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Improving the user experience of financial technology IT services based on UX/UI research

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Abstract

In today's dynamic fintech environment, user requirements are constantly changing, and digital services need to be developed and adapted to meet their expectations and needs. UI/UX research technologies and methods provide rich opportunities to study user preferences and identify problems and shortcomings in existing digital services. The main aspects of improving the user experience of the mobile bank were reviewed. Recommendations were made for the further development of the IT service. The purpose of this article is to examine the main aspects of improving the user experience and to formulate recommendations for the development of IT services in the banking sector. Research methodology - at the first stage, an analysis of user behavior in fintech was carried out: a study of user expectations and preferences in the field of digital financial services. Then user experience was analyzed and UI/UX studies were conducted for the 'Notification Center' of the bank's mobile application. The final stage of the study was to evaluate the effectiveness of the redesign project of the Notification Centre section of the bank's mobile application and to formulate recommendations for the further development of the mobile application.

The research conducted has shown the practical importance of improving the user experience of the bank's mobile application, which consists of improving usability, increasing customer satisfaction and improving the overall impression of banking services. This leads to increased conversion, customer retention and increased loyalty to the bank.

Improving the user experience of the bank's mobile application makes it possible to increase the efficiency of the bank's employees, reduce the burden on the customer support department and reduce the number of errors when performing routine operations or actions. This not only optimises the bank's internal processes, but also helps to improve the overall quality of service, which has a particular impact on the bank's reputation, competitiveness and financial performance.

Keywords: UI/UX research, mobile application, fintech, UX design, A/B testing, banks.

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基于UX/UI研究的金融科技领域IT服务用户体验优化

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简介
在当今动态的环境中，金融科技用户的需求不断变化，必须发展和调整数字服务，以满足他们的期望和需求。 UI/UX研究技术和方法为了解用户偏好以及发现现有数字服务中的问题和不足提供了广泛的机会。本文旨在研究优化用户体验的主要方面，并提出银行业IT服务发展的建议。首先，分析了金融科技领域用户行为，研究了用户对数字金融服务的期望和偏好；接着，对银行手机应用的"通知中心"部分进行了用户体验分析和UI/UX研究；最后，对银行手机应用"通知中心"部分重新设计项目的有效性进行了评估，并提出了进一步发展手机应用的建议。
研究表明，优化银行手机应用的用户体验具有实际意义，包括提高使用便捷性、客户满意度和整体银行服务体验。这将导致转化率增加、客户留存率提高以及对银行的忠诚度提升。
优化银行手机应用的用户体验可以提高银行员工的工作效率，减轻客户支持部门的负担，并减少执行日常操作或任务时的错误数量。这不仅能优化银行的内部流程，还能提升整体服务质量，从而提高银行的声誉、竞争力和财务表现。
关键词： UI/UX研究、移动应用、金融科技、用户体验设计、A/B测试、银行。

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Introduction

In the modern world, information technology services are playing an increasingly important role in various fields. One of these areas is financial technology or FinTech. Fintech means using the latest technologies to provide banking and other financial services.

Financial technology products facilitate traditional banking processes and provide a better quality of user service. Most fintech applications are designed to meet the needs resulting from user frustrations. Another important factor influencing the introduction of fintech technologies in different regions and age groups is the perceived ease of use. However, quality assurance is impossible without involving users in the development of these products [Cordeiro, Weevers, 2016, p. 34].

User experience (UX) refers to the overall assessment of a user's perception and satisfaction when using a product or service. In the context of IT services, UX is a key tool for attracting and retaining customers on a platform. A good UX ensures ease of use, high task completion speed, and positive emotions from using the product [Dietz et al., 2016].

By the 1980s, UX design had become more systematic and methodical. Several models and methods were developed to consider user needs and preferences in product development. For example, the User-Centred Design (UCD) model proposed by D. Norman was popular at that time. In the 1990s, with the advent of the Internet and the emergence of websites, UX design became even more relevant. Web designers began to realise the importance of usability, information architecture, and navigation. The term 'user experience' became widely used in the context of internet products. In the 2000s, with the development of mobile technologies and the arrival of smartphones, UX design gained even greater significance. Companies and organisations began establishing dedicated departments for user experience development. Additionally, specialised courses and educational programmes in UX design began to appear [Cordeiro, Weevers, 2016]. In the 2010s, with the emergence of new technologies such as artificial intelligence, virtual reality, and the Internet of Things, UX design became even more diverse and complex. A large number of tools, methods, and frameworks were developed to improve the user experience.

Today, UX design is an integral part of product development in various industries, such as web design, mobile applications, gaming, the automotive industry, and more. Companies are increasingly recognising the importance of user satisfaction and are investing in UX design to achieve competitive advantages and success in

the market [Barquin, Vinayak, 2016]. The importance of UX in the fintech industry is particularly significant, as the financial services sector has traditionally been considered conservative and has not always paid sufficient attention to developing user-friendly and intuitive interfaces. With the emergence of fintech startups, this situation began to change. New companies actively study customer needs and develop services that provide a high level of UX [Aliyu et al., 2014]. One of the key aspects of UX in fintech is the simplicity of service use. Customers want to access their finances without the need to fill out numerous forms or undergo lengthy identity verification procedures. Fintech companies strive to make registration on their platforms as quick and easy as possible. This helps attract new customers and increases the likelihood that they will become active users [Akinwale, Kyari, 2020].

The goal of this article is to explore the main aspects of improving user experience, as well as to develop recommendations for the development of IT services in the banking sector, which has led to several research objectives: analysing user behaviour in fintech-expectations and preferences of users in the field of digital financial services; analysing the user experience of a selected digital financial service, conducting UI/UX studies; developing recommendations for improving the UI/UX of the digital financial service and assessing the effectiveness of the implemented changes in user experience.

