



EWG-ORSDCE

NEWSLETTER OF EWG ORSDCE DECEMBER 2017

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

Content of the issue

<i>Words of chairman</i>	- 2 -
<i>Forthcoming Events</i>	- 3 -
<i>EURO XXIX - European Conference on Operational Research</i>	- 3 -
<i>Scientific events 2017</i>	- 7 -
<i>2nd International Joint Conference on Innovative Solutions in Construction Engineering and Management – Flexible Approach Poznan , Poland</i>	- 8 -
<i>16th Lithuanian-German-Polish colloquium and 6th meeting of EURO working group Operational Research in Sustainable Development and Civil Engineering . 75th Anniversary of Professor Oleg Kapliński. May, 24th, Poznan</i>	- 8 -
<i>Harmonization of cyclical construction processes: a systematic review</i>	- 16 -
<i>Journal Special Issues related to decision-making methods and their applications</i>	- 20 -
<i>Sustainable decision-making in civil engineering, construction and building technology</i>	- 23 -
<i>International recognition</i>	- 26 -
<i>Highly Cited Papers in Topic MCDM</i>	- 26 -
<i>New scientific papers</i>	- 31 -
<i>International projects in process</i>	- 38 -
<i>PhD Dissertations defended during 2017</i>	- 40 -

Words of chairman

Dear Members of EWG-ORSDCE, dear Friends,

This issue of newsletter presents the overview of 2nd International Joint Conference on Innovative Solutions in Construction Engineering and Management – Flexible Approach and 16th Lithuanian-German-Polish colloquium and 6th meeting of EURO working group Operational Research in Sustainable Development and Civil Engineering took place in Poznan (Poland) on May 24, 2017. We would like to express the acknowledgements to the organizers of event for warm welcome and perfectly organized event.

This newsletter presents also the article dedicated to acknowledge the achievements and valuable contributions of the one of founders of Colloquiums and initiators of EURO Working Group EWG-ORSDCE Professor Oleg Kapliński.

Newsletter presents also this year achievements and forthcoming events. In year 2018 EURO Working Group "OR in Sustainable Development and Civil Engineering (ORSDCE)" will organize invited session in the field "OR for Development and Developing Countries" in forthcoming 29th EURO Conference, that will be held in 8-11 July, 2018 in Valencia, Spain. The papers presented in this session are welcome for publishing in scientific journals: *Technological and Economic Development of Economy*, *Journal of Civil Engineering and Management*, *Journal of Business Economics and Management*, *International Journal of Strategic Property Management*, and new journal *Engineering Structures and Technologies*.

Congratulations on all your achievements and best wishes for future activities.

With my best wishes, Yours sincerely,
Edmundas Kazimieras Zavadskas, Chair of EWG-ORSDCE

Forthcoming Events



EURO XXIX - European Conference on Operational Research **July 8-11, 2018, Valencia, Spain**

EURO 2018 is the largest and most important conference for Operational Research and Management Science (OR/MS) in Europe organized by EURO – the European Association of Operational Research Society and the Spanish Statistics and Operations Research Society. It is held by the two major Valencian universities, Universitat de València and Universitat Politècnica de València.

The conference aims at bringing together operational researchers from around the globe to discuss the full spectrum of topics in OR. All researchers, academics, practitioners, and students interested in all branches of operational research are invited to participate to EURO 2018 by submitting an abstract, or organizing a session or a stream of sessions. EURO 2018 is an exciting international forum and a great opportunity to meet new and old friends and colleagues from all over the world!

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 and Data Mining*
- *Artificial Intelligence, Fuzzy Systems and Computing*
- *Continuous Optimization*
- *Control Theory and System Dynamics*
- *Decision Analysis, Decision Support Systems, DEA and Performance Measurement*
- *Discrete Optimization, MIP and MINLP*
- *Emerging applications of OR*
- *Energy, Environment, Natural Resources and Climate*
- *Financial Modeling, Risk Management and Managerial Accounting*
- *Production, Service and Supply Chain Management*
- *Revenue Management*
- *Practice of OR (Making an Impact)*
- *Graphs and Networks*
- *Multiple Criteria Decision Making and Optimization*
- *Metaheuristics*
- *OR Education*
- *OR for Developing Countries and Humanitarian Applications*
- *OR History and OR Ethics*
- *OR in Health, Life Sciences and Sports*
- *Scheduling, Timetabling and Project Management*
- *Soft OR, Problem Structuring Methods and Behavioural OR*
- *Simulation, Stochastic and Robust Optimization*
- *Routing, Logistics, Location and Transportation*
- *OR in Industry and Software for OR*
- *Game Theory and Mathematical Economics*

Important dates:

Webpage open for abstract submissions	October 2017
Abstract submission deadline	5 March 2018
Early bird registration deadline	6 April 2018
Author registration deadline	20 April 2018
Conference in Valencia	8-11 July 2018

More information: <http://euro2018valencia.com/>

Registration type	Cost (€) *
Regular Early until April 6th, 2018 (inclusive)	400
Regular Late until April 20th, 2018 (inclusive)	500
Student/retired Early until April 6th, 2018 (inclusive)	200
Student/retired Late until April 20th, 2018 (inclusive)	300
Conference Dinner	75
Accompanying persons	125

* The registration fee does not include VAT; because the conference is being organized by universities, the activity is exempt from VAT and therefore no amount is due.

The registration fee for a full delegate covers the following:

- Admission to all sessions and the exhibition
- Conference materials (printed conference handbook with short programme; USB stick with handbook including the complete programme with abstracts; sponsor & exhibitor materials)
- Tea, coffee and lunches throughout the conference (you will receive a lunch coupon for each day)
- Admission to the Opening Cocktail Reception on July 8, 2018 (starting at 18:00) at the Universitat Politècnica de València
- Admission to the Casual Closing Party on July 11, 2018 (starting at 18:00) at Universitat Politècnica de València
- Transfer ticket valid for 10 journeys in Zone A, with transfers permitted between subway network (Metrovalencia), bus (EMT) and MetroBus

The registration fee for an accompanying person covers the same except the admission to sessions and conference materials.

EWG-ORSDCE contributes to the organization of **Special Stream on “OR for Sustainable Development”** with session [OR for Sustainable Built Environment](#) (session code 13c7a9e3).

For registration please visit the web site of EURO conference:

<http://euro2018valencia.com/abstract-submission/> and use the invitation code **13c7a9e3**.

CALL FOR PAPERS: Special Stream on "OR for Sustainable Development"

This stream encourages submission of research papers, research in progress papers, case studies and applications in the following areas (but not limited to) such as :

--- Technological, economic, institutional and policy aspects of specific resource management practices,

--- Conservation, recycling and resource substitution, and of "systems-wide" strategies,

---- Resource productivity improvement, the restructuring of production and consumption profiles and the transformation of industry.

--- Optimization for Green manufacturing, Green Construction, Green logistics, Green procurement, Green IT, Green distribution management, Optimization related Application/ Case studies in the following sessions with codes:

Stream	Session Name	Code
OR for Sustainable Development	OR for Sustainable Development in Developing Countries	2c4cc74a
OR for Sustainable Development	OR for Sustainable Development and Innovation	2d72dd37
OR for Sustainable Development	OR for Sustainable Development and Technology	a69f7c18
OR for Sustainable Development	OR Best Practices for Sustainable Development	8b269f4e
OR for Sustainable Development	OR for Sustainable Built Environment	13c7a9e3

Please visit the Conference website (<http://euro2018valencia.com/>) for more information.

Abstracts: Submit abstract up to 1500 characters to the following sessions: **2c4cc74a , 2d72dd37 , a69f7c18 , 8b269f4e**

Abstract submission open: Friday, October 13, 2017

Abstract submission deadline: Monday, March 5, 2018

Registration:

Registration open: Friday, October 13, 2017

Early registration deadline: Friday, April 6, 2018

Author registration deadline: Friday, April 20, 2018

The Scientific and Organization Committees, chaired by Greet Vanden Berghe, Rubén Ruiz and Ramón Álvarez-Valdés, are preparing a high quality scientific program and an exciting social program for the Conference.

Email: euro2018valencia@upv.es

Stream organizers:

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Scientific events 2017



***2nd International Joint Conference on Innovative Solutions in
Construction Engineering and Management – Flexible
Approach
Poznan, Poland***

***16th Lithuanian-German-Polish colloquium and 6th meeting
of EURO working group Operational Research in Sustainable
Development and Civil Engineering. 75th Anniversary of
Professor Oleg Kapliński. May, 24th, Poznan***

The 2nd International Joint Conference on Innovative Solutions in Construction Engineering and Management and 16th Lithuanian-German-Polish colloquium and 6th meeting of EURO working group Operational Research in Sustainable Development and Civil Engineering were held on May 24, 2017, in Poznan, Poland.

General aims of the conference and especially workshop:

- inspiration of young researchers to work grace to keynote speakers
- discussion and development of new ideas and solutions with partners from industry,
- presentation of innovative projects given by the enterprises,
- knowledge bridge creation between academia – industry – PhD students,
- verification of the concepts in practice – case studies in progress

Topics of the conference:

flexible management; lean management; BIM; agile management; operational research; decision making; civil engineering; construction technology and management; sustainable development in civil engineering; buildings life cycle; qualification of human resources; real estate management; project management; quality management and special event: celebration of Prof. Dr.-Ing. habil. Dr. h. c. Oleg Kapliński 75th birthday.

