

The Problems of Quantitative Evaluation of Socio-Economic Systems' Development: Review

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crossref <http://dx.doi.org/10.5755/j01.ee.22.4.710>

The economic development of socio-economic systems (SES) largely depends on our understanding of their nature and formation mechanisms. Quantitative evaluation of the state of the systems is also an important problem because the effective management ensuring their effective performance strongly depends on it.

Quantitative evaluation of socio-economic systems may be performed by using multicriteria evaluation methods. These methods allow us to generate an integrated criterion reflecting various SES aspects observed in the reality.

Given the methods of quantitative SES evaluation, we can solve such important problems associated with the economic development of a country as the determination of enterprise development strategy, the formation of flexible enterprise organizational structures, etc.

Keywords: *socio-economic systems, MCDM, cooperation of enterprises, market concentration, diversification of enterprise activities, organization theory.*

Introduction

The world around us is getting more and more complicated, while the amount of information we have to handle is growing fast. In this environment, proper decision making often becomes a problem. Therefore, various researchers and practitioners are searching for the ways of simplifying the reality in their descriptions and to alleviate the problems of decision making (Ginevicius, 2009a). The solution was offered by the systems theory allowing complicated objects, phenomena and processes to be considered from various perspectives as systems. This implies that their interrelationships should be analysed. The fundamental works describing further development of the systems theory were published by Bertalanffy (1973) and Rapoport (1978). A description of further development of the systems theory and the comparative analysis of some new works on this topic were presented by Mulej 2007, Bailey 2006, Troncale 2006, Samuelson 2006, Schwaninger 2007, Mlakar & Mulej 2008. A consistent analysis of the transition from post-socialism to capitalism was made by Martin 2008, Melnikas (2008, 2010), Brauers et. al. (2007, 2010), Brauers and Zavadskas (2006, 2010), Balezentis et. al. (2010). Though the investigations of this kind are made in various scientific fields and areas of practical application, there is still a lack of publicly

accepted methods and means of the analysis of the considered problems. This is confirmed by the fact that new definitions of a 'system' are still offered and their comparative analysis is made. Therefore, Romualdas Ginevicius made an effort to carry out a more comprehensive analysis of the systems, their origin and nature. He offered a new, universal definition of the system and described a mechanism of its formation. He also suggested a new approach to tackling the structure of the system and provided its definition (Ginevicius 2009). We live in the world of socio-economic systems (SES). People come across them in real life as often as across engineering systems. Socioeconomics or socio-economics or social economics is an umbrella form with different usages. "Social Economics" may refer broadly to the "use of economics in the study of society" (Entwell et. al. 1989). The founders of social economics were Cassel 1932, Weber 1978, Wieser 1928. Lutz also offered a definition of "Social economics" in 2009. Orcutt 1957, Pettman 1977, Backer and Murphy 2001 made comprehensive surveys of social-economic systems. The main principles of the theory and practice of social economics are being more widely used not only in the field of economics (Yay & Tastan, 2010; Karazijene, 2009; Etzioni et. al., 2010; Delavande et. al., 2011; Zabinski, 2010; Martinkus & Lukasevicius, 2008; Grundey, 2008; Zvirblis and Buracas 2010), but in management (Chen, 2008; Valackiene, 2009; Ciegis et. al., 2009 a, b; Turskis et. al. 2009; Breslin, 2008), urban regeneration economics (Riberio, 2008), power engineering (Supriyasilp et. al., 2009), structural safety (Hartford, 2009), transport engineering (Bazaras & Miceviciene 2010, Kitamura et. al., 2008) and other areas as well (Acar & Sakici, 2008; Ejdays & Matuszak-Fleiszman, 2010; Roggeri et. al., 2010). According to its concept, SES refers to the higher level systems because a socio-economic system is a social system in which an engineering system is integrated. The effective management of such complicated systems, aimed at their sustainable development, requires primarily quantitative evaluation of their performance. Prof. Romualdas Ginevicius (Figure 1) was the first to undertake the research into the problems associated with quantitative evaluation of SES, based on the experience gained in complex quantitative evaluation of engineering systems.



Figure 1. Professor Romualdas Ginevicius

One of the exceptional authors, continuously working on the problems of socio-economics is Professor Romualdas Ginevicius. This article is an attempt to systemize his research and achievements in the field of socio-economics during the last decade.

