EWG-ORSDCE

NEWSLETTER OF EWG ORSDCE
DECEMBER 2014

ORSDCE - The OR in Sustainable Development and Civil Engineering Working Group of EURO
http://www.orsdce.vgtu.lt/

Content of the issue

Words of chairman

Dear Members of EWG-ORSDCE, dear Friends,

It is a great pleasure to address you some introductory words and present the achievements of scientific cooperation. Last year was rich in scientific events were members of EWG-ORSDCE have participated.

This year was reach of scientific papers the list of which presented in separate section. In year 2014 in fields of construction, sustainable development and applyed mathematicas seven dissertations have been defended. The Newsletter presents the short summaries of defended dissertations. This issue of Newsletter also presents the forthcoming events, were the EWG-ORSDCE members are participating as organizers or scientific committees' members, also the events that were held in 2014.

The EWG-ORSDCE conventionally contributes to the organization of EURO conferences. This year during the 20th Conference of the International Federation of Operational Research Societies, which was held in Barcelona, Spain, on July 13-18, 2014, EWG-ORSDCE organized the Invited Session in stream "*Sustainable Development*" belonging to area „*OR for Development and Developing Countries*". We would like to express the gratitude to colleagues contributed to the organization of this stream.

This year the Journal of Civil Engineering and Management edited by EWG-ORSDCE members celebrates the 20th anniversary. Newsletter shortly presents the development and achievements of the Journal in a 20 years period. Editors express their sincerest gratitude to all those who have contributed to the success of the Journal, its quality and significance in the academic world, specifically to Contributors for choosing the Journal of Civil Engineering and Management to publish their research findings, to members of the Editorial Board for many years of cooperation and contribution in ensuring the quality of the Journal, to a large number of Reviewers in providing valuable comments and suggestions aimed at improving the quality of submissions.

We wish you fruitful scientific collaboration, plenty of health, happiness and prosperity in the New Year!

With my best wishes, yours sincerely,
Edmundas Kazimieras Zavadskas, Chair of EWG-ORSDCE coordinating board

Forthcoming Events

27th European Conference on Operational Research

12-15 July 2015
University of Strathclyde

EURO The Association of European Operational Research Societies

THE OR SOCIETY

27TH EUROPEAN CONFERENCE ON OPERATIONAL RESEARCH
Glasgow, United Kingdom
July 12-15, 2015

EURO2015 will be hosted at the University of Strathclyde in Glasgow, which is quickly gaining recognition as a leading international technological university, reflected in the recent awards of THE University of the Year in 2012 and Entrepreneurial University of the Year in 2013. Strathclyde was founded during the Scottish Enlightenment as a "place of useful learning" and remains true to that initial vision, with a strong commitment to applied research. It is leading the way in the UK in building translational research centres linking industry and academic research. EURO2015 will be the first major conference to be based at the new Technology and Innovation Centre at Strathclyde
EURO2015 takes place from Sunday 12 - Wednesday 15 July 2015 in the University of Strathclyde and will host streams from all branches of ORMS, alongside keynotes and plenaries from leading international thinkers and tutorials on up and coming areas of interest.

Oral presentations will be organized in parallel sessions. Authors can present only one paper at the Conference. Submission invited on, but not limited to, the following areas:

- *Analytics, Data Science, Data Mining*
- *Artificial Intelligence, Fuzzy Systems*
- *Computing*
- *Continuous Optimization*
- *Control Theory & System Dynamics*
- *Decision Analysis, Decision Support Systems, DEA and Performance Measurement*
- *Discrete Optimization, Geometry & Graphs*
- *Emerging Applications of OR*
- *Energy/Environment and Climate*
- *Financial Modeling & Risk Management, Accounting*
- *Game Theory, Mathematical Economics*
- *Location, Logistics, Transportation*
- *Metaheuristics*
- *Multiple-Criteria Decision Making and Optimization*
- *OR Education, History, Ethics*
- *OR for Developing Countries, Humanitarian Applications*
- *OR in Health, Life Sciences & Sports*
- *OR in Industry and Software for OR*
- *OR in Natural Resources*
- *Practice of OR*
- *Production Management & Supply Chain Management*
- *Revenue Management*
- *Scheduling, Time Tabling & Project Management*
- *Service Systems*
- *Simulation, Stochastic and Robust Optimization*
- *Soft OR and Problem Structuring Methods*
- *Telecommunication, Networks and Social Networks*

Important dates:

- Registration: **OPENING SOON!**
- Abstract Submission: **NOW OPEN!**
- Early Bird Deadline: **Monday 20th April 2015**
- Abstract Submission Deadline: **Monday 16th March 2015**
- Registration Deadline: **Friday 8th May 2015**
- Conference Start Date: **Sunday 12th July 2015**
- Welcome Reception @ the TIC Building: **Sunday 12th July 2015**
- Informal Social Evening @ Merchant Square: **Monday 13th July 2015**
- Conference Dinner @ The Arches: **Tuesday 14th July 2015**
- Farwell Gathering @ The Barony: **Wednesday 15th July 2015**
- Conference End Date: **Wednesday 15th July 2015**

More information: http://www.euro2015.org/

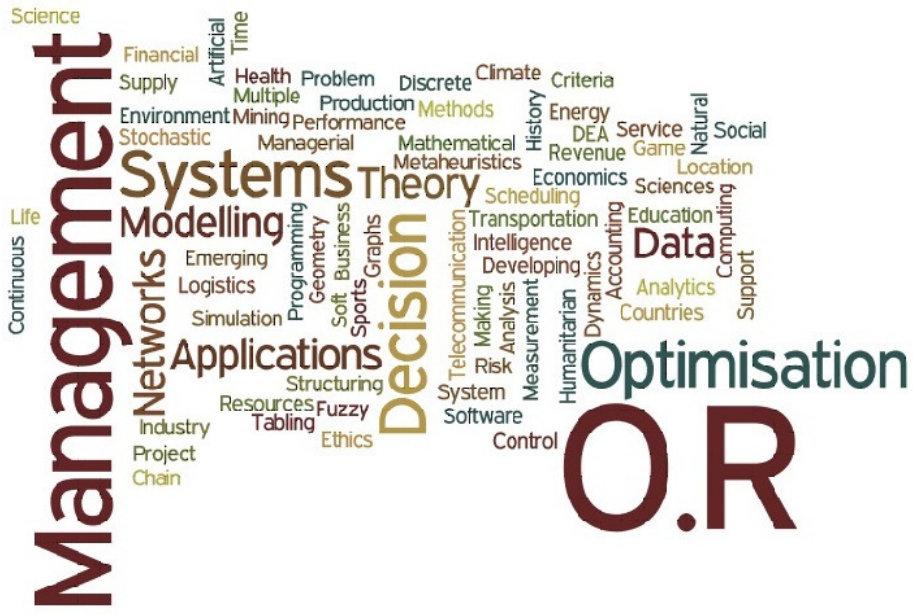
Registration fees:

Registration Category	Early bird registration until April 20th 2015	Regular registration After April 20th 2015
Regular	£300	£400
Students	£165	£250

The registration fee includes:

- Admission to sessions and the exhibition throughout the duration of the conference
- Access to all conference materials (in appropriate format)
- Tea, coffee and lunch throughout the conference
- Admission to the Welcome Reception at the TIC Building on Sunday 12 July 2015

Submit your abstract (max 600 characters) on line:
http://www.euro-online.org/conf/euro27/streams



The 15th German-Lithuanian-Polish Colloquium "Rational Decision and Problem Solving in Building Life Cycle"

Place: Poznan, Poland

Date: 2015, June

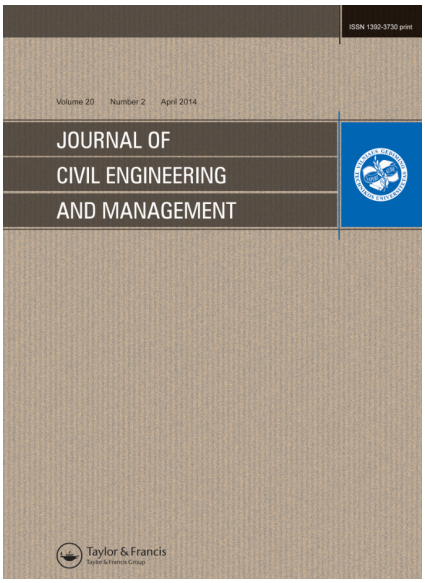
Honourary Members
F. Peldschus (DE)
E.K. Zavadskas (LT)
O. Kapliński (PL)

International program comitee members
G. Girmscheid (SW)
K. Holschemacher (DE)
V. Malienė (U.K.)
J. Paslawski (PL)
M. Radujkovic (CR)
R. Schach (DE)
J. Šelih (SL)
M. Skibniewski (USA)
Z. Turskis (LT)
L. Ustinovičius (LT)
J. Tamošaitienė (LT)
T. Vilutienė (LT)

Organizing committee / Chaiman
J. Paslawski (PL)
T. Vilutienė (LT)

Conference Topics:
· operational research, · decision making, · decision support system, · innovative solutions, · civil engineering, · construction technology and organization, · sustainable development in civil engineering, · construction management, · buildings life cycle, · qualification of human resources, · real estate management, · project management, · quality management, · build environment

Scientific events 2014



THE 20th ANNIVERSARY OF JOURNAL OF CIVIL ENGINEERING AND MANAGEMENT

Edmundas Kazimieras Zavadskas

Miroslaw J. Skibniewski

Jurgita Antuchevičienė

In the current year Journal of Civil Engineering and Management (http://www.tandfonline.com/tcem) celebrates the twentieth anniversary since it was founded. The 20th anniversary is a significant milestone for the Journal.

Journal of Civil Engineering and Management (JCEM) is a peer-reviewed bimonthly journal that provides an international forum for the dissemination of the latest original research, achievements and developments in many areas of civil engineering and management. The topics include building materials and structures, structural mechanics and physics, geotechnical engineering, road and bridge engineering, urban engineering and economy, constructions technology and economy and management, information technologies in construction, fire protection, thermoinsulation and renovation of buildings and labour safety in construction.

The Journal was launched in 1995 as a per-reviewed quarterly journal under the title "Statyba" (Civil Engineering). In March 2002, the current title "Journal of Civil Engineering and Management" with the sub-title "International Research and Achievements" was assigned. In 1995–2001, papers in Lithuanian, English, German and Russian were published in the Journal. Since 2002, the Journal has been published entirely in English, which promoted its wider dissemination.

Since 2008, the Journal reached a new stage of development. The Journal was abstracted/indexed by international databases, including SCOPUS, COMPENDEX, INSPEC, Cambridge Scientific Abstract, EBSCO Publishing, etc. Since 2010, it has been encouraged by CIB (International Council of Research and Innovation in Building and Construction). In 2008, JCEM was indexed by Thomson Reuters Science Citation Index Expanded, Web of Science and the Impact Factor (IF) by the Thomson Reuter's Institute for Scientific Information (ISI) was provided in 2010 (IF=3.711). The latest currently available Journal's 2013 ISI Impact factor IF = 1.372 (2014 Journal Citation Report®).

Since 2011, the Journal has been co-published by Vilnius Gediminas Technical University (VGTU) Press and Taylor & Francis. The design of the Journal was changed, electronic peer review and publishing platforms were launched, the number of submissions as well as internationalization of authors and reviewers increased. In addition, the Journal's visibility expanded in the international academic world. In the beginning of 2014, a survey was made in order to determine the further development of volume of assignments to Lithuanian and foreign institutions in the period 2008–2013, i.e. since JCEM has been indexed by WoS database. In 2008–2013, there were assignments to 47 different countries in Authors

affiliations in published papers in the Journal. Information on the distribution of papers by continents in the period 2008—2013 is as follows: 49.2% papers were from Europe, 37.8% — Asia, 8.3% — North and South America, 3.4% — Africa, 1.3% — Australia.

Journal Volume 20, Issue 3, 2014 was devoted to the anniversary. Editor in Chief, Professor, Academician Edmundas Kazimieras Zavadskas and Managing Editor Jurgita Antucheviciene published editorial paper entitled "The 20th Anniversary of the Journal: Editor's Introduction" [1]. They shortly reviewed development and achievements of the Journal in a 20 years period. Editors express their sincerest gratitude to all those who have contributed to the success of the Journal, its quality and significance in the academic world, i.e. to Contributors for choosing the Journal of Civil Engineering and Management to publish their research findings, to members of the Editorial Board for many years of cooperation and contribution in ensuring the quality of the Journal, to a large number of Reviewers in providing valuable comments and suggestions aimed at improving the quality of submissions.