1. Literature Review

User experience optimisation is the process of enhancing user satisfaction with websites and applications. This involves improving usability, increasing accessibility, and boosting the effectiveness of user interactions with the site or app. The goal of optimisation is to make the site or app user-friendly and valuable, avoiding any confusion for users [Alexander et al., 2017]. User experience design focuses on how customers use a product [Barquin, Vinayak, 2016]. In this context, a product is not just a commodity or service; it also includes the content offered to customers.

There is a wide range of research methods in the field of user interaction, from laboratory studies of user interface usability to more recent methods, such as unmoderated online UX assessments (see Fig. 1). Each measure helps distinguish research in terms of the questions they address and the goals for which they are best suited.

To better understand when to use which method, it is helpful to consider them within a three-dimensional framework with the following criteria:

– evaluative and behavioural;
– qualitative and quantitative;
– context of use [Mohamed, Ali, 2018].

The difference between evaluative and behavioural metrics can be characterised by contrasting what people say versus what they do, with these metrics often differing significantly. The goal of evaluative research is to understand or measure people's stated subjective assessments. This is why evaluative studies are widely used in marketing departments.

Most usability research should rely more on people's behaviour, but methods in which users directly report information can often be quite useful for designers. These methods focus on studying what people say and can be presented in the following forms:

– card sorting: provides insight into users' cognitive models of how they perceive an information space and can help choose the best information architecture for a product, application, or website;
– surveys: assess and classify opinions or gather data based on users' responses; they can help identify or track important issues that need to be addressed;
– focus groups: generally less useful for studying user interface usability for various reasons but offer the most important insight into what people think about a brand or product concept in a group setting.

Fig. 1. Common research methods

There are also methods that evaluate user behaviour. These aim to understand what people do with the product or service being studied [Banker et al., 2006]. Such methods include:

– A/B testing: shows changes in website design to a random sample of visitors, aiming to keep everything else constant to observe the impact of different design variants on behaviour;
– eye-tracking: focuses on understanding how users visually interact with interface designs.

Combining these two completely opposite metrics provides a mix of the most popular methods: usability testing and field research [Ofodile, 2019]. These methods combine user-reported data and information about their behaviour. They may lean more towards one of these metrics, but it is generally recommended to prioritise the behavioural side.

Another approach involves qualitative and quantitative metrics. Qualitative and quantitative metrics have substantial differences that go beyond the narrow view of qualitative metrics as 'open-ended,' such as opinion surveys with open-ended questions [Perry, 2017]. Qualitative research gathers data on behavioural patterns or evaluations based on direct observation. In turn, quantitative research relies on the indirect collection of data on the observed behaviour or evaluations through surveys or analytical tools [Stewart, Jurjens, 2018].

For example, in field studies and usability testing, the researcher directly observes how people use (or do not use) technology to meet their needs. This allows for asking questions, exploring behaviour, or even adjusting the study protocol to better fit its goals. Such data analysis is usually not mathematical. On the other hand, quantitative methods typically rely on mathematical analysis, as the data collection tool (e.g., a survey or web server log) covers vast amounts of data that are easily programmable into numbers.

Since qualitative and quantitative methods are fundamentally different in nature, the questions they answer also differ [Storvang et al., 2020]:

– qualitative methods are much better suited to answering questions about why and how to solve a problem;
– quantitative methods are much better at answering questions that begin with 'how much' and 'to what extent.'

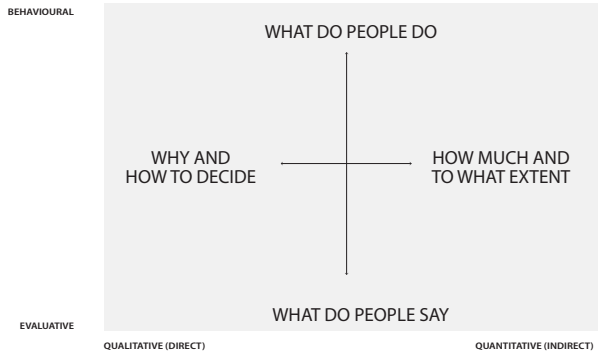
Having these criteria helps prioritise resources, such as focusing on issues that have the greatest impact.

Figure 2 shows how the first two metrics influence the types of questions asked.

The context of use relates to how and whether the study participants use a specific product or service. It can be described as follows:

– use of the product in a natural or near-natural environment;

Fig. 2. Questions for research methods in a three-dimensional structure



– use of the product according to a scenario;
– non-use of the product during the study;
– a combination of the above [Sue, Ritter, 2022, pp. 122-148].

Studying the use of a product in a natural environment aims to minimise research interference to understand user behaviour or judgement as close to reality as possible. Using a product in a natural environment ensures greater credibility but less control over the research subjects [Oyefolahan et al., 2019]. Many ethnographic field studies attempt to use this indicator, although there are always some observational errors. Quantitative examples of this indicator include random surveys, data analysis, and other analytical methods.

Scenario-based product use studies are conducted to focus on specific aspects of use, such as a newly designed process. The accuracy of the scenario can vary significantly depending on the research goals. For example, usability comparative analysis typically has a very strict scenario, and it is more quantitative, thus providing reliable indicators of interface usability.

Studies in which the product is not used are conducted to explore issues beyond use and usability. These include studying the brand or broader cultural traditions [Varga, 2017].

Method combinations involve a mix of product use methods to achieve specific goals. For example, co-design methods allow users to interact with and move design elements to discuss which solutions best meet their needs and why they made such a choice. Such interaction with design elements can also become an experience with the product.

Concept testing methods apply a rough approximation of a product or service, where the essence is (without knowing the details) to understand whether users want such a product or service and whether they need it.

Most methods in the scheme can move along one or more indicators, sometimes within a single study, usually to achieve multiple goals.

For example, field studies can focus on what people say (ethnographic interviews) or what they do (extended observations); preference assessment and card sorting

have both qualitative and quantitative versions; eye-tracking can be conducted with or without a scenario.

In conclusion, it can be noted that user experience plays a key role in improving IT service efficiency. The approaches, tools, and technologies discussed in this section will help companies enhance user experience and achieve greater results in their activities.

