

Personal Finance Management Application

Tihomir Stefanov¹, Milena Stefanova¹, Silviya Varbanova¹, Stanislav Temelkov¹

¹ Faculty of Mathematics and Informatics, St. Cyril and St. Methodius University, Veliko Tarnovo, Bulgaria

Abstract – The paper presents a personal finance management mobile application developed for the Android operating system. The application is in the process of trials and test deployment among selected customers. It provides opportunities for managing a personal budget, retrieval of a financial status report for a certain period, working with expenses and income, report generation and visualization through charts, and barcode scanning. The methodology for designing and implementing the developed prototype includes pre-testing and preliminary interviews with potential customers who need convenient and easy access to manage their personal finances. Extensive research has been done on the availability of similar desktop and mobile applications. Appropriate technologies have been selected for the implementation of the program logic, software part and user interface. As a result, a mobile application has been developed that provides full integration with the web-based personal finance management system, previously created by the authors. The app is open to future improvements.

Keywords – Mobile application, personal finance, finance applications, apps development.

1. Introduction

Managing personal finances is a hot topic nowadays, and interest in it is constantly growing.

DOI: 10.18421/TEM133-34

<https://doi.org/10.18421/TEM133-34>

Corresponding author: Tihomir Stefanov,
Faculty of Mathematics and Informatics, St. Cyril and St.
Methodius University, Veliko Tarnovo, Bulgaria


Email: t.stefanov@ts.uni-vt.bg

Received: 11 February 2024.

Revised: 17 May 2024.

Accepted: 03 June 2024.

Published: 27 August 2024.

 © 2024 Tihomir Stefanov, Milena Stefanova, Silviya Varbanova & Stanislav Temelkov; published by UIKTEN. This work is licensed under the Creative Commons Attribution-NonCommercial-NoDeriv 4.0 License.

The article is published with Open Access at <https://www.temjournal.com/>

Economic and social revolutions are gravely changing people's lives, and both financial planning and the ability to manage personal financial resources are becoming increasingly important.

In today's digital world, managing activities in various sectors of economy, including finance and banking, is more efficient with the integration of mobile financial services. Mobile devices are used not only for communication in people's daily lives, but also for work purposes in different geographical areas and countries. Studies show that the mobile financial service is an important means of facilitating people's work in various economic and social sectors, thus also contributing to the socio-economic growth of many countries around the world [1], [2].

At present, more and more consumers need help in managing their personal finances. This requires a range of processes and activities to ensure financial stability and confidence for the future. The key to achieving financial freedom and security in effectively managing personal finances is to properly identify daily expenses, plan a budget, invest funds, and build a financial strategy. A lot of people who have difficulties managing their personal finances need specific professional guidance. There are also a number of software solutions available on the market that offer a variety of functionalities for managing personal finances. The overall productivity for users of such software is often slower or limited due to the lack of a simplified interface through which they can easily and conveniently access information for quick and accurate data entry. The importance of having a free subscription plan to use this type of software should not be underestimated either.

For a better visual presentation of the process of creating a mobile application for personal finance management, a scientific approach is applied, and the present paper is divided into sections thus:

In the second section, recent publications of other authors on the same or a similar topic are analyzed. The third section describes the methodology used in the process of the mobile application's design and development. Section four gives a detailed account of the very process. In the fifth section, key functionalities of the created application are described, and part of the program code is demonstrated.

Section six summarizes the results and sheds light on the prototype testing. In the seventh section of discussion, both the main results of the present work and its limitations are analyzed. Future improvements are also suggested. The last section outlines the conclusions this paper arrives at.

2. Related Work

There is a growing need among today's consumers for up-to-date mobile cash management solutions. The demand for remote financial capability is on the rise. People living outside major population centres and those with mobility difficulties are particularly concerned. While traveling or vacationing abroad, people seek quick and convenient ways to manage their finances.

On a global scale, the trend in cash flow management in many companies is a major determinant of their development and market penetration. In recent years, this process has been carried out through steady inclusion of modern technologies, where mobile devices belong. Research on the impact of adopting mobile financial management in companies and among customers across continents suggests that, while positive, the effect of modernization is not significant [3]. However, surveys are limited, with studies focusing on the factors that determine the adoption and use of mobile financial management.