The information about the significant milestone of JCEM was also spread outside the Journal. The Editors E. K. Zavadskas, M. Skibniewski (North American Editor) and J. Antucheviciene published the paper in Archives of Civil and Mechanical Engineering (Elsevier) [2]. The presented study analysed the development and performance measures of research journals in the field of civil engineering. Journals are usually ranked based on the values of Impact Factors (IF) published by the Thomson Reuter's Institute for Scientific Information (ISI) Web of Knowledge Journal Citation Reports. However, it has been argued that the IF value is not the sole and possibly not the best measure of journal quality. A number of metrics as well as bibliometric indicators have been developed to measure the impact of scholarly journals. The paper proposed an integrated multiple criteria approach for ranking journals. The paper focused on multiple criteria evaluation and ranking of journals, applying Multiple Criteria Decision Making (MCDM) method. The universally adaptable methodology for ranking of journals using Weighted Aggregated Sum Product Assessment (WASPAS method) was suggested. Seven indicators (criteria) were proposed to be applied and were derived exclusively from ISI Web of Knowledge Journal Citation Reports. Integrated rankings with the use of this method were then compared with journal rankings based on their ISI Impact Factor values. The presented study analysed 30 journals from the first quartile (Q1) in the category "Engineering, Civil" from the Web of Science (2013 Journal Citation Report®). Generalized results of calculation showed a tendency for higher IF journals to be ranked lower when applying the multiple-criteria approach; and vice versa, there was a tendency for lower IF journals to be ranked higher when more indicators were considered (Fig. 1).

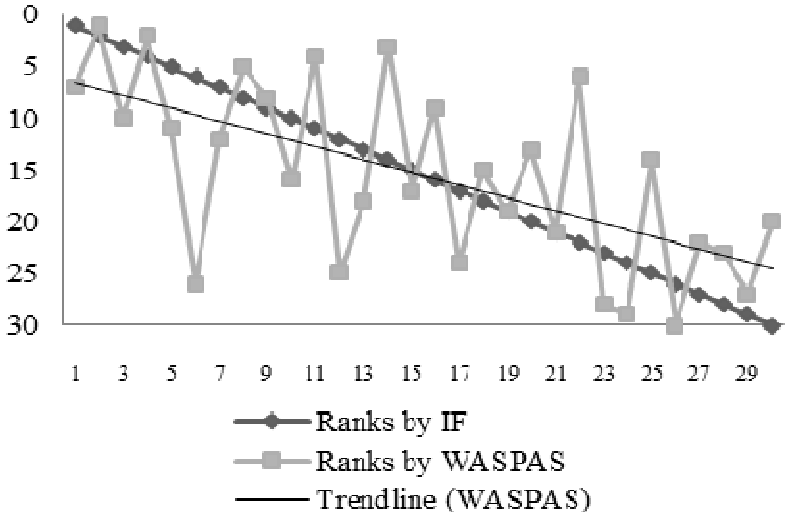


Fig. 1. Visual comparison of rankings:
IF versus proposed multiple criteria integrated assessment [2]

A couple of papers on the occasion of the anniversary were published in popular magazines and devoted for broad audience of readers, not only for scientific community. The latter papers were interviews with Editor in Chief E. K. Zavadskas and Managing Editor J. Antucheviciene on the topic entitled “The Journal's success is resulted by the purposeful work” [3, 4].

References:

[1] Zavadskas, Edmundas Kazimieras; Antuchevičienė, Jurgita. The 20th anniversary of the journal: editor’s introduction / Edmundas Kazimieras Zavadskas, Jurgita Antuchevičienė // Journal of civil engineering and management. Vilnius : Technika. ISSN 1392-3730. Vol. 20, no. 3 (2014), p. 309-310. Prieiga per internetą: http://www.tandfonline.com/doi/pdf/10.3846/13923730.2014.925274.

[2] Zavadskas, Edmundas Kazimieras [Zavadskas, E.K.]; Skibniewski, Mirosław J. [Skibniewski, M.J.]; Antuchevičienė, Jurgita [Antucheviciene, J.]. Performance analysis of civil engineering journals based on the Web of Science® database / E.K. Zavadskas, M.J. Skibniewski, J. Antucheviciene // Archives of civil and mechanical engineering. Oxford : Elsevier Ltd. ISSN 1644-9665. Vol. 14, iss.4 (2014), p. 519-527. Prieiga per internetą: http://www.sciencedirect.com/science/article/pii/S1644966514000879.

[3] Jučiūtė, Edita; Zavadskas, Edmundas Kazimieras (aut., interviu); Antuchevičienė, Jurgita (aut., interviu). Žurnalo sėkmę lėmė kryptingas darbas : žurn. Editos Jučiūtės pokalbis su VGTU prof. Edmundu Kazimieru Zavadsku ir doc. dr. Jurgita Antuchevičiene. / Edita Jučiūtė // Mokslas ir technika : Lietuvos MA ir Lietuvos inžinierių sąjungos mėnesinis žurnalas. Vilnius : UAB "Mokslas ir technika". ISSN 0134-3165. 2014, Nr. 6, p. 36-37.

[4] Jučiūtė, Edita; Zavadskas, Edmundas Kazimieras (aut., interviu); Antuchevičienė, Jurgita (aut., interviu). Tarptautinę žurnalo sėkmę lėmė kryptingas darbas : žurn. Editos Jučiūtės pokalbis su VGTU prof. Edmundu Kazimieru Zavadsku ir doc. dr. Jurgita Antuchevičiene. / Edita Jučiūtė // INŽINERIJA 2014 m. balandžio 18 d. Nr. 3 (1431), p. 5.

70th ANNIVERSARY OF THE BIRTH OF ACADEMICIAN EDMUNDAS KAZIMIERAS ZAVADSKAS

Jonas Šaparauskas

Zenonas Turskis

Born in Vilnius on 12 May 1944, the Academician and Professor Edmundas Kazimieras Zavadskas turned 70. He is the founder and the Editor-in-Chief of the Journal "Technological and Economic Development of Economy" (TEDE, http://www.tandfonline.com/tted). To honour the Professor on this occasion, the editorial staff of the Journal TEDE issued this short biographical overview. As a sole author or co-author, Professor Zavadskas has published over 50 books, including 5 textbooks and 16 monographs, 10 popular science books, over 400 research articles as well as several hundreds of articles on various social and cultural topics. He has edited over 20 collective volumes. About 20 papers have been nominated as Hot Papers in Thomson Reuters database. Professor is one of the most cited scientists in Eastern Europe. Thirty-four PhD dissertations have been defended under the supervision of Prof. Zavadskas and four of his former students have been awarded the title of Full Professor.

A biographical note

Prof. Zavadskas took his first steps down the path of education in Vorkuta (Russia), where he attended a seven-year evening school for workers, from which he graduated in 1959. Next, he continued his education in Dūkšto Secondary School, Ignalina District (Lithuania). After graduating from the school in 1962, Prof. Zavadskas entered Kaunas Polytechnic Institute as a part-time student. In 1963, he moved to Vilnius Branch of Kaunas Polytechnic Institute (VB KPI, now – VGTU). After he was awarded his first degree in Construction Engineering in 1967, he took the position of a mathematics teacher at Gubava Secondary School, Ignalina District (September 1962 – July 1963). During his further studies, he also joined the team of Vilnius and Utena Construction Trusts (September 1963 – August 1964). Since January 1968 to November 1968, he worked as a senior laboratory assistant at the Department of Building Constructions. From November of that year to December 1969, he headed the laboratory of the Department of Mechanics of VB KPI. Soon after, Prof. Zavadskas became a doctoral student at the Department of Construction Technology; and finally in 1973, he became the Candidate of Technical Sciences (Dr) of Vilnius Civil Engineering Institute (VCEI, now – VGTU).

In February 1990, Prof. Zavadskas became Rector of Vilnius Civil Engineering Institute. In February 1990, Prof. Zavadskas became Rector of Vilnius Civil Engineering Institute. By initiative of Prof. Zavadskas, VCEI was reorganised into Vilnius Technical University (VTU) in October 1990 and Professor became its Rector. In August 1996, Vilnius Technical University was awarded the name of Gediminas. Prof. Zavadskas continued as Rector of this institution

till August 2002. Meanwhile in 1993, Prof. Zavadskas became Dr Habil. of Technical Sciences, VGTU. In addition, he was a Member of the Research Council of Lithuania (1994–2000) and Vice-Rector of VGTU (September 2002 – September 2011).

Currently, Professor is Head of the Department of Construction Technology and Management, VGTU, (since September 2001) and Chief Researcher at the Research Institute of Internet and Intelligent Technologies (September 2010–2013). Since 2014, Professor is Chief Researcher at the Research Institute of Smart Building Technologies.

It must also be underlined that Prof. Edmundas Kazimieras Zavadskas is founder and Editor-in-Chief of "Journal of Civil Engineering and Management" and co-founder and Editor of the scientific journal "International Journal of Strategic Property Management" (both are referred by Thomson Reuters Web of Science Database). In addition, Professor is member of editorial boards of 34 different publications.

Research activities

Scholarly papers produced by Prof. Zavadskas are of great interest to the scientific community and are highly cited by other researchers. Prof. Zavadskas is placed on the list of Highly Cited Researchers (fig. 1), which is established by the Centre for World-Class Universities in Shanghai Jiao Tong University and Thomson Reuters (http://community.thomsonreuters.com/t5/InCites-Customer-Forum/Preliminary-publication-of-new-lists-of-Highly-Cited-Researchers/td-p/36685).

Fig. 1. Prof. Zavadskas on the list of Highly Cited Researchers
Source: Tomson Reuters, Highly Cited Researchers http://highlycited.com/

Table 1 provides data on citation of papers authored by Prof. Zavadskas.

Table 1. Published and cited papers in ISI Web of Science database

Results	All items	From the category "Social Sciences"
Published papers	239	109
Number of times cited	2554	1536
h-index	37	24

Honorary titles, membership in academies of sciences, awards, diplomas and distinctions

Prof. Zavadskas was Expert Member (1991–1993), then Corresponding Member (1993–2011) and Full Member (since 2011) of the Lithuanian Academy of Sciences. Professor is member of the International Management Academy since 2005 and member of the International Academy of Informatics since 1997. Prof. Zavadskas is Foreign Member (academician) of following institutions: the Russian Academy of Engineering, 2001; the Russian Academy of Architecture and Construction Sciences, 1996.

Since 2012, Prof. Zavadskas is Honorary Professor of the National Taipei University of Technology, Taiwan. Moreover, Prof. Zavadskas is Honorary Doctor of: (Computer Science), Herzen University (St. Petersburg, Russia), 2003; (Civil Engineering), National Aviation University (Kiev, Ukraine), 2003; (Civil Engineering), Poznan Technological University, 2001.

Since 1996, Prof. Zavadskas is chevalier of the 4th Class Order of the Lithuanian Grand Duke Gediminas. In the same year, he received the Lithuanian State Award for research achievements. In 2004, Professor also received the Lithuanian award for research achievements (with professor Artūras Kaklauskas) for a cycle of works entitled "Modelling in construction (methods, simulation, decision support and information systems, web-based technologies, practical application)" (1996–2003); and the award of the Parliamentary Assembly of Lithuania and Poland.

Professor was also awarded with the 1st Class Cross "Artimo pagalbon" in 2000; Medal "Integral Humanism" awarded by Polish magazine "Lithuania" and Lithuanian magazine "Kultūros barai" in 2000; Memorable Badge "80th anniversary of the Ministry of Interior" for contributing to strengthening of law and order, 1999; Badge "Tėvynės labui" awarded by the Lithuanian Ministry of Interior, 1996; and Silver Medal awarded at the Exhibition of National Economics Achievement, Moscow, 1987. Prof. Zavadskas won a number of prizes: VGTU prize (second place) for textbooks "Building construction technology" and "Organisation of construction", 2006; VGTU prize (first place) for monographs "Decision support systems in construction" and "Multicriteria analysis of building life cycle", 2005; incentive prize of the Lithuanian Ministry of Education and Science for textbook publishing, 2004; and the prize awarded by the Ministry of Environment in 1996.

Prof. Zavadskas was also awarded UNESCO UICEE diploma and a silver badge for contributions to training of engineers in 1997; two honorary diplomas of the Ministry of Higher Education of USSR for successful supervision of student research works awarded by gold medals (1978, 1979); honorary diplomas of the Lithuanian Ministry of Higher and Special Secondary Education for successful supervision of student research works in 1977 and 1978; and the honorary diploma of the Scientific-Technical Association of USSR in 1976.