2. Research Methodology

In today's digital age, a mobile banking app is essential for banks to remain competitive and meet their customers' needs. Mobile banking is no longer considered an additional feature but an integral part of banking and financial service provider operations. With a mobile app, banks can improve overall customer service quality, attract and retain customers, and gain valuable analytics.

The following methodology was used to answer the research questions: in the first stage, an analysis of the issues was conducted, and a product passport was created, which included the 'Business,' 'Users,' and 'Product' sections. An expert assessment of the current user experience of the bank's mobile app was then conducted. In the second stage, UX/UI research of the mobile app was carried out, including qualitative and quantitative studies, based on which hypotheses regarding the mobile app's functionality were created. In the third stage, benchmarking was conducted to identify best practices, processes, or methods and apply them to improve features and achieve a high competitive advantage for the client. In the fourth stage, recommendations for product improvement based on user experience research were developed; in the final stage, feedback collection and effectiveness evaluation were conducted.

To create the 'Business' section of the mobile app passport, several key questions need to be answered: What problems is the business currently facing, and why is the product needed? What goals is the business currently setting to solve these problems? What numbers does the business want to see in the future? What currently generates the main revenue for the business? What should become the revenue source for the future product? What is the business currently spending on? What does it plan to spend on when developing the product? After answering these questions, the first section of the bank's mobile app passport is formed (see Fig. 3).

Next, the 'Users' section was considered - it allows us to define the target audience of the product, its needs and problems that the product should solve, analyse behavioural patterns and preferences of users, describe user scenarios of product use and key functional requirements (Fig. 4).

The final section of the product passport is the 'Product' - it includes the main features and functionality

Fig. 3. Product passport – 'Business' block

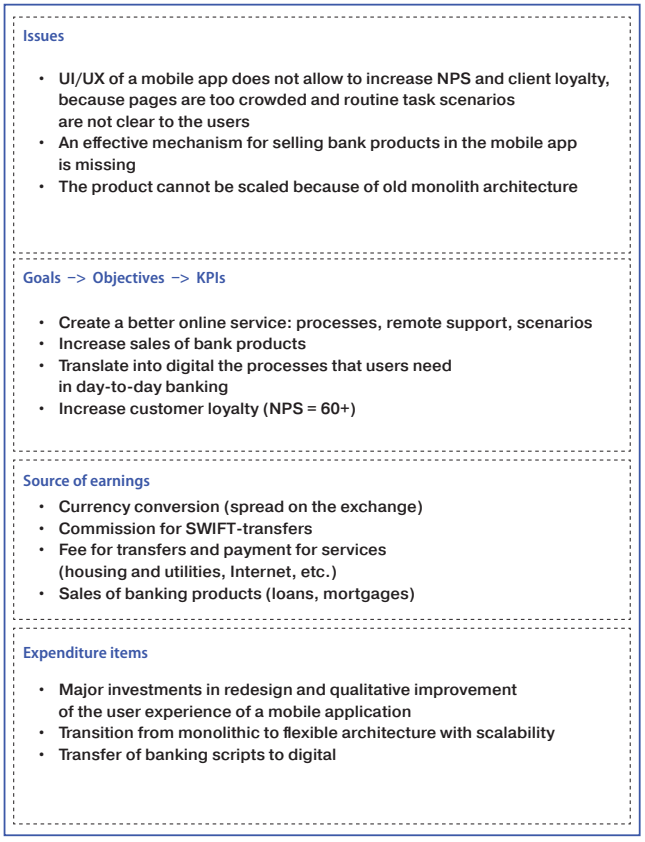
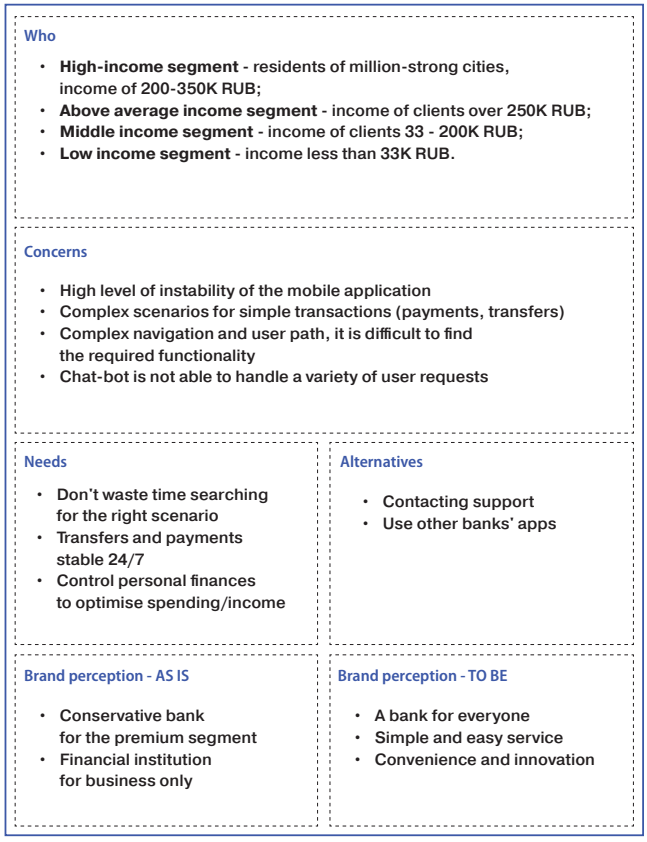


Fig. 4. Product passport – 'Users' block



of the mobile application, technical specifications and requirements for the product, as well as the product development plan, its life cycle and monetisation strategy (Fig. 5).

An expert assessment of the current user experience of the bank's mobile application was then conducted (Table 1). The table presents the criteria, a description of the current state, and an evaluation on a five-point scale, where: 1 - low level (of maturity/development of the criterion); 2 - satisfactory; 3 - average; 4 - good; 5 - high.

The average user experience rating of the bank's mobile application is 2, which indicates a low level of user experience maturity and can significantly affect customer satisfaction and the effectiveness of app usage.