In a number of areas, the process accompanying sales management and after-sales customer service is not entirely possible at a distance. Meanwhile, there has gradually occurred a transition to out-of-office work for sales teams, managers and sole traders, with an increasing need to manage sales through the provision of mobile devices and software resources [4]. The role of banks, government, and regulatory authorities in investing in research and development of mobile financial services and mobile money management is strengthened [5], [6], [7].

Innovations and technological changes contribute both to the development of modern trade and the reporting of greater profits. Over the last decade, business organizations have been focused on making information and mobile technologies an integral part of their operations to account for financial stability and better competitive advantages. With the development of computer technologies and the Internet, the capacity to manage personal finances is constantly evolving, thus making software products more integrated and accessible to the average user [8], [9]. A possible problem with personal finance management is that many people find it difficult to keep track of their expenditure and income, and to plan a budget. As a result, they often end up having financial difficulties or debts.

One solution to the problem is using websites [10] (Fig. 1) or mobile applications designed to provide detailed information on expenses, income and budget planning opportunities in the management of personal finances.

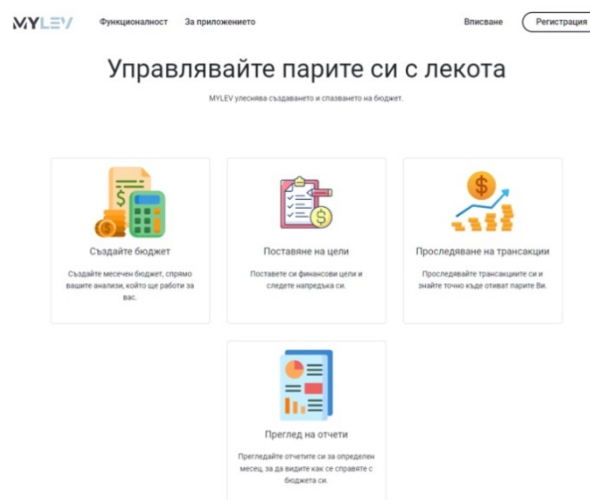


Figure 1. Screen of MyLev website

3. Methodology

The methodology used in the process of designing and developing the mobile application is based on research among potential customers with a detailed analysis of similar desktop and mobile applications. A range of programming technologies is explored and compared to motivate the selection of appropriate software for the programming implementation.






The interviews, conversations, surveys, and opinion polls among potential customers, as well as their summary, are done in order to bring benefits to users of the new application. The integration of these surveys' results [8], [11] is embedded in the implementation of useful functionalities included in the application.



The methodology includes a thorough analysis, review and research of various existing solutions [12], [13], [14], [15], [16]. As a result of the review, it can be concluded that until now, there has not been a free application in Bulgarian providing users with tools for managing personal finances.

Table 1 compares nine English-language mobile apps available on Google Play for the USA region [17]. Bulgarian language is not supported by any applications for the selected financial field [18], and some of the best ones in the world are not available in our country either [19].

This paper describes the process of building and developing an effective mobile application providing users with tools and functionalities for effective management of their personal finances.

Table 1. Overview of mobile apps focused on personal finance management

Personal Finance Apps	Features	Price	Free trial	Difficulty of use	Bank Sync
Mint: Budget&Track Bills 	This mobile application provides tools for financial tracking of cash expenses and account balances. It makes it possible for users to retrieve transactions and monthly budgets' data. It also provides tax information. There are options for managing cryptocurrency and investing in crypto assets [20].	Free, with optional paid upgrade	N/A	Moderately complex	Yes
Buxfer: Budget&Expense Track 	This app includes tools for manually entering transactions and setting budgets. It provides features for tracking expenses and working with different currencies. An option for the user to be notified about upcoming bill payments or exceeding a financial limit is also available [21].	Free version, paid plans	Yes	Relatively easy	Yes
Goodbudget: Budget&Finance 	This app enables the user to pre-allocate funds (envelope budgeting), to manually enter transactions and edit/change a budget according to potential costs. It also offers a tool for transferring unused funds to a future period. An option of saving transaction data for the last 7 years is available, too [22].	Free version, paid plans	Yes	Moderately complex	Yes
NerdWallet: Manage Your Money 	This app includes tools for extracting transaction information on bank and investment accounts. It offers options of manually calculating a budget and expenses according to the 50/30/20 scheme. It provides help and advice on more optimal shopping for goods and gives information on available credit cards' status [23].	Free	Yes	Moderately complex	Yes
EveryDollar: Budget Tracker 	This application allows for adjusting or resetting a budget for a given period. Manual transaction tracking is available. It gives the option of setting up savings funds to avoid overspending by planning spending in advance. Tools are implemented to remind the user of the due dates for a given account [24].	\$79.99 /year or \$12.99 /month	Yes	Relatively easy	Yes

