R E V I E W

from prof. Georgi Tuparov, PhD,

Department of Informatics at New Bulgarian University

on a dissertation work for the acquisition of the educational and scientific degree "Doctor"

in the field of higher education 4. "Natural sciences, mathematics and informatics",

professional field 4.6 "Informatics and computer sciences",

doctoral program "Informatics"

Author of the dissertation: Veselina Rumenova Naneva, a doctoral student at the "Software Technologies" department, Faculty of Mathematics and Informatics (FMI) of the Paisii Hilendarski University of Plovdiv (PU).

Topic of the dissertation: Web-Based Data Visualization Tools

By order of the Rector of the Plovdiv University "Paisii Hilendarski" (PU) No. RD-21-2229/27.11.2023, I have been appointed as a member of the scientific jury for the defense of Veselina Rumenova Naneva, a doctoral student in the professional field "Informatics and Computer Sciences", doctoral program "Informatics" for awarding the educational and scientific degree "Doctor".

Doctoral student Veselina Rumenova Naneva was enrolled in the doctoral program of the the "Software Technologies" department of the FMI at PU in 2020 and was awarded with the right of defense in due course in March, 2023.

My review has been prepared on the basis of the ZRASRB, the Rules for the implementation of the ZRASRB (PPZRASRB), the Regulations of PU for the implementation of the ZRASRB (PRASPU), and decision of the first meeting of the Scientific Jury. The submitted documents for the procedure, the dissertation work and the abstract meet the requirements of the ZRASRB, PPZRASRB and PRASPU.

1. General characteristics of the dissertation work

The dissertation submitted for review has a total volume of 140 pages, with the main text occupying 121 pages, including 40 figures and three tables. The remaining 19 pages are an appendix containing snippets of program code. The main text consists of an introduction, four chapters, a conclusion, an author's statement of contribution claims, a list of the author's publications, and a list of references.

The bibliography includes 86 sources. In general, up-to-date literary sources are used. It is noteworthy that more than a third of the literature sources are Internet resources, which are mostly company publications and are not peer-reviewed. Some of the books mentioned in the second part of the literary sources do not have a monographic character and most likely are not peer-reviewed either. In my opinion, the use of multiple literary sources that are not scientifically peer-reviewed has led in some places to inaccuracies in the definitions, which I will mention later.

2. Relevance of the problem

The development of the information society and the wide penetration of information technologies in all spheres of life focus the requirements concerning the used software products on factors such as price, quality, accessibility and integration of services. The exponential growth of the data needed to make business decisions is immensely increasing the competition of the functionalities provided in the field of Business Intelligence software products and services. Data visualization is an important aspect in the functionality required by customers of these products and services. Given the huge variety of specific customer needs for visualization of specific data, unifying the process of creating a custom visualization would be particularly beneficial. In this regard, I find the topic of the dissertation interesting for scientific and applied research and completely up-to-date.

3. Aim and tasks of the dissertation

The aim of the thesis, as stated in the text provided to me for review, is "to model an architecture for unified creation of custom data visualization for Microsoft Power BI and Tableau environments with the possibility of integration with their specific APIs."

From my point of view, it would be good to avoid mentioning specific software products, which in this case makes the purpose of the dissertation for the award of the educational and scientific degree "Doctor" seem purely applied. In fact, the aim could be stated as: "Develop a model for unified creation of customized data visualization with the possibility of integration with specific application-program interfaces", which would reflect much more accurately the meaning of the entire research presented.

I consider the tasks set to achieve the goal of the dissertation to be adequate. Again, I must point out that the tasks formulated in this software-focused manner mentioned above do not accurately reflect the scientific-applied nature of the dissertation work.

4. Analysis of the candidate's scientific achievements on the content of the dissertation

Chapter 1 discusses the specifics of the Business Intelligence (BI) approach as a set of strategies and technological tools for dynamic processing and visualization of business information in real time. The characteristics of two BI tools for the application of the architecture model, which is the object of research in the dissertation work, are analyzed. However, it is not clear on the basis of which criteria these two software tools were chosen.

