aesthetics.

Name: Monzo



Released: Feb 04, 2016 (iPhone). May 24, 2016 (Android)

Description: "Monzo is building the bank of the future, designed for the world we live in today. Join the thousands of users who have used Monzo in more than 130 countries and become a part of the banking revolution."

Major features	
<ul style="list-style-type: none"> • Instant notifications every time you make a payment • Built-in monthly spending analysis to see how much you are spending • Freeze your card instantly if you lose it 	<ul style="list-style-type: none"> • Intelligent insights into your spending • Send money instantly to your friends • Make bank transfers, set up standing orders and direct debits • Use your card abroad with no fees and get the wholesale MasterCard exchange rate

STRENGTHS	WEAKNESSES
<p>-Easy management of your monthly spending by categorisation.</p> <p>-It monitors and informs the user of real-time spending with notifications. This may help the user become more aware of their spending habits</p> <p>-The user has the ability to freeze their cards if they become lost or stolen, and unfreeze them once they have received a new card.</p>	<p>-In order for the user to start using their card, they must deposit £100 onto the card</p> <p>-Because the bank is solely controlled by your mobile, if you lose your mobile the user will not have any control of their finances.</p>

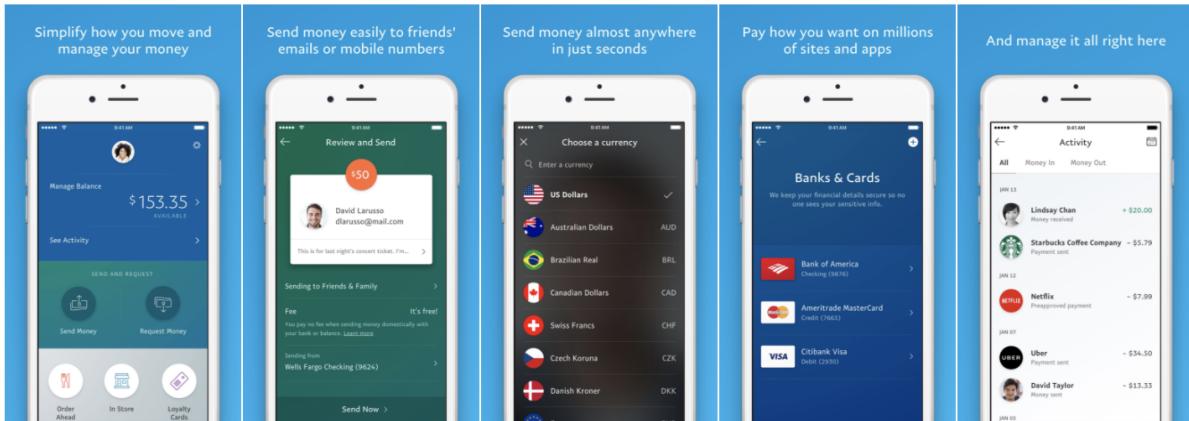
Summary: described as the ‘bank of the future’, Monzo has developed an interface that is extremely easy and simple to use. It provides many functions that are not currently available within the traditional mobile banking apps such as real-time transactions updates and an in-app chat room which connects you directly to customer service.

Additional Established Companies

Name: PayPal

Released: February 2012

Users: 218 million



Major Features:

- | | |
|--|---|
| <ul style="list-style-type: none">- Send and receive money instantly using email addresses without providing financial details | <ul style="list-style-type: none">- Real-time push notification |
|--|---|

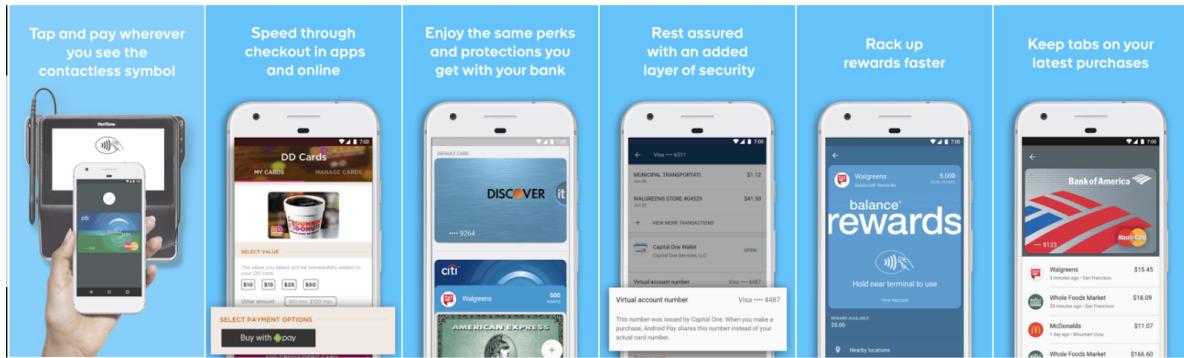
STRENGTHS	WEAKNESSES
<ol style="list-style-type: none">1. Recognizable worldwide2. Offers services both for customers and merchants3. Does not require users' financial details4. Good and simple UI	<ol style="list-style-type: none">1. A limited number of services compared to competitors. E.g. no options for investment or insurance plan.

Overview: PayPal with a simple and easy-to-use UI offers an attractive solution as a payment service. However, the lack of services might discourage users who would like a bank account with a personal IBAN.

Payment Services

Name: Android Pay

Released: May 2012



Major Features:

1. Mobile payments without the need of carrying a credit card

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none">1. Easy to use, does not require to hold a physical card2. High level of security, the actual number of the card is not shared3. In-apps checkout	<ul style="list-style-type: none">1. Limited number of participating banks2. Available only for specific devices3. It requires users to keep their devices locked

Overview: Like Apple Pay, Android Pay is a payment service tool that enables users to pay in physical and online stores using only their phones without having to carry any card. The design is simple and user-focused and the app targets only users who want a simple payment service. Due to security reasons, the app requires users to lock their mobile phones with a pattern, passcode or fingerprint identification. That means that users must continuously unlock their phones every time they want to use them for any service apart from Android Pay.

Evaluation of related work

1. Apps offered by traditional financial institutions (e.g. Barclays, Lloyds, Santander)

Whilst analysing the different variations of traditional banking apps we noticed that they all share a common theme. Users were able to view their statements/transactions, manage their accounts and make payments to already saved payees.

However, essential features such as being able to make a payment to a new payee via a mobile phone were not integrated into most applications. This feature is essential for users and will be integrated into all prototypes. At the same time, users were provided with a moderately secured login, either by fingerprint scanner or online login credentials. Additionally, the user interface of the banking apps offered by traditional banks was mostly outdated and not mobile native as most banks tried to replicate a limited version of their online web banking services. Finally, we discovered that there was a lack of real-time push notifications to warn users for each payment. This would be an ideal feature as it would help users, especially the younger generation (18 – 30), to help the budget their finances and reduce the risk of being in debt.

2. Apps developed by start-ups & payment services (e.g. N26, Monzo, Paypal)

The design of the apps developed by start-ups was significantly more sophisticated and user-centric comparing to the apps designed by traditional banks. Attributes such as their minimal design and user-centric approach are elements that will be integrated into our prototypes.

However, it should be highlighted that app designed by start-ups might be less appealing to older demographics (baby boomers: 51-59), who are not accustomed to using mobile apps for banking. At the same time, apps by start-ups offered less complicated features and fewer layers of security.

Analysis of User Requirements

Before we could create our designs, we needed to decide on the type of audience who would benefit the most out of our application. After much deliberation, we finally decided to focus on three different type of users:

- 1. Young parents**
- 2. International students**
- 3. Young professionals - entrepreneurs**

Scenarios were created for each user describing their requirements, which allowed us to focus certain elements of our designs against the user's requirements. The following paragraphs explain the rationale of why each user was chosen for our study.

Young parents: with the constant juggle of caring for their families and ensuring that their bills are paid on time, young parents will need an application that will help them to budget their finances and to remind them of any upcoming payments which will allow them to become more organise. They also need an application that will give them 24 hours direct contact with their banks for emergency situations (e.g. card replacement, setting up a new product i.e. saving account etc).

International students: users living abroad, especially those who migrate to the UK, are more likely to rely heavily on mobile banking applications. They will need an application which will allow them to send and receive money in different currency. They will also need an application which is easy to use and easy to understand as they may not have a good proficiency in english; thus a need for an application that uses common language and a minimalistic design.

Young professionals (entrepreneurs): young professionals will need an application that will allow them to have the ability to differentiate which transactions were made for their business and which transactions were made for personal use. These type of users live a very busy life compared to 'ordinary' people and as a result, they will need an application that is flexible and efficient.

Young parents

 <p>Name: Johanna Rock Age: 31 Occupation: Pharmacist</p>	<p>Main points:</p> <p>Johanna has not any economic background and does not really understand how the bank system works, she need the easiest way to perform all her bank operations.</p> <p>Johanna works full-time, she has to take care about her family (two children and the husband) so she does not have an opportunity to spend a lot of time on economic issues.</p> <p>Johanna sometimes uses mobile applications if she finds them useful and timesaving.</p>
<p>Goals</p> <ul style="list-style-type: none"> She wants to calculate and keep track on her family budget. She wants to be sure that her money is safe and nobody has an access to her online bank account. Johanna is interested in bank's loyalty program because she always uses the services of this particular bank and she would like to get cash back or any other discount offers. <p>Pain points:</p> <ul style="list-style-type: none"> Implementing high level of security may prevent Johanna from using the app often. Johanna doesn't have the time to make note of each transactions, Johanna needs to have a round the clock access to a history of all her payments and operations. 	<p>Description</p> <p>Johanna is 31 years old, she has a family of two children and her husband. She works as a pharmacist at a pharmacy company and sometimes she stays late at work. Johanna's husband often goes to the business trips so she usually has to lead her children to the school and to the kindergarten and pick them up every day.</p> <p>She always tries to be smart with her money and keep track on all of her expenses. But it is very hard for her to keep all this information in mind and sometimes she forget about some of purchases she made.</p>
SCENARIOS	
<p>1. Johanna noticed that she spent £500 more this month than she planned. She wants to check what kind of expenses her family had during this period of time but she has not saved the receipts for all purchases she made this month. Johanna finds it problematic to plan a budget for the next month without this information.</p>	

2. Johanna is staying late at work and she realizes that today is the last day for paying £150 for water bill. She cannot go to the bank to perform the operation because she has to complete her work by the end of the day. She would like to pay her bill online since it would be much quicker and simpler.
3. Johanna was driving a car when she got a call from her sister. Her sister asked Joanna to transfer £1000 to her bank account as soon as possible. Johanna cannot use her laptop or go to the bank at the moment but she has to transfer money in order to help her sister.

International student

<p>Name: Zoe Schulz</p> <p>Age: 21</p> <p>Occupation: International Student from Germany</p> <p>BSc Biochemistry</p> <p>Computer Literacy: Intermediate Level of Computer Expertise</p> 	<p>Main points:</p> <ul style="list-style-type: none">• Zoe prefers using her mobile banking app.• She does not seem to pay attention if the mobile app connection is secure.• She controls her account through the app.• She wants to transfer money between her account and her family's bank account.
<p>Goals</p> <ul style="list-style-type: none">• Zoe wants to maintain her access and her privacy in her mobile banking app• Zoe wants to help her family, so she wants to have the ability to send money to them, whenever it is needed• Zoe wants to control her account and see all of her transactions instantly when they take place. <p>Pain points</p> <ul style="list-style-type: none">• Zoe has to consider using securely the mobile banking app, by logging in not from a Wi-Fi network but from her mobile data.• The transactions tab has to be immediately updated after a transaction takes place.• Zoe wants to instantly see the amount of the transferred money, especially if there is a conversion in a different currency.	<p>Description</p> <p>Zoe comes from Germany. After finishing the school in Germany, she decided to do her Bachelor's in the UK. So, she does not have plenty of free time for going to the city centre, where her bank branch is located. Now she is in the third year of her studies. She also has a part-time job. So, she helps financially her family when it is needed.</p> <p>Given the fact that she is a student, she makes many, but low-cost payments. That is the reason that she prefers the contactless payment, especially in the supermarkets and in some pubs. So, at the end of the day, she wants to be able to see all of her transactions. But normally, most of the transactions take up to five days to be shown up.</p> <p>The type of her bank account is for students. That means that she is the only owner of that account. So, she has to check often the remaining balance of it and make several payments. For example, she must pay her tuition and her accommodation fees. But logging into the app has to be secure. That's why she has to remember always to get connected to the Internet through the mobile data and not through random Wi-Fi networks.</p> <p>As said, Zoe has to send occasionally some money to her family in Germany. But Germany's currency is Euros (€). So, if Zoe wants to send a specific amount of money in Euros, she has to know the exchange rate that time and all of the applied fees. That means that the mobile banking app has to integrate a system that calculates and converts the amount of money</p>

	from Pound sterling to Euros, including the banking fees.
SCENARIOS	
<ol style="list-style-type: none"> 1. Zoe needs to deposit 200€ to her family's account. She does not know how many pounds are needed for that transaction. So, the final amount will be probably more or less than the given amount of money in Euros. 2. Zoe wants to be safe and login to her mobile banking app only through her mobile data. But if she is already connected to a Wi-Fi, she does not receive any alerts from the application. So, she has always to remember and check her connection type. 3. Zoe wants to check her balance at the end of the day and to see the details of her costs. But she cannot do that, because the transactions tab is not updated. The transactions take several days to show up. So, she will have to wait, till all of her transactions are normally displayed. 	

Young professional

<p>Background</p> <p>Name: Mark White</p> <p>Age: 27</p> <p>Occupation: Recent graduate, gained some work experience, young businessman/startup founder.</p> <p>Computer Literacy: Daily uses mobile application and internet services. Wants to have cutting-edge technologies.</p> 	<p>Main points</p> <ul style="list-style-type: none"> • Mark is an ambitious and hard-working person, who works long hours everyday of the week • Mark has a busy schedule
<p>Goals</p> <ul style="list-style-type: none"> • To have multi-interpersonal functions including budgeting, financial plans and investments. • To have quick and flexible ways to transfer money to contractors, accounts and deposits • To have payment schemes and warning notifications • To have high level of security <p>Pain Points</p> <ul style="list-style-type: none"> • His financial funds are limited. Mark needs to control it strictly but he does not have enough time. • Mark needs up-to-date suggestions about potential investments 	<p>Description</p> <p>Mark is ambitious, confident, and energetic young individual who is eager to develop his own software company. Although his business started quite well and he is making good amounts of money, Mark is considering giving away most of the revenue on company's extension and investments. This in turn will lead to financial planning complications and possibilities of running out of funds.</p>
SCENARIOS	
<ol style="list-style-type: none"> 1. Recently, Mark wanted to expand his transfer limits, but had no time to visit bank branch. Mark finds it too time consuming to visit a branch to sort out his finances. He would like to communicate with the customer support using only his mobile bank. 2. During the previous month he ran out of money and was late with his office lending payment and in turn was made to pay a late payment fee. Mark needs a financial management feature that will be able to differentiate his personal and business expenses.. 3. Mark also needs to be reminded to manage his finances when he is not busy. 	

First Generation Prototypes

After reviewing the user requirements, we set out to design the first generation prototypes. Using the ideas from the related work, we decided that each prototype should include the following features:

- Fingerprint authorizing
- 24/7 online chat
- Payments automation plan
- Payments schedule/notification/spends control
- Make budgeting interesting
- Customization of the platform
- Different bank account management
- Data visualisation of transactions
- ATM search
- Security notification about type of internet connection

The target focus for our first and second prototypes were aimed towards users who would like to keep certain elements that are currently featured in traditional banking apps, but also would like to include new features that are currently presented in the FinTech banking apps. Features such as data visualisation to enhance users analytical abilities and thereby improving their overall decision making when it comes to managing their finances.

The design of the third prototype was targeted towards tech-savvy individuals who likes customisable interfaces and sophisticated analysis of their financial patterns. The main influence behind the design derive from FinTech banking apps (e.g. Monzo and N26), social media platforms and mobile gaming applications (finger gestures such as pinch to zoom in on a page).

After describing each prototype, we evaluated the proficiency against the three user requirements to identify any usability issues. In order to do this, we implemented the Nielsen's heuristic criteria (1994b) as a form of evaluation. Each team member took in turns to evaluate the prototypes using the heuristics criteria in the perspective of the persona's, and the results were collected and summarised. Any identified issues were assigned to a severity rating which were later reviewed to assist with the design of the second-generation prototype. Below is a summary description for the different rating levels.

Severity rating	Description
0	I don't agree that this is a usability problem.
1	Cosmetic problem. Does not need fixing unless extra time is available on project.
2	Minor usability problem: this should be given a low priority.
3	Major usability problem: this issue is very important and should be given a high priority
4	Usability catastrophe: This issue should be fixed before the release

Prototype #1

Tool used: Balsamiq Mockups 3

Amigo is the first of the three first-generation prototypes. People can use it to manage their accounts, transfer money easily and have a general image of their costs through appropriate charts.

Group or Audience Addressed

- Young professionals

Tone of Voice/Tone of the Text

- Modern, relaxed, young
- Formal but simplified design
- Emphasis on the security part of the application

Influences:

- Modern banking apps and systems throughout the world
- The current layout and design of other existing apps
- Applications that are based on the principles of the UI/UX Design

Rationale: The first prototype of our banking app focuses on the needs that almost any target group, but especially young professionals have. Simplicity, minimalism but also usability are the three terms that describe this prototype. For that reason, different applications had been analysed and the difference between the already used apps had been noticed. After gaining a deep

understanding of the design principles of an application, we decided on a minimalist design which will help the users to navigate without any ambiguous layout.

The user experience of this prototype is not limited to young professionals. International students but also ordinary people can use it too. And that, because it provides many useful features like the automatic conversion to a different currency whenever it is needed.

The users can also find useful statistical data about their expenses, the categories of their costs but also a geotagging system where they can see the location of each of their transactions. They can have instantly an overview of their costs and maybe get advice from it so that they adjust their costs on each category.

Finally, we expect from current mobile banking applications to implement more features for serving the customers that are using them. We took into consideration the privacy and the security concerns, like the type of the Internet connection. It is obvious that with the passing of time, more and more mobile devices will implement the face recognition. That could replace in total the fingerprint login. Furthermore, the whole structure of this prototype follows basic design principles that help the user find what he wants without putting much effort into it.

When starting, the application checks the type of the Internet connection whether it is through the Mobile Data or through a Wi-Fi Network. In case that it's the second, a pop-up alert is displayed, which informs the user about it. That happens, because the Mobile Data Connection for accessing a mobile banking application is more secure. If the user wants to continue, then the login screen is displayed.

Detailed Information about the first Prototype

Screen 1 - Opening the application

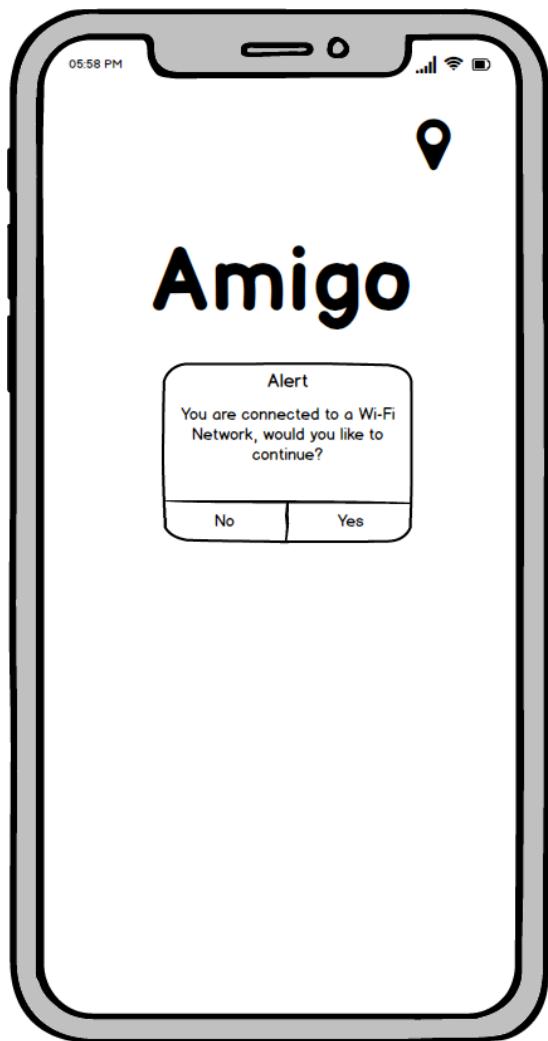


Figure 12: Login screen pt1

Assuming that the user is already connected to a Wi-Fi Network, the application always notifies the user for that. From the security aspect, users should always get connected through their mobile data, instead of a Wi-Fi spot. And that, because their internet traffic can be easily tracked and confidential data to be cloned and hacked.

Screen 2 - Log In page



Figure 13: Login screen pt2

After the notification of the connection type, the login screen is displayed. The user can log in directly with their fingerprint or enter their 4-digit PIN. But there is also another function. On the top right corner of the screen, there is a GPS icon. This is for finding the local branches of the specific branch without opening a connection with the bank's servers.