Reviews of Professor Romualdas Ginevicius activities

Professor Romualdas Ginevicius is celebrating his 65th birthday this year. He was born on September 9, 1946 in Valkininkai (Varena distr.), Lithuania.

In 1969, he received a diploma in Engineering Economics in Construction from the Vilnius Branch of Kaunas Polytechnic Institute. In 1975, he was awarded a PhD in Engineering Economics by Vilnius Civil Engineering Institute (now Vilnius Gediminas Technical University) (Ginevicius, 1975).

In 1978, he became an Associated Professor at Vilnius Gediminas Technical University, in 1997 – obtained a Doctor of Science degree at Vilnius Gediminas Technical University (Ginevicius, 1997). Since 1999 till now he is a professor of Vilnius Gediminas Technical University.

Professor Romualdas Ginevicius is the chair of the Department of Economy and Management of Enterprises at the Faculty of Business Management and Rector (since 2002) of Vilnius Gediminas Technical University.

Professor is a president of Lithuanian Universities' Rectors (since 2006) and a member of the working group "Commercialization of sports" of the European Sport Conference (1993-1998). He is also an Honorary Doctor of Belorussian State Technological University, Tbilisi David Agmashenebeli Technical University, Karaganda State Industrial University, Kiev National Aviation University, Georgian Technical University and an academician of International Academy of Information, Russian Engineering and Georgian Engineering Academy.

Professor Romualdas Ginevicius is the editor and member of the editorial board of the following journals:

- Journal of Business Economics and Management, *editor in chief* (ISSN1439-0833)
- Business: Theory and Practice, *editor in chief* (ISSN 1648-0627)

- Evolution of Science and Technology, *editor in chief* (ISSN 2029-2430)
- Journal of Civil Engineering and Management, *Member of the Editorial Board* (ISSN 1392-3730)
- Technological and Economic Development of Economy, *Member of the Editorial Board*, (ISSN 2029-4913)
- Ekonomska Istraživanja – Economic research , *Member of the Editorial Board* (ISSN 2217-2386)
- Panoeconomicus, *Member of the Editorial Board* (ISSN 2217-2386)
- International Journal of Strategic Property Management, *Member of the Editorial Board* (ISSN 1648-715X)
- Public Administration, *Member of the Editorial Board* (ISSN 1648-4541)

Professor Romualdas Ginevicius was the member of organizing and scientific committees of numerous international conferences. Professor Romualdas Ginevicius is also one of the organizers and active participants of the Colloquiums in the German–Lithuanian–Polish Scientific Triangle. The initiating members of the first colloquium held in 1986 were Prof. K. Fiedler (Leipzig Higher Technical School), Dr F. Peldschus (Leipzig Higher Technical School) and Dr E. K. Zavadskas (Vilnius Civil Engineering Institute). The second colloquium was held in 1989, and a representative from Poland Prof. O. Kaplinski was invited. In 1990, Romualdas Ginevicius joined their activities.

During thirty years of scientific cooperation of three academic centres, i.e. Leipzig University of Applied Sciences, Vilnius Gediminas Technical University and Poznan University of Technology, the active collaboration has been supported due to the efforts of the main initiators. Research topics of the Colloquia covered the important fields of the research associated with the systems theory and social economics:

1. Operational Research: operations research theory, MCDM, MADM methods, statistics, optimization, strategies, games theory, intelligent support systems, etc.;
2. Civil Engineering: building life-cycle, urban development, construction and management, maintenance, various approaches to construction problems, assessment of effectiveness and automation in construction;
3. Sustainable Development: developing of the alternative construction processes, economic and other aspects, sustainable development challenges for business and management at construction enterprises, political influence dimensions of sustainability, technological changes, innovation and sustainability, sustainable building design and environmental impact.

Five of the above-mentioned colloquia were organized in Germany, four were held in Lithuania and three – in Poland. Every colloquium (beginning from the first one held in 1986 and to the last one) made a considerable contribution to the publication of the research papers and books, the development of further academic research, preparation of doctoral dissertations and gaining international recognition. The reports from the colloquia and academic achievement reviews made by various researchers were published (Peldschus, 2009; Kaplinski,

2010, 2008a,b; 2009a,b; Zavadskas & Kaklauskas, 2001; Kaplinski & Zavadskas, 2002; Kaplinski et. al., 2004; Kaklauskas et al., 2005; Zavadskas, 2008; Tamosaitiene et. al., 2010; Kaplinski & Tamosaitiene, 2010).

Professor Romualdas Ginevicius supervised nine PhD dissertations and successfully participated in the presentation of numerous PhD theses. He is the author of 3 monographs (Ginevicius 1995, 1996, 1998) and co-author of 14 monographs (Ginevicius et. al., 2005 c,d,e; 2006 c,d), and textbooks (Ginevicius & Aukscionas 2007; 2008; Ginevicius & Hink 2006; Ginevicius & Sudzius 2005, 2007; Ginevicius & Silickas 2008).

The above-mentioned achievements of Professor Romualdas Ginevicius are further discussed in this article.

Quantitative evaluation of socio-economic systems

In addition to the problem of quantitative evaluation of socio-economic systems, R. Ginevicius analysed the problems of cooperation of enterprises, market concentration, organizational theory, diversification of enterprise activities, etc. (Figure 2).

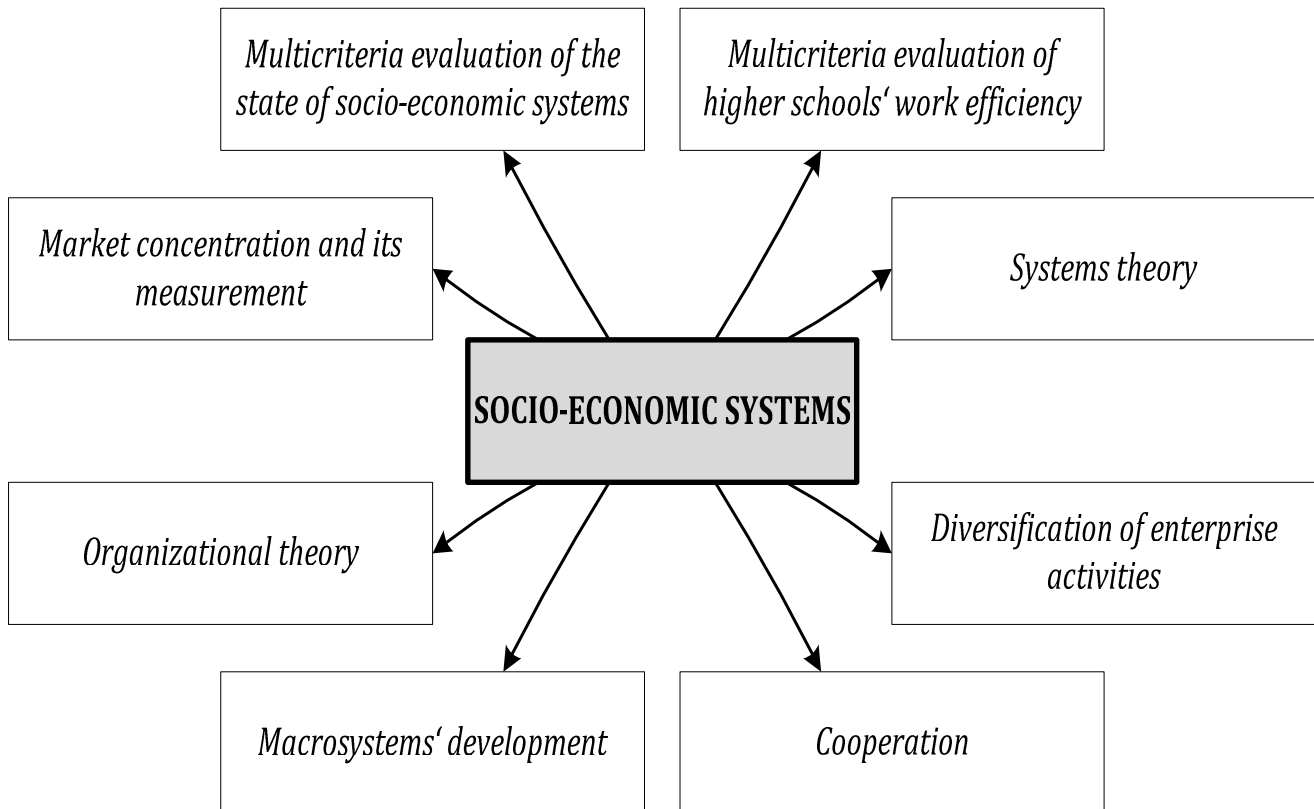


Figure 2. Research problems investigated by professor Romualdas Ginevicius

In Lithuania, multicriteria methods have been developed and used for evaluating the performance of socio-economic systems and for solving the problems associated with engineering systems (Ginevicius & Podvezko 2006c, 2007, 2008; Ginevicius & Ginevicius, 2008; Ginevicius et. al., 2006a, 2007e, 2008a,c; Ginevicius & Zubrecovas, 2009; Kaklauskas et. al., 2006; Zavadskas et. al., 2004). The evaluation is performed in several steps. First, a set of evaluation criteria is defined and their values are normalized (Ginevicius & Cirba, 2005; Ginevicius, 2008), then, the weights of the criteria are determined and the criteria are combined into one integrated criterion (Ginevicius & Podvezko, 2008c). Romualdas Ginevicius made his contribution to the research of the considered problems at the particular stages. First, he offered some new methods, such as the use of mathematical statistics in developing a set of criteria for evaluating a research object (Ginevicius & Podvezko, 2005; Ginevicius, 2007a). Second, he suggested the way of arranging a large number

of evaluation criteria into the hierarchical structure (Ginevicius & Podvezko, 2003 a,b, 2004 a,b) and thereby to reduce the number of criteria which should be assigned the weights by experts (Ginevicius, 2003a, 2007 a,b). Third, Romualdas Ginevicius offered a new method of determining the criterion weight, allowing us to considerably increase the number of criteria whose weights should be determined (Ginevicius, 2006). Fourth, he suggested the way of applying the well-known methods of multicriteria evaluation to the analysis of a hierarchically structured system of criteria. Fifth, he suggested a graphical-analytic multicriteria evaluation method (Ginevicius & Podvezko, 2008).

Multicriteria evaluation methods were used for evaluating the efficiency of higher school performance. The following problems were solved: the quality of work of the teaching staff as well as the Master's degree courses were determined (Ginevicius et. al., 2003; Ginevicius & Gineviciene, 2009) and the quality of performance of

university departments (e.g. chairs, faculties, etc.) (Ginevicius et. al., 2004a) and the professional training as well as the quality of the work of research and academic institutions, etc. were assessed (Ginevicius et. al., 2007a; Ginevicius et. al., 2005a; Tvaronaviciene & Ginevicius, 2003; Ginevicius & Rimkus, 2007; Ginevicius, 2003a; Korsakiene et. al., 2006; Gineviciene et. al., 2006, 2007; Tvaronaviciene et. al., 2006).

The main factor determining enterprise survival under market conditions is the effective development strategy. This has been shown by a recent economic crisis. Enterprises, which could not develop such strategies, were bankrupted. This makes the research of R. Ginevicius into diversification of enterprise activities as one of the main strategies of its development, particularly important (Ginevicius, 1998; Ginevicius & Petraskevicius, 2008; Kutut & Ginevicius, 2005). He suggested a new criterion for the quantitative evaluation of enterprise diversification (Ginevicius, 2009c) and demonstrated by calculations that this criterion is more accurate than Herfindahl–Hirschman index, which is most widely used now (Ginevicius, 2009c; Ginevicius & Andriuskevicius, 2008; Ginevicius et. al., 2008d). Romualdas Ginevicius has been studying the problem of construction enterprise diversification and its effect on commercial-economic activities for several decades. He determined the importance and effectiveness of diversification, depending on the type of the market (Ginevicius & Rutkauskas, 2003).

Another enterprise development strategy is cooperation. It has been highly developed abroad. However, the works on this topic in Lithuania are scarce. Romualdas Ginevicius offered a way of quantitative evaluation of the extent of enterprise cooperation (Ginevicius, 2010; Stein & Ginevicius, 2010 a, b), which helped him to determine its effect on enterprise performance.

A state and its region may be viewed as a macrosystem. Quantitative evaluation of its economic and social development is of theoretical and practical value. This value allows us to rank state regions in the order of the degree of their development, which is the basis for reducing differentiation between the development of regions, and thereby the tension within the country. Romualdas Ginevicius used multicriteria evaluation methods for quantitative evaluation of social and economic development (Ginevicius & Tvaronaviciene, 2005; 2003 a,b,c; 2004 a, b; Ginevicius & Korsakiene, 2005; Ginevicius & Mikelis, 2002; Tvaronaviciene et. al., 2008) of particular states (Ginevicius et. al., 2006b; Ginevicius et. al., 2005b, 2007d; Ginevicius & Podvezko, 2004c; Ginevicius, 2004; Brauers et. al., 2010) and their regions (Ginevicius & Podvezko, 2006b, 2008 a,d, 2009; Brauers et. al., 2006, 2007; Brauers & Ginevicius, 2010, 2009).

One of the main factors determining enterprise competitiveness is its ability to adapt to ever changing market conditions. Therefore, R. Ginevicius extended the research to include situational analysis and the formation of organizational management structures at construction enterprises. The main idea of the research is that the external structure of an organization should proceed from the market requirements. Only in this case, it can adapt to

them (Ginevicius & Podvezko, 2004a; Sturm & Ginevicius, 2004; Ginevicius & Gudaciauskas, 2004; Ginevicius & Andruskevicius, 2004; Ginevicius, 2004b; Ginevicius et. al., 2002, 2004b; Ginevicius & Podvezko, 2006a, 2008; Ginevicius et. al., 2005d,e,f, 2007 c,f, 2008 b,e). For this purpose, he offered a set of criteria for describing enterprise organizational management structure. He also formalized them and used in calculations (Ginevicius & Bruzge, 2008; Ginevicius & Podvezko, 2008; Ginevicius, 1997; Ginevicius & Korsakiene, 2005 a; Ginevicius & Stankeviciene, 2008).

The economic development of a country largely depends on the state of the markets, i.e. on the level of their concentration and liberalization. Therefore, Romualdas Ginevicius performed a comprehensive analysis of market concentration, using quantitative evaluation methods. He also suggested the indicators of concentration and performed the calculations based on them. This allowed him to determine the effect of market concentration both on enterprises and their performance (Ginevicius & Krivka, 2010; Ginevicius et. al., 2010 a,b, 2009, 2008 a,b, 2006, 2005c; Ginevicius & Krivka, 2009 a,b, 2008 a,b; Rutkauskas et. al., 2008; Ginevicius & Cirba, 2007, 2009; Rutkauskas et. al., 2008; Ustinovicius et. al., 2006; Ginevicius & Tvaronaviciene, 2003b).

Conclusions

According to the area of research, the investigations performed by R. Ginevicius may be subdivided into four main groups as follows: systems theory, organizational theory, enterprise development strategies and market concentration.

The main results obtained in the first research area include: a description and thorough analysis of the mechanism of systems formation and the suggestion of a universal system definition; a description of the mechanism of socio-economic system formation and the suggestion of a formalization model allowing for quantitative evaluation of the state of these systems.

The main results obtained in the second research area include: the suggestion of the methods of a thorough analysis and formation of the organizational management structures of construction enterprises, allowing for the formation of flexible organizations structures easily adaptable to ever changing internal conditions.

The main results obtained in the third research area include: a thorough analysis of the problem of enterprise activity diversification, the suggestion of a more accurate indicator of diversification level (compared to the currently used ones), the determination of the dependence of a diversification effect produced on enterprise performance on the market state; the selection of the indicator of the cooperation level of enterprises and its use for calculating the cooperation effect on enterprise commercial activities.

The main achievements in the fourth research area include: the suggestion of the criterion, evaluating the concentration of the markets and its role in the calculation of the cooperation effect on enterprise performance.

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Socioekonominių sistemų plėtros kiekybinio įvertinimo problemos: apžvalga

Santrauka

Norint valdyti reiškinius, procesus, galų gale mus supantį pasaulį, reikia giliau skverbtis į jų prigimtį, t. y. pažinti vidinę sandarą, tarpusavio sąveiką ir pan. Padėtį komplikuoja tai, kad šis pasaulis tampa vis sudėtingomis, dinamiškesnis, informacijų centrai taip pat tampa vis intensyvesni. Žmogus negali suvokti viso jį supančios tikrovės kompleksiško, todėl ieško būdų, kaip ją adekvačiai supaprastinti. Išeitis – sistemų teorija, kurioje struktūrizuojami sudėtingi dariniai, reiškiniai ir pan. ir kartu jie nagrinėjami kompleksiška, sistemaiška, t. y. įvertinami jų sudėtinų dalių tarpusavio ryšiai.

Sistemų teorijos požiūriu visus mus supančius reiškinius galime traktuoti kaip sistemas. Iš esmės tai socioekonominės sistemos (SES), kadangi techninės yra tik sudėtinė jų dalis.

Siekiant kryptingai valdyti SES plėtrą, siekti, kad ši plėtra būtų darni, šias sistemas reikia ne tik pažinti, bet ir kiekybiškai įvertinti jų būklę. Ne veltui sakoma, kad valdyti galima tik tai, ką galima įvertinti. SES tikrovėje reiškiasi daugeliu aspektų. Siekiant kiekybiškai įvertinti jų būklę, šiuos aspektus reikia keisti į kriterijus, rodiklius. Kiekybinio įvertinimo problema apunkina tai, kad šie rodikliai gali būti išreiškiami skirtingomis dimensijomis ir kisti priešingomis kryptimis, t. y. padidėjus vienu rodikliu reikšmės SES būklė gali pagerėti, kitų – blogėti. Tokioje situacijoje sistemos būklei kiekybiškai vertinti tinka daugiakriteriniai metodai, leidžiantys visus rodiklius paversti bedimensiais, kintančiais ta pačia kryptimi ir sujungti juos į vieną apibendrinantį dydį, kiekybiškai atspindintį SES būklę nagrinėjamo laiko momentu.

Socioekonominių sistemų plėtrai reikia įvairaus pobūdžio, visų pirma piniginių, sąnaudų. Plėtros efektyvumui nustatyti reikia įvertinti SES būklę atskaitinio laikotarpio pradžioje ir pabaigoje. Todėl lyginamos plėtros išlaidos su pasiekto jos mastu ir taip nustatomas sistemos valdymo efektyvumas.

Išsprendus įvairaus pobūdžio SES daugiakriterio vertinimo uždavinius (regionų ekonominės ir socialinės plėtros, aukštojo mokslo ir švietimo institucijų, jų padalinių darbo kokybės, įmonių strateginio potencialo, finansinės veiklos ir pan. įvertinimas) galima tvirtinti, kad SES kiekybinis daugiakriteris vertinimas yra universalus metodas, padedantis efektyviai valdyti kryptingą jų plėtrą.

Rinkos sąlygomis aktualu nagrinėti ne tik socioekonominių sistemų būklės kiekybinio vertinimo problemas, bet ir jų efektyvaus funkcionavimo sąlygas. Tokių tyrimų pagrindas yra organizacijų teorija, kurioje pateiktos efektyvių organizacinių valdymo struktūrų formavimo sąlygos ir galimybės.

Prie pagrindinių įmonių, kurios priklauso socioekonominėms sistemoms, efektyvaus funkcionavimo sąlygų, priskiriamos jų veiklos profilio išplėtimo, arba veiklos diversifikavimo, kooperavimosi, rinkų koncentracijos ir kt. problemos.

Įmonės veiklos diversifikacija yra viena iš pagrindinių plėtros strategijų, padedančių išgyventi rinkos nuosmukio sąlygomis. Tai, galima sakyti, parodė masinis statybos įmonių bankrotas, sukeltas ekonominės krizės. Analizė rodo, kad išliko tos įmonės, kurios turėjo daugiau nepriklausomų įplaukų šaltinių.

Kooperaciją taip pat galima traktuoti kaip plėtros strategiją, padedančią smulkioms ir vidutinėms įmonėms išlikti didelės konkurencijos sąlygomis. Tiek diversifikacijos, tiek kooperacijos atveju svarbu adekvačiai įvertinti esamą padėtį tam, kad būtų galima kryptingai valdyti šiuos procesus.

Įmonės komercinės veiklos rezultatai priklauso ne tik nuo jos pačios pastangų, bet ir nuo situacijos rinkose, kuriose ji veikia. Vienas pagrindinių šios situacijos požymių – rinkų koncentracijos, atspindinčios konkurencijos galimybes, laipsnis. Siekiant iširti rinkų koncentracijos poveikį įmonių komercinės veiklos rezultatams, jas reikia įvertinti kiekybiškai.

Taigi siekiant giliau pažinti SES, kurių pasaulyje mes gyvename, kryptingai keisti jų būseną, visų pirma reikia mokėti ją įvertinti kiekybiškai dabartiniu laiko momentu. Atlikti tyrimai rodo, kad tai sėkmingai galima atlikti.

Raktažodžiai: *socioekonominės sistemos (SES), įmonių kooperacija, rinkos koncentracija, įmonių veiklos diversifikacija, organizacijų teorija, daugiakriteriniai sprendimų metodai.*

The article has been reviewed.

Received in May, 2011; accepted in October, 2011.