Personal Finance Apps	Features	Price	Free trial	Difficulty of use	Bank Sync
Mobills: Budget Planner 	This app is used to track and control personal cash expenses and credit card limits. Retrieval of financial statistics by generating graphs is enabled. Reminders of important deadlines on a given cash account as well as the available balance for a set period are integrated into the application [25].	Free, with optional paid upgrades	No	Relatively easy	Yes
Spendee – Budget and Expense T 	This app enables users to manage their personal finances and bank accounts. It contains functionalities for sharing finances/funds and managing them with other persons/clients as well as for managing different currencies. The software contains numerous security and data privacy tools. It also offers the option to redirect the user to a web version/site [26].	Free	Yes	Relatively easy	Yes
Budget planner: Expense tracker 	This application is used to track and plan expenses for a given month. Storing income and expenditure data is enabled. It helps to manage and recognize data through speech/speaking. There is a payment feature on scheduled weekly, monthly and yearly recurring transactions. The app offers a 6-month forecast based on previous transactions. A monthly budget calculator and bar chart of daily transactions is included [27].	Free	Yes	Moderately complex	Yes
Prims: Pay Bills, Money Tracker 	This mobile software has tools for automatically tracking accounts and bank due dates, retrieving financial transaction history and reminding the user of household bills' payments. There is a calendar of current accounts and completed transactions. A review of checking accounts is another option. Protection of data through encryption, such as biometric authentication or PIN assignment, is provided as well [28].	Free app	N/A	Moderately complex	Yes

The application allows creating budgets, recording expenses and income, generating reports and charts, as well as receiving financial status notifications. For the convenience of users, monthly data synchronization can be visualized through charts. The mobile application is fully integrated with the web-based personal finance management system that was previously created by the authors. The final goal has been achieved – for the application to be a helpful and up-to-date tool for customers in managing their personal finances, offering convenient navigation and innovative functionalities.

4. Process of a Mobile Application Development for Financial Management

After a comprehensive review of and research into a number of existing software solutions on the market, it was found that not many of them meet the needs of users for an easier way to manage personal finances, and practically none is available in Bulgarian. Based on preliminary research among potential users, the need for a useful mobile application in the chosen field has been identified.

4.1. Program Implementation

This section describes the main processes of building the software part of the *MyLev* mobile application, setting up the database and its user interface. For the implementation of the program logic and the code part, practical knowledge of working with different programming languages and the skills of effective integration of web technologies have been successfully combined. The *MyLev* mobile application is written in Java using Gradle 8. The base part of the application is created with .NET C#, Microsoft SQL and Angular.

4.2. Database

Database setup is an important component of application design. To facilitate the management of user data, it is important that a reliable database be chosen. In this case, the Microsoft SQL database management system was used. Entity Framework software was applied to describe and execute the requests as well as to connect the data. Each database table has its own "model – module" that is used to interact with the data from the corresponding table. Once the model is created, it is possible to call various CRUD (Create, Read, Update, and Delete) methods on it.

Fig. 2 shows the scheme of the database composed of three main tables – UserObjects, Goals, and TransactionsObjects, which correspond to three of the main modules in the application.

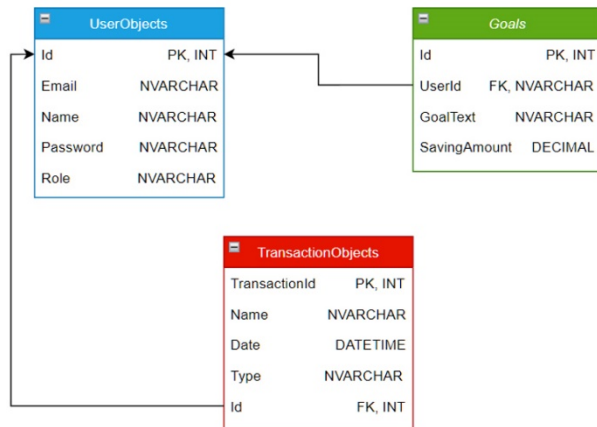


Figure 2. Scheme of a relational database

The leading role of the user in the presented application is only bound to the transactions performed by them. For this purpose, key relationships from the Goals and TransactionsObjects tables are designed for the UserObjects table.

