R E V I E W
by Prof. DSc. Ivan Ganchev Garvanov, Professor at the
University of Library Studies and Information Technologies,
in a competition for the academic position "associate professor"

in the field of higher education:	4. Natural sciences, mathematics and informatics
professional field:	4.6. Informatics and Computer science
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prepared by:	**Prof. DSc. Ivan Ganchev Garvanov**
scientific jury member according to:	Order number 341/23.12.2021 by the Director of IMI

Only a candidate has submitted documents for participation in the announced competition:
Assistant Professor Dr. Boris Blagovestov Shishkov, IMI-BAS.

I. General description of the submitted materials

1. Details of the application

To participate in the competition **Assistant Professor Dr. Boris Blagovestov Shishkov** has submitted: (**a**) Professional CV; (**b**) Diplomas: a diploma (1998) for completed *bachelor's degree* from Sofia University "St. Kliment Ohridski", a diploma (1999) for completed *master's degree* from Sofia University "St. Kliment Ohridski" - specialty "Management information systems", a diploma for acquired educational and scientific degree "*Doctor*", issued by Delft University of Technology (The Netherlands) on 26 September 2005 (legalized and having an apostille), a diploma for recognition of the educational and scientific degree "Doctor" acquired abroad, issued by IMI-BAS on 22 February 2016; (**c**) List of the candidate's publications with a total number of 79, incl. 3 monographs and 76 refereed articles; (**d**) List of 21 publications of the candidate for participation in the competition, comprising a monograph, written in English language (issued by Springer), and 20 scientific articles (written in English language); they are all published in prestigious international editions, were written after the candidate has acquired the educational and scientific degree "Doctor", and are Scopus-indexed (17 of them are with SJR); (**e**) Abstracts of all 21 publications mentioned above – in Bulgarian language and in English language; (**f**) A contribution statement written by the candidate, concerning his publications; (**g**) Lists of citations of the candidate: A list of all citations generated by BAS' SONIX system for reporting the scientific and expert activity of the academy, where 119 citations of 35 publications are mentioned; A list of the citations for participation in the

competition, where 27 citations of 6 publications are mentioned; (**h**) Copy of an excerpt of the minutes from the meeting of the Scientific Council of IMI-BAS, dd. 15 October 2021, initiating the competition; (**i**) Copy of the announcement of the competition in State Gazette; (**j**) Statements certifying lecturing activities, issued by ULSIT (Bulgaria) and TU Delft (The Netherlands); (**k**) A statement for participation of the candidate in scientific juries; (**l**) A statement for editorial activities of the candidate; (**m**) A statement that reflects the participation of the candidate in 8 R&D projects; (**n**) Copies of the candidate's publications for participation in the competition; (**o**) A declaration issued by IMI-BAS, certifying that firstly: as per 1 November 2021, the candidate has a total work experience of 123 (one hundred and twenty three) months; secondly: the candidate has been an Assistant Professor at IMI-BAS since 1 January 2015; (**p**) A sample reference reflecting the fulfillment of the minimum national requirements under Art. 2b, para 2 and 3, and of the requirements under art. 2b, para. 5 of the Act on development of the academic staff in the Republic of Bulgaria as well as the minimum requirements of IMI-BAS, which shows that the candidate meets them and by groups of indicators has points as follows: Group „А" - 50; Group „Б" - 100; Group „Г" - 368; Group „Д" - 162; Group „Е" (as seen from the abovementioned statement that reflects the participation of the candidate in R&D projects) – 100; (**q**) Declaration - Form 3.2 of IMI-BAS and declarations/certificates concerning internship in the specialty, issued by the University of Twente (The Netherlands) and TU Delft (The Netherlands); (**r**) A certificate for the academic position "Associate Professor", issued to Dr. Boris Shishkov in 2017 by the University of Library Studies and Information Technologies, a statement for organizational activities of the candidate, a letter of recommendation from Prof. Dr. Neli Maneva (IMI-BAS, Bulgaria), a letter of recommendation from Prof. Dr. Alexander Verbraeck (TU Delft, The Netherlands), a letter of recommendation from Prof. Dr. Ivan Ivanov (SUNY Empire State College, USA), a letter of recommendation from Assoc. Prof. Dr. Marten van Sinderen (University of Twente, The Netherlands).

All presented documents that were submitted for participation in the competition for the academic position "associate professor" as well as the procedure-related actions that are taking place, are in compliance with the Act on development of the academic staff in the Republic of Bulgaria (ADASRB) and the regulation of its application.