Honorary Committee

O. Kapliński (Poland)
F. Peldschus (Germany)
E.K. Zavadskas (Lithuania)

Honorary Patronage

T. Lodygowski – Rector of PUT
Section of Construction Project Engineering Committee Civil Engineering of Polish Academy of Science

Organising committee

M. Gajzler (Poland)
P. Nowotarski (Poland)
T. Vilutiene (Lithuania)
Construction Innovations Scientific Association

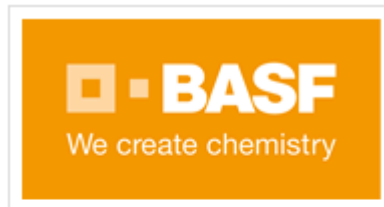
The meeting of EWG-ORSCE was sponsored by the [EURO](#) “Association of European Operational Research Societies” within [IFORS](#), the “International Federation of Operational Research Societies”, civil engineering and construction companies: [ViaCon](#), [BASF](#), [PERI](#) and [DORBUD](#).

Website: <http://www.scfm.put.poznan.pl/>

Sponsored by

EURO

The Association of European
Operational Research Societies



Sustainable Construction & Flexible Management



Conference opening



Colleagues from Poznan University of Technology acknowledge the achievements and valuable contributions of the one of the founders of Colloquiums and initiators of EURO Working Group EWG-ORSDC Professor Oleg Kapliński



Colleagues from Vilnius Gediminas Technical University acknowledge the achievements and valuable contributions of the one of the founders of Colloquiums and initiators of EURO Working Group EWG-ORSDC Professor Oleg Kapliński



Professor Oleg Kapliński presenting his achievements



Acknowledgements from Programme Committee



Professor Oleg Kapliński with delegation from VGTU



Overview of Kapliński publications



75th anniversary greetings



Greetings from social partners and sponsors



Conference participants



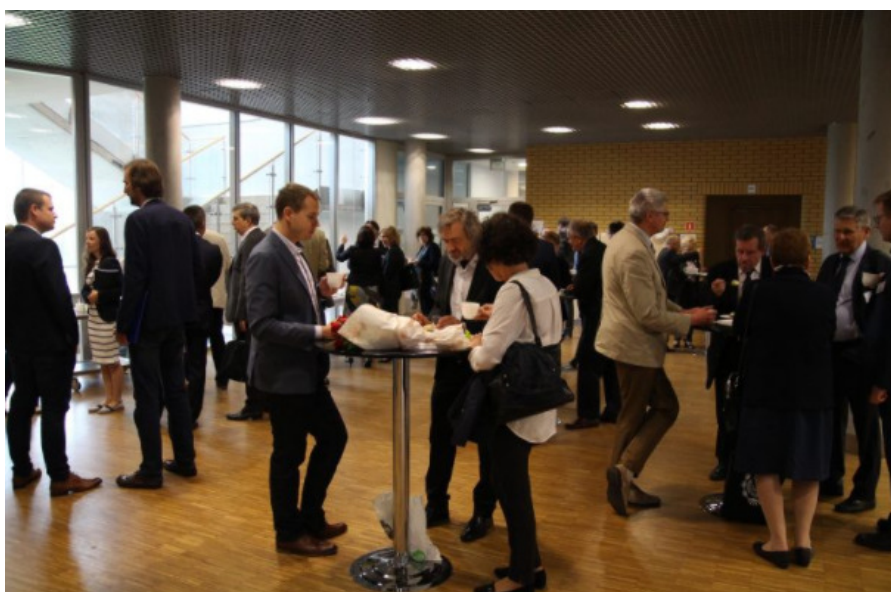
The history of Colloquiums discussed



Conference participants



Coffee break discussions



Poster session



Acknowledgment for organizers



Acknowledgment for sponsors



All ORSDCE 2017 photos available here: <http://www.scfm.put.poznan.pl/orsdce-2017-photo/>

Harmonization of cyclical construction processes: a systematic review

Edmundas Kazimieras Zavadskas, Tatjana Vilutienė, Jolanta Tamošaitienė

Very important role in development of research in harmonization of construction processes and sustainable construction has one of the founders of Colloquiums and initiators of EURO Working Group EWG-ORSDCE Professor Oleg Kapliński. This year he celebrate 75 anniversary, and we would like to present several facts from his impressive path of activities.



Professor Oleg Kapliński

Oleg Kapliński was born in Vilnius in 1942 in the family of intellectuals. Very soon, because of the Second World War, the family moved to Poznan. Basic education he received in Karol Marcinkowski Lyceum. Strong educational basics helped him to pass successfully the maturity exams. Influenced by father, the well-known architect, Oleg Kapliński decided to continue the family tradition and joined the Poznan University of Technology, Faculty of Construction. 22 years old he has defended master's thesis and after the end of the study continued research career at the University. Very young (about 36 years old) Oleg Kapliński passed habilitation procedure. During the long period of research career in the field of construction organization and project management Oleg Kapliński has published more than 260 publications (since 1967). His research focused on solutions of problem in construction. Published articles include the following subjects: planning techniques and advanced approaches to working time management (Stefański & Kapliński 1967a [59], Stefański & Kapliński 1967b [60], Kapliński 1968 [61], Kapliński & Stefański 1970 [62], Kapliński & Skarzyński 1973 [63], Kapliński 1973 [64], Kapliński 1977 [65], Kapliński 1978 [66], Kapliński 2008a [67], Kapliński 2008b [68]), the methods and models in construction (Kapliński 2007 [69]), ICT and intelligent systems in construction industry (Kapliński et al 1991 [70], Kapliński et al 1996 [71], Kapliński et al 1997 [72], Kapliński 2008 [73], Kapliński 2009 [74], Kapliński & Tupenaite (2011) [75]), applications of expert and hybrid systems (Kapliński 1990 [76]), the measures of reliability (Kapliński & Milosz (1996) [77]), flexibility in construction (Janusz & Kapliński (2007) [78]), financial issues in construction (Kapliński 2008 [79], Baumann et al 2014 [80]), the issues of risk management in construction projects (Kapliński 1968 [81], Kapliński 2010 [82], Kapliński 2013 [83], Dziadosz et al 2015 [84]), utility theory (Kapliński 2013 [83], Kapliński 2013 [85]), application of MCDM methods in construction (Kapliński & Tamošaitienė (2010) [86], Kapliński et al 2014 [87], Kapliński & Tamošaitienė (2015) [88]), development of socio-economic systems (Kapliński & Peldschus (2011) [89], Tamošaitienė & Kapliński (2013) [90]), and other issues important to the construction sector analyzed in more than 260 publications. The evolutionary path in the Oleg Kapliński research and methods presented in Figure 1.

O. Kapliński was the first who have undertaken research of problems related to harmonization of cyclical construction processes, developed networking methods in organization and planning of construction. The beginning of work on analysis of planning techniques and advanced approaches to working time management was marked by the findings published in 1967. Proposal for a different way of calculating the activity networks in construction projects [59] and report on determination of work order by mean of decisive string method [60] were published this year. O. Kapliński suggested to adapt the MDC procedure to operational planning and management [61].

The MDC (multinomial discrete choice) procedure analyzes models, in which the choice set consists of multiple alternatives. The MDC procedure uses the maximum likelihood (ML) or simulated maximum likelihood method for model estimation. Early applications of the multinomial logit model in the econometrics are provided by Theil in 1969 [91] and by Schmidt and Strauss in 1975 [92]. In 1968 O. Kapliński one of the first applied this method in construction [61]. Later in 1973 O. Kapliński published the analysis of networking methods in organization and planning of construction [62], the analysis of the selected mathematical methods in organization and planning of construction [63], and the analysis of cyclic construction processes under stochastic conditions [64]. In 1977 and 1978 the work continued with studies on reserves in organization and management of a construction company [65], harmonization of cyclical construction processes on a stochastic basis [66], selected problems of harmonization of construction processes [93]. In 1978 O. Kapliński presented his research on the harmonization of the construction processes under the stochastic conditions in 8 International Congress on Applications of Mathematics in the Engineering held in Weimar [94]. Basic statements and conclusions of results of harmonization of cyclical construction processes in stochastic terms were presented during the Symposium in the field of technology, organization and economics of construction in Poland in 1979 [95]. Later the research on harmonization of the construction processes continued with this topic analyzed under the uncertainty conditions published in 1982 [96], 1990 [97] and 1995 [98], strategic and catastrophic aspects of harmonizing technological processes published in 1985 [99]. O. Kapliński also analyzed planning techniques and decision-making in construction management [67, 68, 100].

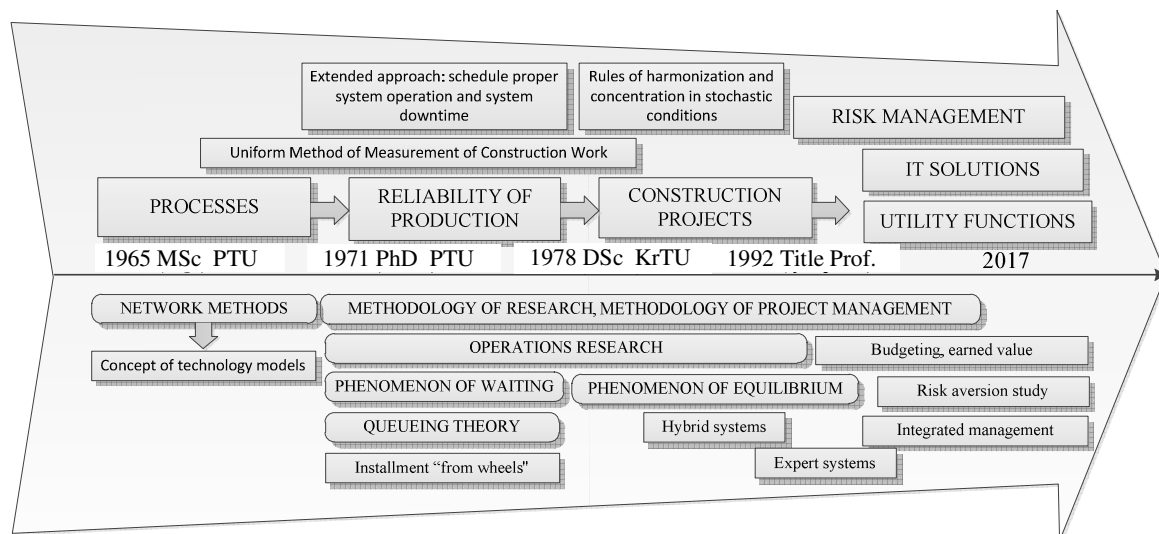


Fig. 1. Evolutionary path in the Prof. O. Kapliński research and methods

A big part of work made by O. Kapliński is focused to the ICT developments in construction industry. Relationships between prosperity in construction market and usage of new planning methods, decision making, and IT systems are discussed in [73-75]. Although study results showed scarce utilization of construction management tools and IT systems in construction, however, revealed that there is a greater demand for software packages focusing on budgeting, risk management, time and cost contingency, ways of financing investment. The beginning of work on problems and concepts of modelling and controlling complex building processes by means of computer simulation was marked by the findings published in 1980 [101]. Proposal for application of simulation modelling for the calculation of technological parameters of construction processes was published in 1980 [102]. Later in 1980, 1981, 1982 and 1958 O. Kapliński

