

REVIEW

of a dissertation for awarding the educational and scientific degree "Doctor"
Topic "Integration and synergy between information and communication technologies and
modern banking"

Field of higher education 5. Technical sciences
Professional direction 5.3. Communication and computer technic
doctoral program "Computer Systems, Complexes and Networks"

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Reviewer: Prof. Dr. Rumen Trifonov – TU-Sofia
Reason: No. 27/29.01.2024 of the Director of ICT-BAS

The presented dissertation is in a volume of 172 pages, structured in 5 chapters, conclusion, contributions, two appendices, a list of publications on the topic, and literature used. There are 8 publications on the topic of the dissertation. The list of used literature contains 108 titles of literature and Internet sources.

1. Relevance of the problem and purpose of research

Information and communication technologies (ICT) are widely entering several areas of the modern world, including banking environments. The dissertation proposes the creation of a banking service with better functionality with the application of ICT.

The topic of dissertation research is relevant due to the increasingly close interaction between banking and ICT and services, to increase the quality of banking services. The PhD student is a representative of banking areas and demonstrates a very good knowledge of the state of the problem.

The aim of the dissertation work is: Through the integration of ICT in modern banking, to achieve a synergy between innovative methods and means of digitization in a banking environment. To fulfill this aim, the following tasks must be solved:

1. To research and analyze innovative methods and means of digitization in a banking environment.
2. To propose an approach for the integration of modern banking technologies to create a new complex banking service that will reduce the time of execution of a transaction, be accessible to all users, and be better in a financial aspect.
3. To propose improving regulations for the payment industry.
4. To validate the synthesized new banking service, and to carry out experimental studies and simulations of the proposed solutions. To verify and analyze the results.

The chosen research methodology and the achieved results are under the set goal and tasks of the dissertation.

2. General characteristics of the dissertation work

Chapter 1 provides an overview, analysis, and systematization of existing ICT in banking. Existing banking products and services, existing information and communication technologies used in banking, and trends for the development of the banking sector are presented.

Chapter 2 explores innovative methods and tools for digitization in a banking environment. Various banking services are presented:

- ICT banking service using payment cards;
- ICT banking service "Payment with mobile devices";
- On-line banking;
- Banking via mobile phone;
- Interactive methods and tools for remote and autonomous banking (Token, CES, chatbot, blockchain).

Chapter 3 presents an approach for integrating modern banking technologies to create a new complex banking service (Ideal) which:

- to reduce the execution time of a transaction,
- be available to all users,
- to be better in financial terms.

A comparison of the New Banking Service with existing banking transactions and a banking transaction using **Ideal** was made. The advantage of this service has been proven.

In Chapter 4, an improvement of the new Ideal banking service with modern ICT is developed. The improvement consists of:

- the so-called "space profile", including data on the sender and the recipient,
- recognition of biometric data (fingerprints, face, voice, etc).
- integration into the new service of a chatbot for customer convenience and service quality.

In Chapter 5, the developed new banking service with modern ICT is validated through experiments on space user profiles, biometric identification, chatbot, compatibility with mobile devices, security of biometric data, etc.

3. Characterization and evaluation of the contributions in the dissertation work

The new service with the additions improves the process of fast international money transfer and interaction between senders and beneficiaries by increasing convenience, efficiency, and security. This is beneficial for both the consumers and the bank.

There is compliance of the chosen research methodology with the set goal and tasks of the dissertation work. I believe that the doctoral student successfully coped with the set goals and tasks of the dissertation and I positively evaluate the results obtained, accepting the stated contributions as scientific and applied. They can be grouped like this:

1. A new approach was created to integrate modern financial and ICT to create a new financial service and a new real-time banking service was synthesized with three main components: physical customer, electronic customer, and customer service.
2. The service offers advantages compared to existing solutions in terms of transfer time, bank correspondents, non-euro area fees, global coverage, etc. An improvement of the new service with modern ICT has been developed.
3. Elements of "space profile", artificial intelligence, and biometric data are integrated into the service. The new service has been validated through multi-scenario tests on various metrics. The advantages of the service, alleged gaps, and methods to overcome them are proposed.

4. Publications of the dissertation student on the topic of the dissertation work

On the topic of the dissertation, 8 scientific publications have been published, of which one is in a journal and 7 are in conference materials. Two of the publications are independent. This gives me reason to conclude that they are all the personal work of the doctoral student. Two of the publications are in refereed editions (SCOPUS, SHS).

The minimum requirements regarding publication activity for the acquisition of the educational and scientific degree "doctor" according to Regulations of the Low have been met - 30 points. According to indicators G7 - G8, the doctoral student exceeds more than 3 times the minimum requirements (100 points). This gives me reason to believe that the results of the dissertation have become known to the international scientific community.

The reviewer did not find any plagiarism in the dissertation.

5. Evaluation of conformity of the abstract and the dissertation work

The abstract is 32 pages long and accurately reflects the research, the main results, and the contributions of the dissertation.

6. Use of the obtained results

The achieved research results are of real interest to both banking institutions and consumers. Interest has been requested from banking circles.

7. Critical notes and recommendations

The dissertation is structured very well. Each of the tasks set for the realization of the purpose of the dissertation is developed in a separate chapter. When reading the publications, it can be seen that a publication has been made on each of the dissertation tasks. A positive side of the presentation is that in each chapter the doctoral student indicates articles/reports in which the results obtained to achieve the goal of the dissertation were published.

In the future use of the synthesized new banking service, I recommend choosing a more appropriate service name.

The notes made are technical and do not detract from the contributions of the dissertation.

8. CONCLUSION

The dissertation of Milvina Todorova Terzieva complies with the conditions of the Law, The Regulations, and the specific conditions in IICT-BAS. The dissertation contains scientific and applied results of an innovative nature, which I evaluate positively. The candidate possesses knowledge in multiple areas of banking technologies, and ICT, applying them successfully in the synthesis of a new banking service. She demonstrates a capacity for independent research. The dissertation's contributions are significant for the banking industry and consumers. I strongly recommend to the Honorable Scientific Jury the awarding of the educational and scientific degree **"Doctor"** to Milvina Todorova Terzieva in the field of higher education 5. Technical sciences, professional direction 5.3. Communication and computer technic in the doctoral program "Computer systems, complexes and networks".

14.02.2024

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