2. Details of the candidate

Boris Blagovestov Shishkov was born in 1973. In 1999 he has graduated **with distinction** from Sofia University "St. Kliment Ohridski", obtaining a **master's degree** in "*Management information systems*". In 2005 he has obtained a **doctoral degree** (PhD) in "*Informatics*" from one of the most prestigious European technical universities – TU Delft (The Netherlands). At the beginning of 2005 he has started a **Postdoc** employment at the Software engineering department of the University of Twente (The Netherlands), lasting until the middle of 2007 and since then he has continued working (as a **researcher**) in the same department for one more year. Dr. Shishkov has established (in 2007) and currently **leads the international institute IICREST**. In the 2008-2010 period, Boris Shishkov has been an **Assistant Professor** at the Systems engineering department of TU Delft (The Netherlands), working full time in the first 10 months and then continuing as a honorary assistant. In the 2010-2013 period, he is **active in contributing to projects** initiated by IICREST and TU Delft. Since 2015, Dr. Boris Shishkov has been an **Assistant Professor at the Institute of Mathematics and Informatics of BAS**, while since 2018 he has been **Associate Professor (0.5 fte) at the Faculty of Information sciences at ULSIT**. Recently, Dr. Shishkov was

a **Visiting Scholar** at TU Delft (The Netherlands), contributing to R&D projects and giving lectures. Over the years, Boris Shishkov has fulfilled also other expert positions corresponding to his interest in the information systems area: **Project Coordinator** at the Information Environmental Centre (1995-1996); **Expert** at Holding "Sveta Sofia" PLC (1997-1999); **ERP Consultant** at Weast Ven Man B.V. (The Netherlands) (2004-2005).

3. General characteristics of the scientific works and achievements of the candidate

As noted in item 1 of this review, **the candidate fulfills the quantitative indicators of the criteria for holding the academic position "associate professor"** according to ADASRB and also according to the Regulations on the terms and conditions for obtaining scientific degrees and for holding academic positions at the Institute in Mathematics and Informatics at BAS.

The candidate is **active in the area of Context-aware information systems**. He is among the *pioneers* in this scientific area - in 2005, while working in The Netherlands, he has contributed to some of the first in the World R&D projects in the area: *MobiHealth*, *AWARENESS*, and *A-MUSE*.

For more than 15 years, Dr. Shishkov has actively worked in two fundamental and inter-related scientific areas: Firstly – **business process analysis and optimization as well as enterprise modeling**, and secondly – **software specification, realization, and development**. He has contributed to bridging the gap between enterprise modeling and software specification, by proposing methodological foundations for specifying software based on corresponding enterprise models.

Building up further on that basis, Dr. Shishkov has worked, touching upon **Context-aware information systems**, mentioned above.

In the competition for associate professor, the candidate participates with 21 scientific publications divided into: **one monograph** published by Springer, whose only author is Dr. Boris Shishkov and **twenty scientific articles**. All these articles and the monograph are **indexed by Scopus and/or Web of Science**, while **17 of the articles are with SJR**, which greatly exceeds the requirement of IMI-BAS for at least 5 publications in editions with IF or SJR (Art. 3, p. 1 and p. 2 of IMI's "ПУРПНСЗАД"). In all those 21 publications, **Dr. Shishkov is the first author**, which is an indicator of his leading place in conducting the research.

The Scopus h-index of Dr. Boris Blagovestov Shishkov is 9 (nine) while his Web of Science h-index is 3 (three).

No plagiarism was found in the scientific publications submitted by the candidate.

4. Characteristics and evaluation of work on projects and other activitiesи

The documents submitted for the competition show that **Dr. Boris Shishkov was and is very active in: contributing to R&D projects, writing scientific articles, giving lectures, participating in organizing committees, being member of juries**, and so on.

His **chairing (in the roles of Program Chair or General Chair) prestigious international scientific conferences and symposia** (40 by now) is impressive. In many cases, he has fulfilled the role of Program Chair, being responsible for the scientific profile of the event and the selection of

papers. In other cases, he has fulfilled the role of General Chair, being responsible for the organization itself.

It's because of him that the proceedings of the events he is organizing, are indexed by Scopus and/or Web of Science, while **the papers presented at the BMSD symposium are published by Springer, in the LNBIP (Lecture Notes in Business Information Processing) series and are with SJR**.

Dr. Boris Shishkov has contributed to **eight R&D projects**, two of which are FP7-EU projects, while others have important technological impact in The Netherlands. Dr. Shishkov has participated in **examination committees**, on (master) theses defenses in The Netherlands. He was part of two **scientific juries for electing Chief. Assistant Professors** and he was also part of two **PhD scientific juries**.