presented simulation methods for the investigation of the reliability of the technological lines [103], for the performance assessment of complex building processes [104], for determining the availability of a technical system [105], for assessing the reliability of production processes of slabs [106], for modeling of complex manufacturing processes in construction [107], for the determination of the production parameters [108], for the investigation and the control of the reliability of production processes in construction [109]. In period of 1987-1988 O. Kapliński analyzed the possibility to combine the simulation and expert systems in design of technology and organization of construction and in the control of technological processes [110, 111]. In period 1991–1997 O. Kapliński analyzed the computer usage in a construction company and on construction site [112], decision techniques in construction management [113] and possibility of construction processes modelling [72].

The research of O. Kapliński contributes to the analysis of reliability of construction processes and risk mitigation measures. Work on these problems starts in 1979 with publication of the research on the reliability of mechanized technological lines in the construction industry [114]. In 1980 O. Kapliński proposed the simulation model for the investigation of the reliability of construction methods [115]. In period of 1984 – 1988 O. Kapliński analyzed the problems of the assessment and control of the reliability of production systems in the construction industry [116], the state of the research on the reliability of construction processes [117], methodological problems of estimation of reliability of building processes [118], reliability and efficiency aspects of the expert systems in building construction [119]. Some aspects of risk management in construction industry analyzed in 2000 [120], 2001 [121], 2002 [122], 2010 [82], 2013 [85] and 2015 [84]. The model presented in 2016 [123] determines vulnerable or weak spots of the architecture form of an office building in case of explosion. This study revealed that working towards removing these points, it is possible to create a building less vulnerable to explosion. In proposed model the specific indexes included: general form of the building, combination of building forms, articulation of corners of forms, variety of roofs, conformity of the architectural form with the structural form, conformity of the architectural form with the environment, coherence or connection between architectural elements with each other, the shape of the surface of exterior shell, ratio of width to height of the building, irregularities in the building plan, irregularities in the façade and placement of building form on the ground.

A significant part of research was dedicated to the problems of decision-making and sustainability in construction. The use of decision techniques in a construction companies was analyzed in 1983 [124-126]. In 1986 O. Kapliński applied the ELECTRE method to select the optimum exterior wall solution [127]. In period of 1987 – 1997 O. Kapliński analyzed the possibilities of application of Entropy method in technology, organization and construction economics [128-131], applications of game theory in the preparation of construction output [132]. Later the analysis of game theory applications in construction engineering and management appeared in 2010 [86] and the applications of utility theory in 2013 [83]. In period of 1990 – 1997 O. Kapliński published research on expert systems in construction [133-137]. Starting in 1993 O. Kapliński periodically analyzed the developments and applications of the decision technics in construction management [87, 88, 75, 138-141]. O. Kapliński analyzed problems of social, economic and technological systems using a variety of operations research methods and models [89, 90]. Sustainable development and intelligent buildings as elements of the humanization of technical civilization were analyzed in 2001 [142, 143].

According to the area of research, Prof. Oleg Kapliński' research work may be divided into following main groups: harmonization of cyclical construction processes, ICT developments in construction industry, risk management in construction projects, decision-making and sustainability in construction.

The main results obtained in the first research area include developed networking methods in organization and planning of construction, planning techniques and advanced approaches to working time management, proposed different way of calculating the activity networks in construction projects, proposed the determination of work order by mean of decisive string method, adapted the MDC procedure to operational planning and management, proposed formalized model allowing the analysis of cyclic construction processes under stochastic conditions,

The main results obtained in the second research area include concepts of modelling and controlling complex building processes by means of computer simulation, proposal for application of simulation modelling for the calculation of technological parameters of construction processes simulation methods for the investigation of the reliability of the technological lines, for the performance assessment of complex building processes, for determining the availability of a technical system, for assessing the reliability of production processes of slabs, for modelling of complex manufacturing processes in construction, for the determination of the production parameters, for the investigation and the control of the reliability of production processes in construction.

The main results obtained in the third research area include the simulation model for the investigation of the reliability of construction methods, the model for assessment and control of the reliability of production systems in the construction industry, model for analysis of vulnerable or weak spots of the architecture form of an office building in case of explosion.

The main achievements in the fourth research area include the applications of a variety of operations research methods and models for problems of social, economic and technological systems. The latest O. Kapliński' research work illustrate quite well his attitude in regard of sustainability (2016 [2]):

“While aiming to develop a healthy and safe environment, based on the holistic approach in the face of the urbanization issues, it is especially important to focus on the sustainable development with the help of the most up-to-date methodologies, systems and solutions. Sustainable development is not only perceived as an integration of economic, social and environmental criteria but also as the creation of healthy and safe environment for the community. Sustainable development belongs to the area of multi-criteria problems, and today it has become an imperative in designing issues at the interface of the human being - ecology - economy.”

Read full text in article:

Zavadskas, E. K., Vilutienė, T., & Tamošaitienė, J. Harmonization of cyclical construction processes: a systematic review. *Procedia Engineering*, 2017, 208, 190-202. <https://doi.org/10.1016/j.proeng.2017.11.038>

Journal Special Issues related to decision-making methods and their applications

Edmundas Kazimieras Zavadskas, Jurgita Antuchevičienė, Jonas Šaparauskas, Romualdas Baušys

Members of EWG-ORSDCE have been continuing tradition and successfully Guest Editing special issues of journals related to the research field.

As was mentioned in the *Newsletter 7 of EWG ORSDCE*, December 2016:

- The Special Issue “*Decision Making Methods and Applications in Civil Engineering*” in “*Mathematical Problems in Engineering*” journal was published in 2015.

See: <https://www.hindawi.com/journals/mpe/si/267648/>

- The Special Issue “*Mathematical Models for Dealing with Risk in Engineering*” in “*Mathematical Problems in Engineering*” journal was published in 2016.

See: <https://www.hindawi.com/journals/mpe/si/162542/>

The third Special Issue, Guest Edited by Members of EWG-ORSDCE, was published in 2017 in “***Complexity***” journal.

“*Complexity*” is a cross-disciplinary journal focusing on the rapidly expanding science of complex adaptive systems. The purpose of the journal is to advance the science of complexity. Papers treating applications in any area of natural science or human endeavour are welcome.

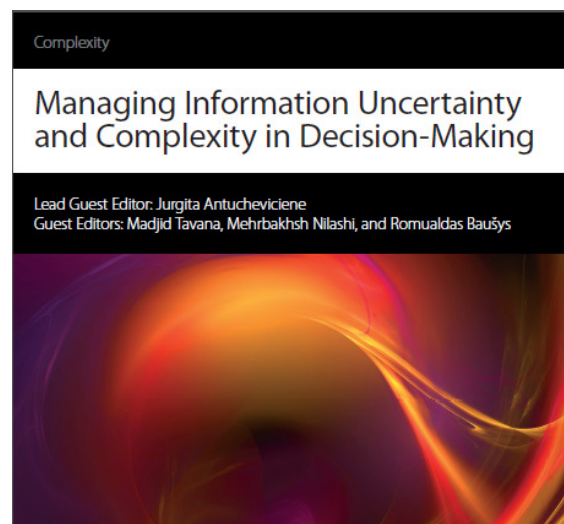
The journal is published by Hindawi Publishing Corporation as part of a publishing collaboration with John Wiley & Sons, Inc.

The most recent Impact Factor of journal “Complexity” is 4.621 according to the 2016 Journal Citation Reports released Clarivate Analytics in 2017. The journal is in quartile Q1 in “Mathematic, Multidisciplinary Applications” Web of Science category and is very highly ranked in the category: 2/100. In the Web of Science category “Multidisciplinary Sciences” the journal is also in quartile Q1 and takes a high 9th position from 64 journals referred in the category (9/64).

- The title of the Special Issue is “***Managing Information Uncertainty and Complexity in Decision-Making***”.

See: <https://www.hindawi.com/journals/complexity/si/513462/>

Lead Guest Editor: Jurgita Antuchevičienė, Vilnius Gediminas Technical University, Lithuania;
Guest Editors: Madjid Tavana, La Salle University, Philadelphia, USA; Mehrbakhsh Nilashi, Universiti Teknologi Malaysia, Johor, Malaysia; Romualdas Baušys, Vilnius Gediminas Technical University, Lithuania.



Information uncertainty and complexity are a common paradigm in modern decision-making because perfect information is seldom available to decision-makers. A wide range of statistical and non-statistical decision-making models have been proposed in the literature to model complex systems under uncertainty. Statistical methods (i.e., probability theory) are useful in modelling complex systems with incomplete or inaccurate data while non-statistical methods (i.e., fuzzy set theory, rough set theory, possibility theory, or fuzzy neural networks) are useful for modelling complex systems with imprecise, ambiguous, or vague data.

