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Poznan, May 14, 2022

Opinion about

**Cand. PhD. Ing. Šárka Křížková, BA**

from

**University of Hradec Kralove**

**Faculty of Informatics and Management**

*Study programme:* Systems Engineering and Informatics

*Branch of study:* Information and Knowledge Management

*Supervisor:* doc. Ing. Hana Tomášková, Ph.D.

for her Promotion for **Doctorate**

Name of PhD. Thesis:

*“Using a fuzzy approach to decision support in sports performance analysis”*

**Dear My Excellency,  
dear Dean Prof. RNDr. Josef Hynek,  
dear Chairman of the PhD. Jury,  
dear Ladies and Gentlemen, dear Professors,**

this is **very remarkable Doctoral Thesis** towards promotion to the degree of *Doctor in the Study programme “Systems Engineering and Informatics”*, in the *Branch of study “Information and Knowledge Management”* in the **Faculty of Informatics and Management at University of Hradec Kralove** and I fully support this submission and goal!

*Cand. PhD. Ing. Šárka Křížková, BA*, is, to my scientific assessment and personal observation, a very educated young scientist, with high intellectual gifts who developed very well in recent years and could further grow towards an international reputation.

With her remarkable intellectual gifts, her perserverance and hard-work, she has become an **example of a modern researcher and young scholar**, in her country and on the international parquetry, with regard to presenting science and establishing an recognition worldwide.

In fact, this international fact is firstly true in her own exciting nation, with its different languages and traditions, which necessitates an even greater sense of humanity and understanding, respect and willingness to adjust and serve to all citicens in a wide sense.

At - and from - *University of Hradec Kralove*, her performance – together with the one the research group whose member she is – shines brightly. The loss of the founder of the

scientific school, *Professor Martin Gavalec*, was very hard for the young people. Their success counts all the more for having made it this far.

Upfront I would like to say that my assessment both above and following, is also supported by her group's excellent participation and remarkable contribution to the organization of *Joint EUROPT-OMS Conference - 2nd Conference on Optimization Methods & Software - 6th EUROPT Workshop "Advances in Continuous Optimization"*, Prague, Czech Republic, July 4,7, 2007, right before the EURO 2007 Prague conference, together with *doc. Ing. Hana Tomášková, Ph.D.*, who is *Cand. PhD. Ing. Šárka Křížková's* PhD. Adviser.

This strong and unique, rich (with its ca. 100 pages) *PhD. Thesis* is well-structured, well and documented and exemplified, and carefully written. In a sense, this thesis' ranges from real-world motivation, scientific concepts and methods, clear and helpful diagrams and illustrations, to feedback from the practitioner(s).

The 8 **chapters** of the thesis are these:

- 1 *Introduction*,
- 2 *The work's objectives*,
- 3 *Background*,
- 4 *Methodology*,
- 5 *Systematic review*,
- 6 *Results*,
- 7 *Discussion*, and
- 8 *Conclusion*.

The many Figures, Tables, etc., make that the *PhD. Thesis* become an *piece of art!*

In my opinion, this *PhD. Thesis* comes very close to a *Great Work*.

Indeed, this *PhD. Thesis* is a strong testimony of intellectual and cordial power, and is it supported by some already made and some surely forthcoming **exquite publications** by the candidate:

*Karel Kolář, Rafael Doležal, Natálie Karásková, Nadezhda V Maltsevskaya, and Šárka Křížková, Molecular models in chemistry education at university and upper secondary school-structure of amides. Chemistry-Didactics-Ecology-Metrology, 24(1-2):45–51, 2019.*

*Šárka Křížková, Hana Tomášková, and Erfan Babae Tirkolae, Sport performance analysis with a focus on racket sports: A review. Applied Sciences, 11(19):9212, 2021.*

There is also a number of publications in conference proceedings.

Personally, I am impressed by her as a rising scholar! I admire her ability to think structurally while still having very concrete and emerging applications in mind – we can also call it as *Modeling*, an approach to *Data Mining, Analytics, System Theory* coming from Industrial Engineering – involving “Human Factors” even, I may say: especially.

Given the nature of us Humans, and of our *Groups* and *Societies*, these “Human Factors” can be considered as among the “hardest” factors. In fact, I think that this is a great advantage also for her future in **teaching – educating** students up to highest levels in profession and personality, in Czech Republic, in Europe and in any other country.

*Cand. PhD. Ing. Šárka Křížková, BA*, has been able to get valuable paper acceptances and published in premium journals. In fact, since I served as Program Committee member, EURO Conference Advisor, etc., I can speak about a High Level and a Diversity of her research

directions. She and her coauthors have understood deep subjects, and in contents and technically they mastered them in written representation.