Activities in professional organisations

Prof. Edmundas Kazimieras Zavadskas is Chairman of the working group and the publisher of the newsletter of EWG–ORSDCE, OR in Sustainable Development and Civil Engineering (EURO). In addition, he is a member of following organisations: the Committee of

Construction and Hydroengineering of the Polish Academy of Sciences, 2001–; the International Association for Bridges and Structural Engineering (IABSE), 1998–; the International Council for Research and Innovation in Building and Construction (CIB); the European MCDA working group (EURO). Professor is President of the Lithuanian Alliance of Experts in Building and Projects, 2000. Prof. Zavadskas is one of the founders of Adam Mickiewicz foundation aimed at fostering Lithuanian and Polish relations and the founding member of the International Academy of Information Technology and Quantitative Management (IAITQM), established on 30 June 2012. He is also an expert of the Cooperation Bureau for Economic Research on Eastern Europe, Berlin. Prof. Edmundas Kazimieras Zavadskas is a former President of the Lithuanian Operational Research Society, 2001–2011; President of Operational Research Society of the Baltic States, 2003; member of the Lithuanian Scientific Awards Committee, 2000–2002, 2006–2009; member of the Conference of Lithuanian Rectors, 1994–2002; and member of the Conference of the Baltic States' Rectors, 1995–2002. Figure 2 illustrates the scientific school of Prof. Edmundas Kazimieras Zavadskas.

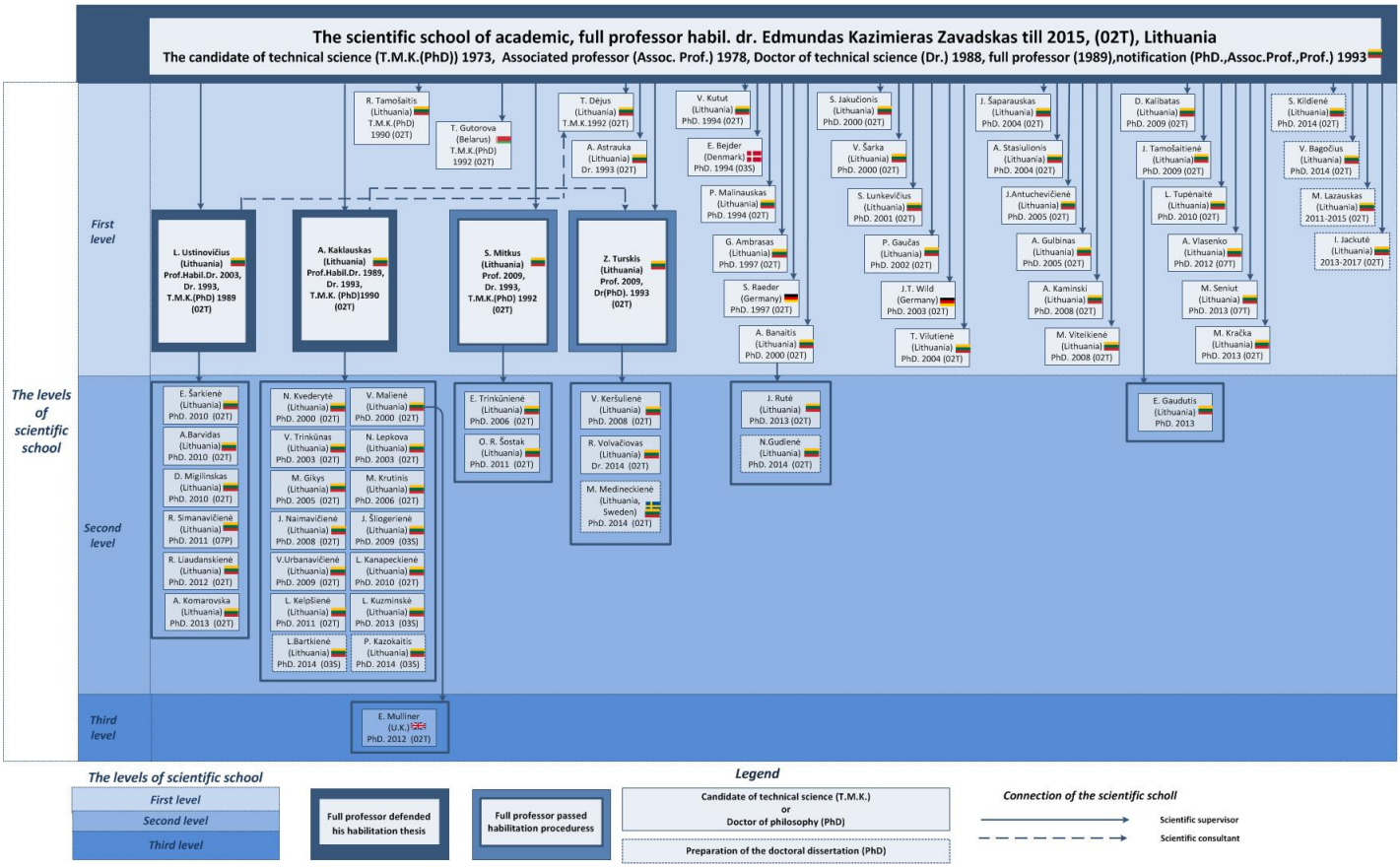


Fig. 2. The scientific school of Academician and Professor Edmundas Kazimieras Zavadskas
Source: Nepaprastų dienų metai. Akademikas Edmundas Kazimieras Zavadskas. Sudarytojas Algimantas Liekis. Vilnius: Technika, 2014. 400 p.

More about Academician Edmundas Kazimieras Zavadskas read in articles:

- J. Šaparauskas, Z. Turskis, G.V. Merkuryeva & R. Liias (2014) 70th anniversary of the birth of Academician Edmundas Kazimieras Zavadskas, Technological and Economic Development of Economy, 20:2, 184-192, DOI: 10.3846/20294913.2014.937585
- Kačianauskas, Rimantas; Kaklauskas, Artūras; Skibniewski, Mirosław J.; Kaklauskas, Gintaris; Antuchevičienė, Jurgita; Tupėnaitė, Laura. A life dedicated to science: on the occasion of the 70th birthday of editor-in-chief Edmundas Kazimieras Zavadskas, Journal of civil engineering and management. Vilnius : Technika. ISSN 1392-3730. Vol. 20, no. 3 (2014), p. 311-314. http://dx.doi.org/10.3846/13923730.2014.925276

Development of MCDM Methods – in Honour of Professor Edmundas Kazimieras Zavadskas on the Occasion of His 70th Birthday

O. Kaplinski, F. Peldschus, L. Tupėnaitė

Multiple Criteria Decision Making (MCDM) methods have substantially evolved since 1970s, and had various types of real world applications. New MCDM methods have been developed, and existing methods improved, showing that research in the decision-making is still critical and valuable. One of the early and exceptional authors, continuously working on the development and improvement of MCDM methods since 1976, is Professor Edmundas Kazimieras Zavadskas (Fig. 1). This article is an attempt to summarise his research and achievements in development of the MCDM methods on the occasion of Professor˙s 70th birthday.

Figure 1: R. J. Slowiński, B. Roy, E. K. Zavadskas at the 52nd Meeting of the EURO Working Group Multicriteria Aid for Decisions (MCDA), 6–7 October, 2000, Vilnius, Lithuania

Edmundas Kazimieras Zavadskas presented his PhD in 1973 – he researched the applications of polymer resins in reinforced concrete. This was the time when he took interest in optimising constructions, technologies and organisations. A selection of decision-making solutions dominated his research. This is how he significantly developed some elements of rational decisions theory. As a synthesis of research results, in 1987 E. K. Zavadskas defended his Post-Doctoral (Habilitation) Thesis where MCDA/MADM methods (TOPSIS, SAW, ELECTRE, ENTROPY, Game Theory, Utility Theory, Permutation Method, Judgement Methods) were applied for construction tasks solutions. Furthermore, these methods were used for development of decision support systems [1].

There is a monograph summarising his achievements from that period [2]. This monograph has had a strong influence on research conducted by young academics working towards their PhD theses in number of countries, from Uzbekistan through Russia, Poland, Germany, Denmark, and Cuba to Syria. Another monograph [3] strengthened the Professor˙s position as a leader in this part of Europe, conquering the area of multi criteria decision aiding methods, and operational research applications in construction industry.

Works on multiple criteria decision support systems in construction have been published in individual monographs or in collaboration with his colleagues [4] – [6]. New methods of performing multiple criteria analysis in a project have been developed by Professor and his team, including:

- A method of COmplex PRoportional ASsessment (COPRAS) [5], COmplex Proportional ASsessment of Alternatives with Grey Relations (COPRAS-G) – presented in publication [7] which was nominatd the New Hot Paper for January 2010 by Science Watch (Thomson Reuters) in the field of Engineering (see http://archive.sciencewatch.com/dr/nhp/2010/10jannhp/10jannhpZavaET/) and COmplex PRoportional ASsessment of Alternatives Applying Fuzzy Sets (COPRAS-F) [8];
- Additive Ratio Assessment (ARAS) method [9], Additive Ratio Assessment Applying Attributes Values Determined in Intervals (ARAS-G) method [10] and Applying Fuzzy Sets (ARAS-F) [11];
- A Selection of Rational Dispute Resolution Method by Applying New Step-Wise Weight Assessment Ratio Analysis (SWARA) [12];
- TOPSIS Method Applying Mahalanobis Distance Measure (TOPSIS-M) [13];
- A new Normalization method in Games Theory [14];
- A method of Weighted Aggregated Sum Product Assessment [15];
- Algorithm of Maximising the Set of Common Solutions for Several MCDM problems [16].

Variety of the new MCDM methods and software was developed in collaboration with academic colleagues from abroad, i.e.:

- Software for Multiple Criteria Evaluation [17];
- A method of Multi-Objective Optimisation on the Basis of Ration Analysis (MOORA) [18];
- A method MULTIMOORA (MOORA plus Full Multiplicative Form) [19];
- COPRAS method for Group Decision Making in an Interval-Values Intuitionistic Fuzzy Environment [20];
- Extensions of LINAMP Model for Multi Criteria Decision Making with Grey Numbers [21];
- Fuzzy DEA Approach Based on Parametric Programming [22];
- Intuitionistic Fuzzy DEA for Efficiency Evaluation under Uncertainty [23];
- Stepwise DEA Analysis and Grey Incidence Analysis [24].

All the above listed methods had wide real world applications in such areas as: sustainable development in civil engineering, building life cycle, modelling of construction and real estate sector, quality control of construction projects, etc. Professor E. K. Zavadskas continuously develops new and researches existing MCDM methods for further improvements. Researches results, among many others, as illustration of Professor˙s works can be distinguished:

- Measuring Congruence of Ranking Results Applying Particular MCDM methods [25];
- Evaluation of Ranking Accuracy in Multi-Criteria Decisions, presented in paper [26] which was titled as Fast Breaking Paper for June 2009 by Science Watch (Thomson Reuters) inthe field of Mathematics (see http://archive.sciencewatch.com/dr/fbp/2009/pdf/09junfbpVysh.pdf);
- Verification of Robustness of Methods when Assessing Alternative Solutions [27] – [31];
- Proposal of Multi-Criteria Assessment Model of Technologies [32] – [39] .

Professor E. K. Zavadskas, in collaboration with his colleagues, has also developed hybrid decision making methods by combining MCDM methods TOPSIS, SAW, ELECTRE, AHP and the methods proposed by the Professor (see, i.e. [40] – [45]). About 20 papers were nominated as Hot Papers in Thomson Reuters database. In one of these papers there is a published interview with the author (see http://archive.sciencewatch.com/dr/nhp/2011/11maynhp/11maynhpZavaET/).

Professor E. K. Zavadskas was granted a Lithuanian award for research achievements for a cycle of works ´Multiple Criteria Assessment of Construction Projects and Technological Solutions (1980–1996) in 1996, and for a cycle of works ´Modelling in construction (methods,

simulation, decision support and information systems, web-based technologies, practical application)' (1996–2003) – in 2004. In 1996 he also was awarded the 4th class medal of the Lithuanian Grand Duke Gediminas.

Prof. E. K. Zavadskas has published over 50 books, including 5 textbooks and 16 monographs as single author, or in collaboration with other authors, 10 popular science books, over 400 research articles as well as several hundreds of articles on various social and cultural topics. He has edited over 20 collective volumes.

Professor E. K. Zavadskas has set up three famous international scientific journals: ´Technological and Economic Development of Economy' (Editor-in-chief since 1994), ´Journal of Civil Engineering and Management' (Editor-in-chief since 1995) and ´International Journal of Strategic Property Management' (Editor-in-chief since 1997 till 2011). Since 2008 all three journals have been referred in Thomson Reuters Web of Science database, and since 2010 – have impact factor (IF). Furthermore, since 2010 these journals are published by VGTU publishing house ´Technika' in collaboration with a famous publishing house – Taylor & Francis.