5. Scientific and scientific-applied achievements of the candidate, contained in the materials for participation in the competition

Thematically, the contributions in Boris Shishkov's publications submitted for the competition fall into the following two scientific areas: (**a**) The candidate has substantially contributed with regard to **bridging two inter-related scientific areas**: On one hand - *business process analysis and optimization as well as enterprise modeling*, and on the other hand - *software specification, realization, and development, based on corresponding enterprise models*; (**b**) Dr. Boris Shishkov has also contributed to building this further, in the direction of **CONTEXT-AWARE INFORMATION SYSTEMS**, considering the desired **adaptability** of the specified software with regard to the *situation of the user*, with regard to *possible relevant public values*, and so on. As abovementioned, with working on several key relevant projects at two Dutch universities (the University of Twente and TU Delft) since 15 years ago, Dr. Shishkov appears to be among the **pioneers** in this area.

The candidate's monograph (entitled "**DESIGNING ENTERPRISE INFORMATION SYSTEMS: MERGING ENTERPRISE MODELING AND SOFTWARE SPECIFICATION**") actually concerns an intersection between (a) and (b), while focusing on one hand on the **SDBC** (**Software Derived from Business Components**) approach that was created by Dr. Shishkov and has been further developed over the years; this approach is about *specifying software based on enterprise modules*, such that the two are **aligned in a component-based way**. On the other hand, it is important that the abovementioned approach has been upgraded, aiming (among other things) at **maximizing the user-perceived effectiveness** with regard to the specified software, sticking to relevant **public values**, and so on. In fact, this represents a **straightforward relationship between the SDBC approach and the context-aware information systems**.

Moreover, I consider it innovative basing those issues on **model transformations**, with Dr. Shishkov not only identifying **model invariances** as it concerns *social theories* and *computing paradigms* but also enriching his approach with **models and notations that are narrowly profiled** either towards *social theories* or towards *computing paradigms*. It is proposed identifying models from this perspective, that reflect parts of the as-is enterprise system – the so called "business modules" (they represent the **components of the corresponding enterprise system**). The software in turn is specified based on such models and this would allow building software that is adequately focused and well-aligned with the user needs. And last but not least, it is possible that such enterprise

models reflect not just business components but **generic business components** - this allows for **re-using enterprise models** in many software specifications.

The well-illustrated monograph represents a solid basis for merging enterprise modeling and software specification, with considering in combination social theories and computing paradigms. I reckon that **the monograph could be successfully used in education**, when teaching students in the software design principles and in how to develop and deploy information systems.

Many issues considered in the monograph are further addressed and thoroughly analyzed in Dr. Shishkov's scientific articles.

I esteem some of the latest articles of the candidate, namely the publications numbered two, six, and seven – see the list of publications submitted for the competition. These publications, and also the monograph, are directly related to CONTEXT-AWARE INFORMATION SYSTEMS. One of these publications (co-authored by Dr. Boris Shishkov and Dr. Marten van Sinderen) presents a relevant **conceptual model**, stemming from corresponding *meta-models*, that places the development of context-aware information systems on a conceptual basis, as opposed to "basing" the development on vendors' platforms. A brief Scopus / Google Scholar browse shows that the above is innovative - although context-aware information systems have been developing for more than 15 years, such conceptual models are missing, proposed by others. This relates, on one hand, to the **perspectives** considered by Dr. Shishkov (in co-authorship with outstanding scientists from The Netherlands and Denmark) with regard to context-aware information systems – *maximizing the user-perceived effectiveness*, *optimizing internal processes*, and the *public-values-driven system behavior adaptation*, and on the other hand – to another innovative proposal of Dr. Boris Shishkov, namely: **identifying the user situation not by means of sensors but by counting on predictions**, considering particularly the *Naïve Bayesian Classification Approach*; I have personally attended the corresponding presentation in Lisbon, Portugal, in 2019 and I consider this a valuable contribution as it concerns the development of context-aware information systems.

In other articles in the list (see the last ones) Dr. Shishkov considers software specification not just in relation to underlying enterprise models, but also in the perspective of delivering the end software product as **web services**, inspired by **service-oriented architectures** that are actual currently and usefully aligned with technologies related to **cloud computing**. Dr. Shishkov considers the **relationship between such web services and corresponding environmental features** while it is of key importance how the **underlying software components** realize those web services and how the components in turn have been specified and realized (based on *enterprise models* that guarantee an adequate relationship with the environment). This establishes a proper **business-software alignment** and also facilitates the **adaptation of the delivered services with regard to the user situation**.

