



UNIVERSITY OF ECONOMICS - VARNA

REVIEW

By: Prof. Dr. Krasimir Todorov Shishmanov

"D. A. Tsenov" Academy of Economics, Svishtov

Appointed as a member of the Scientific Jury by order of the Rector of the University of Economics - Varna RD-06-190/Nov 08, 2022.

Subject: Dissertation for the award of the educational and scientific degree "Doctor" in professional field 3.8 Economics, doctoral program "Application of computing technology in the economy".

Author of the dissertation: SVETOSLAV STEFANOV IVANOV,
Ph.D. student in the "Informatics" department at the "Informatics" faculty of the University of Economics - Varna.

Dissertation Topic: MANAGING SOFTWARE DEVELOPMENT, MAINTENANCE AND SUPPORT BY TECHNOLOGY START-UP COMPANIES

2. Data about the Ph.D. student

Svetoslav Ivanov graduated with a master's degree at University of Economics - Varna in 2009 in computer science. By order of the Rector RD-17-172/Jan 29th, 2018, he was enrolled in full-time doctoral studies in the field of higher education "3. Social, economic and legal sciences", professional field "3.8

Economics", in the doctoral program "Computational application technique in the economy" at the Department of Informatics for a period of 3 (three) years, starting from 01.02.2018, until 01.02.2021. By order of the Rector RD-17-386/09.02.2021, he was dismissed with the right to graduate for a period of five years, starting from 01.02.2021.

Svetoslav Ivanov started his professional career as a programmer in 2002 and for 20 years has been the creator of numerous software applications in the field of economics and education. His professional and research interests are in the field of programming, using different environments and toolkits for application development and application upgrade.

3. General presentation of dissertation work

The dissertation consists of 164 pages. Structurally, the work is presented by an introduction, an exposition in three chapters, a conclusion and a list of references, 15 tables, 13 figures.

The selected research problem is actual and concerns technology start-ups that focus their activity on software production. The research convincingly proves that in recent years, software has turned from a complex and high-tech product into a mass business and consumer product. The author maintains the thesis that in order to survive in the complex competitive environment, technology start-up companies need to adapt the development of software to constantly increasing requirements for it, including both providing the desired functionality and meeting a number of quality and time-to-market criteria.

The innovation process is presented in this research as the second key component with which the business development of technological start-up companies is connected. The emphasis in this direction is the digitization of the business, which gives the opportunity to improve and change the processes in the companies, achieving lower costs, higher speed, better manageability and control.

The **object** of research are technological start-up companies with the

activity of development, maintenance and support of software products, and the **subject** is the development of new software products in an entrepreneurial process with unclear requirements and parameters that change dynamically over time.

An important clarification is made that the research is aimed at appropriate approaches for managing the software development process and designing a software system that can support technology start-ups. This clarification predetermines the research thesis.

The **main research thesis** is that technology start-ups have a specific purpose, processes and organization, therefore entrepreneurs need a specialized management approach, combined with a software system, with the help of which they can achieve their goal.

I believe that these formulations are **correct and correspond** to the set goals and objectives.

The presented theoretical statements are supported by citations of literary sources. In the research, 140 sources are indicated, which were used correctly and expediently.

4. Assessment of the structure and content of the dissertation

In developing the dissertation, the traditional approach was used, in which the main theoretical aspects of the problem under consideration are discussed in the first chapter. It is stated that start-up technology companies have a number of specific features, among which stand out the need to develop their own product, find an adequate business model guaranteeing vitality and growth, as well as the choice of a methodology tailored to the specific conditions (environment, resources, opportunities of the entrepreneur, product and market, risks). The chapter examines important methodological issues related to the development of software products, the management of human resources and software projects in technology start-up companies.

Chapter two presents the developed conceptual and logical model of a

software system managing the main processes and activities in the development, maintenance and support of software.

Chapter three presents the functioning of a software system supporting software development in a technology start-up company. In a real working environment, the applicability of the detailed architecture of the system proposed in the study is tested. Different approaches and toolkits (including virtual tools) for managing software development are reviewed.

Conclusions related to the nature of the exhibition are formulated for each of the chapters.

I believe that the structure and content of the dissertation cover the issues under consideration and meet the requirements.

The abstract has a volume of 39 pages and reflects the main moments of the dissertation and the achieved research results. Also attached to it are a reference to the main scientific contributions and a list of publications related to the dissertation work.

5. Identification and assessment of scientific and scientific-applied contributions

The research reveals the nature of technology startups from a legal and scientific perspective. The main software development issues that start-ups may face are identified.

Different approaches to managing software development are presented and analyzed, with an emphasis on those that are more suitable for small teams.

In the development, the author successfully asserts that there is a fundamental difference between support and accompaniment, which are often equated in practice. He correctly points out that maintenance is related to ensuring the normal operation of a built and deployed product, and support is related to making changes to correct identified errors, adaptation to a new environment, operating system, hardware, to improve existing ones and add new functional

possibilities.