Fig. 3 presents a code from the migrations to create the 'TransactionsObjects' table.

```
protected override void Up(MigrationBuilder migrationBuilder)
{
    migrationBuilder.CreateTable(
        name: "UserObjects",
        columns: table => new
        {
            Id = table.Column<int>(type: "int", nullable: false)
                .Annotation("SqlServer:Identity", "1, 1"),
            Email = table.Column<string>(type: "nvarchar(100)", nullable: false),
            Name = table.Column<string>(type: "nvarchar(100)", nullable: true),
            Password = table.Column<string>(type: "nvarchar(255)", nullable: false),
            Role = table.Column<string>(type: "nvarchar(50)", nullable: false)
        },
        constraints: table =>
        {
            table.PrimaryKey("PK_UserObjects", x => x.Id);
        });

    migrationBuilder.CreateIndex(
        name: "IX_UserObjects_Email",
        table: "UserObjects",
        column: "Email",
        unique: true);
}

protected override void Down(MigrationBuilder migrationBuilder)
{
    migrationBuilder.DropTable(
        name: "UserObjects");
}
```

Figure 3. Program code for creating 'Transaction Objects' table

Fig. 4 presents a code for retrieving data about the goals achieved by a user at a particular time.

```
protected override void Up(MigrationBuilder migrationBuilder)
{
    migrationBuilder.CreateTable(
        name: "TransactionObjects",
        columns: table => new
        {
            TransactionId = table.Column<long>(type: "bigint", nullable: false)
                .Annotation("SqlServer:Identity", "1, 1"),
            Name = table.Column<string>(type: "nvarchar(100)", nullable: false),
            Amount = table.Column<double>(type: "float", nullable: false),
            Date = table.Column<DateTime>(type: "datetime2", nullable: false),
            Type = table.Column<string>(type: "nvarchar(100)", nullable: false),
            Id = table.Column<int>(type: "int", nullable: false)
        },
        constraints: table =>
        {
            table.PrimaryKey("PK_TransactionObjects", x => x.TransactionId);
        });
}

protected override void Down(MigrationBuilder migrationBuilder)
{
    migrationBuilder.DropTable(
        name: "TransactionObjects");
}
```

Figure 4. Data for the purpose of a specific user

4.3. Map of MyLev Mobile App

The authors' main idea of easy and simplified navigation has been implemented for convenient use of the application. In the structural map of the application, the focus is on interaction and the ability of users to intuitively and quickly reach the necessary information in a way similar to working with websites. This is a guiding principle in developing both web [29] and mobile applications.

Fig. 5 presents an optimal mobile application map that satisfies users. The choice of a vertical map structure is consistent with simplified usability and modern user interface and design principles.

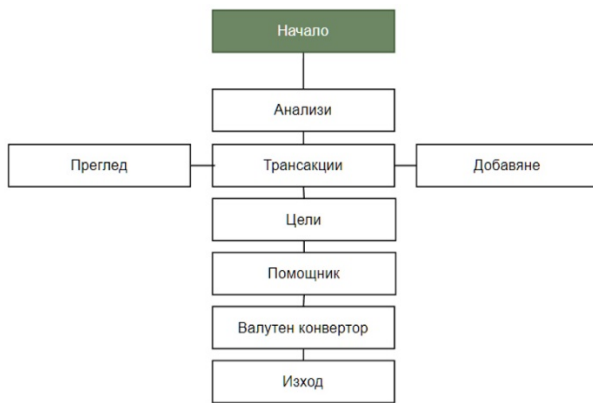


Figure 5. Structural map of MyLev mobile application

5. Key Functionalities of the Mobile Application

After detailed research on customer needs, useful key functionalities are implemented in the application developed by the authors. Four of them are described below.

5.1. Portable Calculator

A basic functionality to assist users is integrated with a 'Portable Calculator' of the 'bubble' type (Fig. 6, left), providing the option of additional calculations. It adds completeness and convenience to the application. The portable calculator is shown or hidden by clicking on a round bubble with a calculator-shaped icon.

5.2. Currency Converter

Another useful functionality has been added to the application. Conveniently, a 'Currency Converter' is built in, providing a currency conversion form with the current exchange rate at the moment (Fig. 6, right).

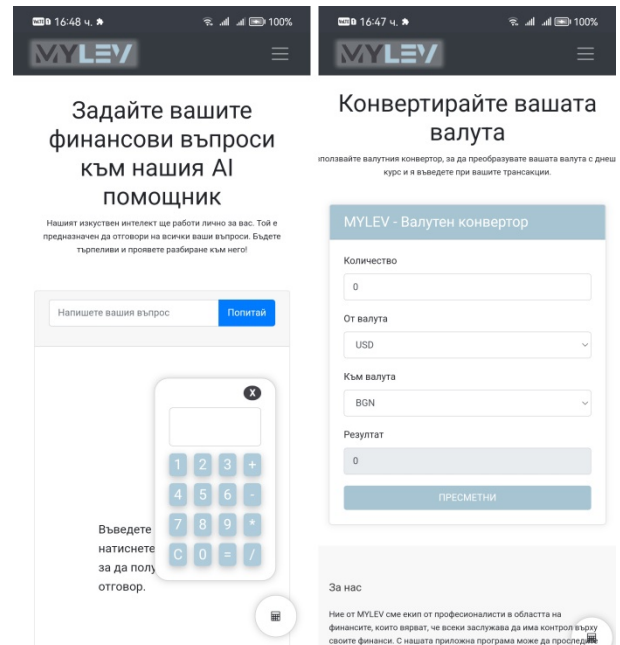


Figure 6. Portable Calculator and Currency Converter

The code for interacting with the database is shown in Fig. 7 and Fig. 8 when showing the charts on the application's homepage.

```

public Analytics GetMostCommonAndDemographics(List<TransactionObject> userTransactions)
{
    var analytics = new Analytics();
    var map = new Dictionary<string, SpendingDemographics>();
    HashSet<string> typesAdded = new HashSet<string>();

    string mostPurchasedType = null;
    int highestTransactionCount = 0;
    double currentMostAmountSpent = 0;
    string typeWithHighestTransactionAmount = null;

    foreach (TransactionObject transaction in userTransactions)
    {
        string type = transaction.Type.ToLower();

        if (typesAdded.Contains(type))
        {
            SpendingDemographics spendingDemographics = map[type];
            spendingDemographics.NumberOfTransactions = spendingDemographics.NumberOfTransactions + 1;
            spendingDemographics.MoneySpent = spendingDemographics.MoneySpent + transaction.Amount;
            spendingDemographics.TransactionDates = (transaction.Date);
            spendingDemographics.Transactions.Add(transaction);
            map[type] = spendingDemographics;

            if (spendingDemographics.NumberOfTransactions > highestTransactionCount)
            {
                mostPurchasedType = type;
                highestTransactionCount = spendingDemographics.NumberOfTransactions;
            }
            else if (spendingDemographics.NumberOfTransactions == highestTransactionCount)
            {
                mostPurchasedType = mostPurchasedType + ',' + spendingDemographics.Type;
            }
        }
    }
}
  
```

Figure 7. First part of the code for chart visualization from the database interaction

The innovative functionality to preview and scan a barcode when adding a current transaction is particularly useful. For this purpose, it is necessary to select a product with a matching barcode. The user scans the valid barcode with the camera of their own mobile device. The image is redirected and scanned by the mobile application, and the data are archived in the appropriate form.

The benefit of the presented functionalities is the possibility to prevent potential errors both when adding data and during its subsequent processing.

6. Results

The article explores the needs of users working with reliable mobile applications, with an emphasis on the available applications for effective management of personal finances. Promptness in solving possible problems accompanying this process is also important.