The special issue aimed at providing recent developments in managing information uncertainty and complexity in decision-making. The researchers were invited to submit original research articles that proposed formal decision-making methods to describe and rationalize the process of decision-making in complex systems under uncertainty.

This special issue received twenty-four articles, and after rigorous review, six articles were accepted and included in the issue.

A short description of each of the articles is provided in Editorial.

See: <https://www.hindawi.com/journals/complexity/2017/1268980/>

All the articles of the special issue you can read here:

<https://www.hindawi.com/journals/complexity/si/513462/>

In addition, the issue includes Review Article co-authored by Guest Editors “Recent Fuzzy Generalisations of Rough Sets Theory: A Systematic Review and Methodological Critique of the Literature”. The article presents a comprehensive and systematic review of methodological approaches and applications of fuzzy-rough set theory including fuzzy logic and fuzzy sets, rough sets, fuzzy logical operators, and fuzzy relations. A total of 132 papers were selected for this systematic review and meta-analysis for a seven-year period from 2010 to 2016. This study found that fuzzy set theory combined with rough set theory was the most widely used method.

You can read the Review Article here:

<https://www.hindawi.com/journals/complexity/2017/1608147/>

We think the special issue is interesting to all those who have to make decisions in uncertain environments, including engineers, managers, and economists interested in the analytical and practical aspects of hybrid multiple-criteria decision-making methods.

Three more Special Issue Guest Edited by Members of EWG-ORSDCE are currently open for submissions. Your papers are welcome.



- Special Issue **"Sustainability in Construction Engineering"** in *"Sustainability"* journal (MDPI Publisher, Web of Science Core Collection, IF = 1.789)

http://www.mdpi.com/journal/sustainability/special_issues/Sustainability_Construction_Engineering

Guest Editors: Edmundas Kazimieras Zavadskas; Jonas Šaparauskas; Jurgita Antuchevičienė
Articles are welcome on this issue, where sustainable solutions in construction engineering that bring economic, social and environmental benefits are offered through a variety of methodologies and tools (e.g. information technologies, life-cycle analysis, multiple criteria decision making methods). Articles that propose new methodologies dealing with construction sustainability issues are also welcome.

Deadline for manuscript submissions: 30 April 2018



- Special Issue **"Civil Engineering and Symmetry"** in *"Symmetry"* journal (MDPI Publisher, Web of Science Core Collection, IF = 1.457)

http://www.mdpi.com/journal/symmetry/special_issues/Civil_Engineering_Symmetry

Guest Editors: Edmundas Kazimieras Zavadskas; Romualdas Baušys; Jurgita Antuchevičienė
The topic of utmost importance in civil engineering is optimal solutions throughout the life cycle of the buildings, roads, bridges and other infrastructure objects. Operational research, management science, optimization methods provide a consistent and applicable groundwork for engineering decision making. Therefore, articles are welcome on these topics and methodologies.
Deadline for manuscript submissions: 31 January 2018



- Special Issue **"Economic Growth as a Consequence of the Industry 4.0 Concept"** in *"Economies"* journal (MDPI Publisher, Emerging Sources Citation Index)

http://www.mdpi.com/journal/economies/special_issues/industry4.0

Guest Editors: Petra Maresova, Jonas Šaparauskas, et al.

To remain efficiency, it is essential for public and private sector to adopt new methodologies of public sector management, process management, manufacturing, and innovation. The impact of change is so crucial that it is referred to as the Fourth Industrial Revolution—Industry 4.0. Papers on the subject, which should highlight the economic consequences, are welcome.

Deadline for manuscript submissions: 31 May 2018

Sustainable decision-making in civil engineering, construction and building technology

Edmundas Kazimieras Zavadskas, Jurgita Antucheviciene, Tatjana Vilutiene and Hojjat Adeli

A pressing task facing the world today is sustainable development of cities and urban infrastructure addressed through constructive interaction of environmental, economic and social factors. Sustainability priorities encompass integrated problems that address environment protection, energy efficiency, optimized mobility, e-city technology and other fostering issues, including those appearing throughout all building life cycle, and deal with various levels of management and interest groups with different goals. From the mathematical point of view, this is multi-criteria group decision-making problems. In other words, the multi-criteria problems came from the multidimensionality paradigm conditioned by the ideology of sustainable development.

The paper of Edmundas Kazimieras Zavadskas, Jurgita Antucheviciene, Tatjana Vilutiene and Hojjat Adeli (2017) aims at filling the gap and summarizing publications related to developments and especially to applications of MCDM methods, including those for supporting overall sustainability in construction and civil engineering and for promoting their usage in modern decision-making. Because of the MCDM ability of to join different techniques MCDM approaches can assist decision-makers in handling miscellaneous information, involving stakeholders' preferences, interconnected or contradicting criteria, and uncertain environments.

This paper comprehensively reviews the literature related to MCDM methods applied in civil engineering, construction and building technology areas in past three years (2015-2017) on the basis of papers referred in Thomson Reuters Web of Science academic database. The domains analyzed in paper presented in figure 1.

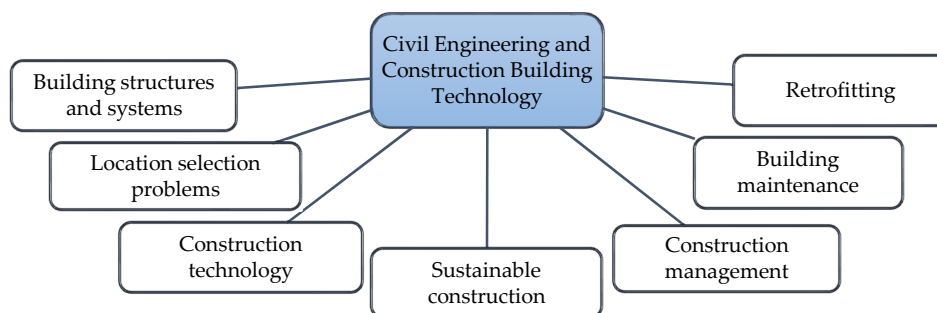


Fig. 1. The domains analyzed.

The research presents the results of analysis and answers the following questions:

- (1) How are applications of MCDM methods distributed by a period of publishing, by a country, by institution, and by research domain?*
- (2) Which MCDM methods are used the most frequently in analyzed research domains?*
- (3) How MCDM methods were combined and which of them were the most popular?*

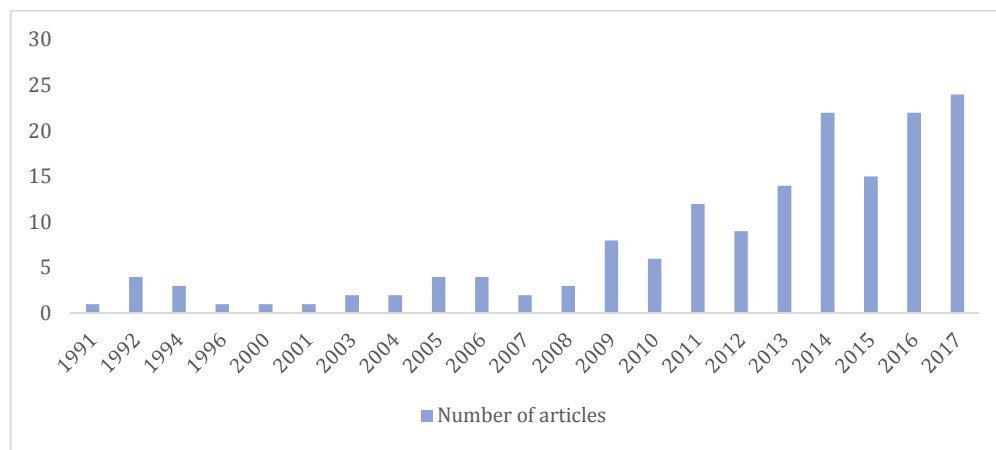


Fig. 2. Number of publications on the topic “MCDM” in Civil Engineering and Construction Building Technology Web of Science Categories (Web of Science Core Collection database, 15 October 2017).

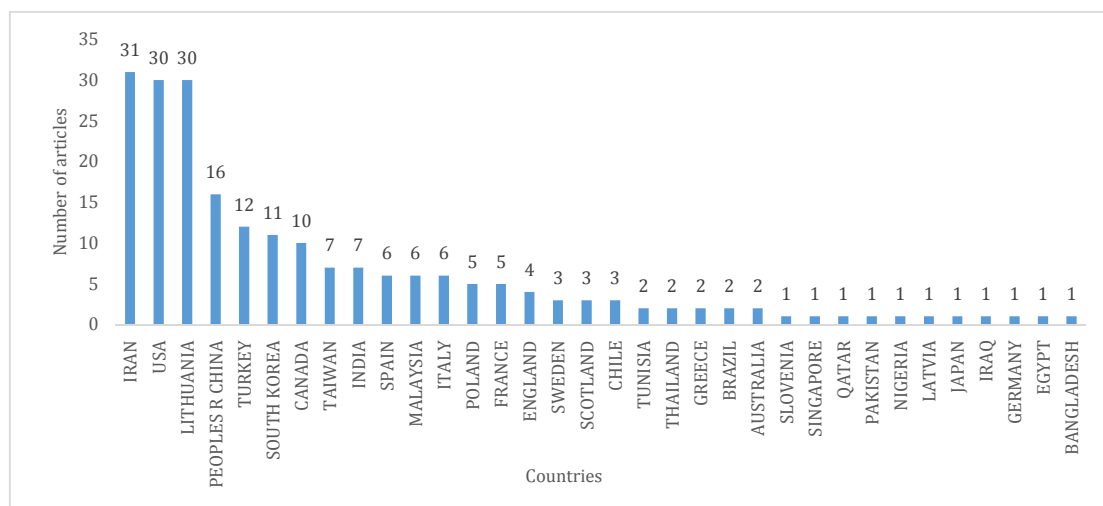


Fig. 3. Publications by country on the topic “MCDM” in Civil Engineering and Construction Building Technology Web of Science Categories (Web of Science Core Collection database, 15 October 2017)