Screen 3 - Map of Branches

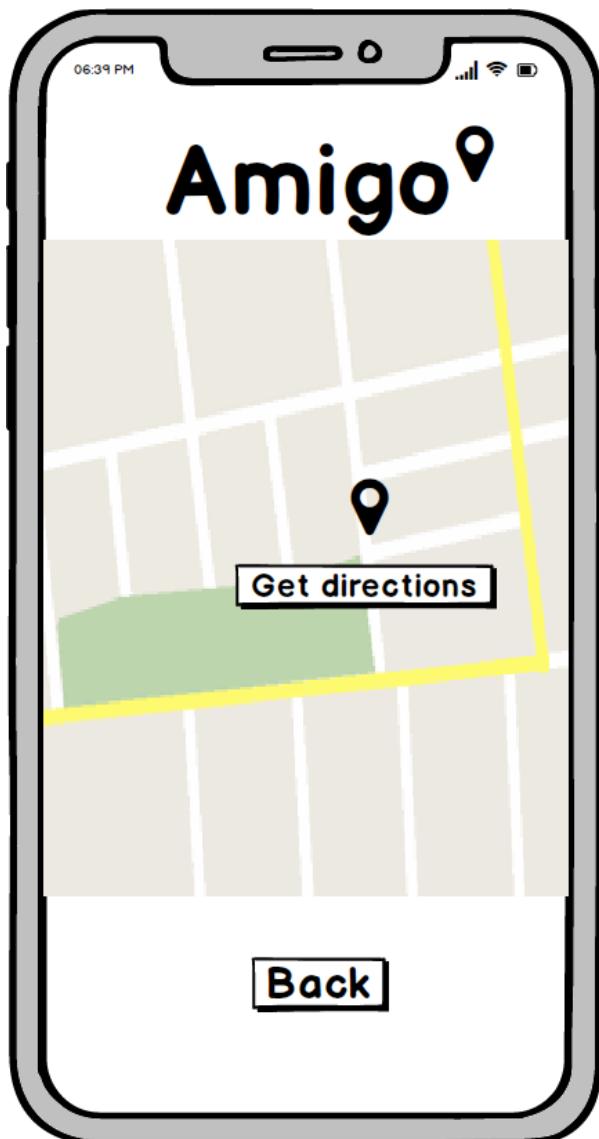


Figure 14: View branches nearby via the login screen

The user can get directions for their preferred branch or return back to the login page. In that way, the app can provide its services to the user in a more secure way.

Screen 4 - Overview of accounts

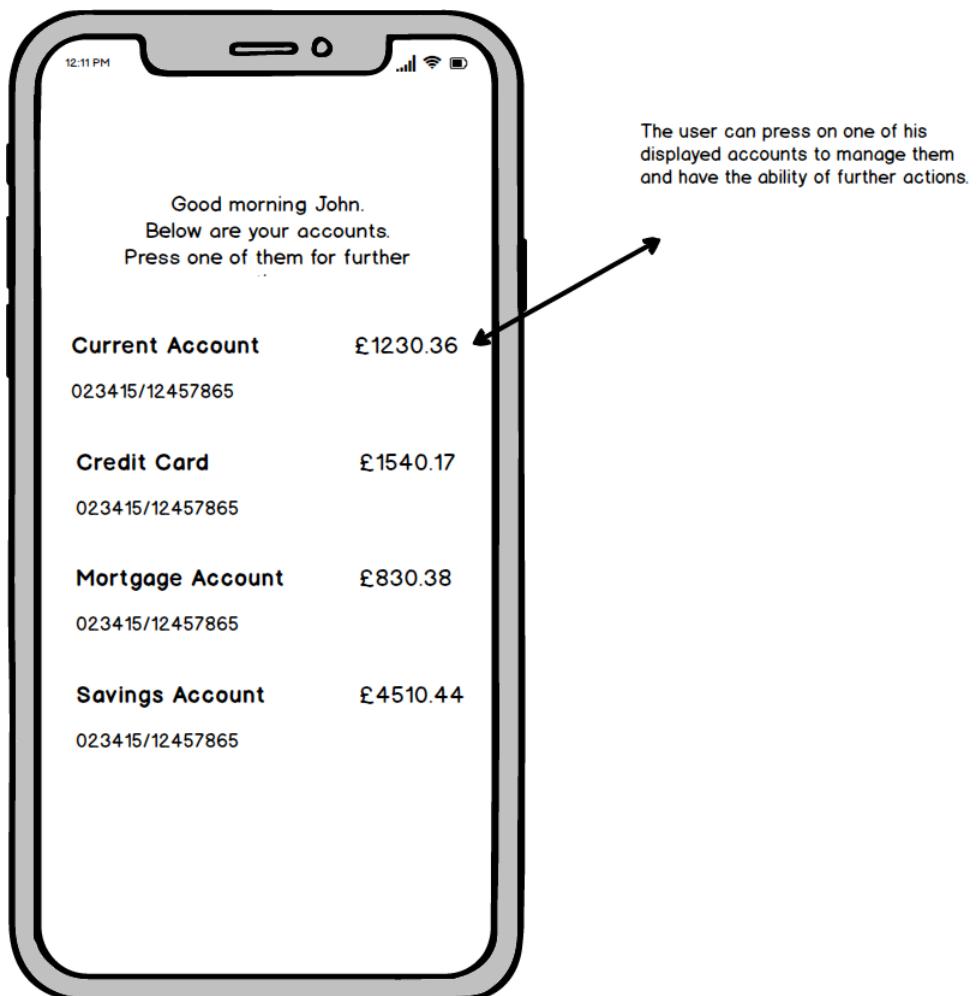


Figure 15: Overview of accounts

After logging in, the app displays the first page which is an overview of all the accounts with the balance displayed.

Screen 5 - Account overview

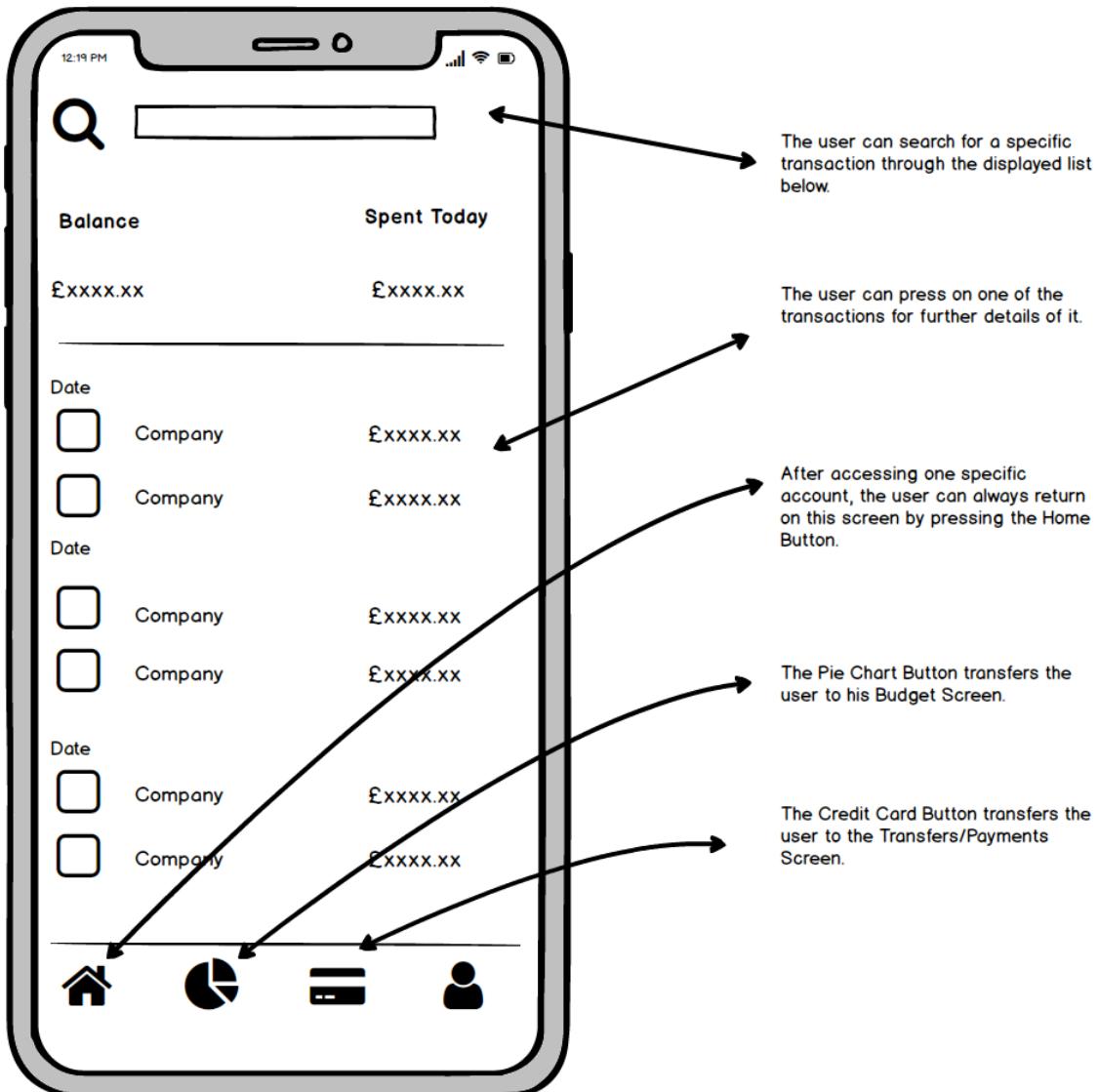


Figure 16: Account Overview

When the user selects one of their accounts, like the “*Current Account*”, they are taken to the account overview. They can view their current balance, the amount of money they have spent on the current day. They also get a list view of all of their transactions grouped by day.

Screen 6 - Details of a specific transaction



Figure 17: Details of a specific transaction

The user can press on a specific transaction for more details such as the number of visits there, the average and the total amount of money spent there.

Screen 7 - Budget Page

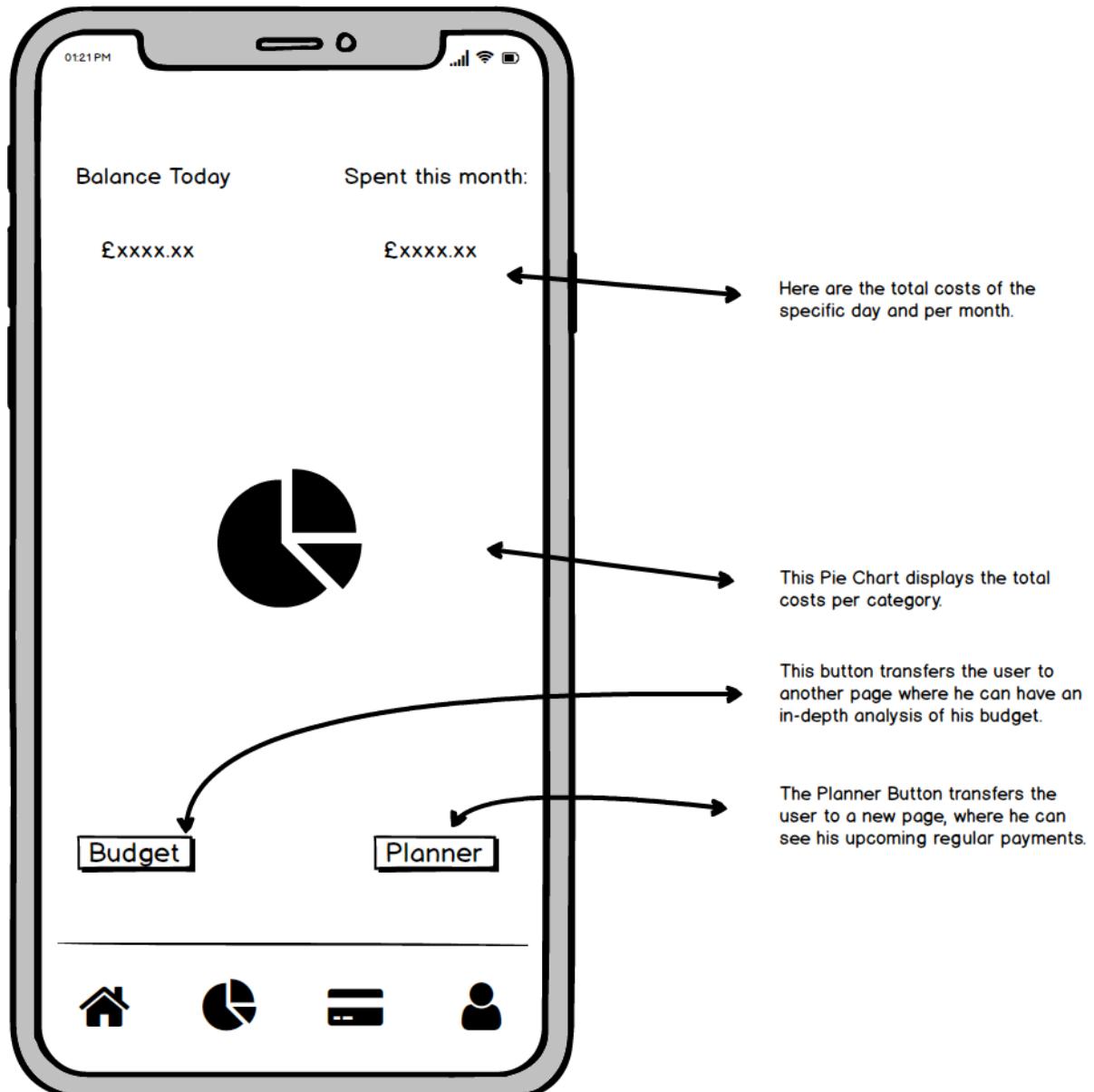


Figure 18: Budget landing page.

If the user wants to check their budget, they can select the 'budget' CTA button.

Screen 8 - In-depth Budget Page

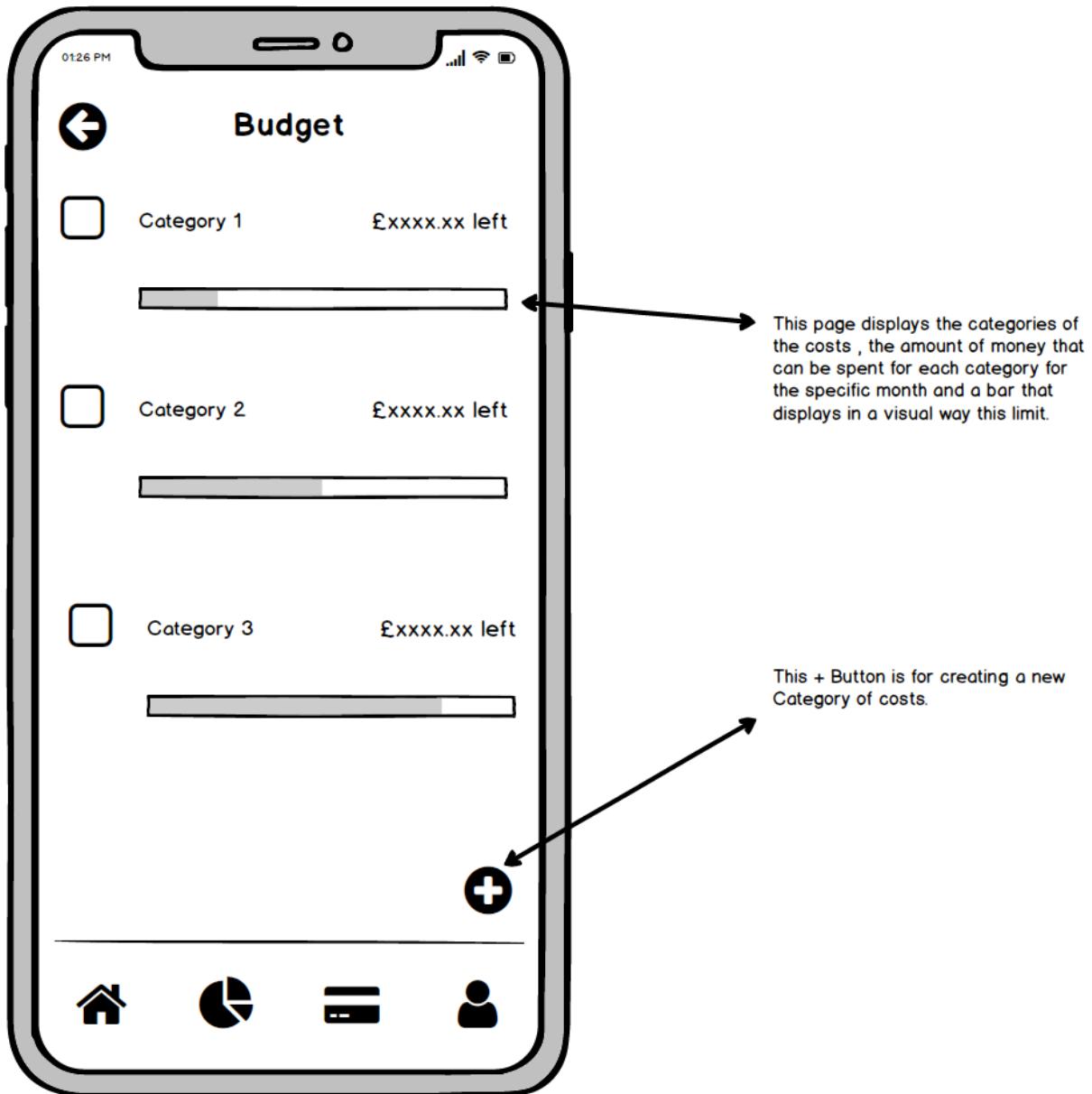


Figure 19: In-depth budget page

When pressing the Budget button, an analytical page is displayed by informing the user about the costs for each category. Moreover, it informs him for the remaining amount of money that is recommended to spend. If the plus button is pressed, then a new “Add Budget” screen is displayed, where the user can add a new category of costs.

Screen 9 - Add Budget Category

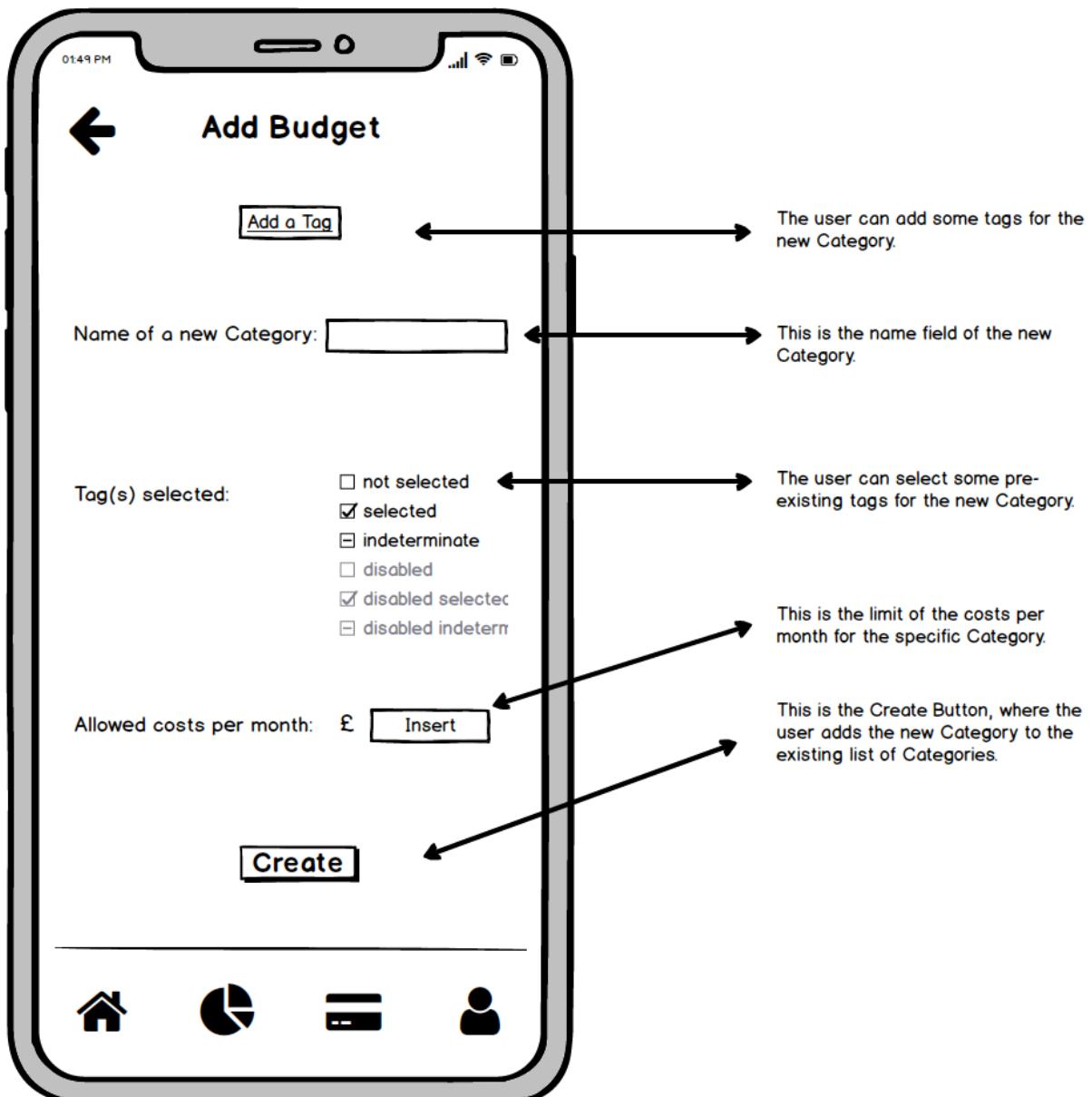


Figure 20: Add a budget category.

In this page, the user can add a new category of costs, when it is needed. They can also add some tags on it and add the preferred amount of the money that they want to spend every month.