Furthermore, I would like to underline *Cand. PhD. Ing. Šárka Křížková*'s eagerness to always improve and learn! What is more, she also seems to have a **pleasant and kind personality**.

She has been a part of the excellent research group of *doc. Ing. Hana Tomášková, Ph.D.* She has combined the best sides of the Optimization traditions of *University of Hradec Kralove*, which had a close relation to different engineering departments already with the great and modern Engineering and High-Tech research of *University of Hradec Kralove*, especially, under the direction and guidance by *doc. Ing. Hana Tomášková, Ph.D.*

Among the remarkable **properties** of *Cand. PhD. Ing. Šárka Křížková, BA*, as I perceive, there could be mentioned:

- interest in “qualitative” and “quantitative” sciences, statistics, data mining, modern “human” sciences, multi-criteria decision making, and their development,
- ability to work in applications,
- loyalty and reliability,
- ability to work hard,
- high intelligence and scientific skillfulness,
- ability to write excellent books (like the thesis) and papers,
- ability to lecture and present scientific work in front of an international audience,
- ability to work in a team,
- international experience,
- interest in different cultures, willingness to develop professional skills in science and organization,
- overcoming of obstacles and hardships in life,
- leadership skills.

*Cand. PhD. Ing. Šárka Křížková*'s and her team's – *doc. Ing. Hana Tomášková*'s team's - work can be characterized as follows:

- Excellent scientific foundations and knowledgeability, especially, in Optimization and Operational Research, Analysis and Calculus, elements of Discrete Mathematics, Probability Theory and Statistics, and elements of Heuristics and Artificial Intelligence;
- Openmindedness and curiosity in modern applications in a wider range of areas, from natural and “human” sciences to modern management;
- Readiness to serve well and carry over responsibility at all levels of academia, and at the international platform;
- Excellence in hospitality of welcoming guests;
- Willingness and decidedness to prepare papers and to publish them in formats of all kinds, in journals of all levels, especially, in top-ranked journals;
- Contributions to better understanding and friendship between the nations.

The candidate, especially with her dear advisor, and with their coworkers, have gained a high recognition. They have provided respect, encouragement, impulses and help to me, to Europe and all worldwide. This has become apparent also in their fruitful contributions in research, application and friendship.

This promotion application witnesses about this exquisite progress! I understand that there has been (and should be further) the research direction in Uncertainty Quantification and

Management, Complexity Theory, Operational Research and Optimization, AI, etc., related to which they got a good publication success of papers that have the promise of giving an **Impact** in the future.

*Cand. PhD. Ing. Šárka Křížková, BA* - with her advisor and the other colleagues - have indeed excellent contacts now to the community of optimizers, natural scientists, engineers and OR scholars. I encourage her to further activate and use these contacts in future, e.g., in the OR community of **EURO** and **IFORS**. The 2020 conference in Seoul, Korea, was not cancelled (as I found written here) - but it was postponed by one year to 2021. It became a success. The candidate may have many future chances to attend EURO and IFORS conferences.

Moreover, I suggest her and her team to take into account **in the Future**,

- to use **some further mathematics**, which is a “Key Technology”;
- the works of recent years on the development and application of new Data Mining, Statistical, Machine and Deep Learning and AI methods like CMARS, RCMARS, RMARS; CGPLM, RCGPLM, etc., which are very helpful in nearly every field of academic life and daily life,
- newest works on information theory, rumor propagation, coupling between both financial/economic dynamics and “Human Factors” dynamics.

Research and presentations have been done here by authors such as, e.g., *Selma (Christina) Belen, Burcu Gürbüç, Ayşe Özmen, Fatma Yerlikaya, Alper Cevik, İnci Batmaz, Pakize Taylan, Gülser Köksal, Semih Kuter, Betül Kalaycı, Güray Kara, Magdalena Graczyk-Kucharska and Gerhard-Wilhelm Weber*.

The aforementioned praise and appreciations fit together comfortably with the nation in **Europe**, its great history and remarkable achievements in science, OR and engineering, with the member societies of **EURO** and **IFORS**, and their shared life and joint future.

With best wishes for *Cand. PhD. Ing. Šárka Křížková, BA*, for becoming a *Dr. PhD.* and for her entire future,  
and also for you,

and with friendly regards,  
yours sincerely,

*Gerhard-Wilhelm Weber*

*Prof. Dr. Gerhard-Wilhelm Weber*