Complex navigation, long wait times for operations, outdated design, frequent errors and crashes, lack of personalised recommendations, and limited options of communication with the bank can create a negative impression for users. This can lead to a loss of trust in the bank, a deterioration in user experience, and even loss of clients to competitors.

To improve the user experience, it is necessary to conduct a thorough analysis of the app's problems and shortcomings, develop a strategy for enhancing user experience, and implement the necessary changes [Bano, Zowghi, 2014]. Only by doing so can the bank increase the maturity level of the user experience, ensure customer satisfaction, and attract a new audience.

Fig. 5. Product passport – 'Product' block

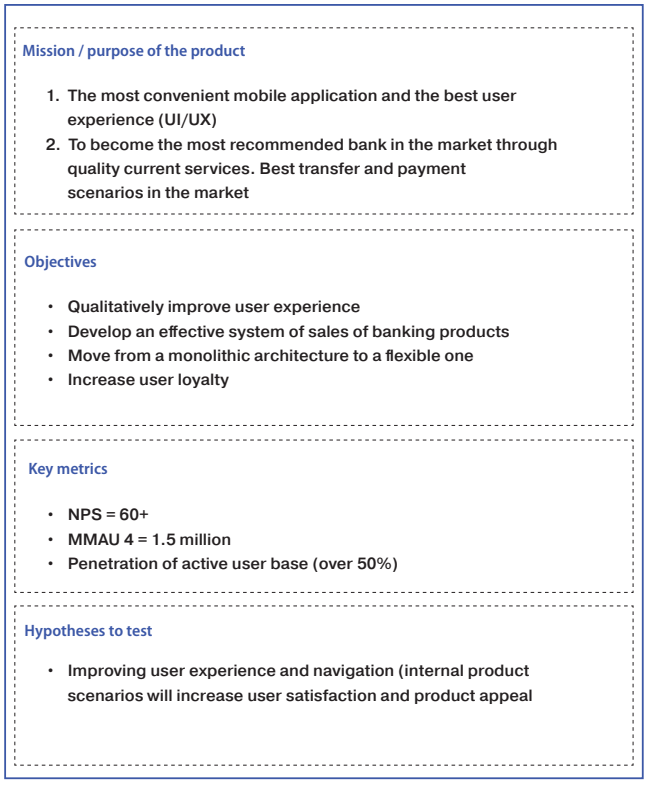


Table 1
The current state of mobile banking user experience

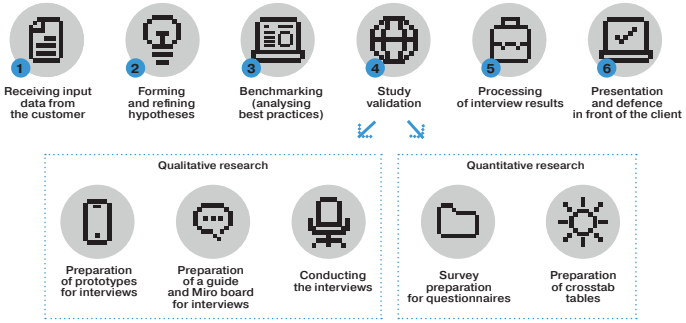
Criteria name	Current state of AS IS
Ease of use	
Easy navigation and intuitive interface	Complicated navigation, overloaded application screens, for example, the main screen has too many banners that make it difficult to access the card, the card and account are displayed separately, which confuses the user
Brevity and clarity of textual information	Errors in the texts on banners and messages, the user has access to basic information about banking services and operations
Ease of access to the main functions of the application	Complex scenarios, additional time required to find the necessary functionality. For example, personal information is located in the 'More' section, where the user expects to see rare operations
Overall expert rating of usability	2
Speed at which tasks are completed by the user	Long wait times when performing operations in the application
Accuracy and completeness of the information provided	Too many steps and unnecessary actions needed to complete simple transactions, such as housing and communal services payments, transfers between own accounts, etc.
Overall expert rating of effectiveness	2
Attractiveness	
Design and visual design of the application	Outdated design, components of varying sizes, and no consistent style throughout the mobile application.
Using colours, fonts, and graphics	Insufficient use of graphic elements and colour solutions
Emotional impact and creation of a positive mood	Lack of positive visual impact on the user, such as the absence of high-quality graphic elements and illustrations. The entire application is designed in dull tones, with a bright yellow colour as the only contrast, and there are no smooth transitions between screens.
Overall expert assessment of attractiveness	1
Reliability	
Absence of errors and failures in the operation of the application	Errors occur when performing standard operations
Quick bug fixes and app updates	Fixing bugs and updating the application takes a long time because of the old architecture, which does not allow for quick changes
Overall expert rating of reliability	3
Personalisation	
Consideration of user preferences and interaction history	No consideration of user preferences
Offering personalised content and recommendations	Personalised recommendations and content are absent
Ability to customise the interface and functionality for specific needs	Limited customisation options for the app's interface and functionality (minimal set of filters, all interface elements are static), for example, on the main screen, you can hide the card/product.
Overall expert rating of effectiveness	2
Overall rating on all the criteria	2

3. Methodology of UX/UI Research of Mobile Application: Case Study on Notification Centre Functionality

The goal of any UX/UI research is to create a product that is intuitive, easy to use, and meets user needs.

The subject of this article is the process of managing user experience and developing IT services in the banking sector. To obtain more accurate results, banks conduct UX/UI research for each functional block of the mobile application separately. Such research requires a comprehensive approach to analysing user experience, which focuses on user needs and expectations, the effectiveness of each function, and interface details. The stages of the research process are demonstrated in Figure 6.

Fig. 6. Stages of UX/UI research



Let's consider conducting a UX/UI study using the example of the 'Notification Centre' functionality in the bank's mobile application.