Screen 10 - Finance planner

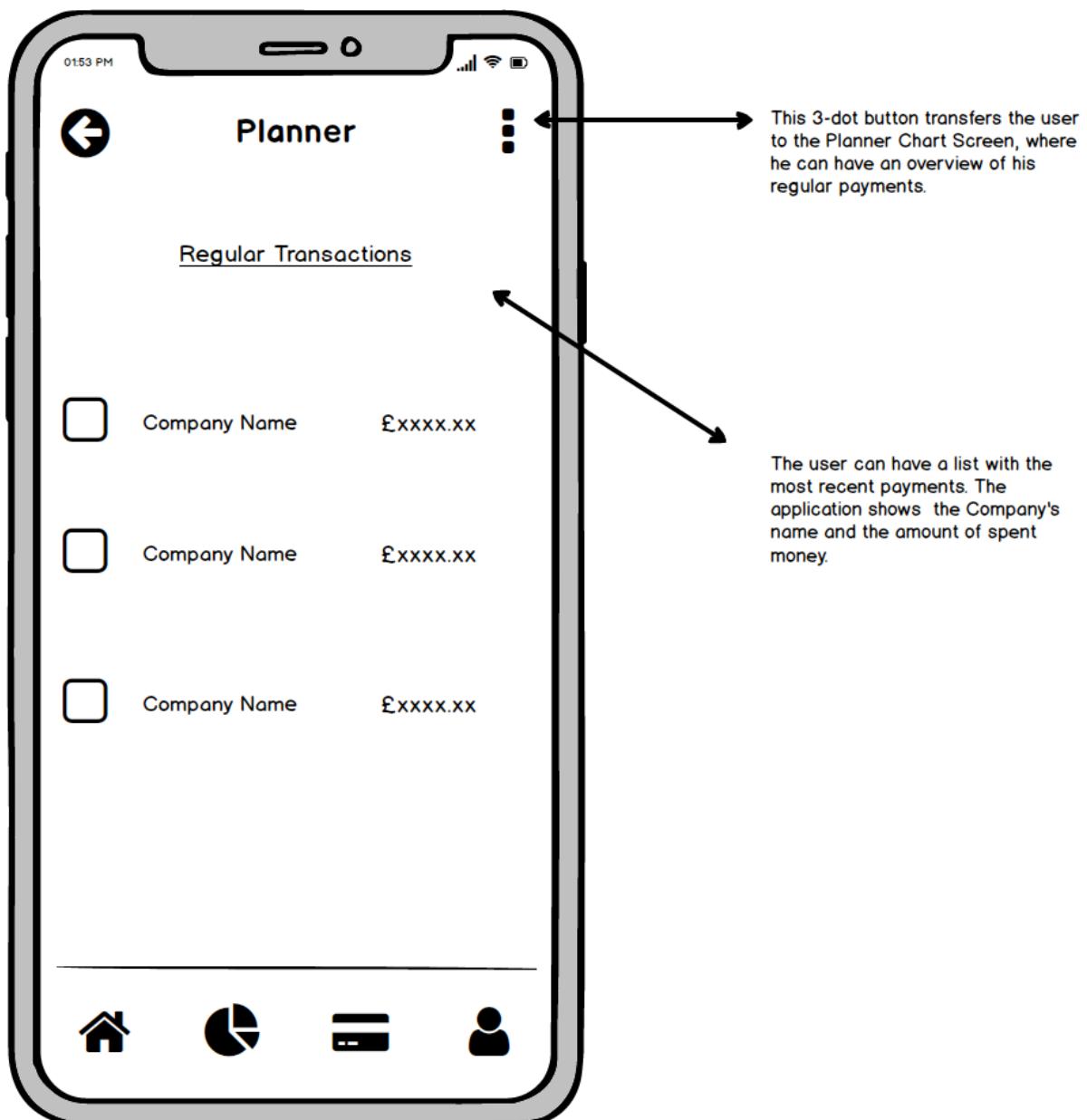


Figure 21: Planner landing page

If the user is still in the Budget screen (figure 18) and presses the button "Planner" CTA, they will see all the regular payments that are established, in a listed form.

Screen 11 - Planner Chart

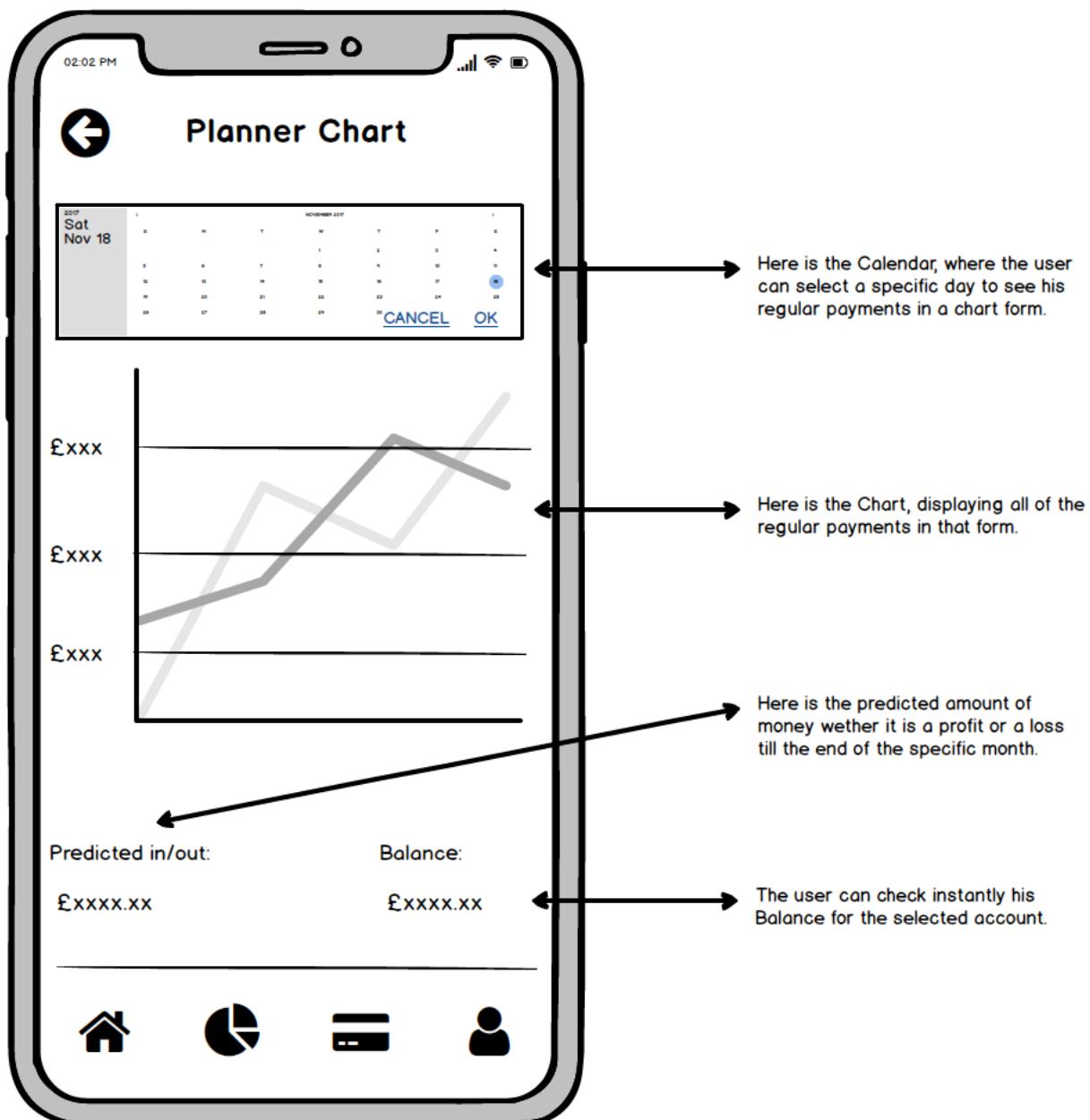


Figure 22: Planner visualisation

In case that more information is needed, then the user can press the 3 dots in the upper right corner of the screen. Then, they can see a calendar and a graph for the amount of the expenses on the specific date that he selects from the calendar.

Screen 12- Make payments

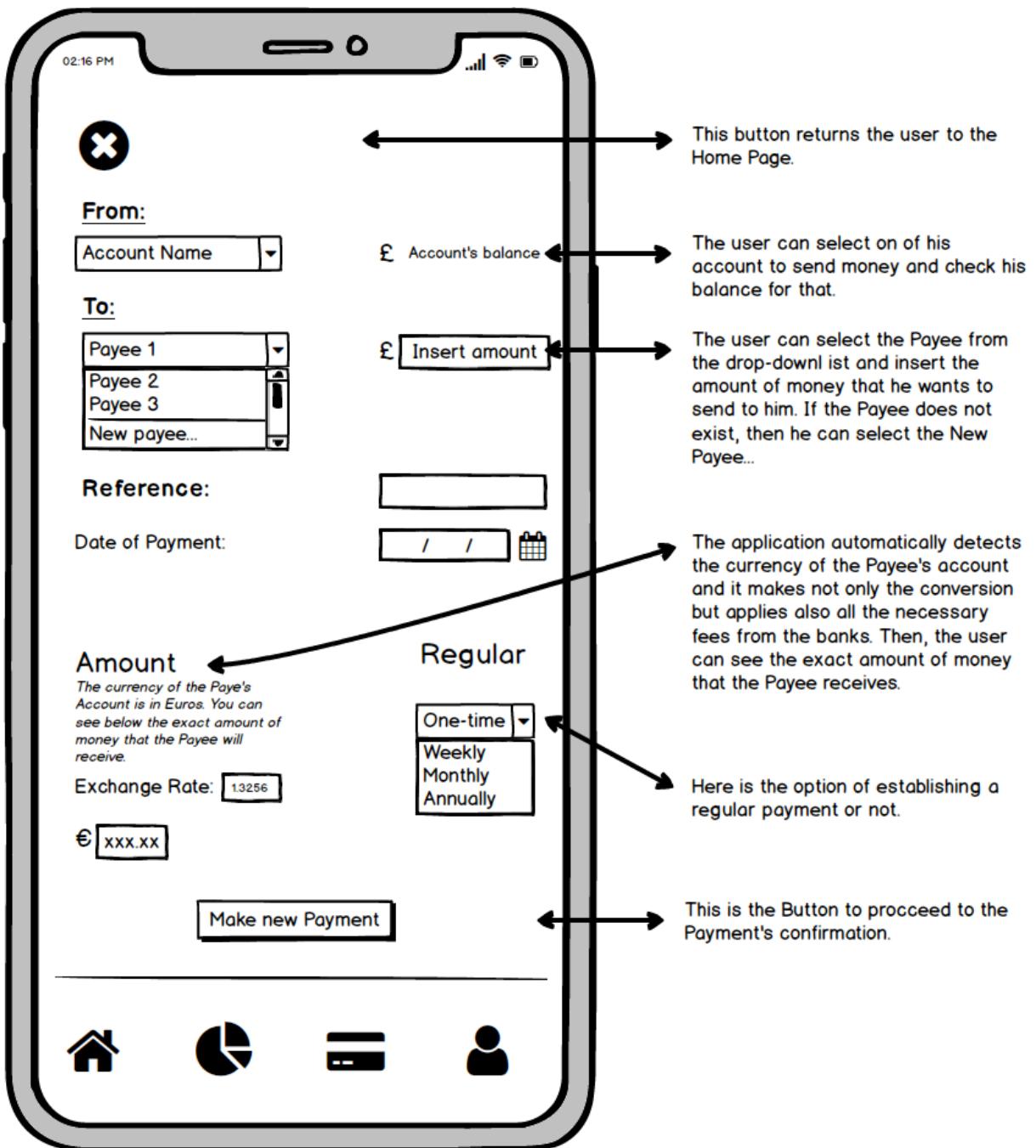


Figure 23: Make a payment landing page.

Finally, the most important part of a mobile banking application is to allow the user to make payments and transfers. So, a new page has been designed and is displayed when pressing the Card Button in the bottom. If the payee is not listed, then the user can create a new entry of him. The actual advantage of this application is that it can detect automatically the currency of the account that will receive the money and if it is different than the user's account, then the exact amount of money will be displayed after the exchange rate and all the fees applied from the banks.

Screen 13 - New Payee

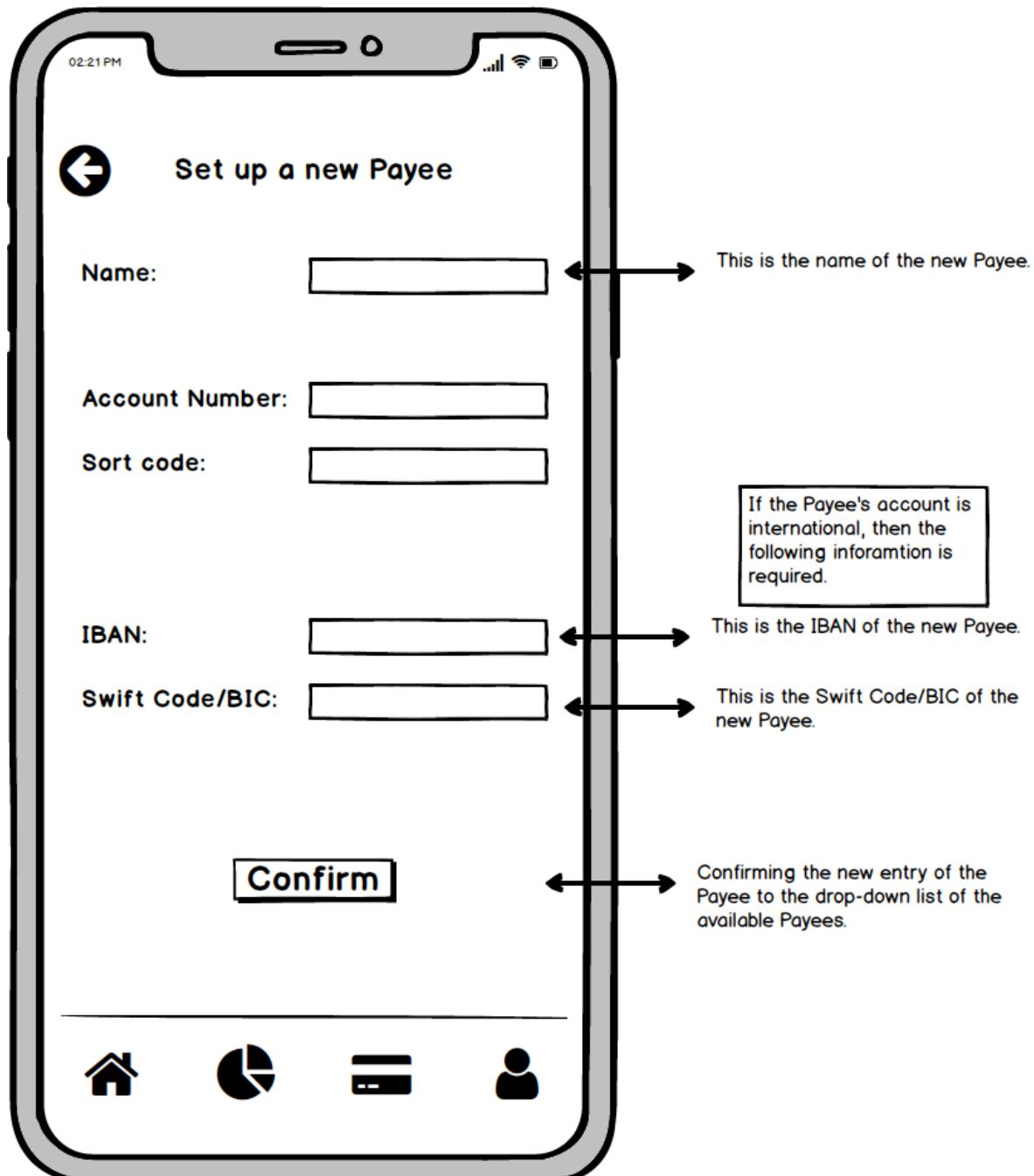


Figure 24: Add a new payee

Below is the screen of creating a new entry of a Payee. If the Payee has an International Account, then the user has to fill the IBAN and the BIC field, instead of the Account Number and the Sort code.

Screen 14 - Payment Confirmation Page

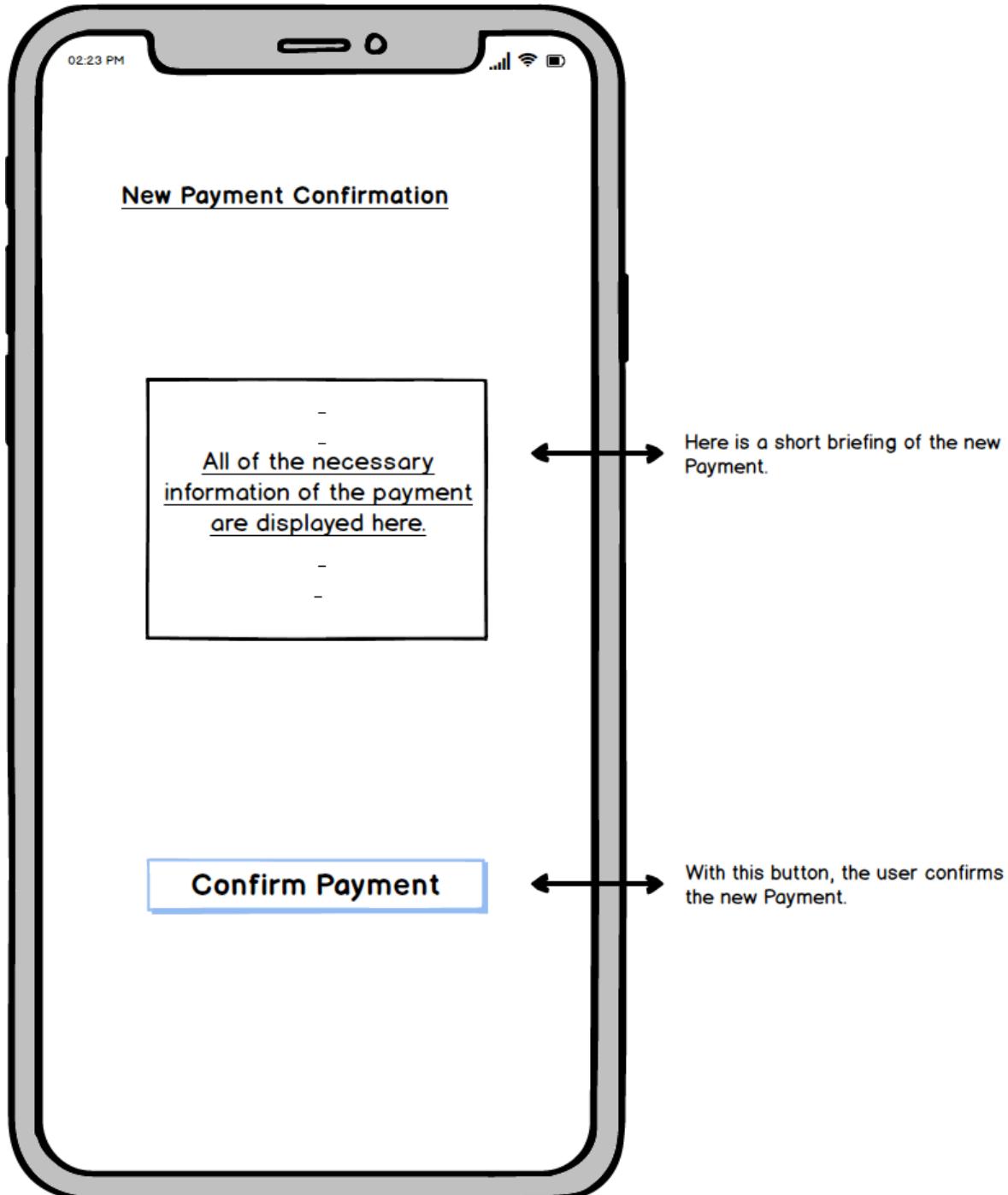


Figure 25: Payment confirmation

When the new Payee is added, then the Payment can be fulfilled. So, the next step that follows is to press the “New Payment” button. After that, they are transferred to a new page where the user can see all the necessary information about the payment and confirm it.

Screen 15 - Completion of Payment

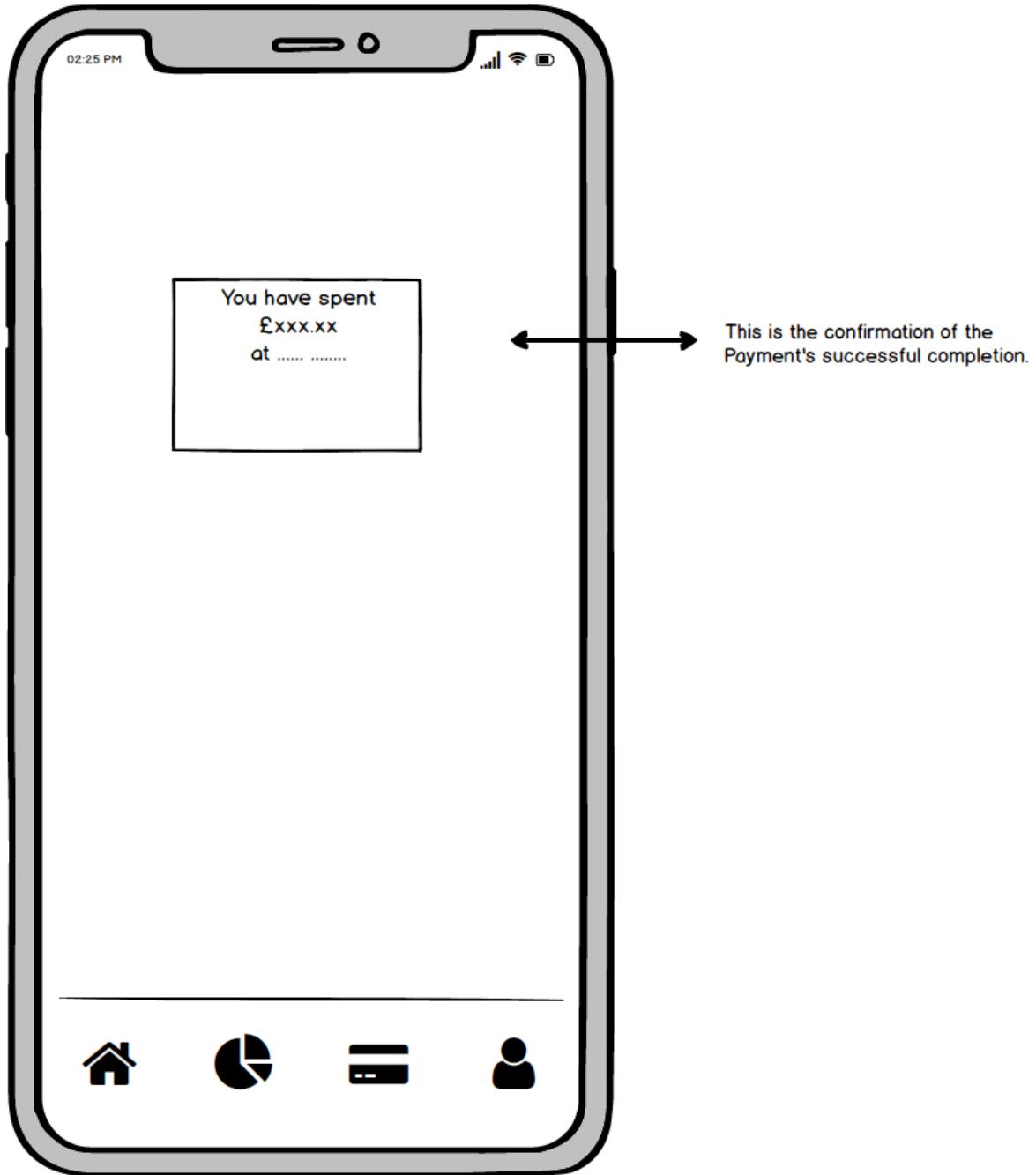


Figure 26: Completion of payment notification via device.