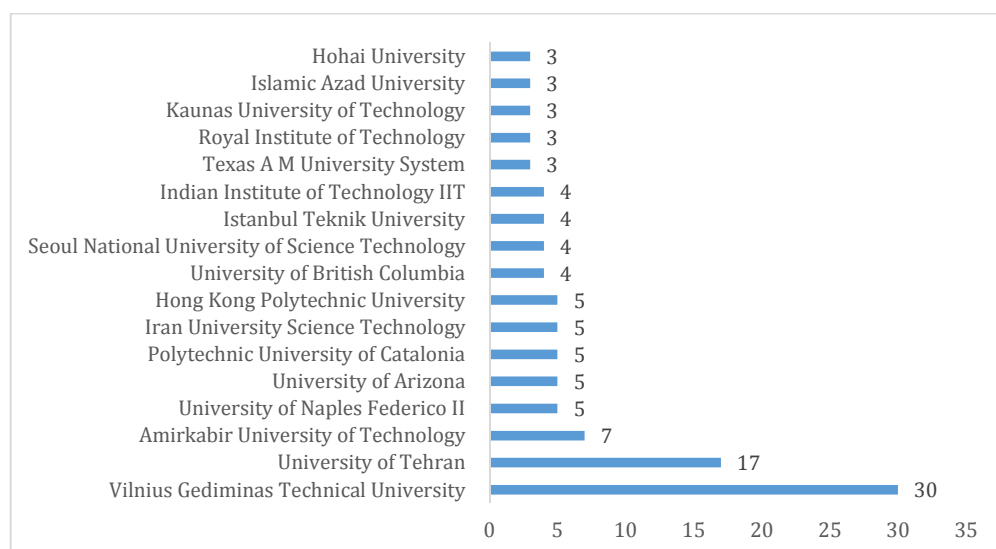


Fig. 4. Publications by institutions on the topic “MCDM” Civil Engineering and Construction Building Technology Web of Science Categories (Web of Science Core Collection, 15 October 2017).

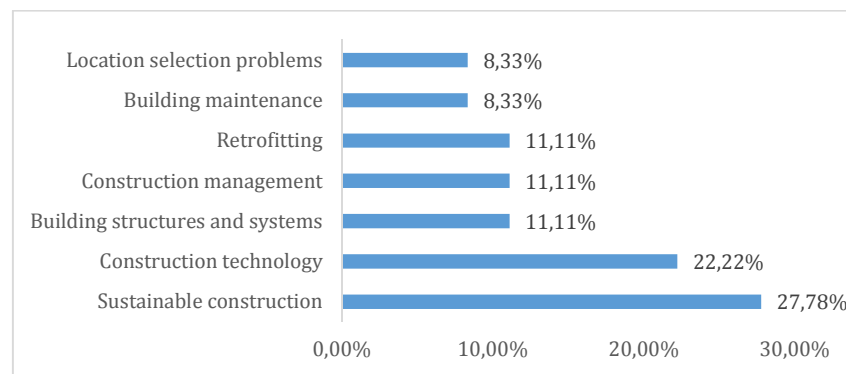


Fig. 5. MCDM applications in domains of Civil Engineering and Construction Building Technology research areas (Web of Science Core Collection, 15 October 2017).

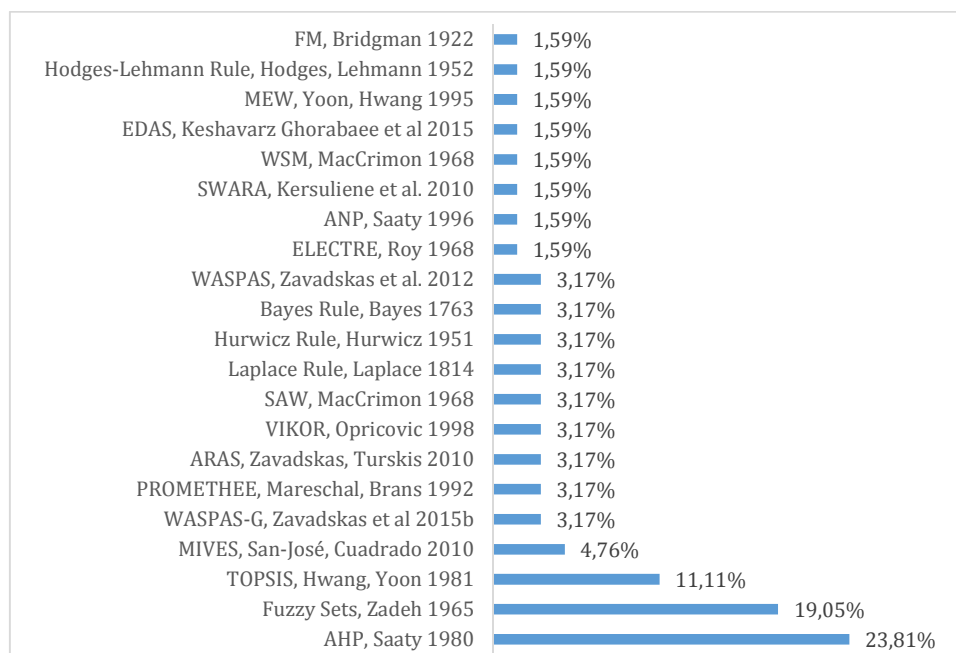


Fig. 6. Methods applied in articles on Civil Engineering and Construction Building Technology (Web of Science Core Collection, 15 October 2017).

In summary, the use of MCDM methods reached out to various subareas of civil engineering and construction/building technology, proving that researchers in many fields are becoming increasingly aware of the importance of considering multiple aspects of reality when it comes to sustainable decision-making in civil engineering and construction/building technology. This review is also of political relevance because it shows that sustainability is a complex, manifold task, which urges political decision-makers to consider aspects that go beyond financials and implement solutions that make a balance between cost and benefits to all stakeholders.

In addition, the findings of the current research confirm that applications of MCDM approaches for sustainability issues are gaining a higher recognition due to their ability to effectively assist decision-makers in handling complex information.

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Edmundas Kazimieras Zavadskas, Jurgita Antucheviciene, Tatjana Vilutiene & Hojjat Adeli (2017) Sustainable decision-making in civil engineering, construction and building technology, *Sustainability*, 2018, 10, 14. [doi:10.3390/su10010014](https://doi.org/10.3390/su10010014)

International recognition

Ranking list of best 10 Lithuanian, Latvian and Estonian researchers from several disciplines, from Google Scholar¹.

No.	Lithuanian researchers			Latvian researchers			Estonian researchers		
	Researchers	h-index	Citations	Researchers	h-index	Citations	Researchers	h-index	Citations
1.	Edmundas K. Zavadskas	62	13 681	Eugene Kotomin	49	8 855	Risto Näätänen	124	58 489
2.	Algirdas Avižienis	45	16 143	Susanne Iwarsson	46	7 340	Martti Raidal	121	76 095
3.	Arunas Ramanavicius	41	5 572	Andris Ambainis	38	7 028	Andres Metspalu	84	31 373
4.	Zenonas Turskis	39	5 400	Alexei Kuzmin	31	3 240	Ülo Niinemets	75	23 336
5.	Artūras Kaklauskas	35	4 840	Juris Purans	30	2 674	Tõnu Esko	63	24 177
6.	Saulius Klimašauskas	33	4 733	Janis Klovins	27	3 610	Marlon Dumas	63	21 738
7.	Kestutis Pyragas	29	8 087	Indrikis Krams	27	2 081	Martin Zobel	62	15 922
8.	Česlovas Venclovas	28	3 073	Rusins Freivalds	26	3 029	Jüri Allik	55	15 456
9.	Arunas Krotkus	27	2 829	Anatoly Trukhin	25	2 080	Reedik Mägi	52	17 710
10.	Gintaras Valušis	27	2 718	Andris Auliciems	23	2 051	Pärt Peterson	51	8 850

Highly Cited Papers in Topic MCDM

Data from [Essential Science Indicators](#)

Date of data search 2017-12-15

Highly Cited July/August 2017

Liou, J. J., Tamošaitienė, J., Zavadskas, E. K., & Tzeng, G. H. (2016). New hybrid COPRAS-G MADM Model for improving and selecting suppliers in green supply chain management. *International Journal of Production Research*, 54(1), 114-134.

<https://doi.org/10.1080/00207543.2015.1010747>

Times Cited: 32 (from Web of Science Core Collection)

Short summary. Greening the supply chain is an increasingly important concern for many business enterprises and a challenge for logistics management. Critical functions within green supply chain management are internal improvements and selection of green suppliers. This study proposes a novel, hybrid model that addresses dependent relationships between various criteria and the vague information coming from decision-makers. The Decision-making Trial and Evaluation Laboratory (DEMATEL) technique structures the relationships among criteria, thereby constructing an influential network relationship map (INRM). Meanwhile the DEMATEL-based, analytical network process (ANP) method aids in obtaining influential weights of the criteria. Decision-makers may hold diverse opinions and preferences due to incomplete information, differences in knowledge or simply conflicts that are inherent between various departments. This can make it difficult to judge the performance of alternatives. One remedy is to apply a modified

¹ Mester, G. Ranking Baltic states researchers. *Interdisciplinary Description of Complex Systems: INDECS*, 2017, 15(3), 174-179.
<https://doi.org/10.7906/indecs.15.3.1>

Complex PROportional ASsessment of alternatives with Grey relations. Next, this is applied to improve each criterion for integration of the performance values obtained in closing the aspiration level from different expert opinions based on INRM. An empirical example using data from a Taiwanese electronics company is provided to demonstrate our proposed method. The results can provide firms with a knowledge-based understanding of the source of some problems, thus reducing the performance gaps and closing the aspiration levels. Finally, there is a discussion on certain managerial implications.