The Notification Centre is a key point of contact between the bank and the customer, where users can receive notifications and special offers related to various products. This section of the mobile app stores all notifications and push alerts. Users have access to different types of notifications: marketing, informational, transactional, and service-related. The bank also offers products with personalised terms for each client. The basic pattern for displaying the entry point to the notification centre is a bell icon located in the top right corner of the main screen.

The bank continuously collects feedback on the functionality within the mobile application, which has revealed several shortcomings affecting usability and informativeness for users. Users have noted that the current notification mechanism is inconvenient due to the lack of categories and colour indicators, making it easy to lose important notifications among the large number of marketing messages. Furthermore, most users paid little attention to recommendations where personalised bank products were featured, as the offers were not sufficiently informative, and the product cards in the old design were not compelling enough to encourage users to click through for more detailed information.

It became necessary to define the development trajectory for the notification functionality in the mobile bank to increase sales conversions through the Notification Centre.

To achieve this goal, the following tasks need to be completed:

- determine which types of notifications should be displayed in the Notification Centre;
- revise the structure of notifications to make them more informative;
- categorise the notifications in a way that is clear to users;
- propose scenarios for opening new products through notifications;
- compare competitor solutions and identify patterns applicable to the bank.

The quality of the research depends on the expertise of the participants, so it is important to plan the role model for the project in advance (Table 2). The number of experts for each role depends on the scope of the functionality being studied. For the study of the Notification Centre, one specialist per role is sufficient. The key role in the research is played by the methodologist, who is responsible for building all processes within the team, ensuring the outcome, and possessing high expertise in the subject area being studied [Pals et al., 2008].

Table 2
Role model on the research stream

Role name	Area of responsibility
Methodologist	Formulating and tracking research methodology Deciding on the timing and methods of research in the project Communicating with the bank's team regarding methodology and research results/ conclusions
Researcher	Conducting the entire research cycle (business briefing with the bank, hypothesis formulation, interview guide preparation, etc.) Analysing data and preparing/presenting results (conclusions)
Business Analyst	Supporting the research process Analysing the competitive market, gathering benchmarking data Analysing product metrics and aligning them with research objectives
Designer	Researching and engineering design layouts Preparing a working prototype Adjusting design layouts for the delivery of results

Next, it is important to form the entire list of hypotheses that will be tested in the interviews. For UX/UI studies, a qualitative research format is used, where respondents are shown a modified prototype based on the proposed hypotheses [McLeod et al., 2007].

The global hypothesis regarding the redesign of mobile application sections is that improving the user experience will significantly increase satisfaction metrics, such as NPS (Net Promoter Score), MAU (Monthly Active Users), and CES (Customer Effort Score).

Other hypotheses for the new screens of the 'Notification Centre' functionality:

1) users know what types of notifications from the bank they will see in the app's notification centre;
2) users do not need notifications older than a month;
3) users want important notifications to be separated from others so that when viewing new notifications, they immediately know what to focus on;
4) when users enter the notification centre, they want to see a simple list of notifications from the bank (without filters and search), as it is important to see only new notifications;
5) when users need to use an offer from the bank received a month ago, they will not search for this notification in the bell icon but will contact the bank manager through chat or check the product showcase;
6) when users need to find a personal offer from the bank, they look for it in the product showcase;
7) users expect the total number of all notifications (counters) in the app to match the number displayed on the app icon.

Benchmarking is conducted based on created hypotheses. Benchmarking is a process of comparing the performance, practices, or characteristics of an organisation with best benchmarks, typically with other companies or industries. The goal of collecting benchmarking data is to identify best practices, processes, or methods and apply them to improve features and achieve a competitive advantage for the client [Ongwae, Duncombe, 2021]. Benchmarking is a comparative table that contains the results of competitive and functional analyses (Table 3).

As seen from the analysis the main pattern across all banks is to put the notification centre on the home page in the top right corner as a bell icon.

Tinkoff integrated the notification centre (bell icon) with the chat. The entry point is hidden within the section, but the icon is still familiar to users. Alfa-Bank, following Tinkoff, moved notifications to chat in newer app versions (bottom navigation menu). Most banks use message categorisation within the 'Bell' section, typically into transactional and informational notifications from the bank, as well as promising proposals. If a bank displays all notifications in one list, this list opens by default. If no general list is available, the first tab in the section is usually for promotional offers. Generally, banks store promotional, transactional, and informational notifications in the notification centre. Search functionality for notifications is mostly absent in banking apps.

Another pattern for receiving specialised bank offers: users receive product notifications in a special tab within the notification centre. It's worth noting that the indication resets when entering the section. However, only Bank N requires entering each specific notification to clear the counters. Other banks update the count after viewing the notification list.

Based on the insights, patterns, and hypotheses gathered, the researcher forms a guide that includes several parts:

- introduction - greeting and interview instructions;
- first set of questions about the value of notifications, presentation of the notification list, types of tasks associated with notifications, and entry points for resolving them (e.g., what types of notifications do users expect to work with? Can users name (list) types of notifications? How do users categorise messages?)
- second set of questions about user tasks, typical scenarios, and notification centre functionality (e.g., when users open the notification list, what tasks do they want to accomplish? What form of presenting the notification list would help users achieve their goals?);
- third set of questions focused on notifications about new products and personal offers (e.g., how do users respond to notifications about new products and personal offers? What motivates users to take advantage of the offer? What stops them?);
- conclusion and acknowledgements.

The designer creates a prototype and key scenarios based on the guide, which the respondent will go through [Veilleux et al., 2020].

The search for respondents takes place simultaneously with the prototype design. Respondent sample parameters for qualitative testing:

– 7 men and 9 women, aged 28-40;
– 8 persons from Moscow and 8 from St Petersburg;
– 4 respondents with high income (over 220,000 RUB), 4 with above-average income (180,000 RUB+), 4 with average income (100,000 RUB+), 4 with low income (60,000 RUB+);
– not working in IT;
– 8 clients of Tinkoff, Alfa-Bank, Sberbank, VTB;
– 8 clients of Bank N.