Finally, a new pop-up notification screen appears. This one displays the amount of the payment and the name of the payee. In that way, it is confirmed that the payment has been completed. After that, the user can press the Home button to return to their Balance page, where the amount of his money will have already been updated after the transaction.

Evaluation of User Personas Scenarios

<p><i>*Scale 1 - 5 (1: Does not accommodate the scenario at all - 5: Fully accommodates the scenario)</i></p>			
User Personas Scenarios	Johanna (International Student)	Zoe (Young Parent)	Mark (Young professional)
Scenario	View all previous transactions	Display exchange rate before making a payment	Provide 24 hours support from the bank via the mobile device
Score	4	5	1
Rationale	Johanna has a clear view of all her transactions; she is able to see where her money is going and she has the option to see an in-depth analysis of a particular transaction i.e. the average and total amount of money spent on a company. However, Johanna is not able to filter her transactions by different time periods e.g. view transactions made in the last week, month, 3 months etc.	The application automatically does the currency conversion from sterling to euros and display it on the payment page before Zoe confirms the payment.	The application does not provide an option for Mark to make a direct contact with the bank.

Scenario	Pay for water bill quickly from her mobile phone	Notification about the security of the network	Notifications about upcoming payments
Score	3	4	1
Rationale	Although there was a payment section for Johanna to pay her utility bills, it was felt that the payment page was too confusing and too time consuming for Johanna if she wanted to make a quick payment.	Before logging into the app, the application notifies the user about their internet connection, however, it there is no warning about the security of the connection i.e. inform the user whether they should or should not connect to the app depending on how they are connected to the internet	The application does not notify the user about upcoming payments
Scenario	Transfer money instantly from her mobile phone	Instantly depict the change in current balance after a transaction	Feature to identify or tag spending
Score	5	5	3
Rationale	The application allows Johanna to transfer money via her mobile	Once Zoe has made the payment she can navigate to the homepage (Screen 5) to see the transaction	Mark can make refinements to particular a payment by adding a note or a receipt however, there isn't an option for Mark to only view a list of transaction that he has tag on the homepage (screen 5).

Overall score	12/15	14/15	5/15
Conclusion	The application fulfills some of Johanna's needs like the being able to view all of her transactions etc however, Johanna may encounter some difficulties whilst performing certain task like viewing transactions made 3 months prior, she doesn't have an option to filter view.	The application caters for majority of Zoe's needs. She is able to view the exchange rate of her payments, she is able to see any changes made to her account automatically. She is able to plan a budget for a new month by	The application does not cater all of mark's needs.

Evaluation of Nielsen's 10 Usability Heuristics

Criteria	Score	Comments
Visibility of the system	0	+The application notifies the user every time a new transaction is made. +The application notifies the user about the type of internet connection
Match between the system and the real world	4	+The use of the planner chart which predicts the amount of money the user may have in the future based on transaction history. -The application doesn't allow the user to update their account i.e. change contact details, add new products, i.e. credit cards or have a direct contact with the bank.

		-The application does not provide the user an option to communicate with the bank directly.
User control and freedom	0	+The user has the option to modify each transaction accordingly by either adding a note or uploading a receipt. +The user also has the opportunity to add receipts to a transaction.
Consistency and standards	0	+The prototype is easy to navigate and has clear CTA's for the user to interact with.
Error prevention	0	+From the login page, the user can use their fingerprint to access the app, if the fingerprint is not recognised, then the user would need to input a 4-digit pin. +The user is presented with a summary confirmation before making a payment. This acts as a barrier to the user's decision process.
Recognition rather than recall	3	-The payment page has too many options available which may confuse the user.
Flexibility and efficiency of use	2	- Novice users may have some difficulties trying to understand how to use some of the features within the app
Aesthetic and minimalist design	0	The overall design is not overloading but it is minimalist
Help users recognise, diagnose, and recover from errors	2	The application is slightly complex, especially for novice users.
Help and documentation	5	- No help function was provided.

Prototype #2.

Prototype Name: Amigo

Tool used: Balsamiq Mockups 3

Amigo is the second prototype of a mobile banking application. It can be used for quick management of the bank cards/accounts. The user can perform different type of operations within the application: to keep track of all expenses, to transfer money, to set the goals, to search for the bank ATMs and branches and etc.

Group or Audience Addressed

- Young adults 20-35 years old

Tone of Voice / Tone of the Text

- modern interface;
- clear and widely used terminology;
- informative content of the app;
- many graphical tools;
- high level of visualization.

Influences:

- Modern banking apps created in different countries;
- Bank websites;
- Tools and methods for the expenses analysis.

Rationale: The application “Amigo” was created for the users who have the need to keep track of their money flow regularly. For this reason the app includes developed graphical interface which first of all is represented by the limit diagrams, pie and bar charts, expenses calendars and etc. These tools allow the user to perceive information about their money flows visually and thus to analyze it in more quick and efficient way.

Besides various types of charts and diagrams the app includes many graphical icons which the user should use to perform their operations. These icons are widely used in most of the modern applications such as banking apps, maps, games, notebooks and etc. Thus the user can easily

associate the icons with particular actions and operations which they are going to implement. High level of graphical design is quite important since it provides the user with more full information about their financial state, as well as helps them to save their time understanding functionality of the app.

Informative value is also one of the main features of the app. Once the user logs in they see the essential information about the state of their bank card/account such as balance available, expenses limits and last transactions. On other pages the user can get more detailed information about their expenses and savings using different charts and categorized lists of expenses. They also can effortlessly perform their transfers and payments, set saving goals and control their achievement.

The app is mostly targeted at users who always need to have actual information about their bank card/account state. They also should be experienced smartphone users since the app provide them with plenty of economic information and diverse tools to manage it. For some inexperienced users the app could seem complicated, requiring some time to understand the principles of its work.

Thus the app “Amigo” is supposed to be quite informative and allows the user to perform all essential operations needed for efficient managing of their bank card/account. Below the main pages of the app with all their features are represented.

Detailed information about the prototype

Page 1: Login page

Once the user opens the application “Amigo” on their smartphone they will see the login page where they are allowed to chose one of two possible options:

- to log in via fingerprints system;
- to log in via pin code system.

The fingerprint symbol and the keyboard are displayed on the page straight away, that is the user does not have to make any extra taps.

The user can set log in preferences during his first use of the application and change them later by pressing the “Settings” button in the app.

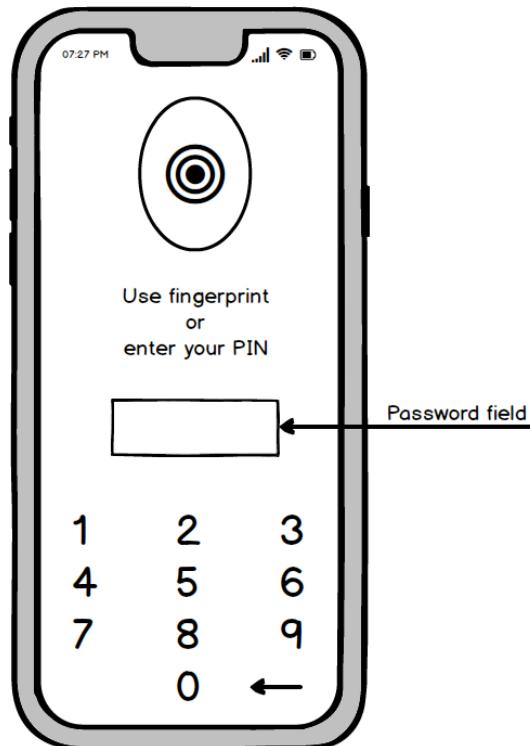


Figure 27: Log in page.

Page 2: Dashboard (Home page)

The dashboard page displays three following areas:

1. Spending diagram: initially the user sets a maximal limit of money which they would not like to exceed within one month. According to this limit the spending diagram illustrates how much money the user has already spent during the current month: the white edge line of the circle stands for the limit, while the black one displays the expenses incurred. In the middle of the circle the user can see the average amount of money they spend per day.

Below the diagram the list of all user's bank cards/accounts with available balance on them is represented.

By pressing "+" button the user can order a new bank product (deposit or card).

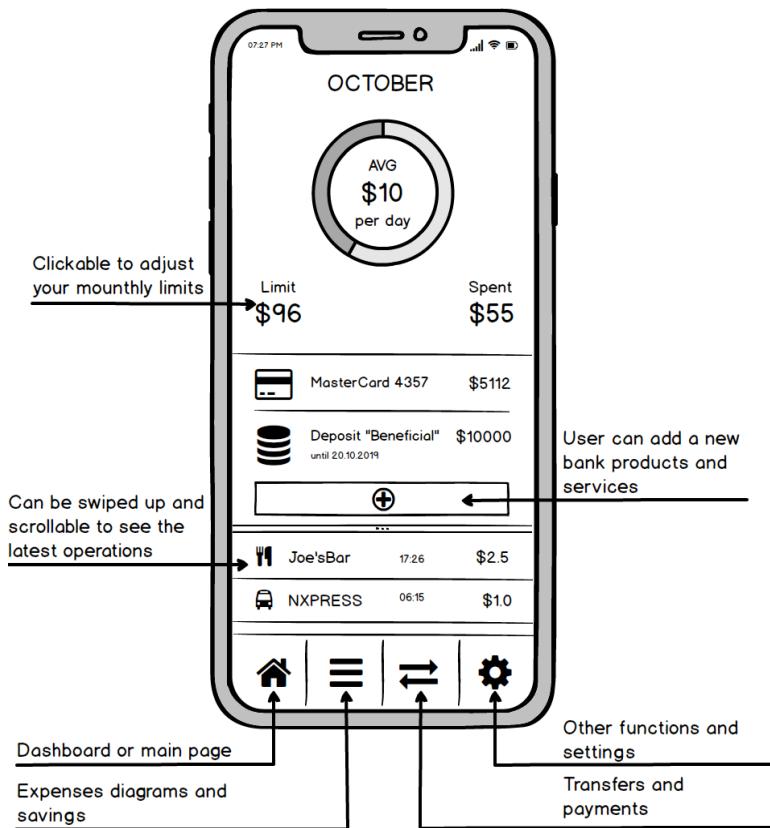


Figure 28. Dashboard page

2. List of transactions - scrolling down the page the user can keep track of all their payments performed from all bank accounts in one list. Each of the payments has the following parameters: when, where and at what time the payment was made, what amount of money were spent.

In order to check all payments made from a particular bank card/account the user can press the icon of this bank card/account at the top of the list.

3. At the bottom of the page there are the following **control buttons which stand for the main functions of the app:**

- Home page button;
- Spending page button (includes expenses diagrams and savings);
- Transfers/payments page;
- Menu page (includes other additional functions).

These buttons are displayed on each page and can be used at any time for switching them.

Page 3: Spending page

At the top of the page the amount of money spent is displayed. The sum is shown for the current month by default but the user can switch the month by pressing the arrows on the left and the right sides of the sum.

In the left and in the right corners of the page the “Calendar” and “Diagrams” icons are placed. These pages present more detailed information about user’s expenses.

The “Calendar” page has the same structure as the simple calendar but with additional information about how much money the user spent each particular day. By pressing the day in the calendar the user can see the list of all payments made within this day.

The “Diagrams” page includes pie and bar charts for presenting detailed graphical information about user’s expenses.

Coming back to the “Spending” all user’s expenses are divided into several categories such as “Restaurants”, “Groceries”, “Transport”, “Pharmacy” and etc. Each of the categories represents the amount of money spent on this particular category during the month and percentage of these expenses in the whole amount of expenses.

On the top of the list the user can switch the card for which the list of categories is represented. By clicking the category the user can see detailed information about all payments made in this particular category.

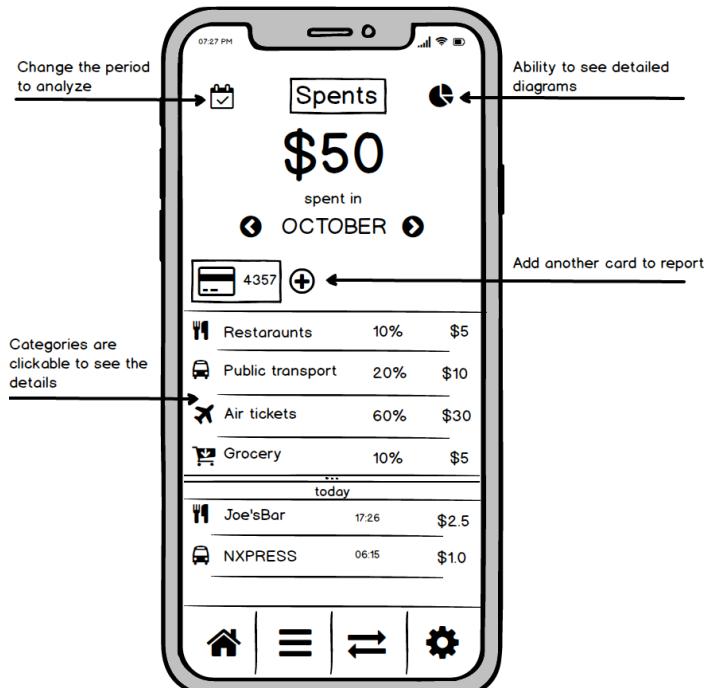


Fig.29. Spends

Page 4: Transfers

The transfer page allows the user to implement different types of transfers and payments.

The following types of transfers are represented in the first group “Transfers”:

- “transfer money between the user’s accounts”;
- “transfer money to the client of Amigo bank”;
- “transfer money to the client of another bank” and etc.

The following types of payments are represented in the second group “Payments”:

- “pay for your mobile phone”;
- “pay for your electricity bills” and etc.

In the third group “Favourites” the user can save data about the payments that he performs regularly in order to avoid the process of filling the gaps every time.

Below the listed functions the user can see the list of all upcoming payments that he has to make.

The app can send the user push-notifications about all their upcoming payments. Notifications can be set in the settings on the “Transfers” page.

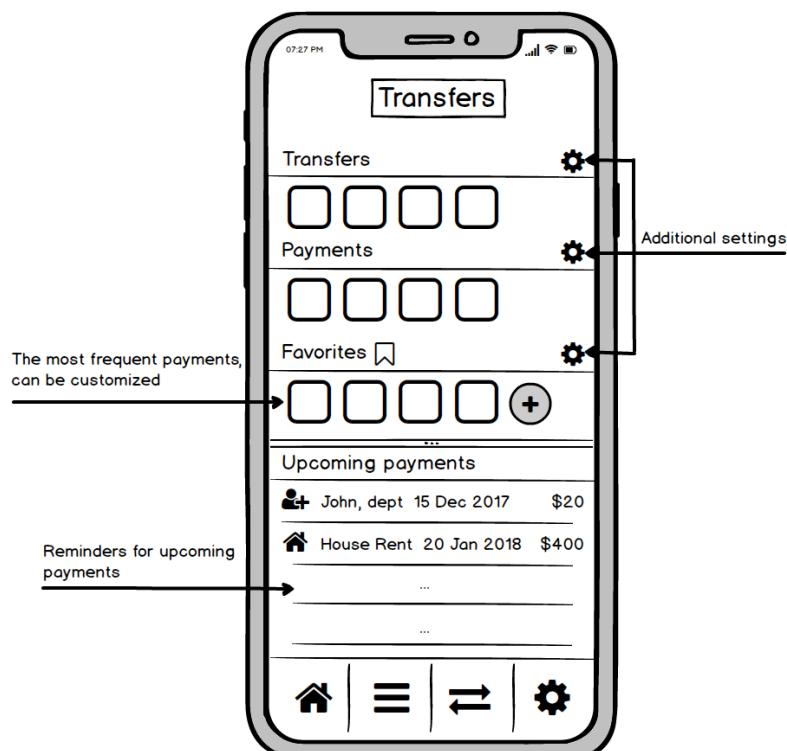


Fig.30. Transfers

Page 6: Menu

The menu page represents the additional operations which the user is allowed to perform. Among these operations are the following:

- *Account details* – user can set and change information about his account in the app;
- *ATM* – search for the ATMs and bank branches around the city and the world;
- *Exchange rate* – user can check the current exchange rates for all world currencies;
- *Investments* - user can set their goal to save particular amount of money by a particular date and control its achievement. According to this information the application calculates the limit of money that the user is allowed to spend during each month. If the user follows this limit they will reach their goal by the end of the period. An example of the investment page is shown below;
- *Chat with the bank* – 24/7 support, user can message to the bank consultant round the clock if they have any questions or problems regarding to the work of the bank.

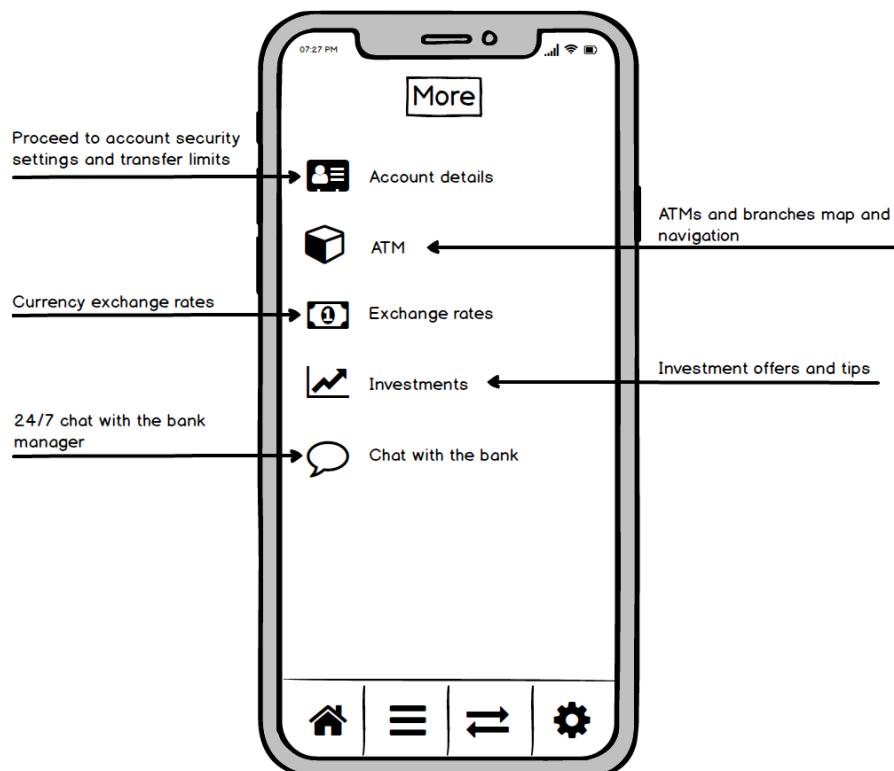


Fig.31.Menu

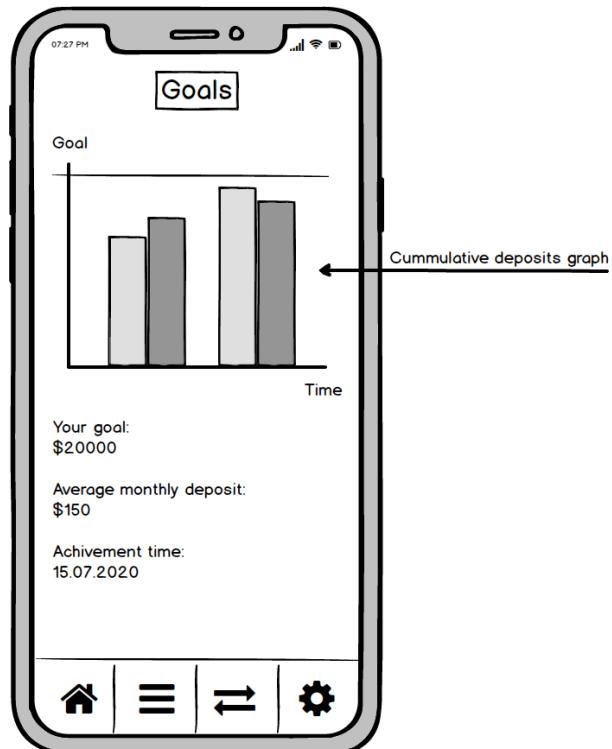


Fig.32. Budgeting and goals

1. Evaluation of Nielsen's ten usability heuristics

Heuristics	Score	Description
Visibility of system status	2	<ul style="list-style-type: none"> - The user can receive notifications about all payments made from their cards. It is very convenient for the user and it is also necessary for security reasons in case when the user's card is stolen. - The user can receive notifications about upcoming payments. - The user cannot receive notifications about change of the type of internet connection. Thus the app does not guarantee the high level of security.
Match between system and the real world	0	<ul style="list-style-type: none"> -The system uses terms that are familiar to the user; the system also has not overloaded, intuitive interface.

		-The system provides the user with chat with the bank – convenient means of communication.
User control and freedom	0	<ul style="list-style-type: none"> - Before completing the transfer/payment the user will be required to confirm the operation (for example, through security code). - All of the changes in settings and limits must be confirmed by the user. - Each page of the app will contain a “back” button that allows the user to come to the previous page.
Consistency and standards	0	<ul style="list-style-type: none"> - The terminology is widely used among different banking systems. Thus most of people are familiar with this type of vocabulary.
Error prevention	2	<ul style="list-style-type: none"> - The system notifies the user about details and possible errors of most important actions (such as transactions). -The system provides the user with an opportunity to use PIN recognition in case of fingerprint recognition failed.
Recognition rather than recall	0	<ul style="list-style-type: none"> - There are many icons used in the application, for example: icons for designation cards, settings, categories and etc. It helps the user to spend less time on finding particular information in the app.
Flexibility and efficiency of use	0	<ul style="list-style-type: none"> -The most important and frequently used functions require as less clicks as possible to perform them.
Aesthetic and minimalist design	3	<ul style="list-style-type: none"> - The pages are filled with necessary information, but some of them could seem overloaded with information (for example, “Home page” or “Transfer page”). - The most important functions are placed on the main pages, that the user has a quick access to them.
Help users recognize, diagnose, and recover from errors	2	<ul style="list-style-type: none"> - All errors are well explained directly in the app. If the user still has any questions they can contact the bank via round the clock chat. - Not all of the actions/operations are provided with error prevention.
Help and documentation	3	<ul style="list-style-type: none"> - There is no any documentation or navigators helping the user to perform their operations in the app.