The thesis correctly states that when developing software for a technology start-up, the requirements may not be predetermined, may not be known, or may change during the search for a niche market. It is also rightly argued that any additional requirement implies an analysis of the marketing and financial effect, since its inclusion involves resources in its development and implementation.

Among the merits of the presented development is the consideration and adaptation of classical management theories in the conditions of work in smaller markets, more flexible product models, in a more unstable external environment. Appropriate models are offered such as: the learning organization model – learning through experience and continuous improvement processes; benchmarking model – comparison with industry leaders; double circle model – to obtain feedback from partners and competitors about changes in the environment.

In the dissertation, it is argued that the software system helps the technological start-up companies to introduce new forms of management with higher efficiency and to optimize processes. It should provide information for timely, adequate and effective decision-making.

I also find it correct to state that the external environment in which a technological start-up company must function is not only the market, but a complex network of interactions with many organizations in different dimensions.

The "coordination practices" are successfully summarized and systematized, which are based both based on practical observations and on the analysis of the publications of various authors.

The importance of team motivation is indicated, specifying that it is a broad-spectrum process with many conditions. The role of the leader in it is also emphasized, who must integrate knowledge and understanding of business needs, technologies and their use. I share the author's opinion that human resource is the most complex element to manage, but the only one that can contribute to

significant achievements in a technology startup company.

Based on a presented conceptual business model, a logical model of a software system was developed, and for its implementation, business entities were identified and developed as classes with corresponding properties and relationships.

A special place in the thesis is devoted to the implementation plan, which includes both the planning of implementations and versions, as well as the features that are implemented in them, together with the distribution of time.

A shortened version of a work product based on interaction scenarios has been developed, which can be expanded and supplemented if necessary, according to the needs and strategic views of the management.

A reasoned and justified proposal is made for software technologies that can be used depending on the size of the software project being implemented by a technology start-up company.

A positive point in the dissertation is the presence of numerous examples and discussion statements, which are evidence of excellent knowledge of the subject and the presence of high practical skills on the part of the doctoral student.

6. Publications and participation in scientific forums

The doctoral student presented 8 publications (3 articles and 5 reports) on the problems of using published in specialized scientific publications and collections of scientific reports. Publications are on the topic of the dissertation and meet the requirements.

7. Critical notes, recommendations and questions

The overall review of the research necessitates the conclusion that it was carried out by a specialist with sufficient knowledge and experience in the issue under consideration, which allow him to successfully present his ideas and views in the present development.

In this regard, the following questions can be asked to the author:

1. What are the main problems and risks facing technology start-ups in the field under study and which of them are critical?
2. What is the key factor for the success of a technology start-up company in the IT sector?

8. Conclusion

The dissertation work of SVETOSLAV STEFANOV IVANOV is an independent study on an actual problem. It contains the necessary scientific and scientific-applied contributions and meets the requirements and criteria for awarding the educational and scientific degree "doctor". All this gives me reason to propose to the respected Scientific Jury to award the educational and scientific degree "Doctor" in professional field 3.8 Economics, specialty "Application of computing technology in the economy" to PhD student SVETOSLAV STEFANOV IVANOV.

Svishtov,
Nov 29th, 2022

Reviewer:

Заличена информация съгласно
33ЛД и регламент (ЕС) 2016/ 679

Prof. Dr. Krasimir Shishmanov

ИКОНОМИЧЕСКИ УНИВЕРСИТЕТ ВАРНА
Вх. № <u>P220-1460 / 06.12.2022</u>

Review

for the dissertation of PhD student Svetoslav Stefanov Ivanov,
entitled "Management of the development, support and maintenance of
software by technology startup companies",
for the educational and scientific degree "Doctor"
in doctoral program "Application of IT in Economics"
Reviewer: Prof. Dr. Vladimir Sulov,
from the University of Economics – Varna, member of the scientific
jury according to an order of the Deputy Rector of the University of Economics –
Varna No RD-06-190 / 8.11.2022, appointed as a reviewer according to a decision
of the scientific jury

1. Brief introduction of the PhD student

PhD student Svetoslav Ivanov was born in 1974. In the CV he did not indicate his secondary education and bachelor's degree. He graduated with a Master's degree in Informatics from the University of Economics – Varna in 2009.

He has worked in many positions – in his own company and in various other companies mostly as a programmer. He has experience in managing projects and teams with different methodologies, he is proficient in a number of software tools.

Since 2018 he has been a PhD student at the Department of Informatics at the University of Economics – Varna under the doctoral program "Application of IT in Economics". He has finished the program in 2021, and in 2022 a defense procedure has been opened.

2. General characteristics of the dissertation, assessment of the structure and content

The dissertation of Svetoslav Ivanov is entitled "Management of the development, support and maintenance of software by technology startup companies" and has a volume of 164 pages, including an introduction, 3 chapters, conclusion, a list of references of 140 sources, a list of the author's publications on the topic, annexes and a list of the abbreviations used (at the beginning of the work).