Each interview lasted 2 hours; respondents received instructions on setting up the prototype in advance so that they could complete tasks as if they were using the mobile app. The researcher asked all questions and gave all

Table 3
Analysis of Russian banks' mobile applications

Criterion/Banks	Bank N (bank under study)	Tinkoff	Alfa-Bank	Sberbank
Availability of a notification centre	Yes Entry point: Main → Upper right corner → Bell icon	Yes Entry point: Bottom navigation menu → Chat → Upper right corner → Bell icon	Yes Entry points: Main → Upper right corner → Bell icon Chat	Yes Entry point: Home → Upper right corner → Bell icon
Notifications divided into types	We recommend: – Credit rating – Personal offers (loans) Notifications: – List of messages from the bank Charges: – Fines, taxes, utilities	There is no division into different lists depending on the type inside the bell icon. Each message in the general list is marked with an icon corresponding to the type of notification. Transactional notifications from individuals are stored in chat as messages	Segmented: – notifications (not displayed, informative message 'Notifications moved to chat') Offers - Personal offers	Segmented within the bell icon: – My notifications – Joint notifications – Deductions – Credits – Cash – Transfers – Savings
Types of notifications stored in centre	Notification types: – Promotional – Transactional – Authorisation – Informational – Debt Collection	Notification types: – Promotional – Informational	Notification types: – Promotional – Transactional – Authorisation (one-time passwords) – Informational	Notification types: – Promotional – Transactional – Informational
Search and notification filters	No search or filter at the notification centre	No search or filter at the notification centre	No search or filter at the notification centre. While viewing notifications filters available in chat: – Deductions – Credits – Issued invoices – Loan Messages – Bank Messages – Other Notifications	Search available (by keywords without suggestions)
Special offers in notification centre	Home → Top Right Corner → Bell Icon → Recommendations	Home → Open New Account/ Product Home → 'Pre-approved Loan' in user product list	Home → Top Right Corner → Bell Icon → Offers Banner display points for new products are available on the home page and in the 'Showcase' section	Home → Upper right corner → Bell icon
Notification retention period	3 months	2 months	3 months	6 months
Notification counter reset method (what action should the user take to reset the '+1')	To reset the indicator, each unread notification must be opened, and the notification centre revisited	Unread message indication resets upon opening the notification centre and scrolling through the message list	Unread message indication resets upon opening the notification centre and clicking on each offer. Indication in chat resets upon entering the scenario	Unread message indication resets upon opening the notification centre

clarifications, and the analyst recorded the respondents' answers verbatim.

Recording responses in detail (always asking 'why?') is crucial to avoid guessing the meaning during analysis. Moreover, a good guide is not a guarantee of good answers. The business analyst should not add their thoughts when recording respondents' answers; it is better to record direct speech. The more detailed the quote, the more valuable it will be for the research.

After completing all interviews, the final stage includes transcription and interpretation of the interview results. This stage involved:

- crouping notes by logical blocks (general information about respondents, comments on entry points, etc.);
- processing notes within each group (looking for commonalities, trends, or deviations);
- structuring the results as prepared by the researcher;
- formulating conclusions about the confirmation/rejection of hypotheses;
- delivering recommendations for functional development.

Two hypotheses were not confirmed during the study:

- When a user needs to locate a personal offer from the bank, they look for it in the product showcase.
- Users expect the total number of all notifications (counters) in the app to match the number displayed on the app icon.

Respondents noted that all personal offers are either stored in the notification centre or they expect to see them on the main screen as a banner or story. If they previously received an offer but cannot locate it, they will check with the chat.

Respondents did not understand the logic of how bank notifications are displayed on the app icon. If users could customise and select which counters to display on the icon, they would expect 'highlighting' only selected types of notifications. They would calmly accept a situation where the notification bell icon in the app shows more notifications than the app icon itself.

4. Results of the study: improving the user experience of a mobile application

The results of the UX/UI studies indicated that the notification centre, along with the overall mobile application of Bank N, requires a redesign and improvement of the user experience.

Based on the results of the in-depth interviews, the following conclusions can be drawn regarding the shortcomings of the user experience in the current 'Notification Centre' section of the mobile application.

1. Respondents did not choose layouts in the old design or with elements of the old UX/UI when completing tasks.

Table 4
Results of UX/UI research

Hypotheses	Result of the study
Users know what types of notifications from the bank they will see in the notification centre of the bank's app.	Confirmed. Comment: respondents intuitively understand that they can find notifications from the bank in the notification centre, although they are not 100% sure about what specific notifications are stored there. This is because different types of messages are delivered through different channels (push notifications, SMS, chat), and due to how they perceive transactional messages: users also consider them as 'Bank Notifications' (even though they will look for them in the transaction history).
The user doesn't need notifications received more than a month ago.	Confirmed. Comment: most respondents did not think about the retention period for notifications in the notification centre, so some respondents suggested that all bank messages should be stored for as long as possible. However, after a detailed review of examples and tasks in the message list, only cashback information and personalised offers from the bank remained for long-term storage. Respondents assume that offers are valid for about a month, but emphasise that such messages should remain in the notification centre for the entire duration so that they can use them at any time.
The user wants important notifications to be separated from others, as it is crucial to immediately identify what to pay attention to when viewing new notifications.	Confirmed. Comment: users paid attention to filters and noted that this allows them to quickly find the needed message. Respondents emphasised the need for colour coding to simplify navigation in the message list.
When a user enters the notification centre, they want to see a simple list of bank notifications (without filters and searches), as it is important to see the new notifications.	Confirmed. Comment: When users enter the notification centre, they want to see a simple list of bank notifications (without filters and searches), as it is important to see the new notifications.
When a user needs to use a bank offer received a month ago, they won't look for it in the notification centre; they will contact the bank manager via chat or check the product showcase.	Partially confirmed Comment: Respondents will scroll through the notification centre to find the message or write in the chat. However, they won't visit the showcase to search for personalised offers.
When a user needs to find a personalised offer from the bank, they look for it in the product showcase.	Not confirmed. Comment: respondents noted that they are accustomed to seeing bank offers in the form of banners, where products with personalised conditions can expand their options. The 'Showcase' section is not currently perceived by users as a place to store individual offers.
The user expects the total number of notifications (counters) in the app to match the number displayed on the app icon.	Not confirmed. Comment: Respondents did not understand the logic by which bank notifications are displayed on the app icon. Users want to see only the number of important notifications on the icon. Respondents wanted the following notifications to be counted as '+1' on the app icon: – readiness of certificates and statements; – document flow: the bank sent a document for signature; – new charges: utilities, taxes, fines, etc.; – message in the chat from a bank employee