		- Every user will have an access to the 24/7 chat with a bank consultant. The bank consultant is responsible for helping the user with any kind of issues and problems regarding to: the work of the application, bank operations.
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Evaluation of users' scenarios

	Johanna Rock	Zoe Schulz	Mark
Scenario 1	Check all payments made	Exchanging rate	Changing transfer limits
Score	5	2	4
Rationale	Johanna can see all payments made from her bank cards on the main "Home page". She also can quickly check all payments from a particular card by clicking on the icon of the card.	Zoe can transfer her money but it is not possible to see the exchange rate on the transfer page. So she needs to check it on the "Menu page" which takes more time.	Mark can use the app for changing his transfer limits. If he has any question about this procedure he can contact the bank assistant via mobile app round the clock.
Scenario 2	Pay for water bill	Security notifications	Controlling money flow
Score	5	0	1
Rationale	Johanna can pay her bills using the "Transfer page". She also can save information about the payment in the tab "Favourites". Next time the information about the payment will be filled automatically.	Zoe will not receive security notifications if the internet connection changes. That is she has risks of losing her data and money.	Mark cannot use the app for separating his own and his business expenses. But he can control the amount of money he spends setting limits for his expenses for each month. It is also very convenient for him to fill the calendar with all his payments and set notifications of all upcoming payments.
Scenario 3	Transfer money	Check payments	Business and own expenses
Score	4	5	1
Rationale	Johanna can transfer money to another	Zoe can check all her payments on the main	If Mark has different accounts for his own expenses and for

	account using the “Transfer page”. She also can save the payment in “Favourites”.	page of the app. The process is very quick and effortless.	business, then he can see all payments for each particular account. But if he performs operations from the same account – he will not be able to split his expenses up.
Overall score	15/15	7/15	6/15
Conclusion	From Johanna's point of view the app is quite convenient for daily use. She can perform all kind of operations effortlessly and save a lot of time.	The app does not meet all Zoe's requirements. She would like it to be more efficient and time saving.	As a businessman Mark would like to separate his business and his own expenses. The app does not implement this function but it can provide Mark with detailed information about his payments and partly help to control his money flow.

Prototype #3

Prototype Name: Bank 365

Tool used: Handwritten Mobile White Frames & Balsamiq

Bank365 is the third prototype of a mobile banking application. People can use it to manage their finances, send or request money, or quickly pay a bill from their mobile phones.

Group or Audience Addressed

- Tech-savvy smartphone users
- Young adults, 16-35+

Tone of Voice / Tone of the Text

- Relaxed, friendly, casual, young
- Informal, colloquial terms are used over formal or academic ones
- Text is modern and straightforward
- Use emojis and emoticons when appropriate!

Influences:

- FinTech banking apps (e.g. N26, Monzo, PayPal)
- Social media apps (e.g. Instagram, Snapchat)
- Photography apps (e.g. VSCO, Lightroom)

Rationale: The third prototype of our banking app focuses on the way millennials and users younger than 35 years old use apps. This prototype departs from the traditional banking apps of the market and approaches the design of various FinTech apps (e.g. N26, Monzo) and social media apps such as Instagram and Snapchat. While brainstorming on this prototype, we wanted to create a seamless user experience with flat modern but clean design.

The user experience of this prototype is not limited to motionless screens of a user interface but it also pays a lot of attention on how users navigate through the user interface and what gestures they can use to reach the app's features faster, in a more natural way. An initiative introduced in this prototype is the fact that users can use simple gestures anywhere on the app in order to navigate to the most used features. For example, by pinching-in on their balance screen, like zooming-in a photo, users can zoom-in their balances and find out analytics about their spending habits. These

navigation gestures were firstly introduced in apps like Snapchat. Even though we believe that gestures will be welcomed by tech-savvy, younger users, at the same time, all these features are also easily reachable by non-tech-savvy users from the main screen by simply touching the “+” button.

In addition to gestures, the tone of language plays an important role in the user experience that this prototype offers. Often neglected in other mobile banking apps, we believe that language could be our unique point to reach younger users. No matter how good UI an app has, it cannot truly penetrate younger audiences if it does not speak to their language. We have picked relaxed and friendly language, totally different from the language traditionally used by banking apps as we mainly aim engaging younger adults 16-35+. Even though we decided to use straightforward, mainstream language the used language should always communicate the correct and clear meaning, leaving no ambiguity to the reader.

Last but not least, we believe that banking apps will integrate more and more features in the future. While creating this model, we wanted to adopt an agile and scalable design that it is easily modifiable and at the same time, the addition of more features in the future should not frustrate existing users. The vast majority of the existing banking apps lack this functionality. It is common thing that even the introduction of a minor new banking feature, usually requires major reformation of the existing app design. Having that in mind, we have reserved space and gestures for future features (e.g. zooming-out, moving up or swipe right the main screen). At the same time, we carefully designed a simple “all features” tab with limited graphic elements in order to be able to enrich the app with new features in the future, in a way that is easily digestible by users.

An in-depth analysis of the screen can be found below. At the end of the analysis, a storyboard can be found that contains all the screens.

Screen 1 - Log In

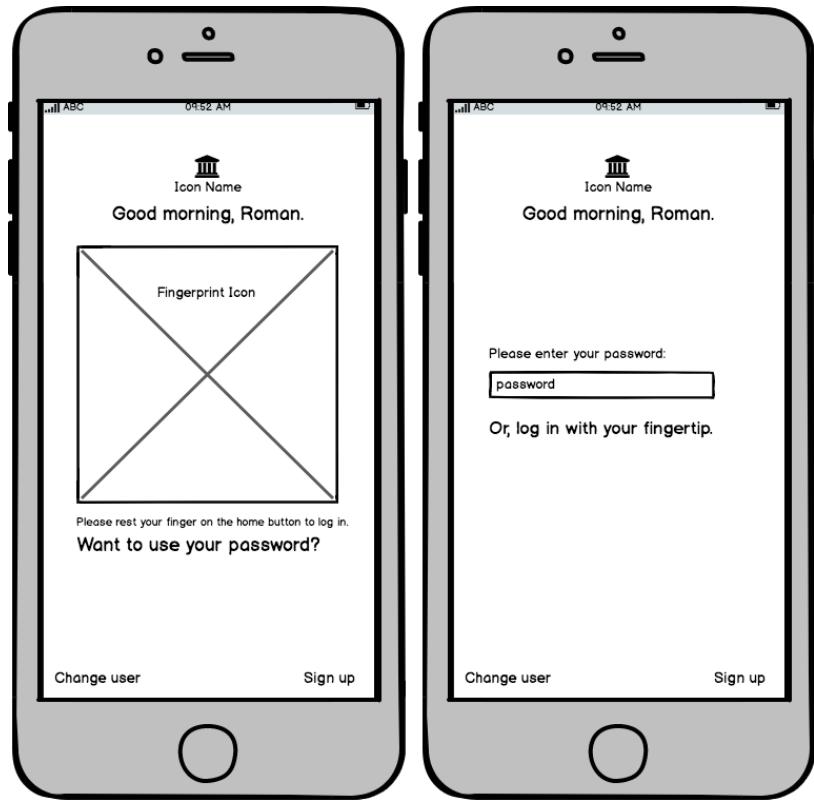


Figure 33 - Login Screen

Assuming that users have already registered to Bank365, the following screen lets them login. Due to security reason, every time users open the app they should login. In order to make this process fast and secure, we introduced fingerprint recognition functionality. An alternative for using a password is provided for instances that fingerprint recognition is not suitable (e.g. when users wear gloves or have wet hands). Additionally, for security reason for each purchase, live push notifications are being sent to the user. If users enter a wrong password more than 5 times, their account is temporary locked and they immediately receive a call from customer support to prevent fraud incidents.

As depicted in Figure 3.1, at the very top of the Login screen, a greeting is the first element users see e.g. "Good morning, First Name". As we want to ensure that the app does not feel static, the greeting will change throughout the day according to the time.

As Bank365 does not have physical branches, we want to ensure that users still enjoy a personalized experience. The name of the user follows the greeting, thus adding a personalized first touching point with users.

At the very bottom of the screen, options to “Change user” or “Sign up” for a new account are provided.

Screen 2 - Introducing the App for the First Time

When users login for the first time, a screen with instructions how to use the “gestures” is provided as seen in the Figure 3.2. Taken into consideration that most users will skip this screen without reading it, a few more messages and in-app gestures suggestions will be provided while users use the app. These in-app guides should be significantly shorter than the message of this introductory screen and should not take more than 5 seconds to be read to avoid users being disturbed.

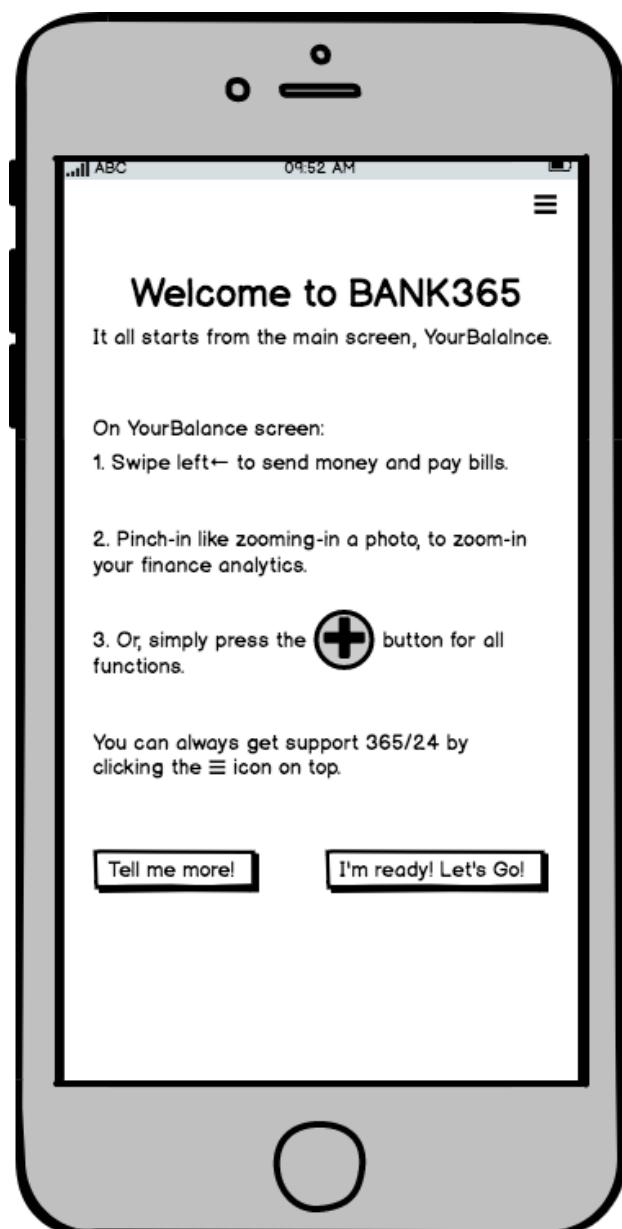


Figure 34 - Initial Introduction Screen

Screen 3 - The Main or “Your Balance” Screen

This is the main and the most important screen of the app, it is called “Your Balance” screen.

It all starts with “Your Balance” screen

1. *Swipe left ← to send money and pay bills.*
2. *Pinch-in like zooming-in a photo, to zoom-in your finance analytics.*
3. *Or, simply press the “+” button to see all features.*

You can always get support 365/24 by clicking the ≡ icon on top.

The initial element users notice on this screen (Figure 3.3) is the current balance, depicted with big bold letter in the center of the screen. Then, below that, users can see their 3 most recent transactions. Each transaction is automatically categorised (e.g. Groceries, Bar & Restaurants, Leisure, Books) and each category has its own icon that allows users quickly identify what the transactions was about.

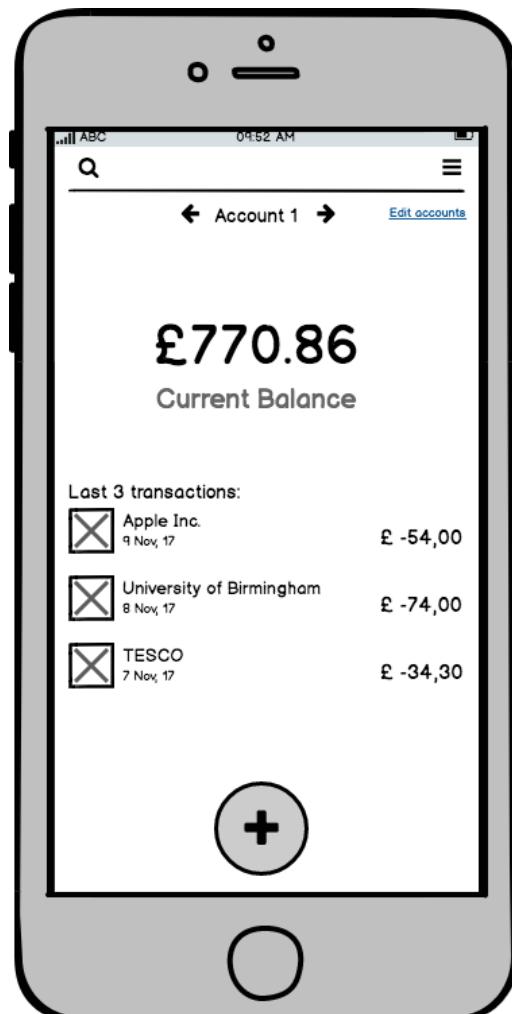


Figure 35 - The Main or “Your Balance” Screen.

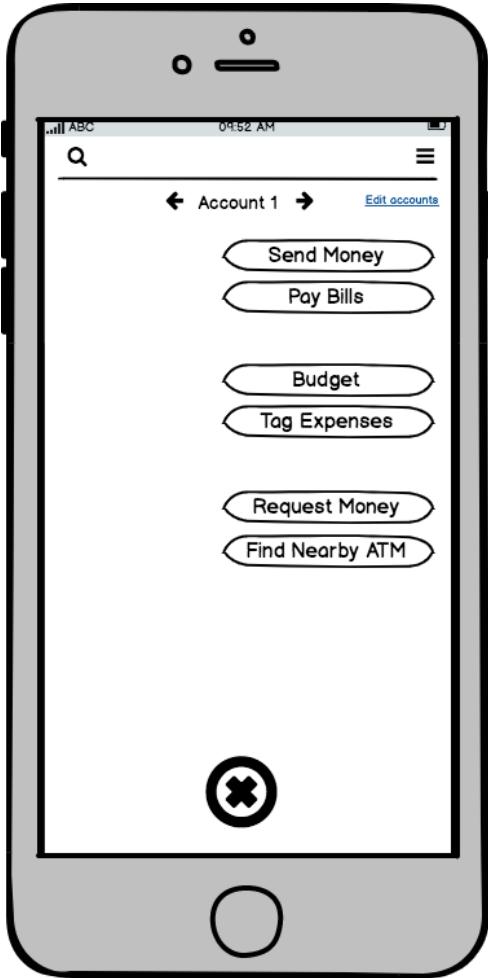
On the top of this screen a search bar powered by artificial intelligence is available where users can search previous transactions and features. By selecting the Options \equiv icon at the right, top users can get information about their accounts, credit cards or get 365/24h customer support.

Below the search bar, users can navigate through their accounts. By tapping “Edit accounts”, users can select their main account or even change the name of their accounts (e.g. Personal Account, Business Account, Children’s Savings Account).

By pressing the “+” button at the bottom of the screen, users can access all the features of the app.

Screen 4 - The All Features Screen

When pressing the “+” button from the main screen users, the “+” transforms into an “x” button and all the features of the app are revealed as seen in Figure 4.4. The search bar, the \equiv icon as well as the account selection bar remain in the same position to maintain coherence. By pressing the “x” button, users return to the main screen.



Screen 36 - The Main or “Your Balance” Screen

This screen is designed to highlight only the features of the app. To make the selection easier and the features more readable, each feature takes an entire line so users can scan them vertically. The left part of this screen should not be used to avoid confusing users. The features are grouped by categories with larger spacing between each category (e.g. Category 1: Send money, pay bills, Category 2: Budget, Tag Expenses). In the future, the most used features could be highlighted, placed on the top of the screen or add an extra button so users can decide which functionalities they want on the top.

While designing this screen, we wanted to create a screen that can be easily moderated and modified in the future as more features will be introduced in banking apps by banking institution in the future. By adopting this simple design, new features can be added without the need of redesigning the entire app. This scalability issue is often neglected in traditional banking apps.

Screen 5 - Transfer Money Screen

Users can transfer money or quickly pay bills by selecting the “+” icon from the main screen and then selecting the “Transfer Money” or “Pay Bills” feature. Alternatively, they can instantly access the “Transfer Money” screen by swiping right anywhere on the app. The swipe right gesture was selected because swipe right, resembles the action of “sending something away from the device”.



Figure 37 - Transfer Money Screen

Taking into consideration that the concept of “Transfer Money” and “Pay Bills” is very similar, the design should be kept similar too as in Figure 3.5. At the top of the both screens the back (<) and “hamburger” (≡) buttons are placed and below them user can view and select the account they would like to control. At the bottom right corner of the screens, a large button with friendly text is placed. The button is placed on the right side of the screen to reveal the fact that by selecting this button users will go to the next “step” which is a pop-up box to confirm the transfer.

For the “Transfer Money” screen, in the middle of the screen users can select the amount of money they want to transfer, the currency and the recipients’ details (such as IBAN, name, or sort & swift

codes etc.). Users can select if they want this transfer to be repeated in the future but by default the option “Never” is selected.

The “Pay Bills” screen is different in terms of input needed by the user. Instead of typing recipients’ details, users can quickly search the information of the company or service they want to pay (e.g. O2, HMRC etc).

Screen 6 - Budgeting Screen

In the Budgeting Screen users can see their spending habits and quickly compare their current monthly spending with their previous 4-month average spending. At the bottom of the screen, they can select if they want to see further analysis and visually pleasant graphs. Additionally, they can request help with saving money.



Figure 38 - Budgeting Screen

When selecting help with saving money, two choices of savings are selected for users by an artificial intelligence system based on their income and spending habits. Alternatively, at the bottom, they can quickly fill in a form explaining how they would like to save money. We are aware that only a few users will fill in this form but while designing the app we wanted to have this option there for visibility to ensure customer service of high quality. As Bank365 does not have physical branches, we wanted to make sure that users feel that they are taken care of. By filling in this form, users are actually connected to the 365/24h support which lets them know if their proposed way of saving money is available.

From the budgeting screen, users can tap on “Add tags” feature which silently lies at the right of the amount users spent during the last month. By clicking this button, they are navigated to a screen that lets them add tags on their spendings and earnings transactions. This functionality is expected to be used only by experienced users and it can also be reached from the “+” button from the main screen.

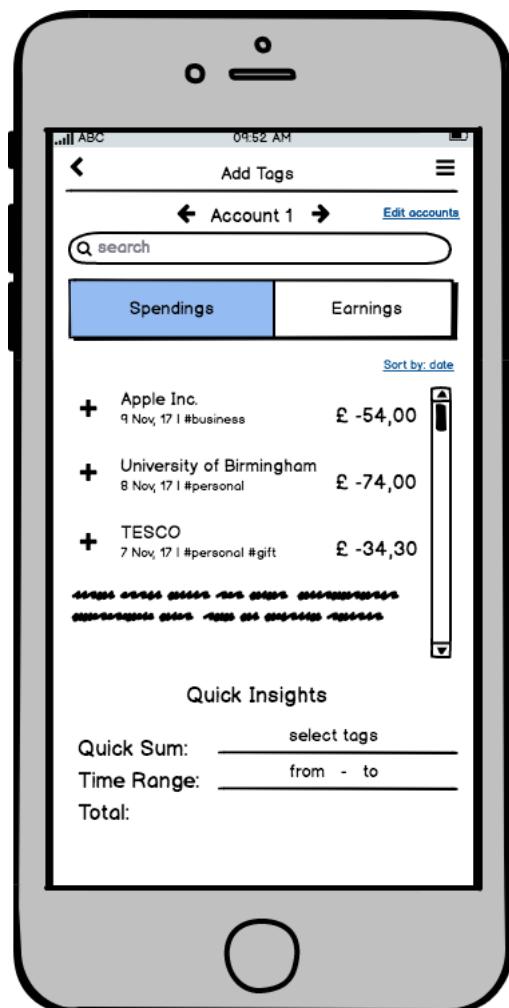


Figure 39 - Budgeting Screen

The evaluation of the third prototype will be based on Nielsen's 10 Usability Heuristics and the evaluation of the scenarios of the three personas that were presented before.

Evaluation the third prototype with:

1. Nielsen's 10 Usability Heuristics
2. Evaluation of User Personas

Evaluation of Nielsen's 10 Usability Heuristics

Heuristics	Severity Rating	Description
Visibility of system status	1	+ Users receive live push notifications about changes in the balances. - Users do not receive security notifications about changing internet network connection (e.g. when connecting to a non-secure WiFi). Expert users that care about the security mind find this issue alarming.
Match between system and the real world	1	+ Gestures control (e.g. zoom-in Your Balance for insights as you zoom-in a photo, or swipe left to send money) add a live notion to the app. + Banking terminology is avoided, the language is friendly and simple. - Older users might find the language too friendly for a banking app.
User control and freedom	2	+ User are not allowed to go further than 2 screens away from the main screen for the majority of features. That way, they can always quickly return back to the main screen. + Gestures let them reach frequently used features instantly (e.g. by swiping right, or zooming-in) - The app is designed to be easily digestible to users, as a result it cannot accommodate the needs of expert users that might need customized features such as professional investment plans or complex banking products . - The app is designed mainly for personal banking. Although, freelancers can benefit from this design for their personal business, bigger businesses might struggle keeping their finance using this prototype.
Consistency and standards	0	+ Features have been built in a consistent way. - This consistency might be negative for expert users who would like highly customizable banking options or private wealth clients.