The Professor is also a member of editorial boards of 16 international journals referred in Thomson Reuters Web of Science database and 17 other journals. On various occasions special issues of journals and collective volumes were dedicated to Professor ¨s works, i.e. Journal of Management and Decision Making: ´Normalisation in Decision Making methods' (2007), International Journal of Environment and Pollution (2007, 2008), Automation in Construction (2010), Informatica (2001), Ecology (2007).

Professor E. K. Zavadskas was a chairman and member of organizing committees of numerous international conferences, as well as editor of conference proceedings, including:

- Modelling and Simulation of Business Systems (Vilnius, Lithuania 2003);
- 33rd Symposium International FESF Strasbourg: Recent developments in Environmental Protection (Vilnius, Lithuania, 2003);
- Simulation and optimization in Business and Industry: International Conference on Operational Research (Tallinn, Estonia, 2006);
- The 20th International Conference EURO mini Conference Ľ'Construction Optimization and Knowledge-Based Technologies´ (EurOPT'2008) (Neringa, Lithuania, 2008);
- The 25th International Symposium on Automation and Robotics in Construction (ISARC 2008) (Vilnius, Lithuania, 2008);
- International Conference on Modelling of Business, Industrial and Transport Systems (Riga, Latvia, 2008);
- International Conference ´Modern Buildings, Materials and Structures', (Vilnius, Lithuania, 2004, 2007, 2010, 2013), etc.

Professor E. K. Zavadskas was one of the main initiators of international German – Lithuanian – Polish colloquium dedicated to Operational Research (OR) in Civil Engineering. The first one was held in 1986, Leipzig, Germany. The Colloquia are organized every two years. Since the first one, 14 colloquia have already been organized. On the basis of collaboration during 11th and the 12th colloquia, the idea of setting up of a new EURO working group ´OR in Sustainable Development and Civil Engineering' (EWG-ORSDCE) was presented. On the initiative of professor Zavadskas, the Working Group was established during the 23rd European Conference on Operational Research ´OR creating competitive advantage', which took place in Bonn, Germany 5–8 July 2009 (http://www.euroonline.org/web/ewg/32/ewg-orsdce-or-in-sustainable-development-and-civil-engineering). Prof. E. K. Zavadskas is a Chairman of this working group.

Under E. K. Zavadskas supervision, 33 PhD dissertations were presented (four of his former students were awarded the title of Full Professor).

Professor Edmundas Kazimieras Zavadskas has greatly contributed to development and practical applications of MCDM methods. This is why a part of the article was devoted to his

achievements. His numerous articles and, most of all, authorship or co-authorship of books contribute to the MCDM theory and practice, as well as encourage continuous innovations in this field.

The full text presented in article:
O. Kaplinski, F. Peldschus, L. Tupėnaitė (2014) Development of MCDM Methods – in Honour of Professor Edmundas Kazimieras Zavadskas on the Occasion of His 70th Birthday. International Journal of Computers Communications & Control (ISSN 1841-9836), 9(3):305-312.

Bibliography

[1] Zavadskas, E.K. (1987); Multiattribute Decision Making in Construction. Dr.Sc. Dissertation. Moscow: Institute of Civil Engineering. 720 p. (in Russian).

[2] Zavadskas, E. (1987); Complex Estimation and Choice of Resource-Saving Decisions in Construction. Vilnius: Mokslas. 210 p. (in Russian).

[3] Zavadskas, E.K. (1991); System of Estimation of Technological Solutions in Building Construction. Leningrad: Stroizdat. 256 p. (in Russian).

[4] Zavadskas, E.; Peldschus, F.; Kaklauskas, A. (1994); Multiple Criteria Evaluation of Projects in Construction. Vilnius: Technika. 226 p.

[5] Zavadskas, E.K.; Kaklauskas, A. (2007); Mehrzielselektion für Entscheidungen im Bauwesen. Stuttgart: IRB Verlag. 276 p. (in German).

[6] Zavadskas, E.; Kaplinski, O.; Kaklauskas, A.; Brzezinski, J. (1995); Expert Systems in Construction Industry. Trends, Potencial & Applications. Vilnius: Technika. 180 p.

[7] Zavadskas, E.K.; Kaklauskas, A.; Turskis, Z.; Tamosaitiene, J. (2008); Selection of the Effective Dwelling House Walls by Applying Attributes Values Determined at Intervals, Journal of Civil Engineering and Management, 14(2): 85-93.

[8] Zavadskas, E.K.; Antucheviciene, J.; (2007); Multiple Criteria Evaluation of Rural Building's Regeneration Alternatives, Building and Environment, 42(1): 436-451.

[9] Zavadskas, E.K.; Turskis, Z. (2010); A New Additive Ratio Assessment (ARAS) Method in Multicriteria Decision-Making, Technological and Economic Development of Economy, 16(2): 159-172.

[10] Turskis, Z.; Zavadskas, E.K.; (2010); A Novel Method for Multiple Criteria Analysis: Grey Additive Ratio Assessment (ARAS-G) Method, Informatica, 21(4): 597-610.

[11] Turskis, Z.; Zavadskas, E.K. (2010); A New Fuzzy Additive Ratio Assessment Method (ARAS-F). Case Study: the Analysis of Fuzzy Multiple Criteria in Order to Select the Logistic Centers Location, Transport, 25(4): 423-432.

[12] Keršulienė, V.; Zavadskas, E.K.; Turskis, Z. (2010); Selection of Rational Dispute Resolution Method by Applying New Step-Wise Weight Assessment Ratio Analysis (SWARA), Journal of Business Economics and Management, 11(2): 243-258.

[13] Antuchevičienė, J.; Zavadskas, E.K.; Zakarevičius, A. (2010); Multiple Criteria Construction Management Decisions Considering Relations between Criteria, Technological and Economic Development of Economy, 16(1): 109-125.

[14] Zavadskas, E.K.; Turskis, Z. (2008); A New Logarithmic Normalization Method in Games Theory, Informatica, 19(2): 303-314.

[15] Zavadskas, E.K.; Turskis, Z.; Antucheviciene, J.; Zakarevicius, A. (2012); Optimization of Weighted Aggregated Sum Product Assessment, Electronics and Electrical Engineering = Elektronika ir elektrotechnika, 122(6): 3-6.

[16] Dadelo, S.; Krylovas, A.; Kosareva, N.; Zavadskas, E.K.; Dadeliene, R. (2014); Algorithm of Maximizing the Set of Common Solutions for Several MCDM Problems and it˙s Application for Security Personnel Scheduling, International Journal of Computers, Communications & Control (IJCCC), 9(2): 140-148.

[17] Zavadskas, E.K.; Ustinovičius, L.; Peldschus, F. (2003); Development of Software for Multiple Criteria Evaluation, Informatica, 14(2): 259-272.

[18] Brauers, W.K.M.; Zavadskas, E.K. (2006); The MOORA Method and its Application to Privatization in a Transition Economy, Control and Cybernetics, 35(2): 445-469.

[19] Brauers, W.K.M.; Zavadskas, E.K. (2010); Project Management by MULTIMOORA as an Instrument for Transition Economies, Technological and Economic Development of Economy, 16(1): 5-24.

[20] Razavi Hajiagha, S.H.; Hashemi, S.S.; Zavadskas, E.K. (2013); A Complex Proportional Assessment Method for Group Decision Making in an Interval-Valued Intuitionistic Fuzzy Environment, Technological and Economic Development of Economy, 19(1): 22-37.

[21] Razavi Hajiagha, S.H., Hashemi, S.S.; Zavadskas, E.K.; Akrami, H. (2012); Extensions of LINMAP Model for Multi Criteria Decision Making with Grey Numbers, Technological and Economic Development of Economy, 18(4): 636-650.

[22] Razavi Hajiagha, S.H.; Mahdiraji, H.A.; Zavadskas, E.K.; Hashemi, S.S. (2013); A Fuzzy Data Envelopment Analysis Approach Based on Parametric Programming, International Journal of Computers, Communications & Control (IJCCC), 8(4): 594-607.

[23] Razavi Hajiagha, S.H.; Akrami, H.; Zavadskas, E.K.; Hashemi, S.S. (2013); An Intuitionistic Fuzzy Data Envelopment Analysis for Efficiency Evaluation under Ucertainty: Case of a Finance and Credit Institution, E&M Economics and Management = E&M Economie a Management, 1: 128-137.

[24] Razavi Hajiagha, S.H.; Zavadskas, E.K.; Hashemi, S.S. (2013); Application of Stepwise Data Envelopment Analysis and Grey Incidence Analysis to Evaluate the Effectiveness of Export Promotion Programs, Journal of Business Economics and Management, 14(3): 638-650.

[25] Antuchevičien˙e, J.; Zakarevičius, A.; Zavadskas, E.K. (2011); Measuring Congruence of Ranking Results Applying Particular MCDM methods, Informatica, 22(3): 319-338.

[26] Zavadskas, E.K.; Zakarevicius, A.; Antucheviciene, J. (2006); Evaluation of Ranking Accuracy in Multi-Criteria Decisions, Informatica, 17(4): 601-618.

[27] Zavadskas, E.K.; Antucheviciene, J.; Saparauskas, J.; Turskis, Z. (2013); MCDM Methods WASPAS and MULTIMOORA: Verification of Robustness of Methods when Assessing Alternative Solutions, Journal of Economic Computation and Economic Cybernetics Studies and Research (ECECSR), 47(2): 5-20.

[28] Brauers, W. K. M.; Zavadskas, E. K. (2012); Robustness of MULTIMOORA: a method for multi-objective optimization, Informatica, 23(1): 1-25.

[29] Brauers, W. K. M.; Kildien˙e, S.; Zavadskas, E. K.; Kaklauskas, A. (2013); The construction sector in twenty European countries during the recession 2008-2009 – country ranking by MULTIMOORA, International Journal of Strategic Property Management, 17(1): 58-78.

[30] Yazdani-Chamzini, A.; Yakhchali, S. H.; Zavadskas, E. K. (2012); Using a integrated MCDM model for mining method selection in presence of uncertainty, Ekonomska Istraživanja – Economic Research, 25(4): 869-904.

[31] Brauers, W. K. M.; Zavadskas, E. K. (2012); A multi-objective decision support system for project selection with an application for the Tunisian textile industry, E&M Economie a Management, 15(1): 28-43.

[32] Zavadskas, E. K.; Turskis, Z.; Volvačiovas, R.; Kildien˙e, S. (2013); Multi-criteria assessment model of technologies, Studies in Informatics and Control, 22(4): 249-258.

[33] Hashemkhani Zolfani, S.; Sedaghat, M.; Zavadskas, E. K. (2012); Performance evaluating of rural ICT centers (telecenters), applying Fuzzy AHP, SAW-G and TOPSIS Grey, a case study in Iran, Technological and Economic Development of Economy, 18(2): 364-387.

[34] Hashemkhani Zolfani, S.; Zavadskas, E. K.; Turskis, Z. (2013); Design of products with both international and local perspectives based on Yin-Yang balance theory and SWARA method, Ekonomska Istraživanja - Economic Research, 26(2): 153-166.

[35] Yazdani-Chamzini, A.; Fouladgar, M. M.; Zavadskas, E. K.; Moini, S. H. H. (2013); Selecting the optimal renewable energy using multi criteria decision making, Journal of Business Economics and Management, 14(5): 957-978.

[36] Hashemkhani Zolfani, S.; Esfahani, M. H.; Bitarafan, M.; Zavadskas, E. K.; Arefi, S. L. (2013); Developing a new hybrid MCDM method for selection of the optimal alternative of mechanical longitudinal ventilation of tunnel pollutants during automobile accidents, Transport, 28(1): 89-96.

[37] Staniunas, M.; Medineckiene, M.; Zavadskas, E. K.; Kalibatas, D. (2013); To modernize or not: ecological-economical assessment of multi-dwelling houses modernization, Archives of Civil and Mechanical Engineering, 13(1): 88-98.

[38] Kračka, M.; Zavadskas, E. K. (2013); Panel building refurbishment elements effective selection by applying multiple-criteria methods, International Journal of Strategic Property Management, 17(2): 210-219.

[39] Brauers, W. K. M.; Kracka, M.; Zavadskas, E. K. (2012); Lithuanian case study of masonry buildings from the Soviet period, Journal of Civil Engineering and Management, 18(3): 444-456.

[40] Zavadskas, E.K.; Vainiunas, P.; Turskis, Z.; Tamošaitien˙e, J. (2012); Multiple Criteria Decision Support System for Assessment of Projects Managers in Construction, International Journal of Information Technology & Decision Making, 11(2): 501-520.