2. Users failed to notice and missed important notifications due to the absence of indicators or colour highlights.
3. The majority struggled to complete tasks, such as finding previously sent specialised banking offers, on the first attempt.
4. Respondents noted the complex structure of notifications in the old design and the lack of separation by the date of receipt.
5. Most users failed to understand the logic behind the counters (the quantitative indicator of new notifications), what is included in the count at the entry point, and the types of notifications.
6. The notification settings scenario was complex, requiring navigation through the 'Profile' or 'More' sections.
7. Most users mentioned that they rarely visit the 'Notification Centre' section due to the inconvenient interface and cluttered screen.
8. Furthermore, the banking offer cards appeared sparse and uninformative; users also noted the lack of adaptation to individual needs-personalisation.

Most of the hypotheses were confirmed, and users liked the prototype with the new functional design. Let's take a closer look at the processed responses within each hypothesis (Table 4).

Based on the tested digital solution (prototype), the bank needs to pay attention to the following recommendations for refining the UX/UI of current solutions in the mobile app [Kola-Oyeneyin et al., 2020].

1. Develop an indication for key notifications in the notification centre - highlight categories that are important to users so they stand out from other notifications. It is recommended to highlight no more than two or three categories related to payments, issued invoices, cashback, and security.

2. To save space, place the date in the upper right corner of the card. For notifications received today, display the time. For messages received within a week - 'Thursday, 12:45.' For older notifications, display only the date, for example, 'December 12.'

3. Separate messages into 'Recommendations' and 'Notifications.' Respondents noted that they are not bothered by promotional banners in the notification feed - it has become a habit to skip banners and continue reading. Advertising notifications can be moved to a separate section and shown by default when entering the notification centre; this way, the entry point for personalised offers remains, helping users quickly navigate the opportunities provided by the bank.

4. It is necessary to review the structure of the banking offer cards and conduct A/B testing.

As a result of the UX/UI research of the notification centre, user scenarios were clarified, entry points and user navigation were refined, and the digital solution was qualitatively tested for implementation.

The new structure includes dividing the section into two tabs: 'Recommended' and 'Notifications.' The 'Notifications' tab provides users with a complete list of notifications, which have colour indications. The colour indication is available for important notifications, including service notifications from the bank. For example, the user needs to update the app, update passport data, or the bank notifies the user when certificates or other documents are ready.

The notification structure includes the following parameters:

– date (sendAt);
– title;
– notification body;
– a link to go to certain screens inside the mobile application (deeplink).

The 'Recommended' tab contains all information about personalised offers and general recommendations from the bank. By default, this tab opens first when entering the notification centre.

Bank offer cards have different parameter structures. The new format standardises the display of information about bank offers for the bank's main products:

1) consumer loans (productType = listLoanOffer):
   – loan name (nameLoan),
   – interest rate (rate),
   – term (term),
   – loan amount (initialAmount),
   – illustration (display according to design);
2) credit cards (productType = listcreditCard):
   – card name (nameCreditCard),
   – interest rate (rate),
   – credit limit (creditLimit),
   – illustration (display according to design);
3) debit cards (productType = debitCard):
   – card name (cardName),
   – card type (cardType),
   – cashback (cashback),
   – illustration (display according to design);
4) savings account (productType = savinAccount):
   – account name (accountName),
   – interest rate (interestRate),
   – deposit and withdrawal conditions (depositWithdrawalConditions)
   – illustration (display according to design);
5) mortgage (productType = mortgage):
   – mortgageprogramname(mortgageProgramName),
   – interest rate (interestRate),
   – mortgage term (mortgageTerm)
   – down payment (downPayment),
   – illustration (display according to design);

6) insurance (productType = insurance):
   – insurance name (insuranceName),
   – type of insurance (insuranceType),
   – coverage amount (coverageAmount),
   – insurance conditions (insuranceConditions),
   – illustration (display according to design);
7) investment management (productType = investment):
   – investment product name (investmentProductName),
   – type of investment (investmentType),
   – minimum investment amount (minimumInvestmentAmount),
   – investment conditions (investmentConditions),
   – illustration (display according to design);
8) management of mutual investment funds (productType = uif):
   – fund name (fundName),
   – fund type (fundType),
   – minimum contribution (minimumContribution),
   – illustration (display according to design);
9) asset management (productType = assetManagement):
   – asset management service name (assetName),
   – service type (serviceType),
   – management structure (managementStructure),
   – illustration (display according to design).

Next, event tracking was implemented in the notification centre, as it is important to collect and analyse data on user behaviour. Event tracking allows monitoring user actions within the app, such as button clicks, screen views, and interactions with various interface elements [Bano et al., 2017]. This data helps understand how users interact with the new functionality structure of the 'Notification Centre' mobile app and which actions they perform most often.

5. Assessment of the Effectiveness of User Experience Improvement

Financial efficiency will be achieved through the enhancement of the user experience, leading to increased user satisfaction and growth in sales of banking products [Bano, Zowghi, 2013].

Based on actual data and a specialised tool in the form of a BI system for product analytics provided by the bank, the following calculations were made:

– Net Promoter Score (NPS);
– Monthly Active Users (MAU);
– Conversion to a target action rate (transition to detailed bank product cards through the notification centre);
– Number of blank screens (error screens) [Oshodin et al., 2019].

To calculate the Net Promoter Score (NPS) for the 'Notification Centre' section, feedback surveys were used. Before the redesign of the mobile app, the NPS was 45%. The NPS is calculated using the formula:

$$NPS = \% \text{ promoters} - \% \text{ detractors}. \quad (1)$$

After the redesign of the mobile app, 350 customers were surveyed by the bank, yielding the following breakdown:

– Promoters who rated 9-10: 245 people (70%);
– Passives who rated 7-8: 71 people (20.29%);
– Detractors who rated 0-6: 34 people (9.71%).

Thus, according to formula (1):

NPS = 70% promoters - 9,71% detractors = 60,29%.

Next, the MAU value for the month following the mobile app redesign was determined using data from the BI system. Before the redesign, the MAU on iOS and Android platforms was 275,000 users, and after the redesign, it increased to 316,250 users, representing a 15% increase.

The conversion rate to detailed bank product cards through the notification centre was calculated using the formula:

$$Conversion = \frac{X_1}{X} * 100\%, \quad (2)$$

where X_1 is the number of users who actually transitioned to the detailed product cards in the 'Recommendations' tab, and X is the total number of users who visited the 'Notification Centre' section.

Before the project to improve the user experience of the notification centre, the total number of users who visited this section was 840,877, of which only 42,044 users transitioned to detailed product cards, resulting in a conversion rate of no more than 5% with the old design. After the redesign, the BI system was used to extract data on section visits and internal scenario transitions. According to formula (2):

$$Conversion = \frac{104\,575}{941\,588} * 100\% = 11,11\%.$$

User experience effectiveness is also influenced by the presence of blank screens (error screens or zero screens) in the mobile app in the 'Notification Centre' section. Blank screens can lead to negative impressions among users, causing confusion and disappointment, which in turn can lead to user loss and reduced conversion rates. Before the redesign, the total number of blank screens was 487, and after the redesign, it was reduced to 162 (a threefold reduction). The number of blank screens was measured using the bank's product analyst and BI system reports.

The results of the calculation of changes in bank N's metrics are presented in Table 5 - before and after the mobile app section redesign.

Table 5
Changing metrics to improve user experience

Metric name	Before redesign	After redesign
MAU (mber of users)	275 000	316 250
NPS (%)	45	60
Conversion to target action (transition to detailed bank product cards through the notification centre) (%)	5	11,11
Blank screens (number of errors/ blank screens)	487	162

After completing the redesign of the notification and recommendations centre within the bank's mobile app, significant improvements in the user experience were noted, as reflected in the project's key metrics. The first significant change was the increase in the monthly active audience (MAU) from 275,000 to 316,250 users, indicating more appealing and engaging content and functionality after the changes were implemented. The increase in the Net Promoter Score (NPS) from 45% to 60% is another indicator of the project's success. The increase in user satisfaction suggests that the new app design and functionality are positively received by the bank's customers, providing an opportunity to attract new target audiences. Moreover, the significant jump in the conversion rate to a target action (transition to detailed bank product cards through the notification centre) from 5% to 11.11% indicates a high-quality structure of the bank's personalised offer cards and the engagement of users in important actions, providing an opportunity to increase sales of the bank's products and services. The reduction in the number of blank screens by three times - from 487 to 162 - also plays a crucial role in enhancing the user experience. The error-free state of the screens helps prevent negative impressions among users and provides them with a smoother and more informative interaction process with the app.

Thus, the redesign of the bank's mobile app 'Notification Centre' functionality has indeed contributed to the improvement of the user experience and the enhancement of the app's key performance metrics.

Conclusion

Improving the user experience in the bank's mobile app plays a crucial role in establishing long-term relationships with customers and ensuring a high level of user comfort and satisfaction. By creating a convenient, personalised, and secure service, the bank aims to provide its customers with innovative solutions that meet modern requirements and expectations [Nugraha et al., 2019].

This study has thoroughly analysed the state of the research object - Bank N and the process of managing the IT service user experience. Benchmarking and a full cycle of UX/UI research were also conducted for the 'Notification Centre' functional block of the mobile app. Based on the analysis of the research results, deficiencies were identified, and suggestions for improving the user experience with the mobile app were made.

As a result, a decision was made to implement a project to develop and redesign the bank's mobile app, which will ensure:

- Improvement of the user experience (increasing the NPS that reflects customers' willingness to recommend the brand to others);
- Increase in the retention rate of the app users;
- Increase in the MAU and improvement in the rate of conversion of users into bank customers.

Directions for future research were also formulated:

- Create information tips for users, where in the app they can view cashback statistics by month;
- Analysis of best practices in fintech shows a trend towards developing banking apps without notification centres or moving the functionality to chats;
- Implement AI tools for generating illustrations in personalised banking products.

Within the project to improve the user experience of the mobile app's notification centre, key system requirements were formulated and grouped according to the FURPS+ methodology. Target mock-ups for the redesign of the notification centre were also developed, key project stages were defined, and the development team was established. The redesign of the mobile app section resulted in positive changes in key performance indicators, demonstrating the feasibility of implementing the project at Bank N. The increase in the active audience, improvement in NPS, growth in conversion, and reduction in blank screens are key indicators of the project's success. The increase in user satisfaction and improvement in metrics following the update indicate the success of the changes made and a more appealing app for users. This may also contribute to user retention and revenue growth.

The project results emphasise the importance of focusing on the user experience and the company's readiness to implement changes to improve service quality. Further monitoring of metrics and user feedback will help continue to improve the app and strengthen its market position.

In developing the notification centre and other functional capabilities of the mobile app, the bank is recommended to:

– Continue to enhance the user experience for sections such as 'Transaction History,' 'Main Screen,' 'Payments and Transfers,' and 'Product Showcase,' based on qualitative testing (UX/UI research);
– Develop user scenarios for the 'Financial Health' functional block to improve users' financial well-being, increase their financial literacy, and make the app a more valuable tool for personal finance management;
– Create an AI assistant to improve customer service, increase user satisfaction, and make interaction with the bank more convenient, efficient, and personalised.

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