Error prevention	2	<ul style="list-style-type: none"> - Security has been sacrificed in order to provide faster transfers and payments. In the "Transfer Money" screen, users might make mistakes as only the minimum safeguards have been adopted in addition to a confirmation box for each transaction. However, we accept this drawback in order to achieve faster actions. + A 365/24/7 support Chat has been added to balance the previous drawback. In the future, an integration with a Facebook Messenger Bot could be available.
Recognition rather than recall	0	<ul style="list-style-type: none"> - While we provide numerous features to users, we wanted users not to get further than 2 screens from the main screen. The main "Your Balance" screen acts as an anchor and almost all functionalities are within a range of 2 screens. That way, user's memory load is minimized.
Flexibility and efficiency of use	4	<ul style="list-style-type: none"> + The search bar on the top allows users to flexibly search features that they want. In addition to the Search Bar, they can access features with gestures or by clicking the + symbol. - Features are designed to work fast, even though that might lead to problems in terms of security. - For security reasons users have to log in every time they tap the app. That will lead to delays. - No options have been provided to quickly control user's credit card. Users should be able to lock/unlock or change the PIN of their credit card through the app. This should be fixed in the next generation prototype.
Aesthetic and minimalist design	0	<ul style="list-style-type: none"> + The design is considered minimal without information that are not useful to the users.
Help users recognize, diagnose, and recover from errors	1	<ul style="list-style-type: none"> + The design addition of the 24/7 Chat can quickly provide solutions and correct errors related to transfers + Users can quickly reach the home screen at any time allowing them to easily recover from errors.
Help and documentation	1	<ul style="list-style-type: none"> + Every user will have access to the 24/7 chat with a bank consultant by clicking the ≡ icon + Brief in-app guides appear sporadically to first-time or inexperienced users.

Evaluation of User Personas Scenarios

*Scale 1 - 5 (1: Does not accommodate the scenario at all - 5: Fully accommodates the scenario)			
User Personas Scenarios	Johanna (International Student)	Zoe (Young Parent)	Mark (Young professional)
Scenario 1	Check all payments made during the previous month	Display exchange rate before a transaction	Changing transfer limit and 24h customer support from mobile phone
Score	3	5	2
Rationale	The app enables Johanna to see all the payments made from her accounts and allows her to easily get spending insights.	The exchange rate can be instantly seen in the “Transfer Money” page the moment she selects the currency and the amount she would like to transfer.	Mark can quickly modify his transfer limit from his mobile phone but he can't modify directly the limit of his card as he has to reach customer support for that.
Scenario 2	Pay for water bill quickly from her mobile phone	Notification about the security of the network	Notifications about upcoming payments
Score	5	1	1
Rationale	Johanna can quickly pay her water bill from the “Transfer Money” or “Pay Bills”. In particular, from the “Pay Bills” screen she can quickly search for the water company without having to know the company's bank account.	Zoe will not receive any security notification regarding the networks she is connected.	The app can't accommodate Mark's requirement to have notifications about upcoming payments.
Scenario 3	Transfer money instantly from her mobile phone	Instantly depict the change in current balance after a transaction	Feature to identify or tag spendings
Score	5	5	4

Rationale	Johanna can quickly pay her water bill from the “Transfer Money” or “Pay Bills”.	Current balance is instantly updated in the app after a purchase.	The app allows Mark to add tags to his costs. That way he can separate the costs between his projects and his personal spendings.
Overall score	13/15	11/15	7/15
Conclusion	Johanna can benefit from using the app to transfer money and pay bills. She can also have access to basic spendings and earnings analysis.	The app meets the functional requirements Zoe has as a user but it does not meet Zoe's security requirements.	Mark can't really benefit even if his requests were not that complex. The next prototype should allow users to accommodate user needs similar to Mark's needs such as seeing upcoming payments and controlling credit card through the app.

Summary

All three prototypes offer a simplistic design and they all include the basic functions that would allow a user to view their current transactions and make payments via their device. However, after reviewing the heuristic analysis and the evaluation of the user personas, it was clear that further improvements were needed.

What went wrong

- All three of the prototypes did not offer any support that would help a user to perform certain operation within the application. Although prototype two offered a feature that allowed a direct contact with the bank, it would also be beneficial to implement help icons on certain sections so that the user doesn't have to keep contacting the bank for help.
- We realised that adding too many features on a particular section may become too overwhelming for a user and may prevent them using the application.
- When evaluated against the persona scenarios, all three prototypes performed badly against the young professionals. The scenarios that performed the worst was 'Notifications about upcoming payments' and 'Feature to identify or tag spending'.
- Trying to balance high level of security and developing a good design is a difficult task, as increasing the level of security may result in poor designs. However, due to the nature of the application, it is a feature that must be included for the second-generation prototype.

What went well

- All three prototypes were designed with a minialitics approach.
- The use of icons to describe the different categories (as shown in prototype one and two) is a good feature to carry over to the second-generation prototype, as they are easy to comprehend what they are.
- We liked the 'Overview of accounts' in prototype one as opposed to prototype two. It would make logical sense to provide a user a clear overview of their accounts in which they can select an account to view further information. We felt that the way this feature was implemented in prototype two, was too complex and hard to comprehend. As a result, the account overview from prototype one will be carried over to the second-generation prototype.
- We liked how the data visualisation was implemented in prototype two. It allows the user to easily comprehend information about their account and help them to identify any issues quickly. We decided to use this feature for the second-generation prototype as we want to re-invent a way of designing a page that the user can read the information in a simple format.

- We liked how the gesture controls were implemented in prototype three. It allows a user to easily navigate throughout the application without the need of performing unnecessary actions to get to where the user wants to be. However, we felt that some of the gesture controls were unintuitive like the pinch-in function to zoom into the finance analytics. For the second-generation prototype, we decided to include this feature but only include a swiping gesture (swipe left or right) which will allow a user to view the same information but for a different account.

Second generation prototype.

Rationale of tools used to build the second generation prototype

More than five alternatives were evaluated before deciding which tools should be chosen to build the draft and the final version of the second generation prototype.

We considered using the Balsamiq tool, which was used to design the first generation prototype. By using Balsamiq, all team members would be able to contribute to building the second generation prototype by quickly visualizing ideas and provide feedback to each other with a tool that acted as a “common language” between all team members.

While designing and evaluating the first generation prototypes, a common mistake that was noticed was the inclusion of too much information in screenshots built for a mobile screen. Considering that, we decided to experiment with more prototype tools that would allow us to create a higher quality mockup app that could be executable on a mobile phone. In that way, the evaluation of the second generation prototype could be more accurate as it would be done by directly running the mockup version of the app on a mobile phone.

Before choosing the Proto.io prototype tool for the final version of the second generation prototype, a few more alternatives were taken into consideration. For example, Adobe XD CC was evaluated by the team but its complexity led to searching for an alternative that would be easier to learn. Proto.io provided the functionality to create a mockup app that could be run on a mobile phone and at the same time, Proto's user interface was one of the easiest to learn. In addition, Proto's design elements such as the navigation bars, the buttons, iOS and Android graphics etc were closer to the aesthetic we would like to have in our prototype. Proto was also a low-cost solution as it offered a

free trial version. Overall, Proto.io was chosen as it was an effective, simple, easy to use and low-cost solution.

Description of prototype.

The link to a working mockup version of the second generation prototype can be found below:

bit.ly/2jov1xw

Screen 1: Login landing page.

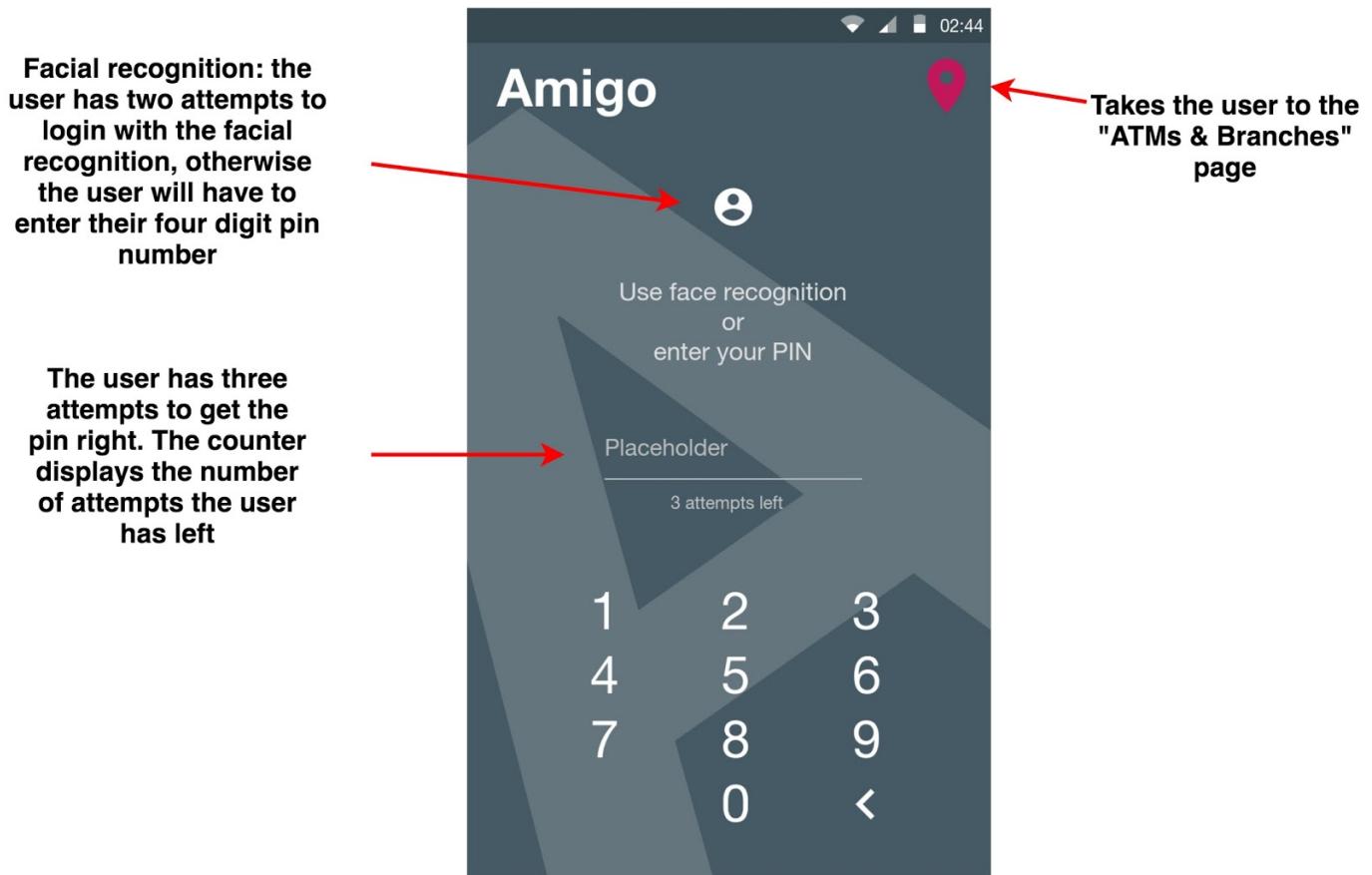


Figure 40: Login screen

The first page that the user will see, once they have opened the application, will be the login landing page. This page consists of two types of authorisation methods which will allow the user access to the app:

- face recognition
- a four digit pin number

The “Location” button in the right corner of the page provides an opportunity to find the nearest ATMs and bank branches using user’s current location.

Screen 2: Unsuccessful login.

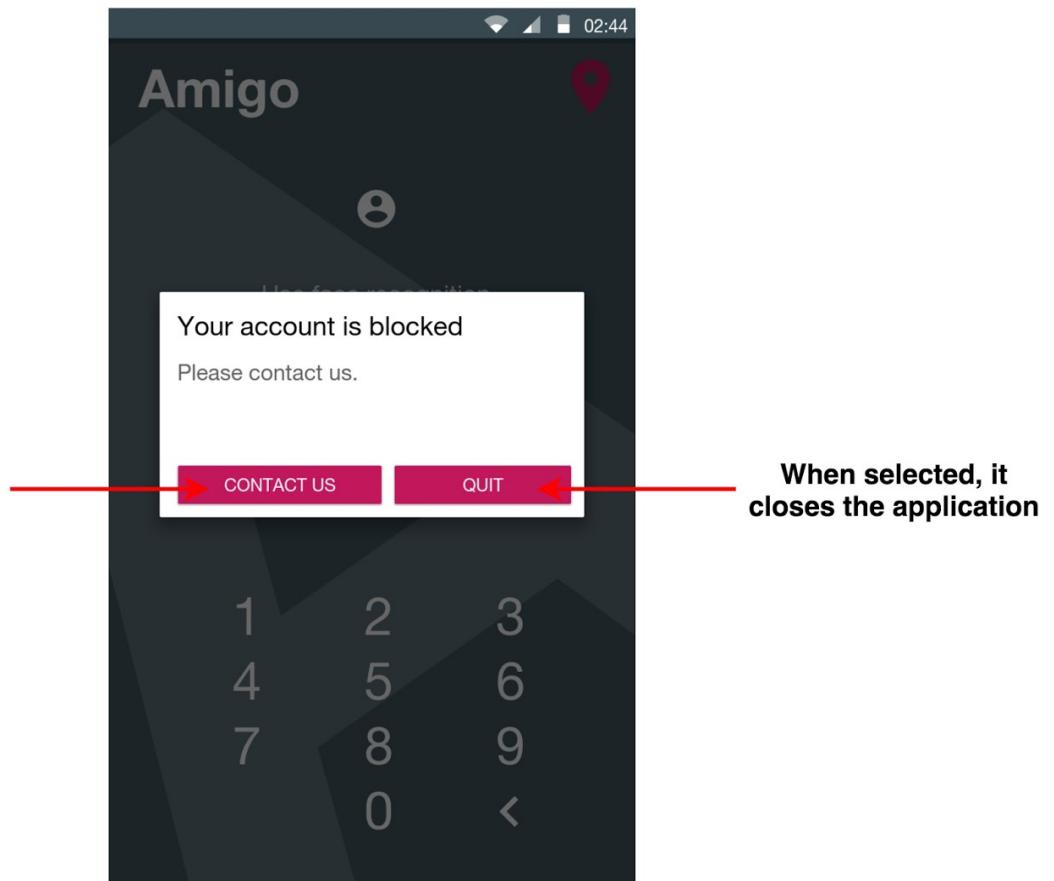


Figure 41: Unsuccessful login

If the facial recognition does not work, then the user will have to enter their pin in order to gain access to the application. The user is given three attempts to enter the correct pin otherwise they will be locked out of the application and they will have to contact the bank to re-gain access.

Screen 3. ATMs and Branches

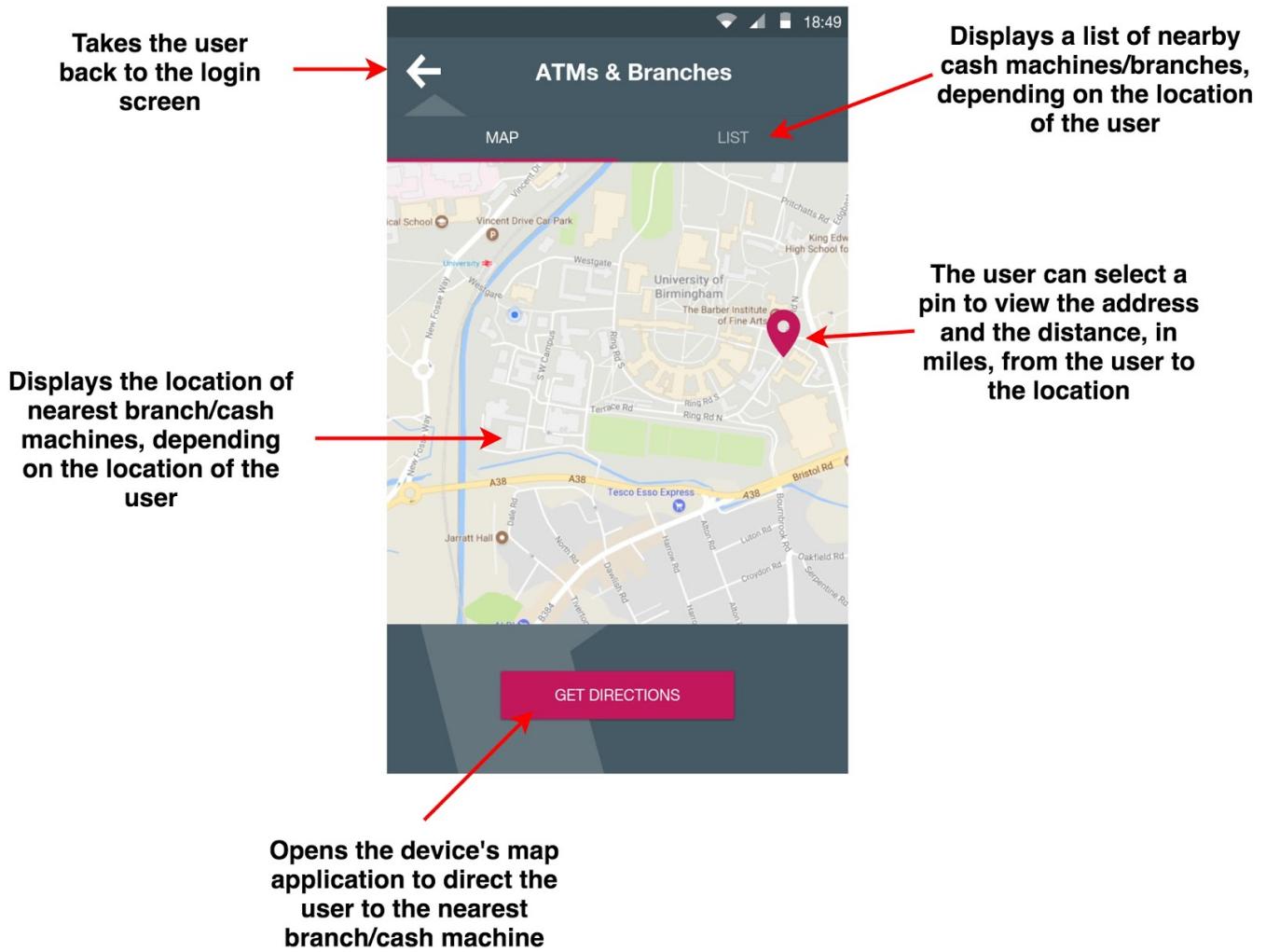


Figure 42: ATMs and Branches

The “ATMs & Branches” page represents the information about the location of all ATMs and branches of the bank.

The user is allowed to search for ATM and branches by two methods:

Method 1: The user can tap the “Map” button to see the location of all the ATMs and branches on the map

Method 2: The user can tap the “List” button to find a list of all ATMs and branches addresses

The user can also take advantage of the “Get directions” function. Once they press the button the app determines their location using GPS system and shows the fastest and the most convenient ways to get to the bank/ATM.

Screen 4: Homepage 1 - select your account

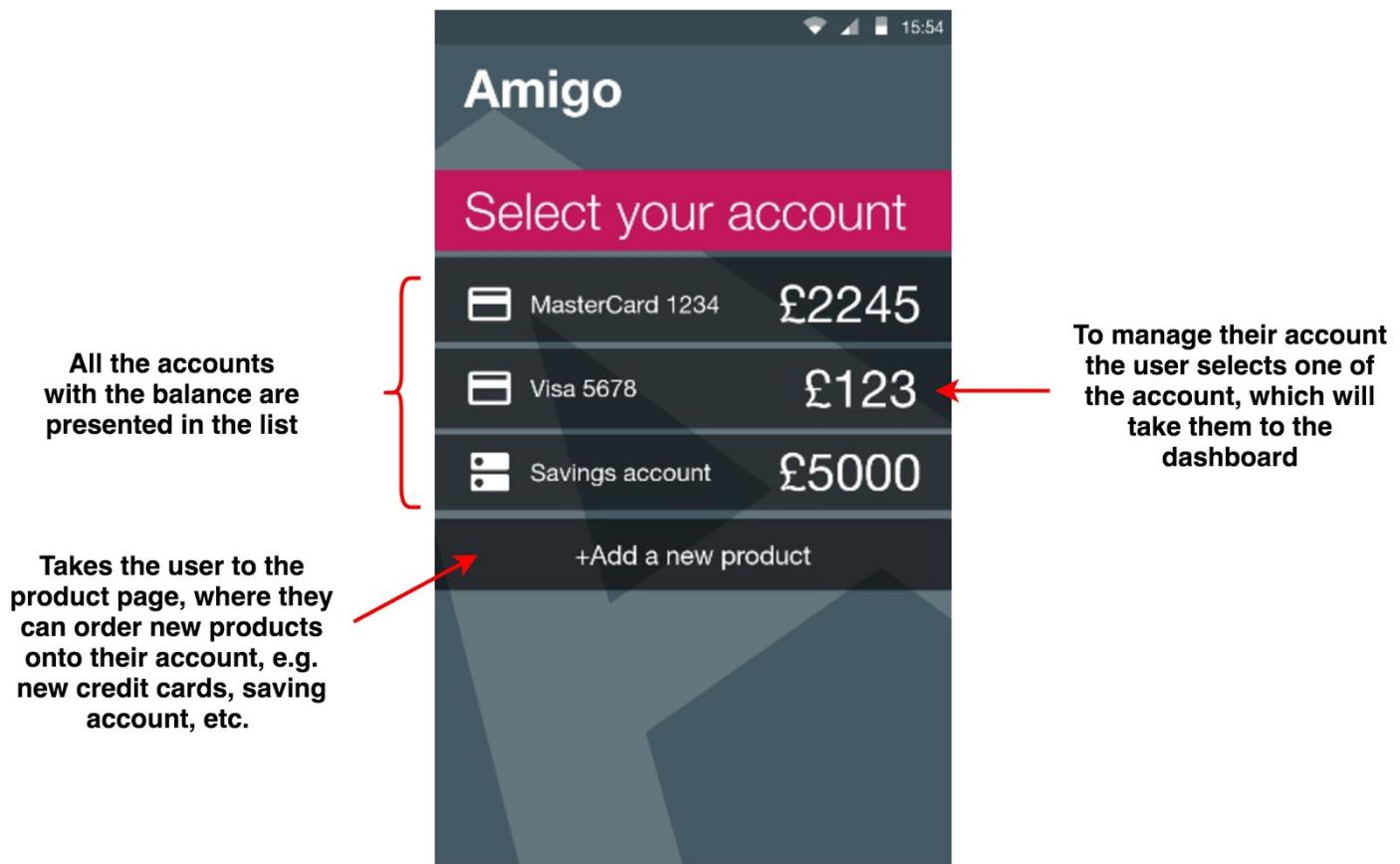


Figure 43: Homepage

The “First” page is the page that the user will see once they log in to the app. The page includes the list of all user’s bank cards and savings accounts with the current balance available on them.