[41] Hashemkhani Zolfani, S.H.; Aghdaie, M.H.; Derakhti, A.; Zavadskas, E.K.; Varzandeh, M.H.M. (2013); Decision Making on Business Issues with Foresight Perspective; An Application of New Hybrid MCDM Model in Shopping Mall Locating, Expert Systems with Applications, 40(17): 7111-7121.

[42] Fouladgar, M. M.; Yazdani-Chamzini, A.; Zavadskas, E. K.; Haji M., Hamzeh, S. (2012); A new hybrid model for evaluating the working strategies: case study of construction company, Technological and Economic Development of Economy, 18(1): 164-188.

[43] Rezaeiniya, N.; Hashemkhani Zolfani, S.; Zavadskas, E. K. (2012); Greenhouse locating based on Anp-Copras-G Methods – an empirical study based on Iran, International Journal of Strategic Property Management, 16(2): 188-200.

[44] Hashemkhani Zolfani, S.; Rezaeiniya, N.; Pourhossein, M.; Zavadskas, E. K. (2012); Decision making on advertisement strategy selection based on life cycle of products by applying FAHP and TOPSIS GREY: growth stage perspective; a case about food industry in IRAN, Inžinerinė Ekonomika - Engineering Economics, 23(5): 471-484.

[45] Zavadskas, E. K.; Sušinskas, S.; Daniūnas, A.; Turskis, Z.; Sivilevičius, H. (2012); Multiple criteria selection of pile-column construction technology, Journal of Civil Engineering and Management, 18(6): 834-842.

New scientific papers

Aviža, Donatas [Aviza, Donatas]; Turskis, Zenonas. An empirical analysis of correlation between the thickness of a thermal insulation layer of the floor and the payback period, Journal of civil engineering and management. Vilnius : Technika. ISSN 1392-3730. Vol. 20, no. 5 (2014), p. 760-766. http://www.tandfonline.com/doi/abs/10.3846/13923730.2014.937356

Bagočius, Vygantas; Zavadskas, Edmundas Kazimieras; Turskis, Zenonas. Selecting a location for a liquefied natural gas terminal in the Estern Baltic sea, *Transport*. Vilnius : Technika. ISSN 1648-4142. Vol. 29, no. 1 (2014), p. 69-74. http://dx.doi.org/10.3846/16484142.2014.897996

Bagočius, Vygantas; Zavadskas, Edmundas Kazimieras; Turskis, Zenonas. Multi-person selection of the best wind turbine based on the multi-criteria integrated additive-multiplicative utility function, *Journal of civil engineering and management.* Vilnius : Technika. ISSN 1392-3730. Vol. 20, no. 4 (2014), p. 590-599. http://dx.doi.org/10.3846/13923730.2014.932836

Bagočius, Vygantas; Zavadskas, Edmundas Kazimieras; Turskis, Zenonas. Sequence determining of construction of the offshore wind farm construction applying permutation method, *E&M Economics and Management = E&M Ekonomie a management*. Liberec : Technická Univerzita v Liberci. ISSN 1212-3609. Vol. 17, no. 3 (2014), p. 50-61. dx.doi.org/10.15240/tul/001/2014-3-005 (externí odkaz)

Bitarafan, Mahdi; Zolfani, Sarfazar Zashemkhani; Arefi, Shahin Lale; Zavadskas, Edmundas Kazimieras; Mahmoudzadeh, Amir. Evaluation of real-time intelligent sensors for structural health monitoring of bridges based on SWARA-WASPAS; a case in Iran, *The Baltic journal of road and bridge engineering*. Vilnius : Technika. ISSN 1822-427X. Vol. 9, no. 4 (2014), p. 333-340.

Chakraborty, Shankar; Zavadskas, Edmundas Kazimieras. Applications of WASPAS method in manufacturing decision making, *Informatica*. Vilnius: Matematikos ir informatikos institutas. ISSN 0868-4952. Vol. 25, no. 1 (2014), p. 1-20. http://www.mii.lt/informatica/pdf/INFO1022.pdf

Chang, Betty; Kuo, Chin; Wu, Chih-Hung; Tzeng, Gwo-Hshiung. Using Fuzzy Analytic Network Process to assess the risks in enterprise resource planning system implementation, *Applied Soft Computing*, In Press, Uncorrected Proof, Available online 11 December 2014.

Dadelo, Stanislav; Krylovas, Aleksandras; Kosareva, Natalja; Zavadskas, Edmundas Kazimieras; Dadelienė, Rūta. Algorithm of maximizing the set of common solutions for several MCDM problems and it's application for security personnel scheduling, *International Journal of Computers, Communications & Control (IJCCC)*. Agora : Agora University Editing House. ISSN 1841-9836. Vol. 9, iss.2 (2014), p. 151-159. http://univagora.ro/jour/index.php/ijccc/article/view/1015/250.

Dadelo, Stanislav; Turskis, Zenonas; Zavadskas, Edmundas Kazimieras; Dadelienė, Rūta [Dadeliene, Ruta]. Multi-criteria assessment and ranking system of sport team formation based on objective-measured values of criteria set, *Expert systems with applications.* Oxford : Elsevier Science Ltd. ISSN 0957-4174. Vol. 41, iss. 14 (2014), p. 6106–6113. doi:10.1016/j.eswa.2014.03.036

Dellino, Gabriella; Meloni, Carlo; Pierreval, Henri. Simulation–optimization of complex systems: Methods and applications, *Simulation Modelling Practice and Theory*, Volume 46, August 2014, Pages 1-3.

Ding, Lieyun; Zhang, Limao; Wu, Xianguo; Skibniewski, Miroslaw J.; Qunzhou, Yu. Safety management in tunnel construction: Case study of Wuhan metro construction in China, *Safety Science*, Volume 62, February 2014, Pages 8-15.

Esbouei, Saber Khalili; Ghadikolaei, Abdolhamid Safaei; Antuchevičienė, Jurgita [Antucheviciene, Jurgita]. Using fanp and fuzzy vikor for ranking manufacturing companies based on their financial performance, *Economic computation and economic cybernetics studies and research*. Bucharest : Academy of Economic Studies. ISSN 0424-267X. Vol. 48, iss. 3 (2014), p. 141-162.

Ghadikolaei, Abdolhamid Safaei; Esbouei, Saber Khalili; Antuchevičienė, Jurgita [Antucheviciene, Jurgita]. Applying fuzzy MCDM for financial performance evaluation of Iranian companies,

Technological and economic development of economy. Vilnius : Technika. ISSN 2029-4913. Vol. 20, no. 2 (2014), p. 274-291. http://dx.doi.org/10.3846/20294913.2014.913274

Grigonis, Vytautas; Burinskienė, Marija; Paliulis, Gražvydas Mykolas; Ušpalytė-Vitkunienė, Rasa; Dumbliauskas, Vytautas; Barauskas, Andrius. Modelling a passenger car system based on the principles of sustainable mobility in Vilnius City, *Transport*. Vilnius : Technika. ISSN 1648-4142. Vol. 29, no. 3 (2014), p. 334-341.

Gudienė, Neringa; Banaitis, Audrius; Podvezko, Valentinas; Banaitienė, Nerija. Identification and evaluation of the critical success factors for construction projects in Lithuania: AHP approach, *Journal of civil engineering and management*. Vilnius : Technika. ISSN 1392-3730. Vol. 20, no. 3 (2014), p. 350-359. http://dx.doi.org/10.3846/13923730.2014.914082

Hajiagha, Seyed Hossein Razavi; Mahdiraji, Hannan Amoozad; Zavadskas, Edmundas Kazimieras [Zavadskas, , Edmundas Kazemieras]; Hashemi, Shide Sadat. Maximizing and minimizing sets in solving fuzzy linear programming, *Journal of economic computation and economic cybernetics studies and research (ECECSR)*. Bucharest : Academy of Economic Studies. ISSN 0424-267X. Vol. 48, no. 2 (2014), p. 113-132. http://www.ecocyb.ase.ro/eng/Seyed%20Hossein.pdf

Hajiagha, Seyed Hossein Razavi; Mahdiraji, Hannan Amoozad; Zavadskas, Edmundas Kazimieras; Hashemi, Shide Sadat. Fuzzy multi-objective linear programming based on compromise VIKOR method, *International journal of information technology & decision making*. Singapure : World Scientific Publishing Company. ISSN 0219-6220. Vol. 13, no. 4 (2014), p. 679-698. doi: 10.1142/S0219622014500667

Hu, Shu-Kung; Lu, Ming-Tsang; Tzeng, Gwo-Hshiung. Exploring smart phone improvements based on a hybrid MCDM model, *Expert Systems with Applications*, Volume 41, Issue 9, July 2014, Pages 4401-4413.

Huang, Chun-Nen; Liou, James J.H.; Chuang, Yen-Ching. A method for exploring the interdependencies and importance of critical infrastructures, *Knowledge-Based Systems*, Volume 55, January 2014, Pages 66-74.

Kapliński, Oleg; Peldschus, Friedel; Tamošaitienė, Jolanta. Professor Edmundas Kazimieras Zavadskas: his academic research, school of thought, and most eminent results of his work, *Archives of civil engineering*. Warszaw : Committee for Civil Engineering PAS. ISSN 1230-2945. Vol. 60, iss. 2 (2014), p. 287-292.

Kačerauskas, Tomas; Kaklauskas, Artūras. Kūrybinis miestas: mitai ir utopijos, *Filosofija. Sociologija*. Vilnius : Lietuvos Mokslų Akademijos leidykla. ISSN 0235-7186. T. 25, nr. 3 (2014), p. 190-199. http://www.lmaleidykla.lt/publ/0235-7186/2014/3/190-199.pdf

Kačianauskas, Rimantas; Kaklauskas, Artūras; Skibniewski, Mirosław J.; Kaklauskas, Gintaris; Antuchevičienė, Jurgita; Tupėnaitė, Laura. A life dedicated to science: on the occasion of the 70th birthday of editor-in-chief Edmundas Kazimieras Zavadskas, *Journal of civil engineering and management*. Vilnius : Technika. ISSN 1392-3730. Vol. 20, no. 3 (2014), p. 311-314. http://dx.doi.org/10.3846/13923730.2014.925276

Keršulienė, Violeta; Turskis, Zenonas. A hybrid linguistic fuzzy multiple criteria group selection of a chief accounting officer, *Journal of business economics and management*. Vilnius : Technika. ISSN 1611-1699. Vol. 15, no. 2 (2014), p. 232-252. http://dx.doi.org/10.3846/16111699.2014.903201

Kildienė, Simona; Zavadskas, Edmundas Kazimieras; Tamošaitienė, Jolanta. Complex assessment model for advanced technology deployment, *Journal of civil engineering and management*. Vilnius : Technika. ISSN 1392-3730. Vol. 20, no. 2 (2014), p. 280-290. http://dx.doi.org/10.3846/13923730.2014.904813

Ko, Yu-Chien; Fujita, Hamido; Tzeng, Gwo-Hshiung. A simple utility function with the rules-verified weights for analyzing the top competitiveness of WCY 2012, *Knowledge-Based Systems*, Volume 58, March 2014, Pages 58-65.

Krylovas, Aleksandras; Zavadskas, Edmundas Kazimieras; Kosareva, Natalja; Dadelo, Stanislavas. New KEMIRA method for determining criteria priority and weights in solving MCDM problem, *International*

journal of information technology & decision making. Singapure: World Scientific Publishing Company. ISSN 0219-6220. Vol. 13, no. 6 (2014), p. 1119-1134. doi: 10.1142/S0219622014500825

Kutut, Vladislavas [Kutut, V.]; Zavadskas, Edmundas Kazimieras [Zavadskas, E.K.]; Lazauskas, Marius [Lazauskas, M.]. Assessment of priority alternatives for preservation of historic buildings using model based on ARAS and AHP methods, *Archives of civil and mechanical engineering*. Oxford : Elsevier Ltd. ISSN 1644-9665. Vol. 14, iss. 2 (2014), p. 287-294. doi:10.1016/j.acme.2013.10.007

Lale Arefi, Shahin; Naghipour, Morteza; Turskis, Zenonas; Nematzadeh, Mehdi. Evaluation of grooving method to postpone debonding of FRP laminates in WPC-FRP beams, *Journal of civil engineering and management*. Vilnius : Technika. ISSN 1392-3730. Vol. 20, no. 2 (2014), p. 237-246. http://dx.doi.org/10.3846/13923730.2013.878379

Lashgari, Shima; Antuchevičienė, Jurgita; Delavari, Alireza; Kheirkhah, Omid. Using QSPM and WASPAS methods for determining outsourcing strategies, *Journal of business economics and management*. Vilnius : Technika. ISSN 1611-1699. Vol. 15, no. 5 (2014), p. 729-743. http://dx.doi.org/10.3846/16111699.2014.908789

Liou, James J.H. Building an effective system for carbon reduction management, *Journal of Cleaner* Production, In Press, Corrected Proof, Available online 29 October 2014.