I regret to note that the doctoral student made quite a few inaccuracies in the definitions of structured, semi-structured and unstructured data (on p. 14) and the text often confuses the concepts of data and information (e.g. on p. 16) and data model with data scheme (on page 18). I believe that these definitions should be refined by the doctoral student during the public defense.

In Chapter 2, an in-depth analysis of the features of working with the application-program interfaces of the Microsoft Power BI and Tableau software products in relation to styling and data access is made. Sample visualizations are created with each specialized tool.

Chapter 3 presents the developed architecture model for unified creation of custom visualizations. The focus here is on the abstractions of ways to access data and ways to shape stylistic changes to the user's view. The text is illustrated with schematics and class diagrams of the main interfaces, classes, objects, and constants that should be used when implementing new visual elements.

Chapter 4 presents an example application of the unified visualization development architecture for Microsoft Power BI and Tableau by building an Insurance Claims Triangle, a single field data label, a Lollipop, and a Tree, and looks at the possibilities them to work in both BI systems.

5. Dissertation contributions

I would summarize the contributions achieved in the dissertation work as scientific-applied (1 and 2) and applied (3 and 4):

1. An analysis of the specifics and application-program interfaces of two BI software products was made and conclusions were drawn for their unification.

2. An architecture for unified development of custom visualizations is created, which covers two aspects of abstraction - at the level of data access and basic styling of the new extension.

3. The specific requirements of a specific subject area - insurance - have been studied, and an industry-recognizable visualization of the development of the quality of an insurance portfolio has been built.

4. Several visualization prototypes have been developed with a specific focus through a unified custom visualization development architecture.

6. Publications that reflect the dissertation

Four co-authored publications were made on the dissertation work, none of which were with the doctoral student's supervisors. Two of them (1 and 2) are in editions indexed in Scopus with SJR, which satisfies the requirements of PPZRASRB for scientometric indicators in the professional direction of the dissertation work, although they are not strictly profiled in it. Publications 3 and 4 are international conference papers that are not indexed. In general, the publications reflect the essence of the research done and the results achieved.

7. Abstract

The abstract consists of 32 pages. It has been prepared in accordance with the requirements of the ZRASRB and PPZRASRB. As a content, it sufficiently accurately and fully reflects the content and results of the dissertation work.

8. Critical notes and recommendations

In addition to the remarks made above, I also have a serious criticism of the dissertation work regarding the statement used, which is quite unclear in some places and should be edited by a language specialist. There are also small terminological gaps, due in my opinion to poor translation - I think the term "Business Intelligence" in the sense that is put into it, could be translated in Bulgarian more like "Бизнес проучване" rather than the literal "Бизнес разузнаване"; "интерактивна справка" is not exactly "data report" but rather "interactive (data) report" etc. These and similar errors in the text, although unpleasant, are not essential.

Literary sources are cited not everywhere in the same style in the dissertation, for example, on pages 15 and 16 the names of the authors and the articles are indicated, the reference to which could only be by the number of the source in the bibliography. It is also not explicitly stated (if there are such cases) which of the figures are author's and which are taken from the literary sources.

Here I would like to recommend that the doctoral student direct her future publication activity in indexed scientific journals that are profiled in her professional field and in particular in the field of Business Intelligence.

CONCLUSION

Dissertation work, abstract and publications submitted for review meet the requirements of ZRASRB, PPZRASRB, PRASPU, and no plagiarism was found in them. My assessment of them is positive.

The achieved scientific-applied and applied results give me reason to recommend to the respected scientific jury to award to Veselina Rumenova Naneva the educational and scientific degree "Doctor" in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.6 Informatics and Computer Sciences.

January 4, 2024   Referee:

Prof. Georgi Tuparov, PhD