If the user has only one bank card/account they will be automatically transferred into the next “Home” page. So the user will not see the “First” page since it would cause one extra tap.

Screen 5: Dashboard



Figure 44: Dashboard

The “Dashboard” page represents general information about the bank card/account state:

- 1) The current balance available;
- 2) The chart that illustrates the general amount of user’s expenses for a particular period of time, where:
 - the whole circle (thin pink line) stands for the limit of expenses which the user would not like to exceed during the period of time given;

- the thick red line stands for the amount of money that the user has already spent by the current date;
- the average sum in the middle of the circle is the amount of money that the user spends per day (calculated automatically by the app).

The user can set the limit settings by pressing the “**Limit**” button in the left corner of the page. When they press the button a small overlay appears on the screen. The overlay allows the user to set the following information:

- the limit of expenses;
- the period of time for which the limit is set for.

When the data has been entered the user can either save or cancel the changes made.

The white area at the bottom of the page represents the **list of all payments** made by the user in chronological order.

The application also includes several **General buttons** which are applied for most of the pages in the app:

1) Buttons for switching the bank card/account

The name of the bank card/account which the user is managing at the moment is displayed at the top of the page. There are also two arrows on the left and on the right sides of it which allow the user to switch the bank card/account by swapping the page. That means that the user does not have to go back to the “First” page to change their card/account.

2) Main controlling buttons

The main buttons displayed at the bottom of the page allow the user to switch between the main parts of the app:

- “Dashboard” page button;
- “Transfers” page button;
- “Expenses” page button;
- “More” page button.

Screen 6: Transfer money

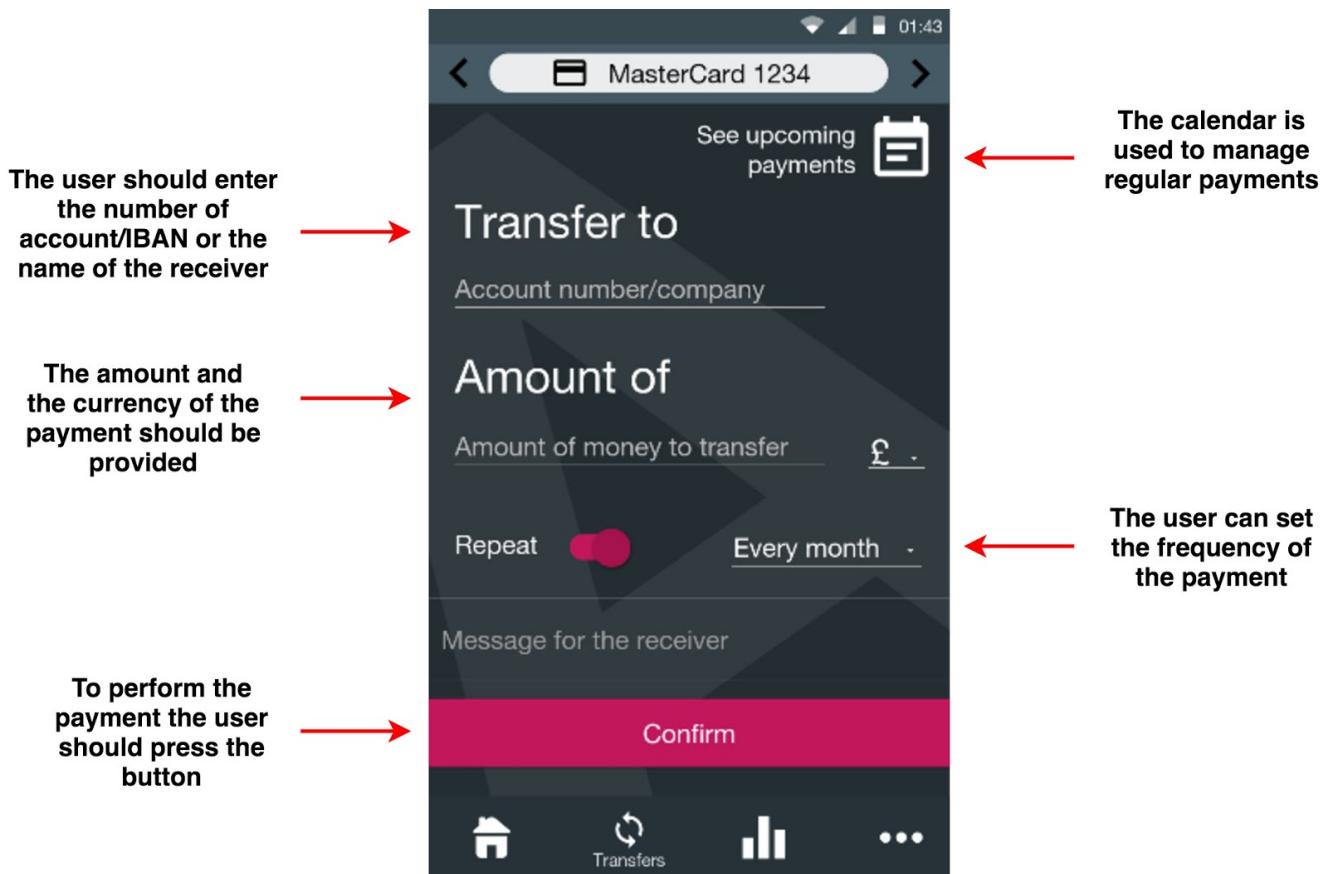


Figure 45: Transfer money

The “Transfer” page is used for any type of money transfers and payments.

Once the user start typing the data into the first field the system automatically determines what type of data is been typing. If it is a name of a person or organisation then the user will be given a list of all appropriate names which match their input. For example, if the user has typed “Jo”, they could see the following list given by the app: “Johanna Rock”, “John Smith”, ... The list is formed on the basis of the user’s previous payments and companies database. It means that when the user repeats their payment they do not have to fill the same information every time again. This information will be automatically filled by the app if the user chooses the name from the list.

This system works the same way with IBAN and account numbers. Once the user starts typing IBAN the system will offer them the list of all probable IBANs. Also the additional field for the swift code will appear below the IBAN. The swift code field is supposed to be filled by the user as well.

When the user starts typing the account number the system will show them the list of all appropriate account numbers and the additional field for the sort code will appear below the account number. This sort code field is also has to be filled by the user.

There is a “Calendar” sign in the right corner of the screen which allows the user to check all their upcoming payments. The user can also change the date/amount/frequency of their payments by pressing the button.

When the transfer/payment is coming the user receives a pop-up notification from the app. The time and frequency of these notifications are also set in the “Calendar” by the user.

Screen 7: Transfer Confirmation

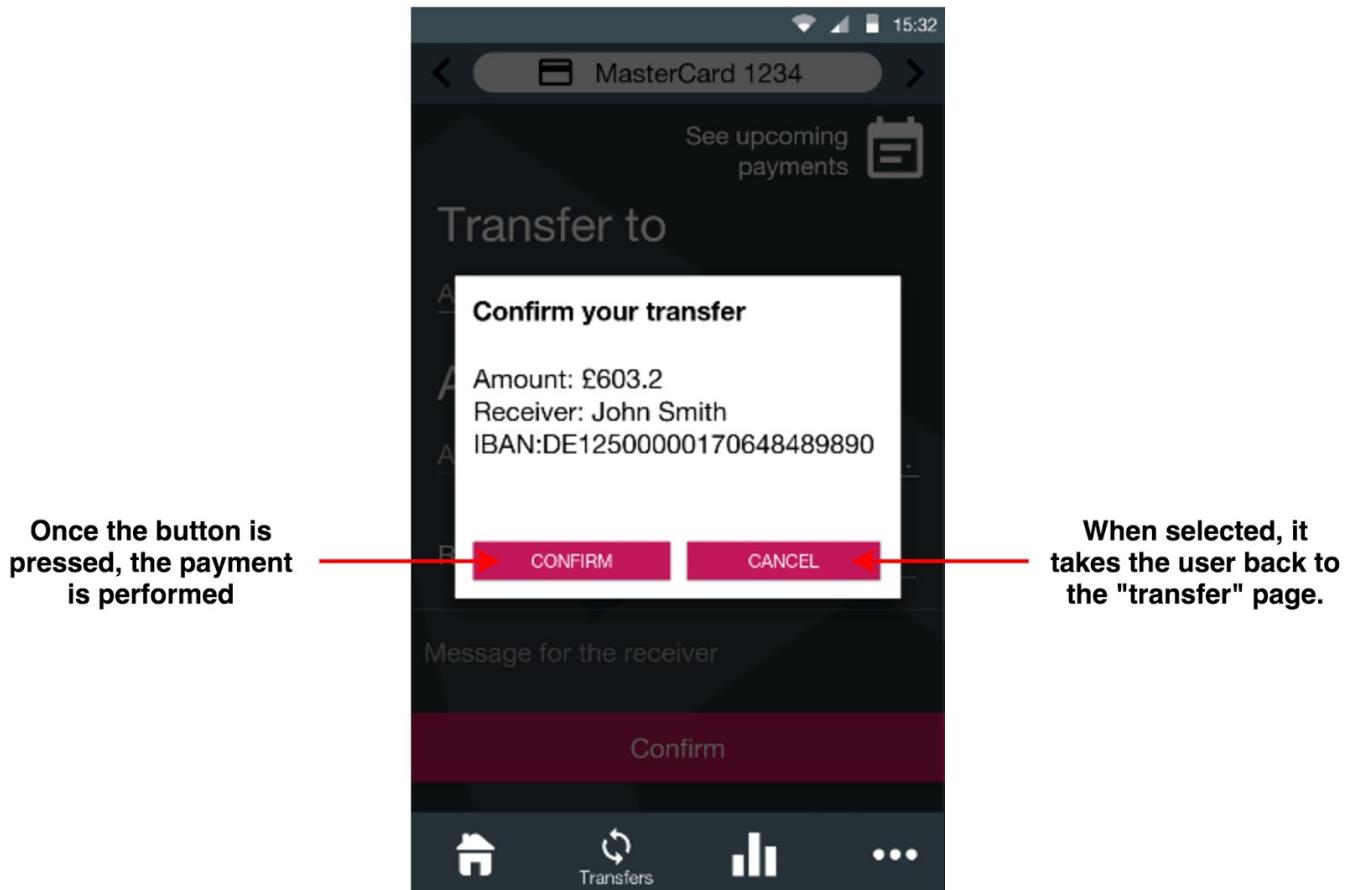


Figure 46: Transfer confirmation

If the information has been entered correctly the user should press the “Confirm” button to complete the payment. Otherwise they are allowed to click the “Back” button and make changes.

Screen 8: Expenses

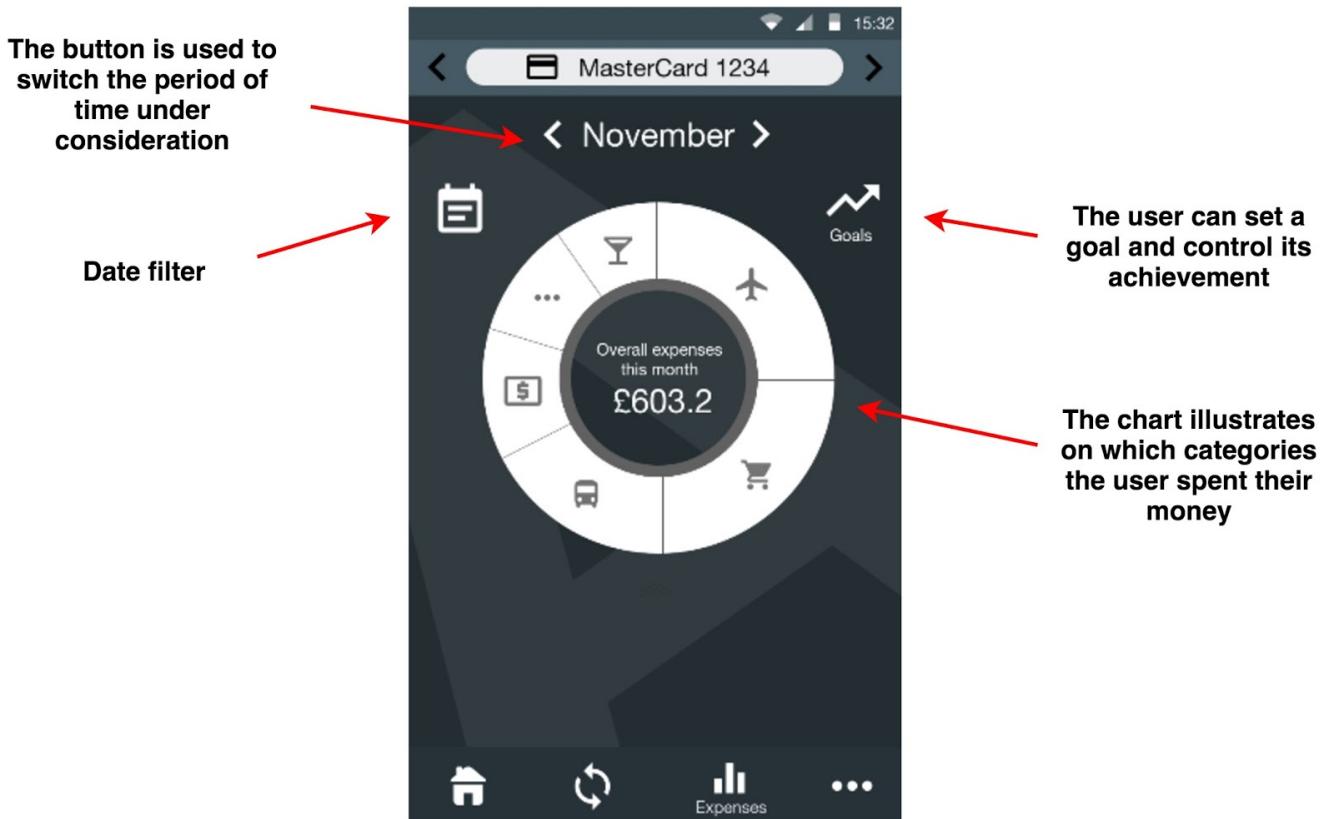


Figure 47: Expenses

The “Expenses” page gives the user an opportunity to see more detailed categorized information about the amount of money they spent during the particular period of time.

The chart in the middle of the page illustrates on which categories the user spent their money during the period of time given. As soon as the user opens the page they see the overall amount of their expenses in the middle of the chart. If the user needs to check all payments made for a particular category they should press the icon of that category (Figure 48).

The user can also make use of two additional functions which are provided on the “Expenses” page:

- 1) The user can see all their expenses made during a particular date or period of time by pressing “Calendar” button (date filter).
- 2) The user can set a particular goal and control its achievement by clicking “Goal” button (Figure 49).

Screen 9: Expenses interacted

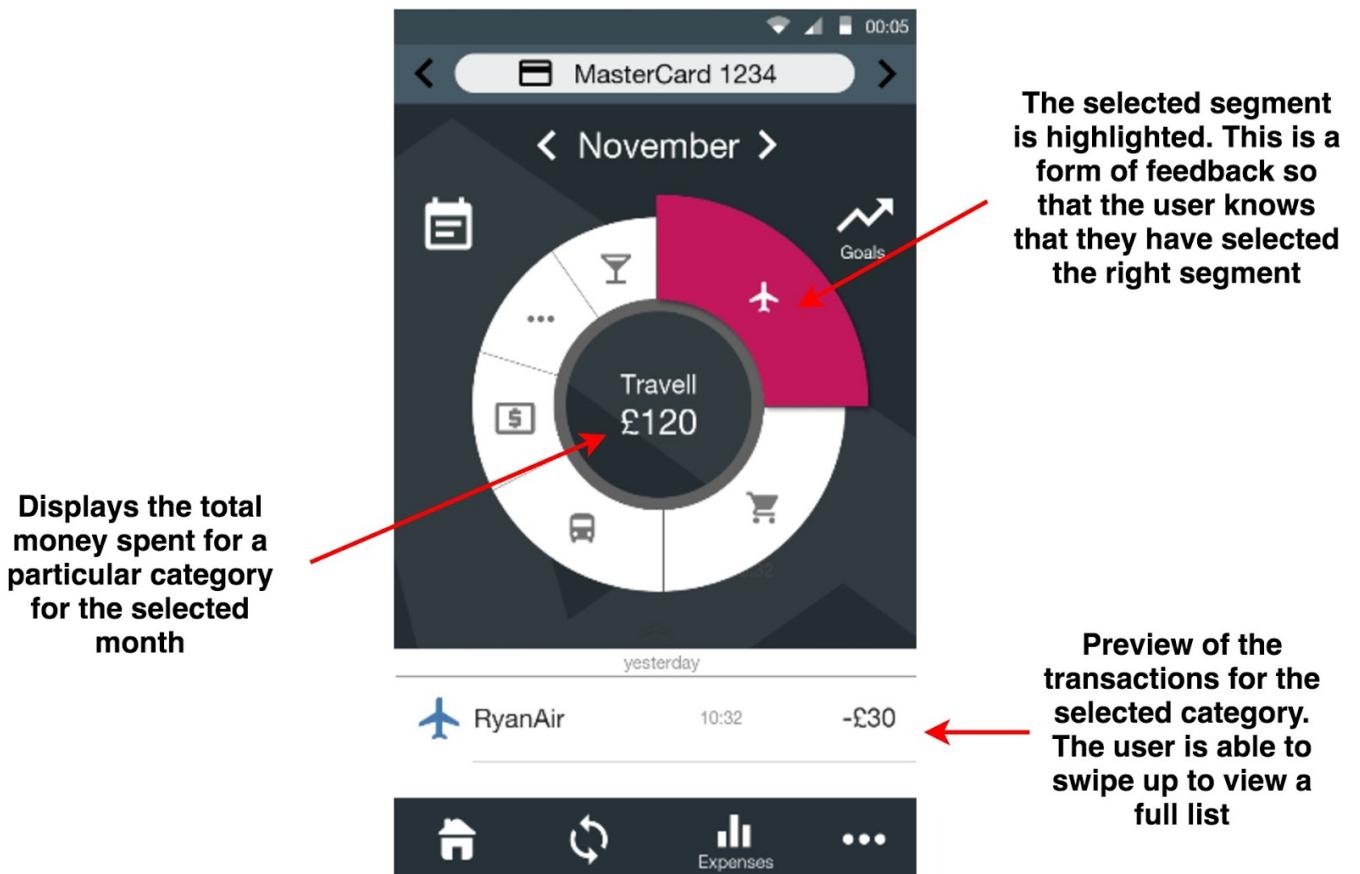


Figure 48: Expenses interacted

Once the user presses the icon of the category they see the amount of money spent on this particular category in the middle of the chart. Below the chart the list of all payments is displayed in chronological order.

The user can also change the period of time under consideration at the top of the chart.

Screen 10: Financial Goals

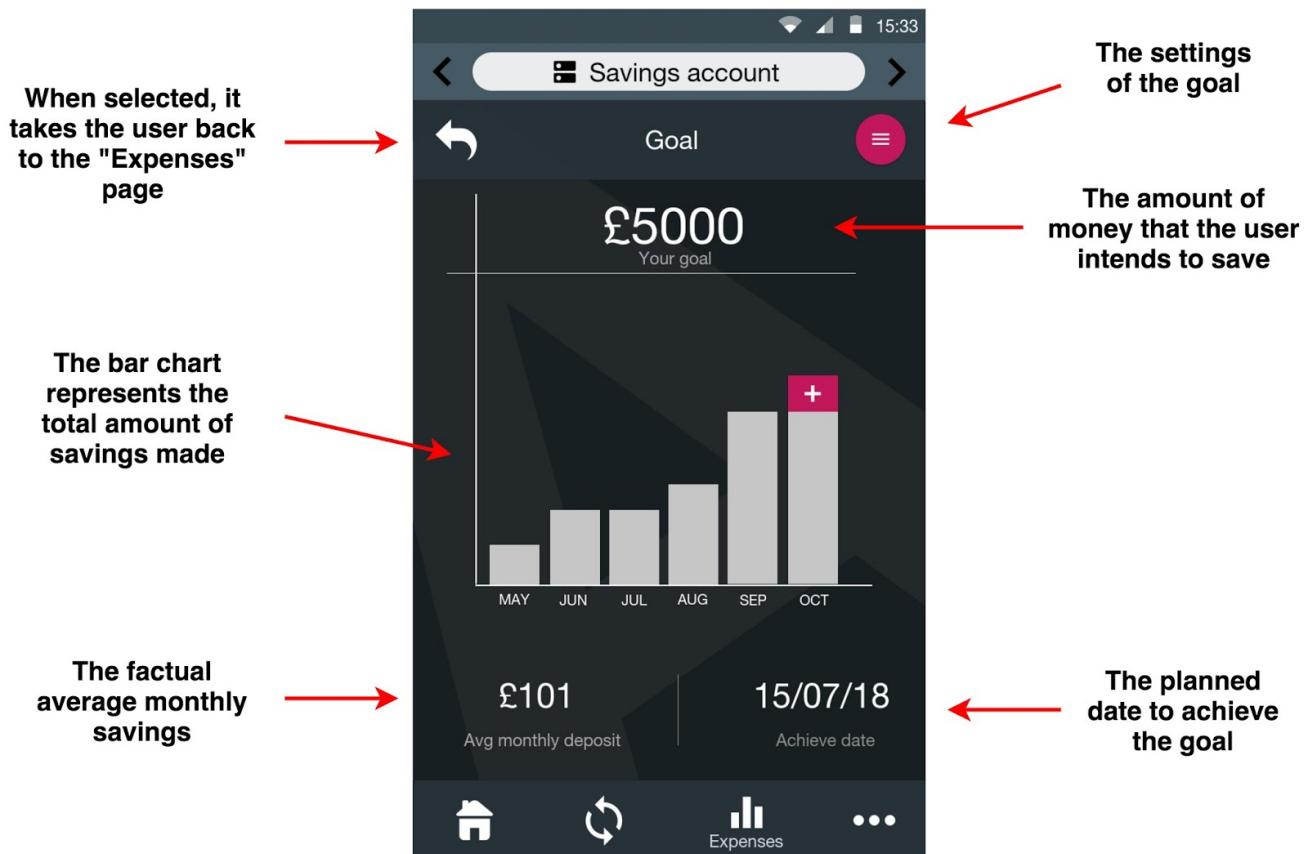


Figure 49: Financial goals

In order to set the goal, the user should press the “Goal” button in the right corner of the screen. After clicking the button they will be transferred into a separate page where they can enter the following goal parameters:

- the amount of money the user is going to save;
- the date to which the user intends to save the money.