Liou, James J.H.; Chuang, Yen-Ching; Tzeng, Gwo-Hshiung. A fuzzy integral-based model for supplier evaluation and improvement*, Information Sciences*, Volume 266, 10 May 2014, Pages 199-217.

Liou, James J.H.; Hsu, Chao-Che; Chen, Yun-Shen. Improving transportation service quality based on information fusion, *Transportation Research Part A: Policy and Practice*, Volume 67, September 2014, Pages 225-239.

Mahdiraji, Hannan Amoozad; Govindan, Kannan; Zavadskas, Edmundas Kazimieras; Razavi Hajiagha, Seyed Hossein. Coalition or decentralization: a game-theoretic analysis of a three-echelon supply chain network, *Journal of business economics and management.* Vilnius : Technika. ISSN 1611-1699. Vol. 15, no. 3 (2014), p. 460-485. http://dx.doi.org/10.3846/16111699.2014.926289

Medineckiene, M.; Zavadskas, E.K.; Björk, F.; Turskis, Z. Multi-criteria decision-making system for sustainable building assessment/certification, Archives of Civil and Mechanical Engineering, In Press, Corrected Proof, Available online 8 October 2014.

Miedzialovski, Česlav [Miedzialowski, Czeslaw]; Maleša, Jaroslav [Malesza, Jaroslaw]; Maleša, Mikolaj [Malesza, Mikołaj]; Ustinovičius, Leonas [Ustinovichius, Leonas]. Monitoring of interactions of a monumental historical complex located on an earth embankment, *Journal of civil engineering and management*. Vilnius: Technika. ISSN 1392-3730. Vol. 20, no. 2 (2014), p. 299-307. http://dx.doi.org/10.3846/13923730.2014.895412

Rabbani, Arefeh; Zamani, Mahmoud; Yazdani-Chamzini, Abdolreza; Zavadskas, Edmundas Kazimieras. Proposing a new integrated model based on sustainability balanced scorecard (SBSC) and MCDM approaches by using linguistic variables for the performance evaluation of oil producing companies, *Expert systems with applications*. Oxford : Elsevier Science Ltd. ISSN 0957-4174. Vol. 41, iss. 16 (2014), p. 7316-7327. doi:10.1016/j.eswa.2014.05.023

Ruzgys, Audrius; Volvačiovas, Robertas; Ignatavičius, Česlovas; Turskis, Zenonas. Integrated evaluation of external wall insulation in residential buildings using SWARA-TODIM MCDM method, *Journal of civil engineering and management*. Vilnius : Technika. ISSN 1392-3730. Vol. 20, no. 1 (2014), p. 103-110. http://dx.doi.org/10.3846/13923730.2013.843585

Šaparauskas, Jonas; Turskis, Zenonas; Merkuryeva, Galina; Liias, Roode. 70th anniversary of the birth of academician Edmundas Kazimieras Zavadskas, *Technological and economic development of economy*. Vilnius : Technika. ISSN 2029-4913. Vol. 20, no. 2 (2014), p. 184-192. http://dx.doi.org/10.3846/20294913.2014.937585

Shen, Kao-Yi; Yan, Min-Ren; Tzeng, Gwo-Hshiung. Combining VIKOR-DANP model for glamor stock selection and stock performance improvement, *Knowledge-Based Systems*, Volume 58, March 2014, Pages 86-97.

Simanavičienė, Rūta; Liaudanskienė, Rita; Ustinovičius, Leonas [Ustinovichius, Leonas]. Assessing reliability of design, construction, and safety related decisions, *Automation in Construction*. Amsterdam: Elsevier Science B.V. ISSN 0926-5805. Vol. 39 (2014), p. 47–58. doi:10.1016/j.autcon.2013.11.008

Šiožinytė, Eglė; Antuchevičienė, Jurgita; Kutut, Vladislavas. Upgrading the old vernacular building to contemporary norms: multiple criteria approach*, Journal of civil engineering and management*. Vilnius : Technika. ISSN 1392-3730. Vol. 20, no. 2 (2014), p. 291-298. http://dx.doi.org/10.3846/13923730.2014.904814

Urbanavičienė, Vita; Kaklauskas, Artūras; Zavadskas, Edmundas Kazimieras; Šliogerienė, Jūratė; Naimavičienė, Jurga; Vatin, Nikolay Ivanovich. Facilitating the housing bargaining with the help of the bargaining decision support system, *International journal of strategic property management*. Vilnius : Technika. ISSN 1648-715X. Vol. 18, no. 3 (2014), p. 213-224. doi:10.3846/1648715X.2014.933137

Vafaeipour, Majid; Hashemkhani Zolfani, Sarfaraz; Morshed Varzandeh, Mohammad Hossein; Derakhti, Arman; Keshavarz Eshkalag, Mahsa. Assessment of regions priority for implementation of solar projects in Iran: New application of a hybrid multi-criteria decision making approach, *Energy* Conversion and Management, Volume 86, October 2014, Pages 653-663.

Vygantas Žėkas, Vytautas Martinaitis, Giedrė Streckienė & Tatjana Vilutienė (2014) A quantitative evaluation of theoretical renewable energy potential of the building site, *Journal of Civil Engineering and Management*, 20:6, 873-883, doi: 10.3846/13923730.2014.976589

Wu, Xianguo; Liu, Huitao; Zhang, Limao; Skibniewski, Miroslaw J.; Deng, Qianli; Teng, Jiaying. A dynamic Bayesian network based approach to safety decision support in tunnel construction, *Reliability Engineering & System Safety*, Volume 134, February 2015, Pages 157-168.

Zagorskas, Jurgis; Zavadskas, Edmundas Kazimieras; Turskis, Zenonas; Burinskienė, Marija; Blumberga, Andra; Blumberga, Dagnija. Thermal insulation alternatives of historic brick buildingsin Baltic Sea Region, *Energy and buildings.* Lausanne : Elsevier Science. ISSN 0378-7788. 2014, Vol. 78, p. 35–42. doi:10.1016/j.enbuild.2014.04.010

Zamani, Mahmoud; Rabbani, Arefeh; Yazdani-Chamzini, Abdolreza; Turskis, Zenonas. An integrated model for extending brand based on fuzzy ARAS and ANP methods, Journal of business economics and management. Vilnius : Technika. ISSN 1611-1699. Vol. 15, no. 3 (2014), p. 403-423. http://dx.doi.org/10.3846/16111699.2014.923929

Zavadskas, Edmundas Kazimieras [Zavadskas, E.K.]; Skibniewski, Mirosław J. [Skibniewski, M.J.]; Antuchevičienė, Jurgita [Antucheviciene, J.]. Performance analysis of civil engineering journals based on the Web of Science® database, *Archives of civil and mechanical engineering*. Oxford : Elsevier Ltd. ISSN 1644-9665. Vol. 14, iss.4 (2014), p. 519-527. doi:10.1016/j.acme.2014.05.008

Zavadskas, Edmundas Kazimieras; Antuchevičienė, Jurgita [Antucheviciene, Jurgita]; Hajiagha, Seyed Hossein Razavi; Hashemi, Shide Sadat. Extension of weighted aggregated sum product assessment withinterval-valued intuitionistic fuzzy numbers (WASPAS-IVIF), *Applied soft computing*. Amsterdam : Elsevier Science BV. ISSN 1568-4946. Vol. 24 (2014), p. 1013-1021. doi:10.1016/j.asoc.2014.08.031

Zavadskas, Edmundas Kazimieras; Antuchevičienė, Jurgita. The 20th anniversary of the journal: editor's introduction, *Journal of civil engineering and management.* Vilnius : Technika. ISSN 1392-3730. Vol. 20, no. 3 (2014), p. 309-310. http://dx.doi.org/10.3846/13923730.2014.925274

Zavadskas, Edmundas Kazimieras; Šaparauskas, Jonas. The twentieth anniversary of the journal: editor's introduction, *Technological and economic development of economy.* Vilnius : Technika. ISSN 2029-4913. Vol. 20, no. 2 (2014), p. 181-183. http://dx.doi.org/10.3846/20294913.2014.937554

Zavadskas, Edmundas Kazimieras; Turskis, Zenonas; Bagočius, Vygantas. Multi-criteria selection of a deep-water port in the Eastern Baltic Sea, *Applied soft computing*. Amsterdam : Elsevier Science BV. ISSN 1568-4946. Vol. 26 (2015), p. 180-192. doi:10.1016/j.asoc.2014.09.019

Zavadskas, Edmundas Kazimieras; Turskis, Zenonas; Kildienė, Simona. State of art surveys of overviews on MCDM/MADM methods, *Technological and economic development of economy*. Vilnius :

Technika. ISSN 2029-4913. Vol. 20, no. 1 (2014), p. 165-179. http://dx.doi.org/10.3846/20294913.2014.892037

Zavadskas, Edmundas Kazimieras; Vilutienė, Tatjana; Turskis, Zenonas; Šaparauskas, Jonas. Multi-criteria analysis of Projects' performance in construction, *Archives of civil and mechanical engineering*. Oxford: Elsevier Ltd. ISSN 1644-9665. Vol. 14, iss.1 (2014), p. 114–121.

Zhang, Limao; Skibniewski, Miroslaw J.; Wu, Xianguo; Chen, Yueqing; Deng, Qianli. A probabilistic approach for safety risk analysis in metro construction, *Safety Science*, Volume 63, March 2014, Pages 8-17.

Zhang, Limao; Wu, Xianguo; Chen, Queqing; Skibniewski, Miroslaw J.; Hsu, Shu-Chien. Towards a safety management approach for adjacent buildings in tunneling environments: Case study in China, *Building and Environment*, Volume 75, May 2014, Pages 222-235.

Zhang, Limao; Wu, Xianguo; Skibniewski, Miroslaw J.; Zhong, Jingbing; Lu, Yujie. Bayesian-network-based safety risk analysis in construction projects, *Reliability Engineering & System Safety*, Volume 131, November 2014, Pages 29-39.

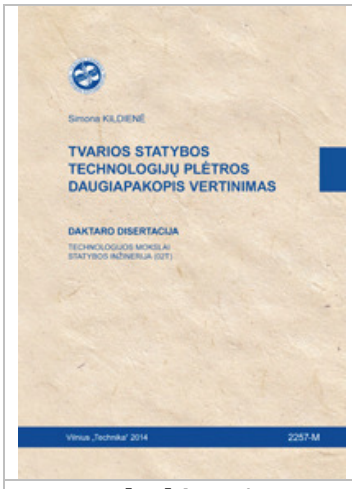
International projects in process

No.	Programme	Project	Short code	Date from - to	Responsible person (project manager)
1	Mokymosi visą gyvenimą (LLP)	Bendra iniciatyva siekiant prevencijos prieš pavojus	CADRE	2013-2016	Prof. Habil. Dr. Artūras Kaklauskas
2	Mokymosi visą gyvenimą (LLP)	Bendradarbiavimas atnaujinant atsparumo nelaimėms srities studijų programas, jose panaudojant atviro kodo intelektines sistemas ir papildytą realybę	RESINT	2013-2015	Prof. Habil. Dr. Artūras Kaklauskas
3	Kita (akademinė)	Studijų programų atnaujinimas užstatytos aplinkos srityje Rytų partnerystės šalyse	CEN EAST	2012-2015	Prof. Habil. Dr. Artūras Kaklauskas
4	Intelligent Energy Europe (IEE)	Initiative to boost continuing or further education and training of craftsmen and other on-site construction workers and systems installers in the building sector http://www.buildupskills.eu/	Build Up Skills - NERGOTRAIN	2014-2016	Assoc Prof Dr Tatjana Vilutienė
5	Leonardo Da Vinci	Postgraduate European Common Studies in Construction Project Management	MBAIC	2013-2015	Assoc.prof. Dr Arūnas Barvidas

PhD Dissertations defended during 2014

Name of doctoral student	Title of dissertation	Year	Scientific supervisor
Simona Kildienė	Multi-Stage Assessment of Sustainable Building Technologies Deployment	2014	Prof. Dr. Habil. Edmundas Kazimieras Zavadskas
Vygantas Bagočius	The Complex Rationality's Justification of Structures in the Sea Environment	2014	Prof. Dr. Habil. Edmundas Kazimieras Zavadskas
Robertas Volvačiovas	Investigation ans Multi-Attribute Assessment into Efficiency of Public Building Renovation	2014	Prof. Dr. Zenonas Turskis
Milena Medineckienė	Fuzzy Multi-Criteria Assessment of Dwelling's Sustainability	2014	Prof. Dr. Zenonas Turskis
Neringa Gudienė	Multiple Criteria Analysis of Critical Success Factors in the Implementation of Construction Projects	2014	Prof. Dr. Audrius Banaitis
Eglė Šiožinytė	Consistency Between Contemporary Building Norms and Tradition in Vernacular Buildings	2014	Prof. Dr. Habil. Josifas Parasonis (2009-2013) Prof. Dr. Jurgita Antuchevičienė (2013-2014)
Rūta Rudžianskaitė-Kvaraciejenė	Efectiveness Evaluation of Public-Private Partnership Automobile Road Infrastructure Construction Projects	2014	Assoc. Prof. Dr. Rasa Apanavičienė

Short review of defended dissertations



Multi-Stage Assessment of Sustainable Building Technologies Deployment

Simona Kildienė
2014

Scientific supervisor: Prof. Edmundas Kazimieras Zavadskas

Research object. Assessment of the expansion and efficiency of construction technologies in the market with the help of sustainability principles.

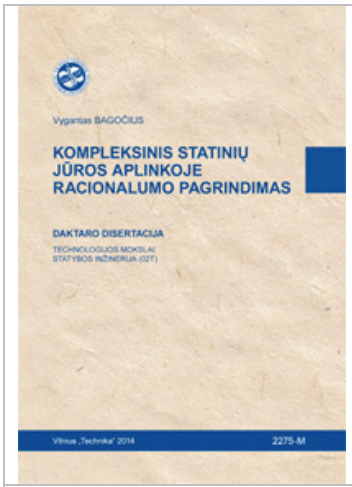
Aim and Tasks of the Work.

The aim – to suggest the multistage model for assessment of expansion of technologies in the construction market and create the algorithm for model practical application.

To achieve the aim of the thesis, the following objectives were formulated:

1. Analyse causes for emergence of new technologies in the construction sector.
2. Assess the factors determining technological success during the strategic planning stage of a construction company.
3. To adjust multi-attributed decision making methods and suggest their combinations for assessment of technology expansion factors on macro, meso and micro levels.
4. Design the theoretical multistage assessment model for the assessment of technology expansion in the construction market and the application algorithm based on sustainability principles.
5. Practically check the theoretical multistage assessment model for efficient technology assessment during the planning stage of a company.

Research methodology.
The thesis is based on publications of foreign and Lithuanian scientists, data of construction companies, statistical data of various institutions, reports and published information. While undertaking investigation the multiattribute decision analysis methods, synthesis, comparison of results, modelling and expert evaluation were used in dissertation.
Defended Statements.
1. Sustainability in the market is created by integration of technologies, which is defined and assessed as a systematic interaction between factors of macro-, meso-, and micro-environments.
2. Combinations of multi-attribute methods should be used to assess the developmental efficiency of new technologies or solve a different problems that contain a large amount of data while the optimal solution is to be found considering a number of attributes.
3. The designed complex multi-stage model aids the assessment the value of technological development while aiming for efficiency of company activities and satisfaction of consumer needs.
The scope of the scientific work.
The thesis comprises an introduction, three chapters, general conclusions, list of literature, resources and scientific publications of the author on the topic of dissertation, abstract in English and the annexes. The volume of the thesis amounts to 133 pages with the exception of annexes; the text contains 33 numbered equations, 19 illustrations and 27 tables. The dissertation has 170 references.
Approval of the thesis.
11 scientific articles were publicised on the topic of the thesis: five in scientific journals included into Thomson Reuters ISI Web of Science; one in ISI Proceedings; one in other reviewed international conference; three in conference proceedings of Lithuanian conferences; and one in other Lithuanian peer-reviewed periodical publications. Findings of the tiesis were presented at 4 scientific conferences.
Practical value.
Research findings may be valuable for construction companies that are planning their business growth directions. The suggested multistage assessment algorithm assesses prospects of technology deployment and dissemination in the market. The designed multistage assessment model may be used to promote consumer accessibility to a technology, new product or a part of a product or a technological process as well as investments into new technologies in a company or development of innovations in a business.



The Complex Rationality's Justification of Structures in the Sea Environment

Vygantas Bagočius
2014

Scientific supervisor: Prof. Edmundas Kazimieras Zavadskas

Research object. Assessment of sustainable development strategies for the expedient coastal zone and discrete alternatives of structures.
Aim and Tasks of the Work. The aim – to propose models for evaluation and analysis of possible development of alternatives for marine structures (deep-water avant-port, liquefied natural gas terminal and wind farm) and perform the multi-attribute assessment of these objects.
To achieve the aim of the thesis, the following objectives were formulated:
1. To determine possibilities for the development of structures on the coastal region (based on the

example of Klaipeda) and expediency of their construction.
2. To formulate possible options of marine structures (deep-see avant-port, liquefied gas terminal, wind farm) and suggest applicable multi-attribute assessment models.
3. To design criteria systems for each problem to be solved and determine the significance of these assessment criteria.
4. Using the designed criteria systems and suggested models for assessment of possible options, to perform multi-attribute assessment of marine structures and rational determination of options.

Research methodology.

The research was undertaken using a complex of methodological principles particular to the systematic approach and systematic analysis, decision-making theory and multi-attribute methods (AHP, TOPSIS, SAW, COPRAS, WASPAS, ARAS-F, Perstatymo, Fuzzy MOORA). During theoretical analysis, the review of contemporary scientific literature was undertaken; and the generalisation involved critical assessment of the aforementioned information aimed at identification of the validity of information, i.e. reliability and suitability in practice. At the end of the thesis, practical examples of suggested solutions are provided. In the course of the thesis preparation, review of scientific literature was undertaken; reports and statistical data of various institutions were used as the basis. Electronic (interactive) databases were the key source of all data. In addition, the thesis used information accumulated by Klaipėda City Municipality and Klaipėda State Seaport Authority.

Defended Statements.

1. Analysis of sites for marine structures necessitates the use of sustainable development criteria (environmental, economic and social) and their supplementation with technical criteria.
2. Assessment of marine structures and resolution of problems related to these structures suggests that it is expedient to use multi-attribute decision making methods and their combinations.
3. Application of multi-attribute decision making methods allows to compare marine structures and to select the most rational one.

The scope of the scientific work.

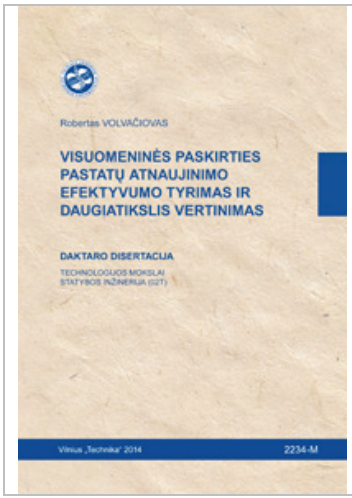
The thesis is comprises of the introduction, three chapters, summary of findings, resources and list of publications by the author on the topic of the thesis, abstract in English and three annexes. The volume of the thesis including the abstract amounts to 139 pages with the exception of annexes; the text contains 49 numbered equations, 32 illustrations and 30 tables. The dissertation is built upon 196 references.

Approval of the thesis.

Six scientific articles were publicised on the topic of the dissertation: four of which – in peer-reviewed journals of Thomson ISI Web of Science; one – in peer-reviewed proceedings of various scientific conferences; and one in proceedings of national conferences. Findings of investigations pertaining to the thesis were announced in two scientific conferences

Practical value.

Research findings may be used in the processes of construction, reconstruction and modernisation of marine structures as well as thorough assessment of strategically significant structures (separate objects or their totality). The suggested multi-attribute assessment methods may be used to solve other problems in areas other than civil engineering.



Investigation ans Multi-Attribute Assessment into Efficiency of Public Building Renovation

Robertas Volvačiovas
2014

Scientific supervisor: Prof. Zenonas Turskis

Research object. Research object - the efficiency of public building renovation. Field experiments and multi-attribute decision analysis were conducted to ensure a more objective investigation of the efficiency of building renovation and improve renovation technology. The research was conducted on four buildings with different structural design, height, total area and planning.

Aim and Tasks of the Work.

The aim of the dissertation – to create a theoretical AEBR model based on multiattribute decision making methods and use it in practice with results of investigations made on public buildings before and after renovation. Tasks of the tiesis: 1. Systemise factors causing the renovation of buildings and highlight the most important attributes that impact on renovation of buildings. 2. Analyse MADM methods that best correspond to the needs of construction engineering objectives and possibilities to use them in the designed AEBR model. 3. Develop the AEBR model based on the use of MADM methods. 4. Analyse methodologies for field experiments and energy-related estimations and expected return. 5. Determine weights of most important attributes that impact on efficiency of building renovation. 6. Establish values of assessed attributes with the help of field experiments and economic estimations conducted before and after renovation of the buildings. 7. Practically apply the designed theoretical AEBR model.

Research methodology.

The model designed for assessment of efficiency of public building renovation is based on the following mathematical methods: SWARA for determining attributes weights, TODIM, TOPSIS, VIKOR multi-attribute decision analysis and Copeland for summarising results. To determine real values of attributes, the following field experiment and calculation methodologies were used: evaluation of physical deterioration, tests on façade absorption, thermovision, indoor microclimate parameters and U-values as well as economic calculations and aesthetic evaluation.

Defended Statements.

1. Assessment of the efficiency of building renovation requires using the following main attributes: overall physical deterioration of the building, indoor air temperature, CO2 concentration, relative air humidity, heat energy consumption, aesthetics, payback period, U-value of external walls, façade absorption and floor temperature on the ground level.
2. Objective assessment of the efficiency of building renovation necessitates a complex assessment of all attributes combined into one system.
3. Subsequent to renovation, values of assessed attributes became closer to values of norms indicated in construction technical regulations and hygiene norms.

The scope of the scientific work.

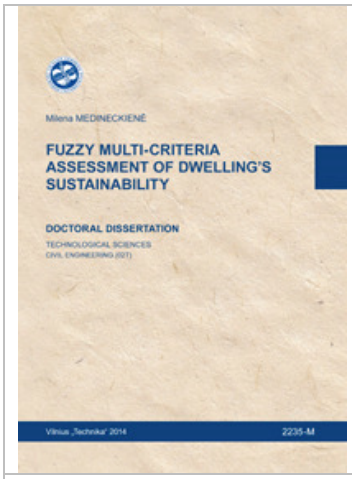
The dissertation comprises an introduction, three chapters, general conclusions, lists of literature, resources and publications of the author on the topic of the dissertation, abstract in English and three annexes. The volume of the thesis with summary amounts to 172 pages without annexes; the text contains 47 numbered formulas, 51 figures and 29 tables. 138 sources of literature were used.

Approval of the thesis.

Nine research articles were published on the topic of the dissertation: two in scientific journals included in Thomson Reuters Web of Knowledge (ISI Web of Science); two in scientific journals included into other databases; two in ISI Proceedings; three in Lithuanian conference proceedings. Findings of the thesis were presented at 4 scientific conferences.

Practical value.

The developed AEBR model may be used by designers, construction engineers, building maintenance specialists or state institutions aiming to determine the efficiency of renovated buildings and improve building renovation technology. Results of field experiments and calculations could be used by designers wile working on renovation projects, construction engineers while executing and controlling construction works, building maintenance specialists (administrators) while supervising maintenance of buildings, and state institutions while shaping the policy on renovation of buildings.



Fuzzy Multi-Criteria Assessment of Dwelling's Sustainability

Milena Medineckienė
2014

Scientific supervisor: Prof. Zenonas Turskis

Research object. Research object – construction tasks with fuzzy criteria values. The alternatives of sustainable housing are analysed. Practical problems such as dwelling con-struction choice between traditional brick house and wood frame house are be-ing solved.

Aim and Tasks of the Work.

The main objective of this work is creation of the fuzzy multiple criteria decision making model by applying grey numbers and game theory methods, which is appropriate to reason the construction engineering decisions. The following tasks were set:

1. Analyse the importance and relevance of sustainability concept in civil engineering.
2. Make conclusions about the importance of the research and problems based on the studies carried out by the scientists worldwide and suggest solutions.
3. Suggest methodology for the solution of the problems with fuzzy criteria. Create decision-making model to solve sustainability related problems in construction.
4. Set the alternatives for sustainable construction which reflect typical characteristics of the building.
5. Collect initial data (compose decision-making matrices) to solve practical problems.
6. Apply the suggested model in practice.
7. Based on calculations provide final conclusions about the research made.

Research methodology.

Generally the methodology for this work is presented as a mix of quantitative and qualitative research methods. For collecting data for the case study, qualita-tive and quantitative research methods were used. For decision making, multi-criteria decision making methods, such as SAW-G, Game Theory, Fuzzy Sets, Fuzzy Game Theory were used. For calculating the weights (qualitative and quantitative research) of criteria, the AHP method with Saaty judgment scale, giving a pair-wise comparison matrix to the respondents, was used.

Defended Statements.

1. The solutions developed during the building's design and operational stage should reflect the essential aims of the sustainable building, as they described by social, environmental and economical criteria.
2. The values which describe the building usually are unknown or vague, that is why they can be characterized as uncertain or fuzzy. In order to solve such type of fuzzy problems the fuzzy multi-criteria decision making methods should be applied.
3. In order to solve the problems with varying criteria and with criteria defined intervals it is convenient to apply multi-criteria methods with grey numbers.
4. The Fuzzy Multi-criteria decision making methods can also be applied to solve deterministic problems with fixed criteria values.

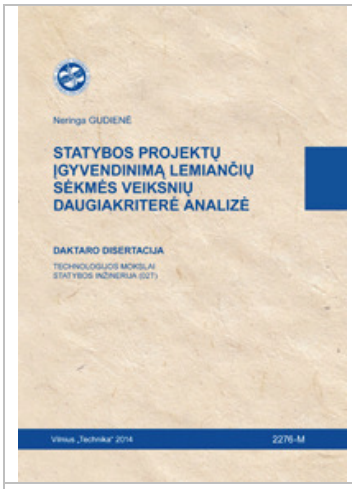
The scope of the scientific work.

Dissertation consists of Introduction, 3 chapters and Conclusions. The scope of the work is 103 pages. In the text were mentioned 37 numerated formulas, 10 figures and 21 tables. For this work 208 references were used.

Approval of the thesis.

The results of dissertation were published in 6 scientific articles: two of them – in scientific journals, included in Thomson ISI list; one of the articles – in science information institute's data base „ISI Proceedings"; another one – in other international data base editions; two – in other reviewed science journals, conference presentation material. The results of the dissertation were presented in 6 national and international conferences.

Practical value.
The suggested model can be used in construction projects planning, evaluation, implementation and operational stages. The results of this research can be applied as a tool which is useful for all the participants interested in building's lifecycle process as they are involved in decision making and are affected by the decisions, made during all building's planning process and its life-cycle. The decision making situations are met in lot of situations, especially where the fuzzy sets are dominating, and is quite difficult to compare (from the first point of view).



Multiple Criteria Analysis of Critical Success Factors in the Implementation of Construction Projects

Neringa Gudienė
2014

Scientific supervisor: Assoc.prof. Audrius Banaitis

Research object. The research object is critical success factors that determine the implementation process of construction projects.

Aim and Tasks of the Work.
The main aim of this research is to identify and assess critical success factors in the implementation of construction projects by applying the developed conceptual model of critical success factors in the implementation of construction projects and employing multiple criteria assessment methods.
The following objectives have been set to achieve the research aim:
1. To overview studies of critical success factors by scientists and their findings in the field of the implementation of construction projects.
2. To create a conceptual model for analysis of critical success factors in the implementation of construction projects and to build a system of critical success factors that describe and assess the success of the implementation of construction projects.
3. To select and apply in practice multiple criteria assessment methodologies for the assessment of critical success factors in the implementation of construction projects.

Research methodology.
This research was based on scientific publications, statistical data, data available online, and other science and information publications. To achieve the research objectives, construction professionals and experts were surveyed, data were analysed and methodologies (the relative importance index, the expert judgement, the analytic hierarchy process, integrated weights) were applied to structure the survey results and assess the success factors.

Defended Statements.
1. The determination of critical success factors is one of the possible ways to ensure the successful implementation of construction projects. A hierarchical system of factors including micro, meso and macro environments allows to provide critical success factors of projects in a detailed and structured way.
2. A conceptual model developed for the analysis of critical success factors in the implementation of construction projects enables to analyse and assess the factors affecting the success of construction projects.
3. In order to assess the implementation of construction projects containing a large number of factors and to obtain reliable results it is expedient to apply a few multiple criteria methods.

The scope of the scientific work.
The scientific work consists of the general characteristic of the dissertation, three chapters, conclusions, list of literature and list of publications. The total scope of the dissertation – 140 pages excluding annexes,

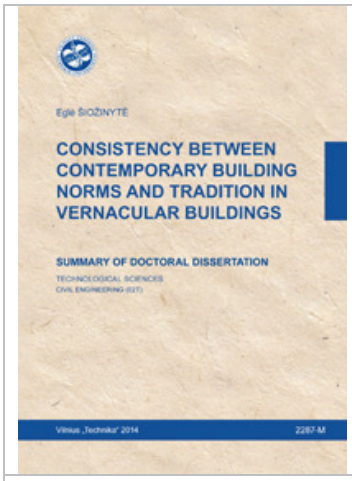
7 pictures, 33 tables and 15 formulas.

Approval of the thesis.

The author published six articles: two in journals listed in the Thomson Reuters ISI Web of Science, one in a peer-reviewed foreign scientific journal, one in a conference proceedings referenced in the Thomson Reuters ISI database, one in a conference proceedings of an international conference, and one in a peer-reviewed conference proceedings in Lithuania. The research findings of this dissertation were disseminated at two International conferences.

Practical value.

The research findings can be applied in any construction company that undertakes construction projects. The system of factors presented here can be used by clients, developers and managers involved in construction projects. Taking account of the success factors introduced here and their impact on project implementation, stakeholders can prevent adverse outcomes of project implementation. When critical success factors are identified, they can help analyse possible causes that made a project a success or a failure, select team members by identifying the development needs and forecasts about project implementation level, make effective allocation of limited resources, help project team members identify and give priority to critical issues of the project implementation plan, and achieve the biggest gains.



Consistency Between Contemporary Building Norms and Tradition in Vernacular Buildings

Eglė Šiožinytė
2014

Scientific supervisors:
Prof. Dr. Habil. Josifas Parasonis (2009-2013)
Prof. Dr. Jurgita Antuchevičenė (2013-2014)

Research object.

The object of the research is the combination of tradition and contemporary norms in residential vernacular buildings' construction and upgrading solutions. The research is based on the case study of Lithuanian residential vernacular buildings.

Aim and Tasks of the Work.

Aim of the work is to develop complex model and basic criteria system to describe and evaluate vernacular architecture's development and to form the rational solutions for problematic situations, based on scientific decision-making methods. The following tasks are going to be solved:

1. To analyse scientific literature and legislation related to the development of vernacular architecture, to analyse the potential of multiple criteria decision making theory to apply for solving the issues of vernacular architecture's development.
2. To identify the trends of Lithuanian vernacular architecture development, analysing rural tourism homesteads as an example. Identify the possible ways of development and make the SWOT analysis of them.
3. To create the complex model and basic criteria system for describing and evaluating vernacular architecture's development when looking for balance between tradition continuity and contemporary norms and for formulating the rational solutions for problematic situations on the basis of Multiple Criteria Decision Making theory, and, to adapt this model for solving residential vernacular architecture's upgrading issues caused by daylighting, thermal performance and building appearance problematic.
4. To offer recommendations for development of new Heritage Management Regulation of the Republic of Lithuania associated with upgrading and maintenance of residential and other type of vernacular buildings while seeking to improve the condition of old buildings. Also, propose the actions that could help to control the development of vernacular architecture in the case of construction of new buildings based on old traditional features.

Research methodology.
The thesis applies statistical and comparative analysis, multi-criteria decision-making methods (COPRAS, TOPSIS, TOPSIS Grey, WASPAS, AHP) and method of strategic analysis (SWOT).
Defended Statements.
1. Compromise solutions based on scientific decision-making methods are required while looking for the consistency between contemporary building norms and saving traditional features of old vernacular architecture.
2. When preparing the compromise solutions for vernacular building management, consistency of interests of stakeholders should be evaluated by applying mathematical methods.
3. Rational management solutions of vernacular buildings can be accepted when the proposed complex model is applied, which is based on Multiple Criteria Decision Making theory.
The scope of the scientific work.
Dissertation consists of introduction, three chapters, general conclusions and a list of references. The total scope of the dissertation – 104 pages without annexes, 14 figures, 22 tables and 154 references.
Approval of the thesis.
Seven scientific articles were published on topic of dissertation: two of them were published in the science journals included in the database of Thomson Reuters ISI Web of Science, one article was published in other peer-reviewed journal, four articles in international and national conference proceedings.
Practical value.
The proposed complex model can be applied in practice for old buildings upgrade and new buildings based on traditional features of old vernacular architecture. Model is suitable to evaluate separate parts of the building, also, the whole building. The proposed model is adapted for different ethnic heritage conservation zones due to its possibility evaluate legal aspects. Recommendations are offered for development of new Heritage Management Regulation of the Republic of Lithuania associated with upgrade and maintenance of vernacular architecture while seeking to improve the condition of old buildings. Also, proposed the actions that could help to control the chaotic development of vernacular architecture in the case of construction the new buildings based on old traditional features.

Efectiveness Evaluation of Public-Private Partnership Automobile Road Infrastructure Construction Projects

Rūta Rudžianskaitė-Kvaraciejenė
2014

Scientific supervisors: Assoc. Prof. Dr. Rasa Apanavičienė

Research object.
The research object is automobile road infrastructure projects developed using the PPP model. Detailed analysis of PPP automobile road, highway, motorway, roundabout construction projects: * That have been already finished, * That are operated and maintained for more than five years, * Main revenues of the projects are generated from tolling.
Aim and Tasks of the Work.
The aim is to create the methodology for the assessment of PPP automobile road infrastructure construction projects that would enable to predict the effectiveness of muture projects according to the planned initial project data. The following objectives were used to reach the goal:
1. Analyse the practice of PPP infrastructure construction project implementation in foreign countries and in Lithuania and review research areas and trends of PPP in automobile road building.
2. Determine the main areas and factors for the assessment of the effectiveness of PPP automobile road infrastructure construction projects and develop a theoretical model for the assessment of the effectiveness

of PPP infrastructure construction projects.
3. Analyse and select the mathematical/computational intellect methods feasible for the modelling of the effectiveness of PPP automobile road infrastructure construction projects.
4. Determine the key factors that influence the effectiveness of PPP automobile road infrastructure construction projects.
5. Establish the accuracy and reliability of the results obtained by applying the developed assessment methodology.

Research methodology.

The analytical part contains the analysis of literature about PPP automobile road construction projects: research publications of foreign and Lithuanian authors, other scientific and informational publications and sources. Empirical research and statistical data processing and analysis methods were used in compiling the PPP automobile road infrastructure construction projects database. Artificial Neural Network (ANN), Support Vector Machine (SVM) and Random Forest (RF) methods were used for the modelling of the efficiency of PPP road infrastructure projects. Computer Modelling was done using MATLAB software.

Defended Statements.

1. The effectiveness of PPP infrastructure construction projects must be analysed and the projects must be implemented in an integrated manner by assessing them interms of the private partner and the public sector and criteria from project assessment areas – technical assessment, financial assessment, private partner selection and sustainable development, i.e. environmental, social and economic assessment – should be combined in modelling the effectiveness of PPP infrastructure construction projects.
2. The new methodology is a highly reliable tool for predicting the effectiveness of the future PPP road projects.

The scope of the scientific work.

The doctoral thesis consists of four chapters, General conclusions, reference list, publications list and annexes. The length of the thesis is 168 pages (without annexes), 10 numbered formulas, 65 illustrations, 31 tables and 7 annexes.

Approval of the thesis.

The main thesis statements were presented and discussed in four international conferences abroad and at home. One article was published and one article was accepted for publishing in ISI scientific journals.

Practical value.

The methodology for assessing the effectiveness of PPP automobilį road infrastructure construction projects is recommended for predicting the outputs of future projects and selection of projects in public sector institutions, financial institutions and private companies.

Editor's comments

Dear EWG-ORSDCE members, dear fiends,

Thank you for all valuable contrubutions to EWG-ORSDCE activities, common initiatives and research papers.
Next year all members of EWG-ORSDCE are welcome to participate in the EURO Conference 2015 that will be held in Glasgow, United Kingdom, July 12-15 2016. You are also invited to participate in next meeting of EWG-ORSDCE (colloquium), which will be held on June, 2015 in Poznan, Poland.

On behalf of the Editorial Board of EWG-ORSDCE Newsletter
Tatjana Vilutienė