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THE IMPACT OF ISO 9001 ON FINANCIAL LIQUIDITY OF SMES OPERATING IN THE RENEWABLE ENERGY SECTOR IN THE PODKARPACKIE PROVINCE

The years 2020–2022 are a time of crises caused by pandemics and the war in Ukraine. In order to survive on the market, enterprises have been forced to introduce appropriate mechanisms that would allow them to run their business without disruption. Among the many tools or strategies that have been tested by various types and types of enterprises, quality management systems play an important role. They make it possible to improve the efficiency of managing the company's assets, retain contractors or lead to an improvement in financial results. Through the use of appropriate quality management systems, there is an improvement in the areas of receivables from customers and inventories. Mistakes made in inventory management create unnecessary costs and sometimes even stop sales. In turn, improper management of receivables reduces the financial liquidity of the company. Therefore, it is particularly important to introduce appropriate tools to improve the quality of management in these two areas. The aim of the article is to analyze and evaluate the functioning of enterprises during the crisis caused by the Covid pandemic. The analysis covered enterprises using quality management systems and entities that do not use such systems. The analysis showed that entities using quality management systems obtained better results regarding financial security.

Keywords: financial liquidity, ISO, energy, SMEs.

1. INTRODUCTION

In general, until 2020, the biggest problem of enterprises operating in the Polish market was the fight for customers and the fight against competition. The years 2020-2022 are a time of crises caused by the Covid-19 pandemic and the war in Ukraine. These crises directly affected basically everyone around the world, all companies regardless of a size, an industry, or a continent where a given entity operated. Their effect wahas been the deterioration of the financial situation of enterprises. In fact, only a few industries in times

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of crisis improve their financial results, these are companies operating in the medical industry, e.g. producing vaccines or protective clothing, companies operating in the defense industry and units operating in the construction industry.

In Poland, the construction industry operated with small restrictions during the pandemic. These companies were not closed down and the society that was closed directed its free time towards investments, renovations, which drove the construction industry and units trading in building materials. In addition, as a result of the interruption of many logistics routes caused by the pandemic, there were shortages in the supply of basic materials or goods. This caused a huge increase in prices.

In 2022, Russia's armed attack on Ukraine caused a series of turbulences in the energy markets, which again pushed prices up. This situation resulted in a decrease in demand in various industries, which was caused by high prices of materials, goods and a cautious policy of consumers.

However, in the case of the construction industry, there was no decrease in interest in products from this industry. At that time, the society began to look for safe investment solutions that would allow them to secure their financial resources. Therefore, investing in apartments gained great popularity, which drove the prices of apartments in the construction industry.

The time of crises have changed the attitude of managers and many companies began to abandon highly risky strategies based on generating huge profits for safe, conservative strategies. In the event of such high uncertainty in the markets, business managers have focused a lot of attention on current assets. Managing them is currently the key to the survival of enterprises in the market. A properly selected asset management policy allows building a strong market position, as well as achieve optimal profits and maintain financial security.

The crises of recent years have taught the management that it is still necessary to control wealth management to a greater extent, and to be prepared for various types of extraordinary phenomena. It is worth introducing new tools into the enterprise management strategy that will allow building in a sense, an „anti-crisis shield" that will protect enterprises against financial problems. Such the „shield" should allow the development of certain financial resources that will enable enterprises to function without obstacles for a short period of time. Such a strategy should also limit the appearance of losses, e.g. related to the lack of deliveries or lack of receipts of receivables from recipients. One of such tools are quality management systems, whose introduction allows increasing the efficiency of company management.

2. LITERATURE REVIEW

Quality management is an important element of the enterprise management strategy aimed at optimizing the level of assets. It consists in ensuring a high level of quality for each product, service, process and organization as a whole. (Bag et al., 2016; Tay et al., 2018; Tuczek et al., 2018; Siwiec, Pacana, 2021; Li et al., 2019; Sofina, 2020; Alkafaji et al., 2023) Quality management is a process that can be reduced to four basic aspects: planning, quality assurance, controlling, and continuous improvement. Currently, bearing in mind the development of products and services, when choosing a given product, customers and contractors often take into account the quality, regardless of whether the product is a basic good, or whether it is considered a premium product. When deciding on a cheap product or service, it is expected to meet the minimum requirements that are

currently standard. Apart from counterfeit products that do not have quality features, such as certification symbols required for sale in a given country, such products are often unreliable or dangerous to health and life. Even the cheapest products that are in official circulation must have a number of standards and certificates.

Therefore, quality management is present in every industry, and most often in production or service companies (Agmon et al., 2003; Kim, Chang, 1995, Prajogo, Brown, 2020). Research in recent years has indicated an increase in interest in implementing ISO systems in commercial enterprises (Zimon, Zimon, 2022; Okey, Semiz 2010). In many cases, when the prices of products or services offered by competing companies are at a similar level, contractors pay attention to quality when making a purchase (Walasek, 2016; Walasek, 2019; Zimon, Zimon 2022; Chiarini et al., 2020). In the literature, statements are slowly appearing that quality management may in the future become a „weapon" in the fight against competition for customers (Bashan, Armon, 2019; G. Zimon, D. Zimon, 2019, Hsu et al., 2022; Su et al., 2020), There are many studies where authors indicate that companies using various types of quality management systems achieve better financial results. Today, however, the results of financial liquidity are a more important item than profits in the area of corporate finance. Maintaining financial liquidity allows for the settlement of current short-term liabilities. It is a basic element of building financial safety (Zimon, 2019).

Studies conducted by many authors clearly indicate that the introduction of appropriate quality management systems, e.g. based on ISO 9001 standards, can improve the financial situation of enterprises. According to G. Zimon and D. Zimon (2022) it is the result of improving the efficiency of the use of current assets in enterprises, the introduction of supervision over documentation and its records, the involvement of the management in building a quality management system, systematizing resource management, establishing product implementation processes, making systematic measurements (customer satisfaction, processes) and control of commitments.

There are also studies that indicate that such systems are used not only by large enterprises, but also by enterprises belonging to the SMEs group.

3. RESULTS

The research was carried out on a group of construction companies operating in the renewable energy sector. These are commercial SMEs operating in the Podkarpackie Province in 2020–2021. These enterprises belong to the group of SMEs. They were divided into two groups: enterprises that apply ISO 9001 (12 enterprises) and those which don't apply ISO 9001 systems (24 enterprises).

Descriptive statistics

Tables 1 and 2 display the information related to the study variables that comprise the number of observations, mean, standard deviation, minimum, and maximum.

As shown in Table 1, the minimum mean with 0.55 is related to the variable of rosreturno, and the maximum mean (69.347) is for inventories. Besides, the variable of rosreturno (0.093) is the minimum standard deviation, and the ccc (39.270) is the maximum standard deviation. Among the variables, the minimum and maximum values belong to ccc (183) and operatonic (-11), respectively. Among the model variables, isocovid, ciovd, sizefirm, and firmswithiso have the same 0 and 1 qualitative natures. Information related to the variables is reported in Table 2.

Table 1. Descriptive statistics of quantitative variables

Symbol	Observations	Total mean	Standard deviation	Minimum	Maximum
rosreturnon	72	0.055	0.093	0	0.8
financiall	72	3.693	2.781	0.8	14.2
quick	72	1.915	1.488	0.2	6.1
receivable	72	57.027	19.476	11	98
inventories	72	69.347	20.828	26	127
operationc	72	126.5	23.489	68	183
liabillity	72	56.013	28.291	11	140
ccc	72	70.25	39.270	-11	150
total debtr	72	0.430	0.214	0.05	0.84
inventoryi	72	0.490	0.108	0.27	0.82
shareofrec	72	0.414	0.129	0.09	0.64
shareofsho	72	0.095	0.096	0	0.51

Resource: research findings.

Table 2. Descriptive statistics of qualitative variables

Symbol	Observations	Total mean	Standard deviation	0 frequency	1 frequency
firmswithiso	72	0.166	0.375	60	12
sizefirm	72	0.25	0.436	54	18
covid	72	0.5	0.503	36	36
isocovid	72	0.166	0.375	60	12

Resource: research findings.

3.1. Normality test of variables

In nonparametric statistics, one of the common methods for examining distribution is the Kolmogorov-Smirnov Test. Using the test, we can determine whether the population follows the desired distribution by a random sample of the statistical population. Moreover, using the test, we can assess co-distribution among two societies. The test is one of the methods for assessing co-distribution in two societies or examining the fitting of distribution, which is referred to as the goodness of fit test. The test was carried out without any presumptions to be placed in the group of nonparametric methods.

Assume that you have collected some data through a special condition from a physical examination. The entire set of data is called the control group. The test was carried out in different situations once more. We want to figure out whether changing the situation contributes to the yield results or not. Such a test is similar to experimental distribution comparison of two statistical populations, which can be assessed using the Kolmogorov--Smirnov Test.

The other method we can use, the Kolmogorov-Smirnov Test, is to compare statistical population distribution with a certain distribution called Goodness of Fit Test. Thus, we can employ the Kolmogorov–Smirnov Test if we collected the data obtained from a physical examination and want to compare the probability distribution of the obtained results with the distribution of, for example, the Empirical Cumulative Distribution

Function. Hence, the empirical distribution of a sample will be compared with the Empirical Cumulative Distribution. It is obvious that the empirical distribution of data is required for the Kolmogorov-Smirnov Test.

Table 3. Results of normality test of variables

Variable	Level	Variable	Level
rosreturno	1.000	*financiall*	0.998
receivable	0.289	*totaldebtr*	0.949
quick	0.847	*inventoryi*	0.562
invetories	0.611	*shareofrec*	0.622
operationc	0.134	*shareofsho*	0.535
liabillity	0.567	*ccc*	0.999
firmswithiso	1.000	*covid*	1.000
sizefirm	0.996		

Resource: research findings.

Given the results of the normality test, we can see that all variables have a normal distribution.

Pooled Test Results

To estimate the models, we should first analyse whether the data are pooled or panel using the F test. The null hypothesis in this test expresses that data are pooled, and hypothesis 1 declares that data are panel. In case after performing the F test, H0 is rejected, the question is that based on which models of fixed effects or random effects the model is analysable, which is determined by the Hausman test. Regarding the results of the pooled test reported in Table 4, the calculated F statistic for models 1, 2, and 3 is 1.01, 1.44, and 1.34, respectively and the null hypothesis concerning the integration of data is accepted for all three models.

Table 4. Pooled test results

	Calculated statistic	Probability level
Model 1	1.01	0.499
Model 2	1.44	0.147
Model 3	1.34	0.205

Resource: research findings.

The test examines the relationship between used variables in models two-by-two, the output of which is the above matrix. Since it assesses the correlation of each variable with itself, the diameter of the matrix is always 1, which is a sign of complete correlation. The closer the figures to one, the higher and more direct is the correlation and the closer to zero, there would be no correlation. Negative figures are indicative of the inverse correlation.

3.2. Models estimation and interpreting the results

According to the facts proposed in the theoretical section, the empirical model is assessed based on the integrated data.

The models are as follows:

Model 1

$$Profitability = \beta_0 + \beta_1 ISO_{it} + \beta_2 Receivables\ in\ days_{it} + \beta_3\ Invetories\ in\ days_{it} + \beta_4 Operation\ cycle_{it} + \beta_5 Liabillities\ in\ days_{it} + \beta_6 CCC_{it} + \beta_7 Debt\ Ratio_{it} + \beta_8 inventory\ in\ current\ assets_{it} + \beta_9 receivables\ in\ current_{it} + \beta_{10} short\ investments\ in\ current\ assets_{it} + \beta_{11} assetsSizeFirm_{it} + \varepsilon_{it}$$

Model 2

$$Financial\ liquidity = \beta_0 + \beta_1 ISO_{it} + \beta_2 Receivables\ in\ days_{it} + \beta_3\ Invetories\ in\ days_{it} + \beta_4 Operation\ cycle_{it} + \beta_5 Liabillities\ in\ days_{it} + \beta_6 CCC_{it} + \beta_7 Debt\ Ratio_{it} + \beta_8 inventory\ in\ current\ assets_{it} + \beta_9 receivables\ in\ current_{it} + \beta_{10} short\ investments\ in\ current\ assets_{it} + \beta_{11} assetsSizeFirm_{it} + \varepsilon_{it}$$

Model 3

$$liquidity\ management = \beta_0 + \beta_1 ISO * Covid_{it} + \beta_2 Receivables\ in\ days_{it} + \beta_3\ Invetories\ in\ days_{it} + \beta_4 Operation\ cycle_{it} + \beta_5 Liabillities\ in\ days_{it} + \beta_6 CCCC_{it} + \beta_7 Debt\ Ratio_{it} + \beta_8 inventory\ in\ current\ assets_{it} + \beta_9 receivables\ in\ current_{it} + \beta_{10} short\ investments\ in\ current\ assets_{it} + \beta_{11} assetsSizeFirm_{it} + \varepsilon_{it}$$

3.3. Model one estimation

Given the pooled test results, model 1 should be analysed using the pooled data. The normality of the disruptive component has also been assessed. According to the obtained results, the probability level for the test is 0.753, so the model 1 residuals enjoy normal distribution.

Heterogeneity variance of the disruptive component has also been assessed, and given the yield results in Table 5, Chi-Square statistics is 156.85 that is larger than the equal parameter in the table and the null hypothesis concerning the homogeneity of the variance is rejected at 99% level. Hence, the disruptive components of the variance model are heterogeneous.

Table 5. Results of heterogeneity variance test of the first model

Test	X^2 statistics	P-value
Breusch-Pagan	156.85	0.000

Note: the null hypothesis is homogeneity variance

Resource: research findings.

Due to the presence of heterogeneity variance in the model residuals, the model is estimated using the FGLS method, the results of which are reported in the following table.

Table 6. Results of the first model estimation using the FGLS method

Variable	Coefficient	Z statistic	P-value
firmswithiso	0.008	2.22	0.026
quick	-0.0008	-5.8	0.000
receivable	0.001	3.6	0.000
inventories	0.001	3.7	0.000
operation	-0.001	-3.3	0.000
liabillity	0.003	3.0	0.000
totaldebtr	0.008	-1.2	0.000
shareofrec	0.067	2.2	0.000
shareofsho	0.070	1.8	0.000
sizefirm	0.020	1.4	0.000
obs	72		
Log like	337.230		
Wald Test	4.65		0.000
Normality of Resid			0.753

Resource: research findings.

The coefficient of Firms with iso is 0.008; hence, by 1% increase of the variable of Firms with iso, the variable of Rosreturno at 95% of confidence level will increase by 0.008. The variables of Operation, Quick, Totaldebtr at 99% of confidence will be -0.008, -0.001, and -0.008, respectively and cause the variable of Rosreturno to decline. In contrast, the coefficient of variables of Receivable, Inventories, Liabilliti, Shareofrec, shareofsho, and Sizefirm at 99% of confidence level is equal to 0.001, 0.001, 0.000, 0.067, 0.070, 0.020, respectively and cause the increase of Rosreturno.

3.4. Model 2 estimation

Given the pooled test results, model 2 should be analysed using the pooled data. The normality of the disruptive component has also been assessed. According to the obtained results, the probability level for the test is 0.847, so the model 2 residuals enjoy normal distribution.

Heterogeneity variance of the disruptive component has also been assessed, and given the yield results in Table 7, Chi-Square statistics is 43.39 that is larger than the equal parameter in the table and the null hypothesis concerning the homogeneity of the variance is rejected at 99% level. Hence, the disruptive components of the variance model are heterogeneous.

Table 7. Results of heterogeneity variance test of the first model

Test	X^2 statistics	P-value
Breusch-Pagan	43.39	0.000

Note: the null hypothesis is homogeneity variance

Resource: research findings.

Table 8. Results of the second model estimation using the FGLS method

Variable	Coefficient	Z statistic	P-value
firmswithiso	0.145	2.2	0.000
quick	1.835	3.7	0.000
inventories	0.012	3.0	0.000
operation	0.330	2.4	0.000
Liabillity	-0.344	-2.5	0.000
ccc	-0.339	-2.6	0.000
totaldebtr	0.105	5.6	0.000
ynventoryi	0.454	6.5	0.000
shareofrec	0.889	1.4	0.000
shareofsho	0.693	1.2	0.000
sizefirm	-0.035	-5.4	0.000
cons	-0.009	-1.4	0.000
obs	72		
Log like	194.875		
Wald Test	8.57		0.000
Normality of Resid			0.847

Resource: research findings.

Due to heterogeneity variance in model residuals, the model is estimated using the FGLS method, the results of which are reported in the above table. Considering the following table, the coefficient of Firmswithiso is equal to 0.145. Hence, with a 1% increase in the variable of Firmswithiso, the variable of Financiall at 99% of confidence level will increase by 0.145. The coefficient of Liabilliti, Ccc, Sizefirm at 99% confidence level is equal to -0.334, -0.339, and -0.035, respectively, leading to a decline in the variable of Financiall. In contrast, the coefficient of variables of Quick, Inventories, Operation, Totaldebtr, Shareofrec, and Shareofsho at 99% of confidence level is equal to 1.835, 0.012, 0.330, 0.405, 0.889, and 0.693 that increase the Financiall.

3.5. Model 3 estimation

Given the pooled test results, model 3 should be analysed using the pooled data. The normality of the disruptive component has also been assessed. According to the obtained results, the probability level for the test is 0.926, so the model 3 residuals enjoy normal distribution.

Heterogeneity variance of the disruptive component has also been assessed, and given the yield results in Table 4–10, Chi-Square statistics is 44.13 that is larger than the equal parameter in the table and the null hypothesis concerning the homogeneity of the variance is rejected at 99% level. Hence, the disruptive components of the variance model are heterogeneous.

Table 9. Results of the heterogeneity variance test of the first model

Test	X^2 statistics	P-value
Breusch-Pagan	44.13	0.000

Note: the null hypothesis is homogeneity variance

Resource: research findings.

Due to the presence of heterogeneity variance in the model residuals, the model is estimated using the FGLS method, the results of which are reported in the following table.

Table 10. Results of the third model estimation using the FGLS method

Variable	Coefficient	Z statistic	P-value
isovovid	-0.068	-2.8	0.000
quick	1.76	4.9	0.000
receivable	-0.038	-5.0	0.000
operationc	0.314	3.5	0.000
liabillity	-0.293	-2.9	0.000
ccc	-0.291	-3.4	0.000
totaldebtr	-0.207	-2.4	0.000
inventoryi	0.214	1.4	0.000
shareofrec	4.031	3.3	0.000
shareofsho	1.07	2.1	0.000
sizefirm	0.121	5.8	0.000
cons	-1.840	1.3	0.000
obs	72		
Log like	178.071		
Wald Test	7.49		0.000
Normality of Resid			0.926

Resource: research findings.

The coefficient of Isovovid is -0.068. Hence, with a 1% increase in the variable of Isovovid, the financiall at 99 confidence level will decline by -0.068. The coefficient of variables of Receivable, Liabilliti, Ccc, Totaldebtr at 99 confidence level is -0.038, -0.293, -0.29, and -0.207, respectively, which lead to the decline of Financiall. In contrast, the coefficient of variables of Quick, Inventories, Operation, Inventoryi, Shareofrec, and Shareofsho at 99% of confidence level is 1.767, 0, 0.314, 0.214, 4.031, 1.07, and 0.121, respectively that lead to the decline of Financiall.

4. CONCLUSIONS AND DISCUSSION

The chapter was concerned about the statistical analysis for estimating the study model using multivariate regression, for which the Stata Software is used. The models were employed using the pooled method, and the hypotheses are confirmed. The summary of the obtained results is reported in the following Table 11.

Table 11. Results

Hypothesis	Significance level	Confirmed/rejected
It is assumed that companies using ISO have a higher one profitability than companies not using ISO	95%	Confirmed
It is assumed that companies using ISO have a higher one Financial liquidity from enterprises not using ISO	99%	Confirmed
Companies using ISO during the COVID period applied a safe, conservative liquidity management strategy	99%	Confirmed

When analyzing the conducted research, it can be concluded that the introduction of appropriate quality management systems brings benefits to enterprises. Enterprises that apply ISO 9001 obtained better financial results and a higher level of financial liquidity. This is confirmed in the study of other authors, which, however, did not cover times of crisis. (Su et al., 2009; Zimon et al., 2022; Omurgonulsen, 2009; Zimon, 2015, Zimon 2019, Siwiec, Pacana, 2021). This is related to the transition to conservative strategies in managing financial liquidity. This strategy is characterized by a high level of current assets. Therefore, in their case, it is very important to control resources, sources of funding and optimize their levels, which can be achieved thanks to the use of ISO 9001 standards. In times of crisis, this type of strategy seems to be the best. Although in many cases the managers of an enterprise, especially those belonging to SMEs, reject standard strategies and modify them. They use strategies appropriate for a given moment, day, they use strategies to survive the crisis.

Today, in times of high uncertainty, managers should more often use proven methods and tools to improve the financial security of units. Introducing quality management systems based on the principles of ISO 9001 in the analyzed entities, in addition to improving financial liquidity in the long term, should also boost the efficiency of the organization's use of current assets, which will certainly translate into better financial results. The next stage of the research will be to compare the results of enterprises in 2022, i.e. times related to the crisis caused by the war in Ukraine in the Podkarpackie Province, which directly borders the areas where the war is going on.

REFERENCES

Agmon, N., Kordova, S., Shoval, S. (2022). *Global Quality Management System (G-QMS) in Systems of Systems (SoS).* „Aspects of Definition, Structure and Model", Vol. 10. DOI: 10.3390/systems10040099.

Alkafaji, B.K.A., Dashtbayaz, M.L., Salehi, M. (2013). *The Impact of Blockchain on the Quality of Accounting Information: An Iraqi Case Study.* „Risks", 11. DOI: 10.3390/ risks11030058

Bag, S.N., Kumar, U.C., Pal, A.K. (2016). *Status and scope of the jute industry in India in comparison to other world producers*. *„*Fibres Text. East. Eur.", 24.

Bashan, A., Armon, B. (2019). *Quality management challenges in a dynamic reality of mergers, acquisitions and global expansion." International Journal Quality Reliab, Manag.",* Vol. 36.

Chiarini, A., Castellani, P., Rossato, C. (2020). *Factors for improving performance in ISO 9001 certified small- and medium-sized service enterprises. „*TQM J.", 32.

Glaser, B.G., Strauss, A.L. (2009). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Transaction Publishers: Piscataway, NJ, USA.

Hsu, C.-H., Yu, R.-Y., Chang, A.-Y., Liu, W.-L., Sun, A.-C. (2022). *Applying Integrated QFD-MCDM Approach to Strengthen Supply Chain Agility for Mitigating Sustainable Risks*. „Mathematics", 10. DOI: 10.3390/math10040552.

Kim, K.Y., Chang, D.R. (1995). *Global Quality Management: A Research Focus*. *„Decis. Sci.",* Vol. 26.

Li W., Pomegbe W., Dogbe C. (2019), *Employees' customer orientation and customer satisfaction in the public utility sector: The mediating role of service quality. „African Journal of Economic and Management Studies",* Vol. 10, No. 4. DOI: 10.1108/AJEMS-10-2018-0314.

Okay, S, Semiz, S. (2010), *The effects of ISO 9000 quality management system implementation in small and medium-sized textile enterprises: Turkish experience. „African Journal of Business Management",* 14(4).

Omurgonulsen, M. (2009). *A research on the measurement of quality costs in the Turkish foodmanufacturing industry. „Total Quality Management & Business Excellence"*, 20(5).

Prajogo, D., Brown, A. (2006), *Approaches to adopting quality in SMEs and the impact on quality management practices and performance*. *"Total Quality Management & Business Excellence",* 17(5).

Siwiec D., Pacana A. (2021), *Method of improve the level of product quality. „Production Engineering Archives"*, Vol. 27, No. 1. DOI: 10.30657/pea.2021.27.1

Sofiina, E. (2020). *Modern systemwide processes of quality management in agricultural tenure at the regional level*. „International Journal for Quality Research", 14.

Su, H.C., Kao, T.W.D., Linderman, K. (2020). *Where in the supply chain network does ISO 9001 improve firm productivity? „*Eur. J. Oper. Res.", 283.

Su, Q., Shi, J., Lai, S. (2009). *Research on the trade-off relationship within quality costs: A case study*. *„Total Quality Management & Business Excellence"*, 20(12).

Tay, H.H., Ariffin, M., Sharaai, A.H. (2018). *Key factors for adoption of ISO 14001 by the manufacturing industry: A review paper. „*Int. J. Product. Qual. Manag.", 25.

Tuczek, F., Castka, P., Wakolbinger, T. (2018). *A review of management theories in the context of quality, environmental and social responsibility voluntary standards*. „J. Clean. Prod.", 176.

Walasek, R. (2016). *Supply chain optimization and competitiveness of an enterprise-results of the study. „Research in Logistics & Production"*, 6, Poznań.

—— (2019). *Post-transactional customer service in a company's competitive approach – results of the study. „Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu"*, 63(5).

Zimon, D., Zimon, G. (2019). The *Impact of Implementation of Standardized Quality Management Systems on Management of Liabilities in Group Purchasing Organizations*. *„Quality Innovation Prosperity"*, 23(1). DOI: 10.12776/qip.v23i1.1210.

—— (2022). *Quality Management Systems and Working Capital SMEs in GPO – A Case of Poland. „*Adm. Sci.", 10. DOI: 10.3390/admsci10040076.

Zimon, G. (2019). *The impact of quality management on inventories In commercial enterprises operating within group purchasing organizations*. *„Problems and Perspectives in Management"*, 17(3).

Zimon, D., Madzík, P., Dellana, S., Sroufe, R., Ikram, M., Lysenko-Ryba, K. (2022), *Environmental effects of ISO 9001 and ISO 14001 management system implementation in SSCM. „The TQM Journal"*, Vol. 34 No. 3. DOI: 10.1108/TQM-01-2021-0025.

Zimon, D. (2015). I*mpact of the implementation of quality management system on operating cost for small and medium-sized business organizations affiliated to a purchasing group*. *„International Journal for Quality Research"*, 9(4).