Highly Cited July/August 2017

Mardani, A., Zavadskas, E. K., Govindan, K., Amat Senin, A., & Jusoh, A. (2016). VIKOR technique: a systematic review of the state of the art literature on methodologies and applications. *Sustainability*, 8(1), 37. doi:[10.3390/su8010037](https://doi.org/10.3390/su8010037)

Times Cited: 26 (from Web of Science Core Collection)

Short summary. The main objective of this paper is to present a systematic review of the VlseKriterijuska Optimizacija I Komoromisno Resenje (VIKOR) method in several application areas such as sustainability and renewable energy. This study reviewed a total of 176 papers, published in 2004 to 2015, from 83 high-ranking journals; most of which were related to Operational Research, Management Sciences, decision making, sustainability and renewable energy and were extracted from the “Web of Science and Scopus” databases. Papers were classified into 15 main application areas. Furthermore, papers were categorized based on the nationalities of authors, dates of publications, techniques and methods, type of studies, the names of the journals and studies purposes. The results of this study indicated that more papers on VIKOR technique were published in 2013 than in any other year. In addition, 13 papers were published about sustainability and renewable energy fields. Furthermore, VIKOR and fuzzy VIKOR methods, had the first rank in use. Additionally, the Journal of Expert Systems with Applications was the most significant journal in this study, with 27 publications on the topic. Finally, Taiwan had the first rank from 22 nationalities which used VIKOR technique.

Highly Cited July/August 2017

Mulliner, E., Malys, N., & Maliene, V. (2016). Comparative analysis of MCDM methods for the assessment of sustainable housing affordability. *Omega*, 59, 146-156. <https://doi.org/10.1016/j.omega.2015.05.013>

Times Cited: 23 (from Web of Science Core Collection)

Short summary. While affordability is traditionally assessed in economic terms, this paper tests a new assessment method that draws closer links with sustainability by considering economic, social and environmental criteria that impact on a household's quality of life. The paper presents an empirical application and comparison of six different multiple criteria decision making (MCDM) approaches for the purpose of assessing sustainable housing affordability. The comparative performance of the weighted product model (WPM), the weighted sum model (WSM), the revised AHP, TOPSIS and COPRAS, is investigated. The purpose of the comparative analysis is to determine how different MCDM methods compare when used for a sustainable housing affordability assessment model. 20 Evaluative criteria and 10 alternative are as in Liverpool, England, were considered. The applicability of different MCDM methods for the focused decision problem was investigated. The paper discusses the similarities in MCDM methods, evaluates their robustness and contrasts the resulting rankings.

Highly Cited July/August 2017

Zavadskas, E. K., Mardani, A., Turskis, Z., Jusoh, A., & Nor, K. M. (2016). Development of TOPSIS Method to Solve Complicated Decision-Making Problems—An Overview on Developments

from 2000 to 2015. International Journal of Information Technology & Decision Making, 15(03), 645-682. <https://doi.org/10.1142/S0219622016300019>

Times Cited: 18 (from Web of Science Core Collection)

Short summary. In recent years several previous scholars made attempts to develop, extend, propose and apply Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) for solving problems in decision making issues. Indeed, there are questions, how TOPSIS can help for solving these problems? Or does TOPSIS solved decision making problems in the real world? Therefore, this study shows the recent developments of TOPSIS approach which are presented by previous scholars. To achieve this objective, there are 105 reviewed papers which developed, extended, proposed and presented TOPSIS approach for solving DM problems. The results of the study indicated that 49 scholars have extended or developed TOPSIS technique and 56 scholars have proposed or presented new modifications for problems solution related to TOPSIS technique from 2000 to 2015. In addition, results of this study indicated that, previous studies have modifications related to this technique in 2011 more than other years.

Highly Cited July/August 2017

Zavadskas, E. K., Antucheviciene, J., Turskis, Z., & Adeli, H. (2016). Hybrid multiple-criteria decision-making methods: A review of applications in engineering. Scientia Iranica. Transaction A, Civil Engineering, 23(1), 1-20.

http://scientiairanica.sharif.edu/article_2093_39002dbcaa0fc5bb8f4f33b6b189a977.pdf

Times Cited: 18 (from Web of Science Core Collection)

Short summary. To support evaluation and selection processes in engineering, formal decision-making methods can be used. A great number of works applying diverse Multiple-Criteria Decision-Making (MCDM) techniques for engineering problems have been published recently. A new approach of hybrid MCDM methods has been developed, rapidly, during the past few years. The current paper aims at filling the gap and summarizing publications related to applications of hybrid MCDM for engineering. The study is limited solely to papers referred in Thomson Reuters Web of Science Core Collection academic database. It aims to review how the papers have been distributed by period of publishing and by country; multiple-criteria decision-making methods have been used, most frequently, in developing hybrid approaches and in domains the methods have been applied for. For a more detailed analysis of applications, journal articles from engineering research area were grouped by research domains and further by analyzed issues. Findings of the current review paper confirm that hybrid MCDM approaches, due to their abilities in integrating different techniques, can assist in handling miscellaneous information taking into account stakeholders' preferences when making decisions in engineering.

Highly Cited July/August 2017

Yazdani, M., Chatterjee, P., Zavadskas, E. K., & Zolfani, S. H. (2017). Integrated QFD-MCDM framework for green supplier selection. Journal of Cleaner Production, 142, 3728-3740.

<https://doi.org/10.1016/j.jclepro.2016.10.095>

Times Cited: 14 (from Web of Science Core Collection)

Short summary. Supplier evaluation and selection is a significant strategic decision for reducing operating costs and improving organizational competitiveness to develop business opportunities. Moreover, with increasing concern towards environmental protection and sustainable development, it becomes important to pay more attention to environmental requirements and evaluating the potential suppliers by incorporating green factors into the selection process. Thus, the aim of this paper is to put forward an integrated approach for green supplier selection by

considering various environmental performance requirements and criteria. The proposed approach addresses the inter-relationships between the customer requirements (CRs) with the aid of decision-making trial and evaluation laboratory (DEMATEL) method while constructing a relationship structure. Quality function deployment (QFD) model is used to establish a central relationship matrix in order to identify degree of relationship between each pair of supplier selection criteria and CRs. Finally, complex proportional assessment (COPRAS) applied to prioritize and rank the alternative suppliers. A case study is presented to reveal the potentiality and aptness of the proposed methodology.

Highly Cited July/August 2017

Keshavarz Ghorabae, M., Zavadskas, E. K., Amiri, M., & Antucheviciene, J. (2016). A new method of assessment based on fuzzy ranking and aggregated weights (AFRAW) for MCDM problems under type-2 fuzzy environment. *Economic Computation and Economic Cybernetics Studies and Research*, 50(1), 39-68, 2016. <https://ssrn.com/abstract=2939724>

Times Cited: 12 (from Web of Science Core Collection)

Short summary. Fuzzy multi-criteria decision-making (MCDM) methods and problems have increasingly been considered in the past years. Type-1 fuzzy sets are usually used by decision-makers (DMs) to express their evaluations in the process of decision-making. Interval type-2 fuzzy sets (IT2FSs), which are extensions of type-1 fuzzy sets, have more degrees of flexibility in modeling of uncertainty. In this research, a new ranking method to calculate the ranking values of interval type-2 fuzzy sets is proposed. A comparison is performed to show the efficiency of this ranking method. Using the proposed ranking method and the arithmetic operations of IT2FSs, a new method of Assessment based on Fuzzy Ranking and Aggregated Weights (AFRAW) is developed for multi-criteria group decision-making. To obtain more realistic and practical weights for the criteria, the subjective weights expressed by DMs and objective weights calculated based on a deviation-based method are combined, and the aggregated weights are used in the proposed method. A numerical example related to assessment of suppliers in a supply chain and selecting the best one is used to illustrate the procedure of the proposed method. Moreover, a comparison and a sensitivity analysis are performed in this study. The results of these analyses show the validity and stability of the proposed method.

Highly Cited July/August 2017

Mardani, A., Zavadskas, E. K., Khalifah, Z., Zakuan, N., Jusoh, A., Nor, K. M., & Khoshnoudi, M. (2016). A review of multi-criteria decision-making applications to solve energy management problems: Two decades from 1995 to 2015. *Renewable and Sustainable Energy Reviews*, 71, 216-256. <https://doi.org/10.1016/j.rser.2016.12.053>

Times Cited: 7 (from Web of Science Core Collection)

Short summary. Energy management problems associated with rapid institutional, political, technical, ecological, social and economic development have been of critical concern to both national and local governments worldwide for many decades; thus, addressing such issues is a global priority. The main objective of this study is to provide a review on the application and use of decision making approaches in regard to energy management problems. This paper selected and reviewed 196 published papers, from 1995 to 2015 in 72 important journals related to energy management, which chosen from the "Web of Science" database and in this regard, the systematic and meta-analysis method which called "PRISMA" has been proposed. All published papers were categorized into 13 different fields: environmental impact assessment, waste management, sustainability assessment, renewable energy, energy sustainability, land management, green management topics, water resources management, climate change, strategic environmental

assessment, construction and environmental management and other energy management areas. Furthermore, papers were categorized based on the authors, publication year, nationality of authors, region, technique and application, number of criteria, research purpose, gap and contribution, solution and modeling, results and findings. Hybrid MCDM and fuzzy MCDM in the integrated methods were ranked as the first methods in use. The Journal of Renewable and Sustainable Energy Review was the important journal in this paper, with 32 published papers. Finally, environmental impact assessment was ranked as the first area that applied decision making approaches. Results of this study acknowledge that decision making approaches can help decision makers and stakeholders in solving some problems under uncertainties situations in environmental decision making and these approaches have seen increasing interest among previous researchers to use these approaches in various steps of environmental decision making process.