From the moment the user set the goal, the “Goal” page will show them the current result in achieving it: that is how much money they have saved by the current moment in comparison to the planned amount . The information will be presented graphically in the chart.

Screen 11: More options

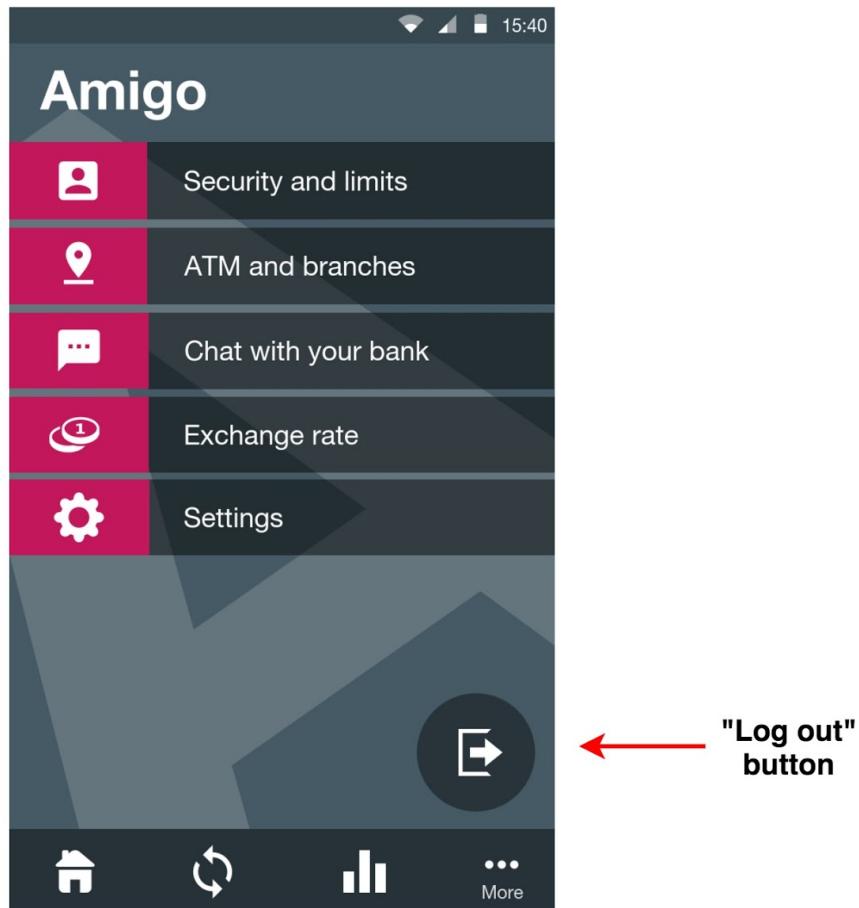


Figure 50: More options

The “More” page gives the user an access to the following services:

- 1) “Security and limits” – the page is used to perform additional operations with a bank card (Figure 51).
- 2) ATM and branches – the page allows the user to search for the closest ATMs and bank branches.
- 3) Chat with your bank – the online chat with the bank assistant which is available round the clock.
- 4) Exchange rate – the page includes the current exchange rate for all world currencies.
- 5) Settings – the page allows the user to set different settings for the app such as notifications, GPS access settings, language and etc.

The button “Logout” is placed in the right corner of the page. When the user presses the button, a small notification, confirming the intention of the user to close the app, appears on the screen. Once the user confirms exiting the application, the app is closed.

Screen 12: More options #2

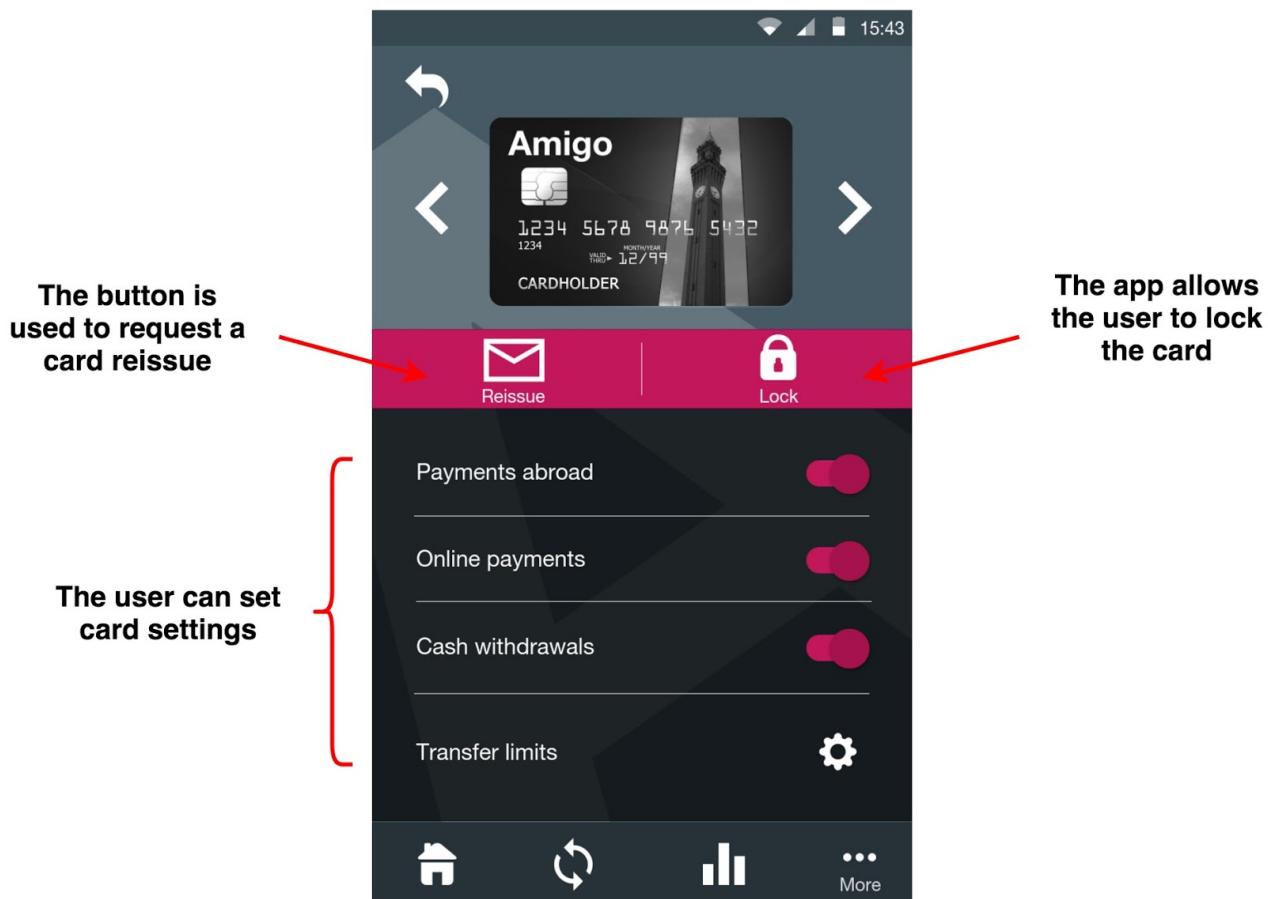


Figure 51: More options (2)

The “Security and limits” page is used to perform additional operations with a bank card such as:

- to reissue the card;
- to lock the card;
- to allow making payments abroad;
- to allow online payments;
- to allow cash withdrawals;
- to manage transfer limits.

Methodology of the second-prototype evaluation.

In order to evaluate the second generation prototype, the team decided to use three different types of assessments; Nielsen's heuristic criteria, inspection methods with scenarios, and usability testing.

We decided to repeat the heuristic-based assessment that was originally used in the first generation prototype evaluation. For this round we recruited two independent users to complete the Nielsen Heuristics assessment. The users were not involved in the usability assessment and had no relation to any of the team members. We then explained to each user what each category within the heuristic criteria meant so that they were able to perform the task. Each user was given access to the app on a mobile device and they each were given 20 minutes to explore the application whilst filling out the Heuristics criteria.

As well as using the independent users to fill out the heuristics criteria, one of the team member assessed the application using perspectives of each of the three user's requirements in order to identify where problems may arise. We then combined our results with the result from the independent users and created one heuristics assessment.

To perform the usability assessment we recruited two random independent users who were either not involved in the design process of the second-generation prototype or had no prior knowledge about our study. We provided each user access to the prototype on a mobile device and gave each user 20 minutes to explore the application and provide vocal feedback of their initial thoughts. One of the team members recorded and documented their responses which will be included in the evaluation of the second prototype.

We created three specific scenarios to test not only the usability of the mobile banking application, but also the learnability of it. These scenarios implement three common situations for daily users of mobile banking applications. The first one is for finding the closest ATM or branch to the user, while the second one is for having an overview of his costs. Usually, most of the users want a simple and clarified page that helps them have a general image by filtering their transactions into Categories, based on the type of them. Finally, the last scenario tests the usability of making a payment through the mobile application. The design of this page is unique, implementing some special features, like automatically recognizing the type of the payee's account. Moreover, the user can type in the same field, a combination of numbers and characters. That allows the user to insert the necessary information for the payee faster. That can be the name, the IBAN or the account number of him.

Evaluation of the second generation prototype.

Heuristic assessment results

Nielsen Heuristics for the second generation prototype

Criteria	Score
Visibility of the system	5
Comments	
+The application provides feedback whenever the user enters the pin incorrectly when trying to login to the application.	
+The application also informs the user, after a number of attempts of entering their pin, that they are locked out of the application and gives the user an option to call the bank directly.	
-The application does not notify the users about upcoming payments; however, users do have the option to view upcoming payments within the transfer section. [2]	
-The application does not notify the user about the type of internet connection. This may not be a problem for novice users however, more experienced users may have some concerns. [4]	
-Doesn't notify the user that it is tracking their current location when using finding the nearest branch/cash machines feature [3]	
Criteria	Score
Match between the system and the real world.	2
Comments	

+The application uses simple common language instead of the formal language that traditional banks use – this creates a friendlier atmosphere.

+The bottom icons - using common icons will allow the user to quickly identify what each icon represents and if they don't know what they are, when a user select an icon a description of what it is, appears underneath the icon.

-The use of the word 'Transfer' may cause some confusion for some users as they may think that the application can only transfer money from one account to another and not able to make payments to company. [1]

-The functionality of the transfer section may be too confusing for some users as they would expect to see an actual list of previous payee's to select from and an additional option to create a new payee. [1]

Criteria	Score
User control and freedom	1

Comments

+Gesture control e.g. swipe left or right to view information for different accounts allows the user to have more control without having to go back to the homepage to select a different account.

+Clear labels to indicate to the user what they should do i.e. the left/right arrows to swipe.

+The application allows the user to set new goals target for each account and they can update the target whenever they like.

-The user is not able to customise the main icons i.e. home, transfer etc. The user may want to include additional tabs which they use regular like contact the bank which is currently located within the more section. [1]

Criteria	Score
Consistency and standards	0

Comments

+The application uses the same colour scheme throughout the different stages i.e. the main CTA buttons are the same colour in each state.

+The gesture controls allow the user to perform the same action within different states i.e. swiping left or right to see the same information for a different account; and they located in the same place in each state.

Criteria	Score
Error prevention	0

Comments

+The application notifies the user whenever they've entered the wrong pin or when the facial recognition fails.

Criteria	Score
Recognition rather than recall	2

Comments

+The application makes use familiar icons e.g. calendar, plane, home etc which makes it easier for the user to understand what they represent/or do.

+The static icons positioned at the bottom of the app within each state (i.e. the home, transfer, expenses, and more icons) – every time a user interacts with the icon, the label is displayed.

-The functionality of the transfer page may cause some issue for some users, especially for novice user. [2]

Criteria	Score
Flexibility and efficiency of use	0

Comments

+Appreciation of the flexibility of viewing multiple accounts by swiping the screen instead of having to go back to the 'Select your account' screen.

-No customisation for the categories. The user may want to

Criteria	Score
Aesthetic and minimalist design	0

Comments

- + The design is very minimalist, and aesthetically pleasing.
- + Minimal information presented - only showing the main concepts on the screen e.g. use of data visualisation to present spending habits

- + Using contrast colours to represent the CTA buttons helps allows the user .

Criteria	Score
Help users recognize, diagnose, and recover from errors	0
Comments	
<ul style="list-style-type: none"> + Confirmation of the transfer + Huge exit button within the 'other' section. + Back buttons on sub-landing page (e.g. transfer confirmation, goal page) 	
Criteria	
Help and documentation	5
Comments	
<ul style="list-style-type: none"> - No help icons to explain some of the complexity of the application [5] 	

Scenarios

1. The user wants to find the closest ATM or Bank Branch to him.

Best way to solve scenario: Initially, the user has two options to access the necessary information. The first one is to log in to the mobile banking application and from that point to press the “More” button which is symbolized with 3 dots on the bottom right of the screen. Then he presses the GPS Button. In total, it is two screen taps after logging in. On the other hand, the user can have direct access on the specific information through a map or a list which is available to him by pressing the GPS Button that is located in the top right of the logging screen. And that, in terms of security, is preferable as no secure connection is required to be established with the bank’s servers.

2. The user wants to have an overview of his expenses, grouped in Categories.

Best way to solve scenario: The user logs into the application. After that he is transferred to a page that he can have an overview of his accounts. At that point, he is able to select a specific card or account from the list. Finally, he can press the “Expenses” Button at the bottom of the screen, where he can have all the necessary information in a modern and simplified design. Moreover, in terms of learnability, he can understand the pie chart, grouping the costs into categories. The whole procedure needs two clicks on the screen after the user logs in.

3. The user wants to make a payment to a Payee or a Company

Best way to solve scenario: The user logs into the application. After that he is transferred to a page that he can have an overview of his accounts. Then, he can select his preferred account or card that he wants to send the money from. The next step is to press the Transfers Button, which is the second one at the bottom of the screen. In the “Transfer to” field, the user can enter either a number, like the IBAN or the Account Number, or the name of the Payee or of the Company. The application automatically recognizes if the Payee’s account is local or international and a new appropriate field is displayed. This can be for entering either the Swift Code/BIC or the Sort-Code, respectively. After entering the remaining fields, the user has to press the Confirm Button, where he is prompted to the last step of making a new Payment. Finally, he has to press the Confirm Button to the pop-up window and the payment is successfully completed. The whole procedure needs only a few clicks, because of the automatic recognition of the Payee’s information.

Usability Test

User 1



Name: **Qais Khaled Temeiza**

User type: **Cyber-Security MSc International Student**

Task: **Overviewing his expenses**

Observations:

- Although face-recognition is a new and secure authentication method, there are specific circumstances, where the fingerprint authentication works better. For example, face recognition might now work efficiently in low-light situations. That's why he would prefer two-factor login authentication.
- In general, he found the design of the mobile banking application modern, futuristic and simplified. He managed to navigate directly to the right page, for getting the necessary information of his expenses.
- He touched the center of the pie chart, thinking that the application gives him more options.

User 2



Name: **Angeliki Bompetsi**

User type: **University of Birmingham Staff, Worklink**

Task: **Money Management and Transfers**

Observations:

- She found really appealing the ability of finding a local ATM or a bank branch without having to log into the mobile banking application.
- She found the Transfer Page really convenient and well-designed. Moreover, she found that the automatic recognition of the Payee is a big advantage. Her only concern was the absence of the Extra PIN code (two-step authentication), that makes the procedure more time-consuming but adds an extra layer of security.
- In terms of security, she liked the feature of locking immediately her card in case of loss. In that way, she can deactivate it and get protected from any unwanted transactions.

Evaluation summary

After reviewing the evaluation for the second-generation prototype, we identify some design flaws and usability issues.

Heuristics assessment summary

The heuristic evaluation identified two usability issues:

1. The lack of feedback
2. No information of how to use certain features within the app.

Lack of feedback: The main concern for the 'lack of feedback' criteria was around the notification of internet connection type. As mention previously in the first generation summary, designing an application that has high-level security and good UI is a difficult task. We decided to omit the notification for data connection type as we felt that adding too many notifications would cause disturbance for the user.

No information of how to use certain features within the app: Although there was an option to contact the bank directly if the user encountered any issues with the application, the process can become too exhaustive for the user. If there were to be another iteration of the second-prototype, we would recommend adding help icons on each page to explain how conduct certain functions within the application.

Usability assessment conclusion:

Both the testers from the usability evaluation liked the design of the application in comparison to their current bank application. They particularly liked the colour scheme of the application and the way that the information was presented in each state of the app. However, they both identified minor usability flaws with the application. They both flagged concerns with the security of the app and they both suggested to include the following features which would make the application feel more secured; a two-step authentication for each transfer and a fingerprint scanner instead of the facial recognition.

Conclusion

Overview of the steps taken for this study:

The main objective of this study was to design a new banking application that could improve the user's experience and encourage users to become more proactive with their finances. We first conducted a literature review which looked into the current trends of mobile applications and the theories into why users reject or accept new technology. We also reviewed related work from organisations and discuss the advantages and disadvantages of their product's UI interface. This process gave us a foundation to design the first-generation prototype, which was evaluated using Nielsen's heuristic criteria and scenarios based on the persona's perspective. The analysis of the evaluation helped us to design the second-generation prototype. Then we evaluated the second-generation prototype using the Nielsen's Heuristics Criteria, Usability assessment with two independent users and scenarios assessment using the perspective of the persona's

Difficulties that we encountered

From this study we have learnt that designing a UI interface that caters for all user's needs can be a difficult task. We encountered some difficulties in aligning all of the persona's requirements against our design especially for young professionals. For future designs, we suggested creating an interface that has two different states; one for general use and one for business purposes. This way, a user would be able to choose what type of interface that would like to use based on their own requirements.

We also found that a lot of time was spent deliberating what features should be included in the second-generation prototype and as a result, we neglected to include some features that alleviated some usability issues that were flagged up during the reviews of the first-generation designs for example the pop-up notification to inform the user about their internet connection. If we were to repeat this study again, we would set clear objectives before commencing with the design process, so that no features would be left out.

Additional improvements for the second-generation prototype

The evaluation of the second-generation prototype identified additional improvements for our design:

- Include a two-step authentication for transfers - this would increase the level of security for the application, in case the user's lost their phone, or if their phones were to get hacked
- Implement visible help icons to provide guidance for the user on difficult/unintuitive functions within the app.
- Implement a pop-up notification which will inform the user about the type of internet connection (e.g. 4G or public WiFi) when accessing the application.
-

The team achievements

Despite encountering some difficulties whilst conducting this study, as a team we are happy with what we have accomplished. From this study we have learnt how to use a wireframing tool, for the first time, to create the initial/final prototypes and due to the cultural diversity of the team members, we developed an appreciation of each other perspectives on how a banking application should look like, based on individual experiences. We were originally given a task to improve the user experience and improve the interface layout for a particular application, and overall, we have completed the task to the best of our ability. We have designed a new mobile banking application which we feel is highly aesthetically pleasing makes banking more enjoyable and easy to use.

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Appendix

Appendix 1: User journey for prototype 3 of the first generation.

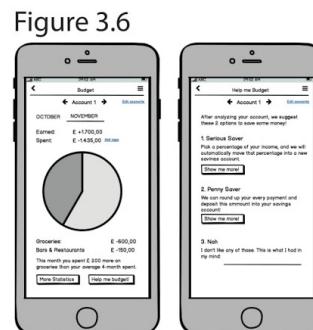
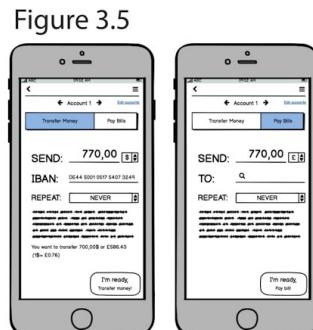
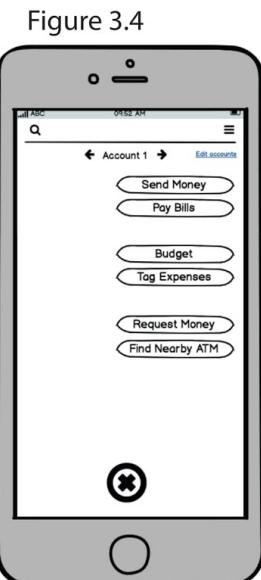
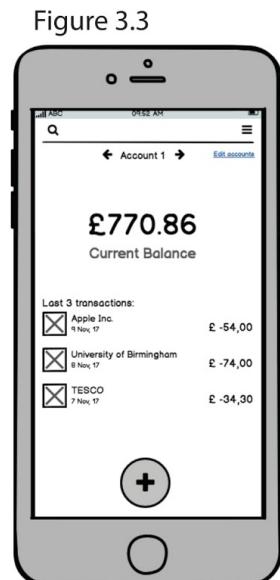


Figure 3.3: Home page / "Your Balance" page

Figure 3.4: Screen can be reached by tapping the "+" button on Figure 3.3

Figure 3.5: Screen can be reached by tapping the "Send Money" or "Pay Bills" button on Figure 3.3

Figure 3.6: Screen can be reached by tapping the "Budget" button on Figure 3.3

Figure 3.7: Screen can be reached by tapping the "Tag Expenses" button on Figure 3.3 or by tapping "Add tags" on Figure 3.6

Appendix 2: The user flow of the second prototype:

