



## REVIEW OF TRANS-BORDER CO-OPERATION IN CONSTRUCTION MANAGEMENT BETWEEN LITHUANIA, GERMANY AND POLAND

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**Abstract.** Academic cooperation between three research and didactic centres of Lithuania, Germany and Poland (focusing on development of construction engineering and management) is presented. Formal meetings have been called Colloquia, and were organized alternately every two years in various academic centres. The last, 12<sup>th</sup> Colloquium, took place in Vilnius. This cooperation was highly praised not only by University Senates, but also by groups of prominent politicians. The collaboration continues without a hint of prejudice or xenophobia, and results in a variety of joint publications, including books and monographs; and even academic promotions of PhD and Habilitation theses. Issues of applications of mathematical methods were initially dominant, but the prime focus is on development of planning tools. At present, the range of subjects is considerably broader. Apart from development and applications of operational research and multiple criteria methods, such issues as sustainability have also appeared. Since Professor E. K. Zavadskas was the godfather of the Colloquia the article highlights the importance of VGTU.

**Keywords:** Construction management, international collaboration, multiple criteria methods, operational research, history of colloquia.

### Preface

The cooperation within the Lithuania–Germany–Poland triangle already has had a 30 year tradition (c.f., Peldschus 2009). Indeed, initial sporadic meetings took place during international conferences in the German Democratic Republic, for example at the IKM Congress in Weimar, or IKIB in Leipzig. IKMs were connected with mathematical methods in construction industry, while IKIB focused on industrialized construction processes. These sporadic meetings soon proved to be insufficient. Then a PhD, E. K. Zavadskas (VISI) participating in academic internship at Technische Hochschule Leipzig (now: Hochschule für Technik, Wirtschaft und Kultur Leipzig) suggested more systematic meetings in 1980–1981. The then Vice-Chancellor of THL, Professor K. Fiedler, gave his approval to this initiative. The first Colloquium took place in 1986, and a joint publication followed (Fiedler *et al.* 1986). F. Peldschus, later a Professor, had already participated in this event. Following his internship at the THL (1981), the then Docent O. Kapliński from the Poznań University of Technology, travelled to VISI as a Visiting

Professor (1985). Also Professor K. Fiedler, and later Dr F. Peldschus visited the VISI (in 1989).

Apart from research authority and solid methodological basis, the dowry that the three centres brought to this relationship was primarily their scientific achievements: the German side the development and application of games theory, the Lithuanian side multiple criteria methods and the Polish side balancing construction processes under stochastic conditions in the application of theory of queue and theory of reliability. Obviously, the subject matter of subsequent Colloquia changed, researchers and academics developed, conditions of collaboration changed rapidly, moreover, shared scientific achievements were to be seen very clearly. It is worth mentioning some facts from the historical viewpoint, as well as basic achievements, because this collaboration is unique and spectacular in Central and Eastern Europe.

## **History and evolving trends of the colloquia**

Therefore, the years 1986 and 1989 refer to the first two colloquia. From the third on, which took place in Vilnius (1991), three German university centres participated: Leipzig, Weimar and Aachen (RWTH). Articles in published materials were also written by authors from Leningrad (LISI), Moscow (MISI), Bratislava (BTU) and Aalborg (Denmark). From now on, changing number colleagues from other countries had participated, but core centres remained in Leipzig, Vilnius, and Poznań. Mathematical methods dominated both during the second and third colloquium, as well as the operational research and, generally, decision making theories.

The fourth took place in Poznań (1993) under the heading of “Planning Instruments in Construction Management”. Multi-criterion optimization dominated, the first expert systems applications appeared.

The fifth colloquium returned to its sources, i.e., to Leipzig (1995). Apart from such issues as new methods of multi-criterion evaluation of construction projects, application of fuzzy methods, hybrid expert systems – transformation about economy in Eastern Europe and investment problems have been presented. A photo to remember this event is presented in Fig. 1.

In Vilnius (1997) the meaning information, data systems, applications of expert systems, solving the location problems, quality management and real estate evaluation have been discussed. The general title of the colloquium was: „Rational Decisions in Construction Companies Activities”.

Prof. R. Seeling from RWTH-Aachen organized the seventh colloquium in 1999. Colleagues from Vilnius and Leipzig presented a shared project – the new version of LEVI-0.3 programme. Apart from the above, such issues as building live cycle, controlling and advisory systems were discussed. “Planungs Instrumente für das project management” was the theme of the entire event.

In Vilnius (2001) the subject of “Rational Decisions in the Activities of Construction Companies” returned: Information Technologies issues (IT) predominated the discus-

sions. Moreover, such issues as: multi dimensional data analysis, multi-criteria decision adding methods, reliability of construction processes, risk management and cash flow were presented. The photograph (in Fig. 2) presents the leaders from the four universities.

The ninth colloquium took place in Kołobrzeg, and was organized by colleagues from Poznań. An earlier name of the conference was used: "Planning Instruments in Construction Management". The Decision Support Systems (DSS) was the dominating theme. Habilitation thesis assumptions from this range were discussed (Ustinovicus 2003). Additionally, verbal decision methods, e-business systems, risk in property valuation method were presented.

Papers presented during the colloquium (Rakowski, Kapliński 2004; Kapliński *et al.* 2004) had been published.



**Fig. 1.** The Leipzig colloquium (1995). Lithuanian delegation was the strongest



**Fig. 2.** The five "tigers" of the colloquia. From left to right: Professors E. K. Zavadskas (Vilnius), F. Peldschus (Leipzig), R. Ginevicius (Vilnius), R. Seeling (Aachen), O. Kapliński (Poznań). Vilnius, 2001

Following three colloquia were related to jubilees of three main representatives of academic centres and co-organizers of the events. The 10<sup>th</sup>, Leipzig colloquium, was devoted to Prof. F. Peldschus' jubilee. A strong representation of other German universities was present, as well as representatives of the industry. The main subject was: "Modern Instruments in Management". Apart from "traditional" of methods, such as Multi-criteria decisions in construction industry, many issues from the range of construction economics and rationalization were presented, as well as new approaches to modelling construction processes, and even new educational methods.

The 11<sup>th</sup> colloquium, which took place in Kołobrzeg (2007), was devoted to celebrating the jubilee of Professor O. Kaplinski, who is the Head of the Division of Construction Engineering and Management (Poznań University of Technology). Colleagues from VGTU were the strongest delegation to this conference. Subjects the range of DSS were presented, as well as artificial intelligence, life cycle of objects, facility management and IT applications. Achievements to date and developments of application of two methods – MCDA and MCDM – were summed up. Moreover, investment problems in cooperating countries were compared.

The last, 12<sup>th</sup> colloquium, took place in Vilnius (May 20–24, 2009) and Professor E. K. Zavadskas was honoured by a jubilee. Representatives of three academic centres from Poland participated in the event traditionally, from the Poznań University of Technology (10 people), Katowice School of Economics (2 people), and from AGH University of Science and Technology in Kraków. Representatives from the Czech Republic, Slovenia, and the UK were also present. "Sapere Aude" was the motto of the meeting – not only a VGTU logo, but also a honourable mention for Professor E. K. Zavadskas (see: Kapliński 2009c).

From the viewpoint of theoretical issues, such areas were touched upon as: game theory, multi-attribute decision making, COPRAS-G method, interactive multi-criteria, analytic hierarchy process, intelligent green construction, and a number of other.



**Fig. 3.** The last Vilnius colloquium. From left to right: Dr J. Selih (Ljubljana), Dr J. W. Hink (Nürtingen), Prof. F. Peldschus (Leipzig) and Prof. E. K. Zavadskas (Vilnius)

The subject areas that can be named, looking from the point of view of applications, are as follows: commercial activities, real estate crisis management, increasing labour productivity, assessment of foundation technologies, internet system in concrete placing, Public-Private Partnership, eco-energetic building, sustainability, risk in construction and other.

Abstracts had been published (Vilutiene 2009). Articles are going to be systematically published in VGTU journals. A photograph in Fig. 3 presents an informal discussions scene.

### Characteristic results of the colloquia

Understandably, the Colloquia had a strong impact on research in all academic centres involved, primarily on publications and promotion work development, especially on Ph.D. theses.

The synthesis of achievements is difficult to present. We will find such attempts in following works: Wagner *et al.* 1985; Kapliński 2000; Zavadskas, Kaklauskas 2001; Rakowski, Kapliński 2004; Kapliński *et al.* 2004; Peldschus *et al.* 2006; Zavadskas 2008a, b.

It is easier to presents those achievements in numbers. It is estimated that the colloquia were the inspiration to writing 40 books, 12 habilitation theses, and around 50 successfully presented doctoral theses (in various countries). Articles and papers represent the largest number, evaluated at above 300. The fact that many of them is the effect of cooperation between partners from various centres is quite typical.

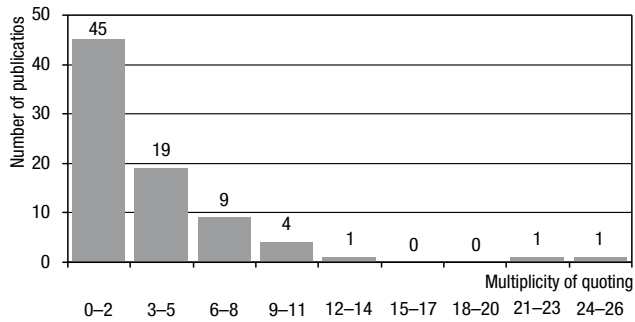
The recent attempt at a synthesis has been made in the publication by Professor Zavadskas (Zavadskas 2008b). The synthesis is based on 80 sources of quoted bibliography, and embraced five subject areas:

- Creation of decision-support systems intended for designing rational technological processes,
- Creation, improvement and application of the multiple criteria decision-making methods,
- Construction process balancing and reliability,
- Complex assessment of sustainable development,
- Modelling and forecasting construction in Lithuania, Germany and Poland.

These achievements were announced in many international periodicals – on the example: Brauers *et al.* 2006, 2007, 2008; Kapliński 2008b; Zavadskas, Kaklauskas 2007, 2008; Zavadskas *et al.* 2003, 2007, and many another mentioned in: Zavadskas 2008b.

A recent measure of achievements is a number of quotations assessed on the basis of international abstract databases.

A quotations histogram of the above mentioned 80 publications, summing up the heritage of the 11<sup>th</sup> Colloquium, is presented in Fig. 4. It is clear from the histogram that the majority of texts have beer seldom quoted – in the first bracket there are 45 items. One of the texts was quoted 26 times (the last bracket). The graph can be commented as follows: the histogram does not cover all items connected with the achievements of



**Fig. 4.** A quotations histogram of part of publications (80) summarising earlier Colloquia

the Colloquia, some of the items originate from the times when abstract databases had not been in existence, and others, ex., PhD self-summaries, had not been included in such databases. The author has made the comparison using SCOPUS database, however this base embraces texts published after 1996. The comparison was made in March 2009.

SCOPUS database shows the so called Hirsch index. Professor Zavadskas can boast the highest value of  $h$ -index all of us, i.e.,  $h$ -index = 15, meaning that out of 78 documents considered for this index, 15 have been cited at least 15 times. Those 78 texts, including self-quotations, have been quoted 750 times. It is January 2010 status. According to SCOPUS database, the most often quoted text (44 times) was “Evaluation the sustainability of Vilnius city residential”, published in the Journal of Civil Engineering and Management (Viteikiene, Zavadskas 2007). The same text, in a more comprehensive Google Scholar database, was quoted 52 times. The most often quoted text in Google Scholar (56 times) was “Development of software for multiple criteria evaluation”, published in Informatica (Zavadskas *et al.* 2003). SCOPUS database quotes it 38 times. Vice-Chancellor R. Ginevicius and Professor Zavadskas regard those indices as very important and have offered their help to Polish editors who want to put them in proper order.

Books and monographs are part of the heritage of the Colloquia. Let us name the most characteristic of the 40 altogether. The first text, published by international authors, was (Badjin *et al.* 1989). A monograph on estimation of technological solutions (Zavadskas 1991) was widely read in Central and Eastern European academic communities. Those two texts were published in the Russian language. The collaboration with Aalborg University (Denmark) brought fruit, and common book was published (Zavadskas *et al.* 1992). Earlier, another book was published in 1991 (Zavadskas, Kaklauskas 1991). Texts that followed were written jointly with Professor Peldschus (Zavadskas *et al.* 1994; Peldschus, Zavadskas 1997). The first Polish-Lithuanian monograph was published in 1995, and was the first text on expert systems in construction industry in this part of Europe (Zavadskas *et al.* 1995). Further joint effort with German academics made it possible to publish further texts: Ginevicius *et al.* 2005; 2006; Zavadskas, Kak-

lauskas 2007. Other characteristic monographs in decision making, process modelling, and construction projects were: Zavadskas 2000; Kapliński 1997, 2007.

As mentioned before, during the Colloquia promotional texts are discussed (consulted), that is given the first assessment. Therefore, during the last colloquium, J. Tamosaitiene presented her PhD thesis to be officially defended at a later time, Dr. Nowak brought his Habilitation thesis (Nowak 2009); and Dr J. Paślowski from Poznań also consulted most recent version of his Habilitation thesis (Paślowski 2009).

## Other characteristic phenomena

Experiences brought by subsequent Colloquia proved that it was necessary raise the rank of our achievements by disseminating them and, first of all, internationalising them. Colloquia participants – VGTU academics (formerly VISI and VTU) – set up a number of periodicals. Some of them evolved: for instance “Statybos technologija ir menedžmentas” evolved into “Statyba”, and later into “Journal of Civil Engineering and Management”. Former “Ūkio technologinis ir ekonominis vystymas” evolved into “Technological and Economic Development of Economy” with the characteristic subtitle: “Baltic Journal of Sustainability”. Present “International Journal of Strategic Property Management” was formerly known as “Real Estate Valuation and Investment” and “Property Management”. Professor Zavadskas is Editor-in-Chief of JCEM, TEDE and IJSPM. Professor Kaklauskas is in Editor-in-Chief of IJSPM. Professor Ginevicius is Editor-in-Chief of “Journal of Business Economics and Management” and “Business: Theory and Practice”.

The editors made sure that the periodicals were added to international databases. Most of them are already quoted in ISI Web of Science by Thomson Reuters Services. Care about the impact factor is clearly visible (c.f. Zavadskas 2008a, b).

The periodicals are made available to Colloquia participants.

There is yet another characteristic aspect of our meetings. Our Colloquia are saturated with the spirit of integral humanism. It was Professor Zavadskas, at the helm of the academic vessel of Lithuania, with enormous influence on academic communities, and Central and Eastern Europe in particular, who noticed and talked about negative effects of technical and scientific revolution which might be disastrous without simultaneous scientific-humanist revolution. He pointed at social philosophy known as socially involved personalism. He tried to teach us to think in terms of academic community. He took up a task of creating order within academic communities which would synthesize the extremes (of social capital and social individualism) into a balanced entity based upon the philosophy of integral humanism. It is, therefore, no wonder that this subject has become a foundation of the Professor’s speech on “University and Integral Humanism” during the promotion of his Honorary Doctorate at the Poznań University of Technology (January 2002).

## **Change of formula of meetings**

Not only the subject matter of the Colloquia changed. Gradually, the formula of the meetings began to evolve, because the condition of collaboration was changing. The initial meetings relied on the so called barter currency exchange, as travelling abroad at the time was limited. A need and self-organisation of academic life was the foundation of the first formula. What was characteristic was mutual consultations and first publications (individual or joint) regarded already as international publications. There had been not a trace of xenophobic atmosphere at those conferences, not a single political undertone. They were an example of good collaboration in the exchange of research information, consultation of publications and promotional papers, their reviews, collaboration on joint publications, developing planning tools in the area of civil engineering and construction projects.

Good academic collaboration and good atmosphere made steady development possible, regardless grave political events running parallel to the meetings. Such events had taken place, as breakdown of the USSR, Lithuanian independence, division of Czechoslovakia, Poland's accession to NATO. Fall of a political system, and changes in economy did not have a negative influence on the level of the collaboration, but created conditions to apply theory to practice.

Such considerations as freedom and rate of information exchange (e.g. Internet), better access to foreign periodicals, participation in scientific organizations, participation in international conferences around the world brought about the need to develop another formula. The majority of Colloquia participants had become members of the European Working Group of Multi-Criteria Decision Aiding. Moreover, an international working group concerning Decision-Making in Civil Engineering and Sustainable Development has been created. Professor Zavadskas makes every effort possible to make the group part of the European Association of Operational Research (EURO). No wonder that the subject of the last Colloquium was "Sustainable Development in Civil Engineering and Multi-Attribute Decision Making".

Friendship bonds are still strong. The rule that every centre shall report its achievement every two years is still in place.

## **The Polish glance on the trans-border co-operation**

The author's cooperation with colleagues from Vilnius formally began in 1985, i.e., from an invitation to lecture as a visiting professor. Further contacts intensified. Professor Kapliński sat on a number of PhD thesis committees (for future PhD candidates) as well as in three Habilitation thesis committees: R. Ginevicius' (1997), A. Kaklauskas' (1999), and L. Ustinovicius' (2003). Contacts translated into work on PhDs in a number of countries, including Poland – mainly at the PUT. Research work authored by W. Meszek, M. Celińska, M. Hajdasz, M. Gajzler, P. Szymański, T. Wiatr, and T. Thiel are just a few examples. In the latter case, Professor Zavadskas was a formal reviewer. All the



work had earlier been presented during the Colloquia. In January 2010, the PUT Civil and Environment Engineering Department Council nominated Professor Zavadskas as a formal reviewer of Dr. Paślowski's Habilitation thesis.

Making Lithuanian periodicals available for colleagues in Poland was a significant step in the development of our academic staff. The review of some Polish texts published in Lithuanian periodicals is presented in (Kapliński 2009a, b, c). Our academic environment's first recorded text published in Vilnius was written by Kapliński/Meszek in 1987, and appeared in the VISI periodical: "Ekonomija Matierial'nych i Energiyeticeskich Resursov v Stroitel'stve". The article concerned balancing of construction processes under unspecified conditions (see: Kapliński, Meszek 1987).

The impact of presented meetings on publications in Poland is to be seen also in the monograph (Kapliński 1997). On page 8, following acknowledgement is to be found:

*"Special recognition should be given to the collaboration between the three academic centres: Vilnius Technical University, former VISI, The Chair of Building Technology and Management (Lithuania); Leipzig, Lehrbereich Baubetrieb, HTWK former THL (Germany); and Poznań University of Technology, Division of Construction Engineering and Management (Poznań). This cooperation resulted in joint publications and review of Ph.D. theses as well as colloquia organized every second year. I would like to thank Prof. Edmundas Zavadskas and Prof. Friedel Peldschus. I hope that, in the future, our cooperation will be equally fruitful. The book features, as well, a part of the research presented by the author during Polish, German and Lithuanian colloquia."*

Recently a publisher (Polish Academy of Sciences) of another monograph (Kapliński 2007) entrusted its review to Professor Zavadskas. The monograph contains the most important Polish achievements from many research centres in formally presented organization and management. The assessment of this monograph has also appeared in print (Zavadskas 2008c).

Additional conferences organized by colleagues from VGTU play a significant role in mutual academic contacts, as well as in staff development, for example *the 25th International Symposium on Automation and Robotics in Construction ISARC – 2008* and, primarily, cyclical international conferences on *Modern Building Materials, Structures and Techniques*. The colloquia participants are often invited as guest editors of foreign periodicals, making it easier for remaining members of academic community access the published texts. These are clear examples: Zavadskas, Kaklauskas 2007b, 2008; Kapliński 2008a; Sakalauskas, Zavadskas 2008.

What more:

- The Polish quarterly "Lithuania" published interviews with professors Ginevičius, Zavadskas, Kapliński – (c.f., Zavadskas 2000).
- Polish and Lithuanian periodicals informed about colloquia, for example: *Modern* 2001; *The jubilee* 2001, 2009; *Tradition* 2007; Kapliński 2002.
- First characteristic common publications with colleagues from Germany and Lithuania were following: Kapliński *et al.* 1987, 1990; Kapliński, Zavadskas 2002; Ustinovichius *et al.* 2006;
- Authors from Germany and Lithuania published in periodicals PUT: c.f., Ginevici-

us, Podvezko 2004; Kapliński *et al.* 1990, 2004; Ustinovich, Kochin 2004; Zavadskas *et al.* 2004a, b.

- The monograph presented by colleagues from VGTU on the future of universities has been reviewed in Poland (Kapliński 2002).

Three Senates of technical universities: in Warsaw, Gdańsk and Wrocław have highly praised individual achievements and collaboration within the Colloquia, and have supported the PUT's motion to grant Professor E. K. Zavadskas the status Doctor honoris causa (2001/2002).

Earlier such was obtained by Professor Peldschus and Professor Kapliński in Vilnius.

Professor E. K. Zavadskas' name and achievements are well known in Poland. His influence on the development of good relationships with Poland is clearly visible in the fact that Prof. E. K. Zavadskas was one of the founders of the Adam Mickiewicz Foundation Presidents of Lithuania and Poland, an organisation working towards the amendment of relationships between Lithuania and Poland. He also collaborates with parliamentary groups in both countries. In 2004, he was honoured with the Award of Polish and Lithuanian Parliamentary Assembly. He is a laureate of the 'Integral Humanism' Medal, awarded by a Polish magazine 'Lithuania' and a Lithuanian magazine 'Culture'. In 2001 he was univocally elected as member of the Civil Engineering Committee of Polish Academy of Sciences.

## Conclusions

Academic meetings of members from three research centres – Lithuanian, German, and Polish, devoted to construction management, decision aiding techniques and planning have become something of a sensation in the academic world.

One can notice the predominant part of the Lithuanian centre, in this VGTU.

A number of research promotion texts have been consulted and initially assessed during those meetings.

Experience exchange in the old or new formula has proved beneficial for young academic staff.

The colloquia have also opened a path to extend their participant's research volume, which was a significant factor fostering their academic careers.

The subjects always touched upon new trends, both in theory and in practice. However, there is still a need to extend the range of research subjects, for example towards the issues of sustainability development.

Another clear need is to internationalise further contacts.

## References

- Badjin, G.; Zavadskas, E.; Peldschus, F. 1989. *Game Modelling in Preparation for Building Production*. Leningrad: Leningrad Civil Engineering Institute.
- Brauers, W. K.; Ginevicius, R.; Zavadskas, E. K.; Antucheviciene, J. 2007. The European Union in a transition economy, *Transformation in Business & Economics* 6(2): 21–37.

- 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.
- Brauers, W. K. M.; Zavadskas, E. K.; Peldschus, F.; Turskis, Z. 2008. Multi-objective decision-making for road design, *Transport* 23(3): 183–193. doi:10.3846/1648-4142.2008.23.183-193
- Fiedler, K.; Peldschus, F.; Zavadskas, E. 1986. Methoden der Bautechnologischen Entscheidung, in *Berichte der Technischen Hochschule*, Heft 17. Leipzig.
- Ginevičius, R. 1997. *Die Situationsanalyse und Gestaltung der organisatorischen Leitungsstrukturen von Bauunternehmen*: Diss. Dr Habil. Vilnius: Technika.
- Ginevičius, R.; Hausmann, T.; Schafir, S. 2005. *Projektmanagement – Einführung*. Gernsbach: Deutscher Betriebswirte-Verlag.
- Ginevičius, R.; Hausmann, T.; Schafir, S. 2006. *Projektmanagement – Wege zum Erfolgreichen Projekt*. Gernsbach: Deutscher Betriebswirte-Verlag.
- Ginevičius, R.; Podvezko, V. 2004. Determination of weightiness of the hierarchically – structured organization according to its commercial activity, *Foundations of Civil and Environmental Engineering* 5: 21–33.
- Kaklauskas, A. 1999. *Multiple criteria decision support of building life cycle*: Research report presented for habilitation. Vilnius: Technika.
- Kaklauskas, A.; Kapliński, O.; Peldschus, F.; Zavadskas, E. 2005. Historie und Trends des Kolloquiums, 20 Jahre wissenschaftlicher Gedankenaustausch, *Podium*, Sonderheft HTWK, 3–9.
- Kapliński, O. 2007. Metody i modele badań w inżynierii przedsięwzięć budowlanych. PAN, KILiW, IPPT, v *Studia z Zakresu Inżynierii*. Ed. by O. Kapliński. Vol. 57. Warszawa. 415 p.
- Kapliński, O. 1997. Modelling of construction processes: A managerial approach. KILiW PAN, Inst. Podstawowych Problemów Techniki, in *Studia z Zakresu Inżynierii*. Ed. by O. Kapliński. Vol. 43. Warszawa. 175 p.
- Kapliński, O. 2000. Collaboration of two universities: Poznań University of Technology and Vilnius Gediminas Technical University, in *Technikos mokslų raida Lietuvoje*. Vilnius: Technika, 16–24.
- Kapliński, O. 2002a. E. K. Zavadsko ir A. V. Valiulio monografijos „A Time of Challenge and University's Growth“ recenzija, *Socialiniai mokslai [Social Sciences]* 2: 91.
- Kapliński, O. 2002b. Doktorat honoris causa Politechniki Poznańskiej dla profesora technologii i organizacji budownictwa – rektora wileńskiego Uniwersytetu Technicznego im. Giedymina – prof. Edmundasa Zavadskasa, *Przegląd Organizacji* 5: 36–37.
- Kapliński, O. 2008a. Planning instruments in construction management, *Technological and Economic Development of Economy* 14(4): 449–451. doi:10.3846/1392-8619.2008.14.449-451
- Kapliński, O. 2008b. Usefulness and credibility of scoring methods in construction industry, *Journal of Civil Engineering and Management* 14(1): 21–28. doi:10.3846/1392-3730.2008.14.21-28
- Kapliński, O. 2009a. Professor Edmundas K. Zavadskas: the research achievements and transborder cooperation, *Archives of Civil Engineering* 55(3): 287–300.
- Kapliński, O. 2009b. Problems of the information technologies use in Polish construction sector: state of the art, *Archives of Civil Engineering* 55(2): 173–198.
- Kapliński, O. 2009c. Sapere Aude: Professor Edmundas Kazimieras Zavadskas, *Inzinerine Ekonomika – Engineering Economics* 5: 113–119.
- Kapliński, O.; Meszek, W. 1987. Stabil'nost' urovnja garmonizacii stroitel'nykh potokov, in *Ekonomija material'nykh i eniergeticeskich resursov v stroitel'stve*. Vilnius: VISI, 84–89.
- Kapliński, O.; Peldschus, F.; Meszek, W. 1990. Zastosowanie teorii gier w przygotowaniu produkcji budowlanej, *Budownictwo Łądowe* 34: 181–190.
- Kapliński, O.; Thiel, T.; Zavadskas, E. 1987. Zastosowanie metody entropii w przedmiotach z technologii, organizacji i ekonomiki budownictwa, in *Mater. konfer. nauk. Jednostek Jednoimiennych Technol. i Organiz. Budown. nt. Aktualne problemy naukowo-badawcze i dydaktyczne technologii i organizacji budownictwa*. Zielona Góra: WSI, 89–98.

- Kapliński, O.; Zavadskas, E. 1997. Expert systems for construction processes, *Statyba* [Journal of Civil Engineering and Management] 4(12): 49–61.
- Kapliński, O.; Zavadskas, E. K.; Peldschus, F.; Kaklauskas, A. 2004. Problems and evolving trends of construction colloquia on decision making and operational research, *Foundations of Civil and Environmental Engineering* 5: 83–90.
- Kapliński, O.; Zavadskas, E. K. 2002. An overview of problems related to the research in construction engineering, management and economics in Poland, *Journal of Civil Engineering and Management* 8(4): 231–239.
- Modern foray in Lithuania. 2001. *Głos Politechniki* 10: 14–15.
- Pasławski, J. 2009. *Elastyczność w Zarządzaniu Realizacją Procesów Budowlanych*. Poznań: Wydawnictwo Politechniki Poznańskiej. 214 p.
- Peldschus, F. 2009. 29 years of successful scientific co-operation, in *Proc. 12th German–Lithuanian–Polish Colloquium on Sustainable Development in Civil Engineering and Multi-Attribute Decision Making*, May 23–25, 2009, Vilnius, Lithuania. Vilnius: Technika, 12–15.
- Peldschus, F.; Kapliński, O.; Zavadskas, E. K.; Kaklauskas, A. 2006. Historie und Trends des Kolloquiums, *Technological and Economic Development of Economy* 12(3): 227–235.
- Peldschus, F.; Zavadskas, E. K. 1997. *Matriciniai lošimai statybos technologijoje ir vadyboje* [Matrix games in building technology and management]. Vilnius: Technika.
- Polish scientists in Vilnius. 2001. *PION* 2(4): 24.
- Rakowski, J.; Kapliński, O. 2004. Preface, *Foundations of Civil and Environmental Engineering* 5: 5.
- Sakalauskas, L.; Zavadskas, E. K. 2009. Optimization and Intelligent decisions, *Technological and Economic Development of Economy* 15(2): 189–196. doi:10.3846/1392-8619.2009.15.189-196
- The jubilee of the brother university. 2001. *PION* 1(4): 28.
- The jubilee in Vilnius. 2009. *Głos Politechniki* 6: 24.
- Tradition and renown: trans-border co-operation. 2007. *Głos Politechniki* 9: 16.
- Ustinovich, L.; Kochin, D. 2004. Verbal decision analysis methods for determining the efficiency of investments in construction, *Foundations of Civil and Environmental Engineering* (5): 35–46.
- Ustinovichius, L.; Zavadskas, E. K.; Migilinskas, D.; Malewska, A.; Nowak, P.; Minasowicz, A. 2006. Verbal analysis of risk elements in construction contracts, *Lecture Notes in Computer Science* 4101: 295–302. doi:10.1007/11863649\_36
- Ustinovičius, L. 2003. *Decision-support System for Determining the Efficiency of Investments in Construction*: Summary of the research report presented for habilitation. Vilnius: Technika. 68 p.
- Vilutiene, T. (Ed.). 2009. *Proc. 12th German-Lithuanian-Polish Colloquium on Sustainable Development in Civil Engineering and Multi-Attribute Decision Making*, May 23–25, Vilnius. 62 p.
- Viteikienė, M.; Zavadskas, E. K. 2007. Evaluating the sustainability of Vilnius city residential areas, *Journal of Civil Engineering and Management* 13(2): 149–155.
- Wagner, Ch.; Zavadskas, E.; Rupprecht, L. 1985. Ergebnisse der Zusammenarbeit der Wissenschaftsbereiche Technologie der HAB und des VISI, *Wissenschaftliche Zeitschrift der HAB Weimar*, 3B: 91–93.
- Zavadskas, E. K. 2000. *Mehrkriterielle Entscheidungen im Bauwesen*, Vilnius: Technika.
- Zavadskas, E. K.; Kaklauskas, A. 2007a. *Mehrzielselektion für Entscheidungen im Bauwesen*, Stuttgart: Fraunhofer IRB Verlag.
- Zavadskas, E.; Kaklauskas, A. 1991. *Automated Multivariant Design of Buildings, Multi-purpose Comprehensive Evaluation and Selection of the Most Efficient Versions*. Aalborg: Aalborg Universities center.
- Zavadskas, E.; Kaklauskas, A.; Bejder, E. 1992. *Multiple Criteria Analysis of Projects*. Aalborg: Aalborg Universities Center.

- Zavadskas, E.; Kapliński, O.; Kaklauskas, A.; Brzezinski, J. 1995. *Expert Systems in Construction Industry. Trends, Potential and Applications*. Vilnius: Technika.
- Zavadskas, E.; Peldschus, F.; Kaklauskas, A. 1994. *Multiple Criteria Evaluation of Projects in Construction*. Vilnius: Technika.
- Zavadskas, E. K. 2000. Sapere aude, *Lithuania* 3/4: 11–15.
- Zavadskas, E. K. 2008a. Beginning the fifth decade of development, *Journal of Civil Engineering and Management* 14(4): 213–215. doi:10.3846/1392-3730.2008.14.19
- Zavadskas, E. K. 2008b. History and evolving trends of construction colloquia on sustainability and operational research, *Technological and Economic Development of Economy* 14(4): 578–592. doi:10.3846/1392-8619.2008.14.578-592
- Zavadskas, E. K. 2008c. Book review. Methods and models of research in construction projects engineering, *Journal of Business Economics and Management* 9(3): 240–243. doi:10.3846/1611-1699.2008.9.240-243
- Zavadskas, E. K.; Kaklauskas, A. 2001. History and trends of development of colloquy, *Statyba* [Journal of Civil Engineering and Management] 8(4): 265–275.
- Zavadskas, E. K.; Kaklauskas, A. 2007b. Normalization in decision-making methods, *International Journal of Management and Decision-Making* 8(5/6): 441–444.
- Zavadskas, E. K.; Kaklauskas, A. 2008. Special issue on external and internal housing environments: technological and facilities approach, *International Journal of Environment and Pollution* 35(2/3/4): 153–157.
- Zavadskas, E. K.; Kaklauskas, A.; Kaklauskienė, J.; Trinkunas, V.; Krutinis, M. 2004a. Web-based multiple criteria analysis of ethical and trust problems, *Foundations of Civil and Environmental Engineering* 5: 57–72.
- Zavadskas, E. K.; Kaklauskas, A.; Peldschus, F.; Turskis, Z. 2007. Multi-attribute assessment of road design solutions by using the COPRAS Method, *The Baltic Journal of Road and Bridge Engineering* 2(4): 195–203.
- Zavadskas, E. K.; Kaklauskas, A.; Trinkunas, V.; Trinkuniene, E. 2004b. Innovations in construction e-business systems: improving materials selection, *Foundations of Civil and Environmental Engineering* 5: 47–56.
- Zavadskas, E. K.; Peldschus, F.; Ustinovichius, L. 2003. Development of software for multiple criteria evaluation, *Informatika* 14(2): 259–272.
- Завадскас, Э. 1991. *Системотехническая оценка технологических решений* [System of estimation of technological solutions in building construction]. Ленинград: Стройиздат.

## TARPTAUTINIO LIETUVOS, VOKIETIJOS IR LENKIJOS BENDRADARBIAVIMO STATYBOS VADYBOS SRITYJE APŽVALGA

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**Santrauka.** Straipsnyje apžvelgiama ir analizuojama tarptautinių Lietuvos, Vokietijos ir Lenkijos koliokviumų, skirtų daugiakriterių sprendimo metodų kūrimui, tobulinimui ir taikymui, 30 metų patirtis.

**Reikšminiai žodžiai.** Statybos vadyba, tarptautinis bendradarbiavimas, daugiakriteris metodas, operaciniai tyrimai/skaičiavimai.

**Olegas KAPLINSKIS.** Poznanės technologijos universiteto profesorius, Statybos inžinerijos ir vadybos katedros vedėjas, Lenkijos mokslų akademijos Statybos komiteto narys, šio komiteto inžinerinių konstrukcijų projektų sekcijos pirmininkas. Mokslinių interesų sritys: statybos procesų organizavimas ir modeliavimas, sprendinių priėmimo teorija.

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