The authors take the view that consumers need professional help and specific guidance in managing their money. As a result, a mobile app has been developed that offers a user-friendly interface and useful functionalities. The app is called *MyLev*, and the name has a certain connotation. It is in a beta testing phase and bound to be published on the Google Store. It is also designed to be used by visually impaired or totally blind people. In the process of its development, the application was also tested by partially sighted users [30]. For this purpose, the possibility of reading a text through a built-in function in the Android OS when clicking on the corresponding drop-down menu has been implemented. It is designed to provide visually impaired people with both an excellent UX and a seamless experience with *MyLev*. The tests were conducted with charts in the 'Analysis' / 'Home' menu, and 'Goals' functionality, with the current month target selected and charts including a specific descriptive text part.

MyLev Mobile App supports Android versions up to Android 14 and is optimized for different screen sizes and resolutions. The app requires internet access. Its logo is copyrighted (Fig. 11) and designed with graphics software.



Figure 11. *MyLev* mobile app logo

7. Discussion

The relevance of the topic is determined by the need to quickly resolve possible difficulties related to personal finances and their management. In doing so, users need help and specific professional guidance.

One of the main limitations after the conducted studies is the lack of similar mobile applications in Bulgarian. This obstacle for Bulgarian users was the motivation behind the creation of the proposed prototype. These days a variety of foreign language applications based on the Android OS are available to assist people in managing personal funds [31] as well as such that help them make marketing decisions accompanying this process [13], [32]. In regards to managing their personal finances, both young consumers in our country and Bulgarians working abroad have a preference for using their mobile devices with available applications, mostly in English.

The results of the present study show that free mobile money management applications could be used by a larger group of users and for a longer period of time. Similar to other studies, they indicate the need for mobile financial management not only on the part of businesses but among ordinary users, too [33]. With the survey conducted and the review of scientific publications on the subject, users' behavioural intentions to adopt mobile banking are analysed.

The present study is based on a detailed study and comparison of a number of active mobile applications in the chosen field. However, the study has certain limitations stemming from the need for the usability of the developed prototype to be confirmed by statistically proven results. First, the analysed applications were selected purposefully – those that offer free versions and ease of use were explored. On the other hand, the fact that there was no mobile application for managing personal finances entirely in Bulgarian further spurred the creation of *MyLev*.

The various applications studied and their functionalities contribute to the integration of more innovative and user-desired financial management operations into the developed *MyLev* application.

As a result, the development of the presented prototype, based on a preliminary survey of prospective users, can be indicated as the main contribution of the present publication. *MyLev* mobile application offers innovative opportunities in managing personal finances, which is a prerequisite for its future market realization.

One of the limitations in the current version of the developed prototype is the lack of cryptocurrency support.

This will be the first major update the authors are planning to offer in the future. Another desired functionality is improved user experience for people with special needs. The next step will be the creation of a mobile application running on iOS with the same features and an effort to expand target users' group.

Currently, the economy, trade and banking sector, together with software companies, provide customers with offers, potential solutions and financial packages that are still not in mainstream use. Their benefits have not been thoroughly analysed and researched yet, which is why accurate data cannot be determined or extracted to date.

8. Conclusion

Software products available on the market offer a number of solutions for managing personal finances. Through mobile devices, this process can be greatly facilitated. Nowadays financial management is prioritized to help consumers. This article features a mobile application prototype for managing personal finances. It expands on the previously built web-based system by supporting users with fast and convenient access through mobile devices. The application can be used at any time and from any place with internet access.

The article aims to describe features of the database design process and the main application modules so that they are flexible enough, but at the same time specific in order to be able to satisfy the requirements of a particular client.

Some of the existing software products provide sufficient functionalities for financial management, and a number of additional requirements are also present. One, for example, is the lack of a completely free subscription plan for use. Another significant limitation is the need for a simplified interface for straightforward and convenient user access to everything they need for quick and accurate data entry and management.

One of the conclusions of the article is that even with the number of software products available in the chosen field, there remains a necessity for a software solution that will bring together all the requirements of users and provide free mobile access to personal finance management. *Barcode Scanning Preview*, *Currency Converter*, and *Portable Calculator* are some of the innovative functionalities offered by the featured mobile application.

The application supports current versions of Android – from 6 to 14 and is optimized for different screens and resolutions, both on smartphones and on tablets. The creation of a new mobile application with the presented functionalities and excellent user experience running on iOS is planned to occur in the future.

References:

- [1]. Ahmed, A., Raihan Uddin, S.M. and Rifat Hassan, S.M. (2022). Early career researchers: Factors affecting consumer behaviour in mobile financial services in Bangladesh. *Asia-Pacific Sustainable Development Journal*, 29(1), 143–167. Doi:10.18356/26178419-29-1-7
- [2]. Fernando, S. D. (2016). Employee Personal Financial Literacy as Strategic Human Resource Management Initiative: With special reference to ABC Bank PLC. In *7th International Conference on Business & Information ICBI–2016, Faculty of Commerce and Management Studies*, 9.
- [3]. Njinyah, S., Asongu, S., & Jones, S. (2023). The role of mobile money adoption in moderating the influence of access to finance in firm performance. *Journal of Science & Technology Policy Management*. Doi:10.1108/JSTPM-07-2022-0114
- [4]. Julian Vasilev, Maria Kehayova-Stoycheva. (2019). Sales Management by Providing Mobile Access to a Desktop Enterprise Resource Planning System, *TEM Journal. Volume 8(4)*, 1107-1112, Doi:10.18421/TEM84-01
Priantinah, D., Aisyah, M. N., & Nurim, Y. (2019, July). The analysis of technology acceptance model (TAM) for personal financial management on mobile application technology. In *International Conference on Banking, Accounting, Management, and Economics (ICOBAME 2018)*, 262-266. Atlantis Press. Doi:10.2991/icobame-18.2019.56
- [5]. Hazra, U., & Priyo, A. K. K. (2020). Mobile financial services in Bangladesh: Understanding the affordances. *The Electronic Journal of Information Systems in Developing Countries*, 87(3). Doi:10.1002/isd2.12166
- [6]. Lukić, V., Čolić, L., & Prica, I. (2019). Perspectives and adoption of mobile banking in Serbia: The case of young adults. *Ekonomika Preduzeća*, 67, 334–344. Doi:10.5937/ekopre19063341
- [7]. Mijić, M., Čebić, B. (2023). Mobile Applications for Personal Finance Management: Technology Acceptance Perspective. In: Benković, S., Labus, A., Milosavljević, M. (eds) *Digital Transformation of the Financial Industry. Contributions to Finance and Accounting*. Springer, Cham. Doi:10.1007/978-3-031-23269-5_16
- [8]. Nurbekova, Z., Grinshkun, V., Aimicheva, G., Nurbekov, B., & Tuenbaeva, K. (2020). Project-Based Learning Approach for Teaching Mobile Application Development Using Visualization Technology. *International Journal of Emerging Technologies in Learning (iJET)*, 15(08), 130–143. Doi:10.3991/ijet.v15i08.12335
- [9]. Pissinati, P. D. S. C., Évora, Y. D. M., Rossaneis, M. A., Gvozd, R., Santos, M. S. D., & Haddad, M. D. C. F. L. (2019). Desenvolvimento de um protótipo de web software de apoio ao planejamento da aposentadoria. *Revista Latino-Americana de Enfermagem*, 27, e3169.

- [10]. Uddin, M. K., & Nasrin, S. (2023). Customer Satisfaction and Intention to Use Mobile Financial Services: A Systematic Literature review. *European Journal of Business and Management Research*, 8(1), 274–283. Doi:10.24018/ejbmr.2023.8.1.1815
- [11]. Makalew, B. A. (2022). Android based Personal Finance Management Application: design and development. *Engineering, Mathematics and Computer Science Journal (EMACS)*, 4(1), 5–9. Doi:10.21512/emacsjournal.v4i1.8085
- [12]. Wataya, R., Frauches, P. & Bergamo, A. (2020). Persönliche Finanzen in der Handfläche: ein Erfahrungsbericht. *Revista Científica Multidisciplinar Núcleo do Conhecimento*, 109-124.
- [13]. French, D., McKillop, D., & Stewart, E. (2021). Personal finance apps and low-income households. *Strategic Change*, 30(4), 367–375. Doi:10.1002/jsc.2430
- [14]. Jian, B. K. W., Sivaguru, A., Subramaniyan, L., & Joo, M. O. T. (2020). Personal Financial Planning and Management Apps (PFPMA). *International Journal of Management (IJM)*, 11(11).
- [15]. Garcia, M. B., & Claour, J. P. (2021, November). Mobile bookkeeper: personal financial management application with receipt scanner using optical character recognition. In *2021 1st Conference on Online Teaching for Mobile Education (OT4ME)*, 15-20. IEEE. Doi: 10.1109/OT4ME53559.2021.9638794.
- [16]. Prime, & Prime. (2022). *The 5 best Books, Magazines and apps for personal Finance*. PrimeView. Retrieved from: <https://primeview.co/the-5-best-books-magazines-and-apps-for-personal-finance/> [accessed: 30 January 2024].
- [17]. Yakal, K. (2024). *The best Personal finance software for 2024*. PCMAG. Retrieved from: <https://www.pcmag.com/picks/the-best-personal-finance-services> [accessed: 31 January 2024].
- [18]. Irby, L. (2023). *Best Personal Finance Apps*. The Balance. Retrieved from: <https://www.thebalancemoney.com/best-personal-finance-apps-4170650> [accessed: 02 February 2024].
- [19]. *Mint: Budget & Track Bills - apps on Google Play*. (n.d.). Google Play. Retrieved from: <https://play.google.com/store/apps/details?id=com.mint&hl=en&gl=US> [accessed: 03 February 2024].
- [20]. *Buxfer: Budget & Expense Track - apps on Google Play*. (n.d.). Google Play. Retrieved from: <https://play.google.com/store/apps/details?id=com.buxfer.app&hl=en&gl=US> [accessed: 05 February 2024].
- [21]. *GoodBudget: Budget & Finance - apps on Google Play*. (n.d.). Google Play. Retrieved from: <https://play.google.com/store/apps/details?id=com.daspringtech.envelopes&hl=en&gl=US> [accessed: 06 February 2024].
- [22]. *NerdWallet: Manage Your Money - apps on Google Play*. (n.d.). Google Play. Retrieved from: <https://play.google.com/store/apps/details?id=com.mobilerecords&hl=en&gl=US> [accessed: 06 February 2024].
- [23]. *EveryDollar: Budget Tracker - apps on Google Play*. (n.d.). Google Play. Retrieved from: <https://play.google.com/store/apps/details?id=com.everydollar.android&hl=en&gl=US> [accessed: 07 February 2024].
- [24]. *Mobilis: Budget Planner - apps on Google Play*. (n.d.). Google Play. Retrieved from: https://play.google.com/store/apps/details?id=br.com.gerenciadorfinanceiro.controller&hl=en_US [accessed: 08 February 2024].
- [25]. *Spendee - Budget and Expense T – Apps on Google Play*. (n.d.). Google Play. Retrieved from: <https://play.google.com/store/apps/details?id=com.cleevio.spendee&hl=bg&gl=US> [accessed: 09 February 2024].
- [26]. *Budget planner—Expense tracker - Apps on Google Play*. (n.d.). Google Play. Retrieved from: <https://play.google.com/store/apps/details?id=com.colpit.diamondcoming.isavemoney&hl=en&gl=US> [accessed: 10 February 2024].
- [27]. *Prism Pay Bills, Money Tracker - apps on Google Play*. (n.d.). Google Play. Retrieved from: https://play.google.com/store/apps/details?id=com.mobilligy.android&hl=en_US [accessed: 10 February 2024].
- [28]. Pavlova, A. I., & Kuskov, N. S. (2022). Developing the Structure of a Web Application for Personal Finance Accounting. *Krasnoyarsk Science*, 11(3), 96–106. Doi:10.12731/2070-7568-2022-11-3-96-106
- [29]. Todorov T. & Dochkova-Todorova, J. (2023). Accessible UX/UI Design, *International Conference Automatics and Informatics (ICAI)*, Varna, 362-366. Doi:10.1109/ICAI58806.2023.10339066.
- [30]. Dewi, L. S. (2023). Comparison of Android-Based personal Financial management applications with variative financial conditions. *JAS (Jurnal Akuntansi Syariah)*, 7(1), 102–114. Doi:10.46367/jas.v7i1.1098
- [31]. Fauzia, H., & Wansen, T. (2020). Mobile Pooling and tracking order application for finance company. *IT For Society: Journal of Information Technology*, 5(1). Doi: 10.33021/itfs.v5i1.1204
- [32]. Afshan, S., & Sharif, A. (2016). Acceptance of mobile banking framework in Pakistan. *Telematics and Informatics*, 33(2), 370–387. Doi: 10.1016/j.tele.2015.09.005