

Opinion

By Assoc. Prof. Dr. Denis Safidinov Chikurtev

On a dissertation work for the acquisition of an educational and scientific degree "**doctor**"

Professional direction: **5.3. Communication and computer technology**

Scientific specialty: "**Computer systems, complexes and networks**"

Author of the dissertation: **Milvina Todorova Terzieva**

Dissertation topic: **Integration and synergy between information and communication technologies and modern banking**

1. Timeliness of the problem

Information and communication technologies are the basis of the development of modern banking. Nowadays, banking systems mainly rely on information and communication technologies. Thanks to technology, a number of services have developed, such as electronic banking, which includes sending and receiving transfers, paying household bills, managing stocks, withdrawing and servicing loans, opening and managing savings deposits and others. All these electronic services are based on innovative methods and algorithms based on ICT. This includes methods for managing and protecting databases, encryption and data transfer over safe communication channels, authentication and protection of user profiles and personal data.

The issues addressed in the dissertation are current and of particular importance in terms of improving banking services, ensuring better protection of users' accounts and data, reducing costs and automating operations.

2. Degree of knowledge of the state of the problem and general characteristics of the work

The author of the thesis shows in-depth knowledge of banking issues related to resource management, remittances, settlements, account management and more. In addition, the author shows good competencies and understanding of information and communication technologies used primarily in the banking sector. Technologies such as web-based systems, SOAP architectures, database organization are reviewed.

The dissertation is structured in five chapters, in a volume of 172 pages. Contains 26 figures, 108 literature sources and 2 appendices.

In Chapter 1 of the dissertation, details are described in detail regarding the various banking tools for financial management, types of cards and their capabilities, types of money transfers, banking systems, online banking and others. At the end of this chapter, the aim and tasks of the dissertation are presented. The goal is short and clearly defined - through the integration of ICT to achieve synergy of innovative methods and means for digitizing the banking environment. Four tasks have been defined that correspond to the set goal and are expected to lead to its achievement.

Chapter 2 presents innovative methods and tools for digitization in a banking environment. Various ICTs that are used in banking environments are described here. The author mentions technologies such as artificial intelligence, blockchain, web systems and services. The difference between online banking and mobile banking is described, as well as the information technology used in both banking methods. The presented ICT serve as a good basis for building complex solutions for research and development of improved systems and services in the banking sphere.

Chapter 3 presents a new complex banking service called Ideal, which is designed to work in real time. Various solutions such as real-time money transfer approach - Account Based Money Transfer, global network of money transfer provider and web software are integrated into the presented service. The connection between the Ideal database and the individual participants in the remittances is presented. The functionality of Ideal is described, presenting all the steps for sending a transfer from a sender client to a recipient client. At the end of the chapter, a comparison is made between a bank transaction, Ideal transaction and the innovative new Ideal bank transaction, where the advantages of the developed innovative service are clearly visible.

In Chapter 4, technologies for improving the developed innovative service are presented. The author introduces a new type of profile - a space profile to be used specifically for this service. Biometric recognition is introduced to increase security and protection. A chatbot based on artificial intelligence is integrated to speed up the work of users and improve system functions.

Chapter 5 validates the new financial service by presenting experiments and research results. An analysis of the integrated ICT methods and technologies to the financial service was made. Through various scenarios, the risk and benefits for each integration technology have been assessed. The achieved results show that the integrated methods lead to improved functionality and easy control by users.

3. Correspondence of the proposed research methodology and the set goals and objectives of the dissertation work

The structure of the dissertation has a logical sequence, the chapters are connected and well arranged. This results in easy readability and tracking of the defined problems and presented solutions. The arrangement of the chapters and their structure corresponds to the set tasks. Each chapter of the dissertation presents a solution to one of the tasks.

4. Contributions

Claims submitted for six contributions, lacking categorization. Contributions can be classified as follows:

Scientific and applied

- A new approach has been created to integrate modern financial and information and communication technologies in order to create a new financial service.
- A new real-time banking service has been synthesized with three main components: physical customer, electronic customer and customer service. The service is based on information banking technologies and applies modern web communication standards.

Applied:

- Elements of artificial intelligence and biometric data are integrated into the service. The results of the testing confirm the usefulness of the new service.
- An improvement of the new service has been developed with modern information and communication technologies, in which the space user profile technology is integrated, providing convenience, personalized experience and speed of service for the customer when he interacts with various partner locations of Idil platforms, including partner bank branches such as in at the same time, the security and protection of the user's personal data is maintained.
- The new service has been validated by testing multiple scenarios on different metrics. The advantages of the service, alleged gaps, methods to overcome them are proposed. The results of experiments and simulations confirm the advantages and usefulness of the service.

Contribution 3 describes the benefits of a system and I do not recognize it as a contribution.

5. Dissertation Publications

The doctoral student has presented 8 publications on the subject of the dissertation, two of which are referenced in Scopus . Of the remaining six publications, five are in international scientific conferences and one is in a scientific journal, all of which are not referenced in the world-renowned databases. Six of the publications are co-authored with the doctoral student's supervisor, and two are independent. The obtained publication points significantly exceed the minimum for ICT and indicate that the scientometric indicators are met.

6. Opinions, recommendations and notes

It makes a good impression that the work of the candidate and the presented developments and service find direct and real application in the banking environment in the country and abroad.

I recommend preparing a unifying figure to show all the individual functional blocks of the developed Ideal service . This will improve the reader's understanding of the overall structure of the system and its place as an intermediary in electronic banking.

I have some notes regarding the technical layout of the dissertation work: some of the literary sources are not cited in the text (2, 7, 8, 9, 10); some of the figures are not mentioned in the text (6, 7, 8, 9, 11); another part of the figures should be designated as tables (15, 16, 17, 18, 19, 23, 25)

Conclusion

The presented dissertation meets the set of criteria and indicators for the acquisition of the educational and scientific degree "doctor", according to the Law on the Development of the Academic Staff in the Republic of Bulgaria (ZRASRB), the Rules of the Bulgarian Academy of Sciences for the Implementation of the ZRASRB, the Rules of the Specific Conditions for Acquiring scientific degrees and for holding academic positions at IIKT-BAS. In conclusion, I give a **positive assessment** of dissertation work.

Strongly recommended to the scientific jury to award **Milvina Todorova Terzieva** the educational and scientific degree "**doctor**" in professional field **5.3. Communication and computer technology**.

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