Highly Cited July/August 2017

Stanujkic, D., Zavadskas, E. K., Smarandache, F., Brauers, W. K., & Karabasevic, D. (2017). A Neutrosophic Extension of the MULTIMOORA Method. Informatica, 28(1), 181-192.

<https://content.iospress.com/articles/informatica/inf1131>

Times Cited: 5 (from Web of Science Core Collection)

Short summary. The aim of this manuscript is to propose a new extension of the MULTIMOORA method adapted for usage with a neutrosophic set. By using single valued neutrosophic sets, the MULTIMOORA method can be more efficient for solving complex problems whose solving requires assessment and prediction, i.e. those problems associated with inaccurate and unreliable data. The suitability of the proposed approach is presented through an example.

New scientific papers

The list presents papers co-authored by the members of EWG-ORSDC and published in 2017 only in journals with IF.

Krylovas Aleksandras; Kosareva Natalja; Zavadskas Edmundas Kazimieras. WEBIRA - comparative analysis of weight balancing method. International Journal of Computers, Communications & Control (IJCCC). Agora: Agora University Editing House. ISSN 1841-9836. 12, 2 (2017), p. 238-253.

Stević Željko; Pamučar Dragan; Zavadskas Edmundas Kazimieras; Ćirović Goran; Prentkovskis Olegas. The selection of wagons for the internal transport of a logistics company: a novel approach based on rough BWM and rough SAW methods. Symmetry. Basel: MDPI AG. ISSN 2073-8994. Vol. 9, iss. 11 (2017), p. 1-25.

Brauers Willem Karel M.; Zavadskas Edmundas Kazimieras; Lepkova Natalija. The future of facilities management in Lithuania. Romanian Journal of Economic Forecasting (RJEF). Bucharest: Institute for Economic Forecasting (IPE). ISSN 1582-6163. Vol. 20, iss. 1 (2017), p. 98-115.

Zavadskas Edmundas Kazimieras; Baušys Romualdas; Kaklauskas Artūras; Ubartė Ieva; Kuzminskė Agnė; Gudienė Neringa. Sustainable market valuation of buildings by the single-valued neutrosophic MAMVA method. Applied soft computing. Amsterdam: Elsevier Science. ISSN 1568-4946. Vol. 57 (2017), p. 74-87.

Keshavarz Ghorabae Mehdi; Maghsoud Amiri; Zavadskas Edmundas Kazimieras; Antuchevičienė Jurgita. Supplier evaluation and selection in fuzzy environments: a review of MADM approaches. Economic Research-Ekonomska Istraživanja. Oxon: Routledge-Taylor & Francis. ISSN 1331-677X. Vol. 30, no. 1 (2017), p. 1073-1118.

Keshavarz Ghorabae Mehdi; Amiri Maghsoud; Zavadskas Edmundas Kazimieras; Turskis Zenonas; Antuchevičienė Jurgita. Stochastic EDAS method for multi-criteria decision-making with normally distributed data. Journal of Intelligent & Fuzzy Systems. Amsterdam: IOS PRESS. ISSN 1064-1246. Vol. 33, iss. 3 (2017), p. 1627-1638.

Meimand Sajad Ebrahimi; Khalifah Zainab; Zavadskas Edmundas Kazimieras; Mardani Abbas; Najafipour Amir Abbas; Ahmad Ungku Norulkamar Ungku. Residents' attitude toward tourism development: a sociocultural perspective. Sustainability. Basel: MDPI AG. ISSN 2071-1050. Vol. 9, iss. 7 (2017), p. 1-29.

Stanujkic Dragisa; Zavadskas Edmundas Kazimieras; Karabasevic Darjan; Turskis Zenonas; Keršulienė Violeta. New group decision-making ARCAS approach based on the integration of the SWARA and the ARAS methods adapted for negotiations. Journal of business economics and management. Vilnius; London: Technika; Taylor & Francis. ISSN 1611-1699. Vol. 18, iss. 4 (2017), p. 599-618.

Keshavarz Ghorabae Mehdi; Amiri Maghsoud; Zavadskas Edmundas Kazimieras; Turskis Zenonas. Multi-criteria group decision-making using an extended EDAS method with interval type-2 fuzzy sets. E & M Ekonomie a management. Liberec: Technická Univerzita v Liberci. ISSN 1212-3609. Vol. 20, iss. 1 (2017), p. 48-68.

Zavadskas Edmundas Kazimieras; Baušys Romualdas; Juodagalvienė Birutė; Garnytė-Sapranavičienė Inga. Model for residential house element and material selection by neutrosophic MULTIMOORA method. Engineering applications of artificial intelligence. Oxford: Elsevier. ISSN 0952-1976. 2017, 64, p. 315-324.

Zavadskas Edmundas Kazimieras; Cavallaro Fausto; Podvezko Valentinas; Ubartė Ieva; Kaklauskas Artūras. MCDM assessment of a healthy and safe built environment according to

sustainable development principles: a practical neighborhood approach in Vilnius. Sustainability. Basel: MDPI AG. ISSN 2071-1050. Vol. 9, iss. 5 (2017), Art. no. 702.

Fernando Charith Kaushalya; Hosseini M. Reza; Zavadskas Edmundas Kazimieras; Perera B. A. K. S.; Rameezdeen Raufdeen. Managing the financial risks affecting construction contractors: implementing hedging in Sri Lanka. International journal of strategic property management. Vilnius; Londonas: Technika; Taylor & Francis. ISSN 1648-715X. Vol. 21, no. 2 (2017), p. 212-224.

Kahraman Cengiz; Keshavarz Ghorabae Mehdi; Zavadskas Edmundas Kazimieras; Cevik Onar Sezi; Yazdani Morteza; Oztaysi Basar. Intuitionistic fuzzy EDAS method: an application to solid waste disposal site selection. Journal of environmental engineering and landscape management. Vilnius; Londonas: Technika; Taylor & Francis. ISSN 1648-6897. Vol. 25, iss. 1 (2017), p. 1-12.

Yazdani Morteza; Chatterjee Prasenjit; Zavadskas Edmundas Kazimieras; Hashemkhani Zolfani Sarfaraz. Integrated QFD-MCDM framework for green supplier selection. Journal of cleaner production. Oxford: Elsevier Ltd.. ISSN 0959-6526. Vol. 142, Part. 4 (2017), p. 3728-3740.

Zavadskas Edmundas Kazimieras; Turskis Zenonas; Viltutienė Tatjana; Lepkova Natalija. Integrated group fuzzy multi-criteria model: Case of facilities management strategy selection. Expert systems with applications. Oxford: Elsevier. ISSN 0957-4174. Vol. 82 (2017), p. 317-331.

Stanujkic Dragisa; Zavadskas Edmundas Kazimieras; Liu Sifeng; Karabasevic Darjan; Popovic Gabrijela. Improved OCRA method based on the use of interval grey numbers. Journal of Grey System. Burnham: Research Information Ltd. ISSN 0957-3720. Vol. 29, iss. 4 (2017), p. 49-60.

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Trinkūnienė Eva; Podvezko Valentinas; Zavadskas Edmundas Kazimieras; Jokšienė Izolda; Vinogradova Irina; Trinkūnas Vaidotas. Evaluation of quality assurance in contractor contracts by multi-attribute decision-making methods. Economic Research-Ekonomska Istraživanja. Oxon: Routledge-Taylor & Francis. ISSN 1331-677X. Vol. 30, no. 1 (2017), p. 1152-1180. [

Kosareva Natalja; Krylovas Aleksandras; Dadelo Stanislavas; Zavadskas Edmundas Kazimieras. Entropy-KEMIRA approach for MCDM problem solution in human resources selection task. International journal of information technology & decision making. Singapore: World Scientific Publishing Company. ISSN 0219-6220. Vol. 16, iss. 5 (2017), p. 1183-1209.

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Ferreira Fernando A.F.; Jalali Marjan S.; Zavadskas Edmundas Kazimieras; Meidutė-Kavaliauskienė Ieva. Assessing payment instrument alternatives using cognitive mapping and the choquet integral. Transformations in business and economics / Vilnius University, Brno University

of Technology, University of Latvia. Vilnius: VU leidykla. ISSN 1648-4460. Vol. 16, no. 2 (2017), p. 170-187.

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International projects in process

No .	Programme	Project	Short name	Date from - to	Responsible person (project manager)
1	HORIZON2020	Regeneration and Optimisation of Cultural heritage in creative and Knowledge cities https://rockproject.eu/	ROCK	2017-2020	Prof. Habil. Dr. Artūras Kaklauskas
2	HORIZON2020	Students Achieving Valuable Energy Savings https://saves.unioncloud.org/articles/welcome-to-saves2	SAVES2	2017-2020	Prof. Habil. Dr. Artūras Kaklauskas
3	HORIZON2020	Network for Using BIM to Increase the Energy Performance http://www.net-ubiep.eu/lt/home-lt/	Net-UBIEP	2017-2019	Assoc Prof Dr Tatjana Vilutienė



Network for Using BIM to Increase the Energy Performance (Net-UBIEP)

Net-UBIEP aims at increasing energy performance of buildings by wide spreading and strengthening the use of BIM, during the life cycle of the building. The use of BIM will allow to simulate the energy

performance of the building using different materials and components, both to be used in the building design and/or in building design refurbishment.

BIM, which stands for Building Information Modeling, is a process that lasts for all the building life cycle from the design phase through the construction, management, maintenance, demolish. In each of this phase is very important to take into account all the energy aspects in order to decrease the environmental impact of the building during its life cycle.

Four target groups have already been selected according to the role they play in building processes, namely Public Administrations, Professionals (Engineers / Architects), Technicians (Installers / Maintainers), Tenants/Owners/Building Administrator.