In some of his publications submitted for the competition, Dr. Shishkov addresses the potential for **aligning software models with concrete (web) technologies and applications**. It is also studied what *restrictions are imposed by different technological platforms* with regard to the specification of software and how *the as-is enterprise models restrict the specification* too. Ways to **maximize the effect of corresponding model transformations** are proposed, based on theories, paradigms, and precise definitions of the transformations themselves. All this is brilliantly presented by Dr. Shishkov, particularly in those publications that consider **drone technologies** and/or (corresponding) **public values** (such as *privacy*, *transparency*, *accountability*, and so on). Drones are actually considered by Dr. Shishkov as (parts of) context-aware systems and often what a drone "does" would need adaptation not only with regard to the current user needs but also to some (currently) actual public values. What I consider valuable is that in his research, Dr. Shishkov follows an in-depth approach at

least in three perspectives: (a) **The "drone" notion is put on solid conceptual foundations** concerning context-aware systems, systemics (system theory), systems of systems, and so on; (b) Drones themselves are considered from a **hardware perspective** and from a **software perspective**; (c) *Public values* are thoroughly explored from the perspective of the so called "**Value-Sensitive Design**" and some theories of the outstanding Dutch scientist, Prof. Jeroen van den Hoven.

My consideration of the candidate's contribution is as follows: **scientific novelty** (here I would mention *the SDBC approach* that was created and has been upgraded by Dr. Boris Shishkov as well as his *research and corresponding results (see above) that concern the context-aware information systems*); **confirmation of known facts**; **enrichment of existing knowledge**: by adding (discovering) new facts and by identifying new ways of applying the research achievements in practice.

In his publications, Dr. Shishkov addresses not only **conceptual (theoretical) problems** but also **practical (application-related) challenges** and with regard to both, his *knowledge and experience as it concerns enterprise modeling and (context-aware) information systems* are important. Boris Shishkov has explored in-depth the **context-aware systems and technologies** as well as their application with regard to achieving **resilience against disruptive events**, solving problems related to **border security** and transport (**drone technologies**). The strengths of current technologies have been analyzed as it concerns the desired delivery of flexible and intelligent services to people/infrastructures during and/or after disruptive events, this leading to the proposal of context-aware solutions, assuming the use of sensors and artificial intelligence, and enriched by risk analyses. Context-aware border security systems have been considered, focused particularly on land borders and counting on intelligent devices. Issues have been considered that concern the **energy consumption management** with regard to a household, a district, and a city, counting on service-oriented architectures.

In addition to what was stated above concerning: (a) the scientific novelty contributions of the candidate; (b) the application domains which he has addressed, I would emphasize also the contributions of Dr. Boris Shishkov that are about **researching concrete applications including applications of scientific and of scientifically applied nature**. Due to the high societal relevance of enterprise information systems and the need for developing such systems in many public domains, I consider as valuable also the candidate's works that reflect contributions that are about the **application in practice of achieved scientific results**.

6. Critical remarks and recommendations

I would like to recommend Dr. Boris Shishkov to get involved in the **supervision of PhD students**, for the sake of transferring valuable experience to younger researchers and lecturers.

7. Personal impressions of the candidate

I have known that candidate in the current competition, Dr. Boris Shishkov, for around fifteen years. I am a regular participant in international scientific conferences chaired by him. Next to that, he is currently lecturing in the department I chair at ULSIT. The research output of Dr. Shishkov is impressive and in my opinion, **he has a well-established scientific profile, possessing remarkable knowledge and experience**, and I hope that he will continue working with the same enthusiasm.

8. Conclusion on the application

The scientific achievements of Dr. Boris Blagovestov Shishkov **meet the requirements of ADASRB, the regulations of its application, the Regulations on the terms and conditions for obtaining scientific degrees and for holding academic positions at BAS (in general) and particularly, at the Institute in Mathematics and Informatics at BAS**.

The candidate **fulfills the minimum national requirements in the professional field** and **no plagiarism has been found out** in the scientific papers submitted for the competition.

I give my **strongly positive assessment** of the candidacy.

II. Overall conclusion

After getting acquainted with the materials and scientific papers presented in the competition, analysis of their significance and the scientific, scientific-applied and applied contributions contained in them, I find it reasonable to give my **strongly positive assessment** and recommend the Scientific Jury to propose to the Scientific Council of IMI-BAS to elect **Assistant Professor Dr. Boris Blagovestov Shishkov** to take the academic position "**associate professor**" in the field of higher education 4. Natural sciences, mathematics and informatics, professional field 4.6. Informatics and computer sciences (**Context-aware information systems**).

8 February 2022   **Reviewer:**

Sofia   (Prof. DSc. Ivan G. Garvanov)