The introduction is thorough. The thesis of the dissertation is that "technology startup companies have a specific purpose, processes and organization, so entrepreneurs need a specialized approach to management, in combination with a software system, with the help of which to achieve their goal". The aim of the work is "to develop a project of a software system, applied with an appropriate approach to process management, to successfully support the activities of technology startup companies". Five tasks are defined to achieve the goal. I accept the thesis, goal and tasks as appropriately defined for a dissertation. The object of research is "technology startups with the activity of development, support and maintenance of software products" and subject – "development of new software products in an entrepreneurial process with unclear pre- and dynamically changing over time requirements and parameters". I also accept these formulations, although the subject could have been more precise. Some limitations are also defined.

Chapter one is entitled "Theoretical Foundations of Software Technology Startups" and has a volume of 54 pages.

It examines the nature of technology startups, in particular software startups and their management; methodological problems related to software development; organizational structures and project management of/in similar companies, including management approaches.

The chapter ends with conclusions and generalizations.

Chapter two is entitled "Software system for software production in technology startups" and has a volume of 41 pages.

This is the most important chapter of the dissertation and with the largest share of author's participation and contributions. The chapter is divided into three parts:

1. Conceptual model – including scope, components/elements, scenarios, business entities and properties, activity/state diagrams, interface requirements, etc.

2. Logical model – including class and case diagrams, distribution of components by layers.

3. Prototype of the interface, structure of menus and commands, etc.

In each of the parts the PhD student presents in detail his vision regarding the designed system, explained and illustrated variously – with a descriptive text, a number of figures, enumerations, etc.

The second chapter also ends with conclusions and generalizations.

Chapter three is entitled "Building and using the software development management system in BitPioneers Black Sea Ltd." and has a volume of 40 pages.

The author briefly describes the activity of the specific company, after which the organizational aspects for the implementation of the proposed system are considered, including plan and peculiarities. The last part of the chapter concerns the physical implementation of the system, including the selection of technological tools, development tools, opportunities for using virtual tools.

The chapter, like the previous ones, ends with conclusions and generalizations.

The conclusion of the work summarizes it briefly and points out a total of 6 contributions in 2 categories (theoretical and applied).

The chosen theme and topic are current and in general I think they are suitable for dissertation.

I highly appreciate the excellent knowledge on the part of the author of the matter under consideration, including the fact that a large number of theories, models and sources have been studied, as compared and analyzed.

The style of writing everywhere is very good, the presented concepts, theories, technologies and information are correct.

In general, the work has a suitable structure and contents, and together chapters two and three represent a scientifically applied solution to an actual practical problem.

In view of the above, I believe that the dissertation works meet the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its application (and in particular Art. 27), as well as the Regulations for the Development of the Academic Staff at the University of Economics – Varna, incl. Art. 34, para. 2 and 3.

No plagiarism is detected.

The supplied auto abstract reflects correctly the content of the dissertation.

3. Scientific and applied research contributions

As stated, the author has declared 6 contributions, divided into 2 categories – theoretical and applied.

I would consolidate them as follows:

1. A study is made of the peculiarities of the startup technological companies, developing software and the methodological problems related to the organization of their activities.

2. A project for a new information system for software production management in technology start-up companies has been proposed.

3. A plan for the development and implementation of the software system in a specific company is proposed, which we can call project approbation.

4. Publications on the dissertation

The author has 8 publications on the dissertation – 3 articles (of which 2 are single authored) and 5 papers (of which 3 are single authored). The publications are sufficient, they meet the minimum national requirements, as well as the requirements of the Rules for the Development of the Academic Staff at the University of Economics – Varna.

5. Dissertation notes and recommendations

My recommendation to improve the subject of the dissertation has already been mentioned.

I disagree with the author's view of the differences between the terms "maintenance" and "accompaniment" and accordingly I think that the presence of both words in the title of the dissertation is not appropriate.

Subsections 3 and 4 in Chapter 1 should have been better synchronized and integrated with each other.

In some places there is an imbalance in the volume of different parts – for example, the first chapter is much larger than the others, which is not logical for a dissertation. Subsection 2.2.1 is just one paragraph of text.

6. Questions

I have a question for the Ph.D. student:

Are there similar systems in the world, and possibly how does the proposed in Chapter 2 differ from them?

Conclusion

I believe that the dissertation on "Management of the development, support and maintenance of software by technology startup companies" meets the requirements of the Law on the Development of the Academic Staff in the

Republic of Bulgaria, the Regulations for its implementation and the Rules for the Development of the Academic Staff at the University of Economics - Varna. I give a positive assessment of the dissertation and propose that Svetoslav Stefanov Ivanov be awarded the educational and scientific degree "Doctor" in doctoral program "Application of IT in Economics".

5.12.2022

Varna

Reviewer:

Заличена информация съгласно
ЗЗЛД и регламент (ЕС) 2016/ 679

(Prof. Dr. Vl. Sulov)