The partners will elaborate a three dimensional matrix for the identification of competences required to each target group to ensure the highest energy performance using a BIM model.

Standardize the schemes for BIM Qualification Models through the CEN/BT/WG 215 "Building Information Modelling (BIM)", which works in close relationship with ISO/TC 59/SC 13 – Organization of information about construction works, for the recognition of the BIM professional profiles at international level.

Consortium



Via Europa Competence Centre



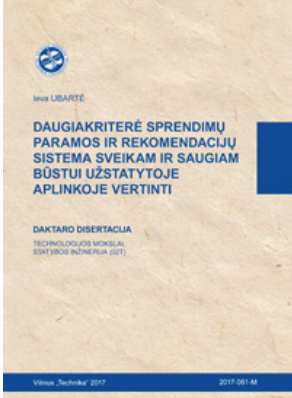
TALLINNA TEHNIKAÜLIKOOL
TALLINN UNIVERSITY OF TECHNOLOGY



PhD Dissertations defended during 2017

Name of doctoral student	Title of dissertation	Year	Scientific supervisor
Ieva Ubartė	Multiple Criteria Decision Support and Recommendation System for the Assessment of healthy and Safe Homes in the Built Environment	2017	Prof. Dr. Habil. Edmundas Kazimieras Zavadskas
Aurelija Peckienė	Multi-Stage Assessment of BIM Technologies Efficiency Conception of Site and Building Spatial Planning Using Building Information Modelling methodology	2017	Prof. Dr. Habil. Leonas Ustinovičius
Romas Rasiulis	Building Information Modelling Technology Based Model for Renovation of Administrative Building Assessment	2017	Prof. Dr. Habil. Leonas Ustinovičius

Short review of defended dissertations

	Multiple Criteria Decision Support and Recommendation System for the Assessment of healthy and Safe Homes in the Built Environment Ieva Ubartė 2017 Scientific supervisor: Prof. Dr. Habil. Edmundas Kazimieras Zavadskas
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Research object. The object of research – healthy and safe home which is influenced by factors of macro, meso and micro environment.

Aim and Tasks of the Work. The main aim of this thesis is to propose an assessment methodology for healthy and safe home based on the principles of sustainable built environment, and to develop a multiple criteria assessment decision support and recommender system for healthy and safe home.

Research methodology. The thesis is based on publications, researches and reports of foreign and Lithuanian scientists. Analysis of statistical data provided by Vilnius City Municipality, Lithuanian Department of Statistics and real estate and the England Government, collection of information provided in printed information sources have been performed in the course of development the criteria systems. Systems of criteria combining qualitative and quantitative criteria are proposed. Expert analysis and multiple criteria methods (COPRAS, INVAR, SAW, TOPSIS, EDAS) were used in the research. The criteria weights were established with the help of expert judgment and the entropy, CILOS and IDOCRIW methods.

Defended Statements.

1. Sustainable development should be assessed as an integral part of the economic, social and environmental aspects and the healthy and safe environment and homes in it.
2. Healthy and safe homes can be assessed at macro, meso and micro levels using multiple criteria assessment methods: COPRAS and INVAR for the macro level; COPRAS, SAW, TOPSIS and EDAS for the meso level; and COPRAS for the micro level.
3. The new original multiple criteria assessment decision support and recommender system for healthy and safe home is an automated tool that can determine the healthiness class of homes against a healthy and safe home benchmark, and provide recommendations, how to reduce the risk of potential hazards.

4. The recommender subsystem developed as part of this research is a risk management tool. Armed with the tool home owners, occupants, national authorities and other stakeholders can assess potential hazards and mitigate their likelihood according to provided recommendations.

Approval of the thesis. The key research findings were announced in eight research papers: two in Clarivate Analytics journals, four in peer-reviewed foreign scientific journals, one in conference proceedings indexed in the Clarivate Analytics ISI database, and one in peer-reviewed conference proceedings. Four presentations on the topic of the dissertation were given at conferences in Lithuania and abroad.

Practical value. The main practical direction of these research findings is more efficient decision making for healthy and safe homes in the built environment, which will help to reduce the accident risks. The research findings were put into practice in “Building a national certification model for healthy homes”, a commissioned study, in “Greening the Business: Green Business Management Trainings” (GreenB; 2015-1-FR01-KA204-015377), „Academic Network for Disaster Resilience to Optimize educational Development” (ANDROID; 518173-LLP-1-2011-1-UK-ERASMUS-ENW), „Learning Augmented Reality Global Environment” (LARGE; 519195-LLP-1-2011-BG-KA3-KA3MP), „The iProfessional” (iPro; 540097-LLP-1-2013-1-BG-ERASMUS-EQR), an ERASMUS+ projects, and in “Boosting the Lithuanian Construction Technology Platform (LSTP) and optimizing research areas in construction” (VP1-3.1-ŠMM-05-K-02-006), a project co-financed by the EU Structural Funds.



Multi-Stage Assessment of BIM Technologies Efficiency Conception of Site and Building Spatial Planning Using Building Information Modelling methodology

Aurelija Peckienė
2017

Scientific supervisor: Prof. Dr. Habil. Leonas Ustinovičius

Research object. The object of research – site and building spatial planning in the digital BIM environment, in assessment with territorial planning documents and Lithuanian construction legislation.

Aim and Tasks of the Work. The main aim of the thesis –to develop a conceptual model of digital site and building spatial planning system, taking into account the requirements of spatial planning documents and legislation on construction.

Research methodology. The dissertation was prepared based on foreign and Lithuanian scientific sources analysis, synthesis and generalization. In order to achieve the objective of the work, was apply research methods – data comparison, grouping, detail. In determining the requirements of the law was carried out in the Republic of Lithuania adopted laws and laws accompanying legislative review, analysis and structuring. An example of practical application of part of the model is presented using Matlab and artificial neural networks.

Defended Statements.

1. In the BIM environment, the building planning phase can be supplemented (modified in part) by the building and site spatial planning phase, analyzing the information on the building environment (i.e. site) and ensuring more rational implementation of the construction project.
2. Building and site spatial planning consists of four main groups of solutions: requirements for volume-related solutions of the building, requirements for the mandatory elements of the site, 3D digital spatial planning document and preliminary volume of the building. Of these, only preliminary volume-related solution of the building can be modified at the spatial planning phase. The remaining elements remain unchanged during the planning.
3. The proposed conceptual model for building and site spatial planning allows for a detailed and comprehensive assessment of the main building, site, utilities network and transport communication solutions for the building.

Approval of the thesis. Six scientific articles on the topic of the dissertation were published: two articles were published in a scientific journals, included in the Thomson ISI list, two articles were published in other peer reviewed journals, one article was published in peer reviewed international conference materials, and one article was published in a Lithuanian set of conference articles. The results of the research covered by the dissertation were presented in three scientific conferences.

Practical value. The research results could be useful to investment project developers, designers, builders (customers) and other persons participating in the building planning phase. The results can also be applied by the state institutions inspecting the compliance of planned buildings with the requirements of the applicable legislation.



Building Information Modelling Technology Based Model for Renovation of Administrative Building Assessment

Romas Rasiulis
2017

Scientific supervisor: Prof. Dr. Habil. Leonas Ustinovičius

Research object. The object of research – efficiency evaluation of renovation options using BIM technologies for the administration buildings.

Aim and Tasks of the Work. To create a multi-criteria model for administrative building renovation options and decision efficiency investigation and evaluation methodology, applying BIM technology and its algorithm for practical application.

Research methodology. This thesis is based on foreign and Lithuanian scientists' publications, researches, construction companies' data, construction and design governing laws, construction technical regulations, construction law, and BIM standards. Experimental evaluation, data structuring, graphical data representations are carried out. Decision-making method, modernization options synthesis' decision method, multi-criteria analyses, assessing the modernization effectiveness, are applied. Statistics of Lithuanian and foreign institutions were used. Technical information of BIM manufacturers, various reports, and return on investments calculation methodology were examined.

Defended Statements.

1. Proposed energy efficiency of a public building renovation and reconstruction using base model passive house and BIM technology allow to assess the role of each participant and its level implementing BIM technologies for design company.
2. Administrative building renovation technology tree synthesis methodology and multi-criteria model, which are the basis for the administrative building renovation algorithm for project in BIM environment, were designed.
3. Decision model for selection of modernization measure, allowing to determine the most efficient construction and engineering facilities decision for building renovations, was designed.

Approval of the thesis. 9 scientific articles on the subject of the thesis were published, three of which are listed in Thomson Reuters Web of Knowledge, other three listed in Conference material ISI Proceedings, two – in other peer-reviewed foreign and Lithuanian scientific publications, one of the articles – in peer reviewed Lithuanian conference material. Thesis research results were published in five scientific conferences (four international).

Practical value. Research results might be useful for companies in identifying the efficiency of administrative building renovation technologies and decisions and evaluating them in BIM environment and applying to company's activities. Thesis results in macro-level can be useful for digitalizing construction sector on individual country level. Research results may have significant influence on both micro-level and macro-level decision making relating to the introduction of innovations to construction sector, which directly and indirectly will affect other sectors of the economy as well as technology, social and humanitarian fields of science development.

Editor's comments

Dear EWG-ORSDCE members, dear friends,

Thank you for all valuable contributions to EWG-ORSDCE activities, common initiatives and research papers.

Next year all members of EWG-ORSDCE are welcome to participate in the forthcoming 29th EURO Conference that will be held in 8-11 July, 2018 in Valencia, Spain. 2018 EURO Working Group "OR in Sustainable Development and Civil Engineering (ORSDCE)" will organize invited session in the field "OR for Development and Developing Countries" The papers presented in this session are welcome for publishing in scientific journals: Technological and Economic Development of Economy, Journal of Civil Engineering and Management, Journal of Business Economics and Management, International Journal of Strategic Property Management, and Engineering Structures and Technologies.

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

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