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VERIFYING CAPITAL ASSET PRICING MODEL IN GREEK CAPITAL MARKET

Abstract

To begin, the article verifying of Capital Asset Pricing Model (CAPM) would be appropriate for capital asset valuation on the Greek capital market. We examined 32 companies listed on the Athens Stock Exchange (ASE) on a weekly basis for a period from June 2009 to December 2013 under this model. The CAPM model is tested by performing two-pass characteristic regression analyses. The first-pass characteristic line regression was used to estimate stocks of beta. Hence, the second-pass characteristic line regression was taken to analyze the intercept and the slope coefficients of stocks. The two characteristics of line regression verify the adequacy of the CAPM. According to our results, we came to a conclusion that there was a linear relationship between systematic risk and returns. The CAPM would be the verification of our major hypotheses from the time series tests. In order for this to be true, the intercept ought to be approximately equal to zero, supporting the theories for both individual assets and portfolios. However, the testing provides evidence against the CAPM, but do they do? It should be kept in mind that it does not necessarily represent evidence in favor of any alternative model.

JEL Classification Code: **G12, G11**.

Keywords: CAPM, coefficient Beta, coefficient (Intercept), securities market portfolio, systematic risk, unsystematic risk, market risk premium.

Introduction

The CAPM (capital asset pricing model) is useful as a decision-support tool for corporate finance. Firms need to estimate their cost of capital to evaluate new investment projects that are considered capital budgeting decisions. For this reason, financial managers can use the CAPM to calculate the cost of their equity.

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The CAPM is established on the basis of the modern theory of Markowitz portfolios. This type of CAPM was developed using a theory of modern portfolios by William F. Sharp (1963 and 1964) and John Linter. William F. Sharp was awarded the Nobel Prize. This CAPM is based on the assumption of positive risk-return trade-offs. The theory affirms that the expected return on every asset is a positive function of only one variable: its market beta (defined as the covariance of asset return and market return). The CAPM, being a theoretical model, is based on some key assumptions:
– all investors look at only one-period expectations about the future;
– investors are price takers, and they cannot influence the market individually;
– there is a risk-free rate for which any investor lends or borrows money;
– investors are risk-averse;
– taxes and transaction costs are irrelevant.

One of the major results of the CAPM is the proof of the relationship between expected risk premiums on special assets and their „systematic risk". This relationship shows that the expected return on every asset is directly proportional to its „systematic risk". This study aims to test the standard form of the CAPM in the Greek capital market. The study was divided into four parts. The first part represents the introduction, and the next part reviews some of the empirical evidences on the CAPM. The third part considers the CAPM for methodology application and data selection. The last contains a verification of the CAPM and analysis of the results. Finally, a summary and some conclusions will be given.

1. Literature review

The CAPM built on the model of choice was developed by Markowitz (1959) and Tobin (1958). They developed the „risk-return portfolio theory" based on the benefits model of von Neumann and Morgenstern (1953). The model assumes that investors are risk-averse when choosing among portfolios. Markowitz selected the „mean-variance-efficient" stock portfolios to be used in his model. After that, the CAPM model was developed independently by Sharpe (1964), Linter (1965), and Mossin (1966). They added two fundamental hypotheses to the Markowitz model to determine one portfolio that must be mean-variance-efficient. The development of the Sharpe-Lintner version of the CAPM is to use the assumption of risk-free borrowing and lending the expected return on zero-beta assets. The expected return on any asset that is uncorrelated with the market return must equal the risk-free rate. Thus, the Sharpe-Lintner CAPM becomes the familiar relationship between expected return and beta.

Starting in the later 1970s, Fisher Black developed a version of the CAPM without risk-free borrowing and lending. The unlimited risk-free borrowing and lending was said to be an unrealistic assumption by Fisher Black. Later, Jensen Scholes (1972) studied and extended the notions, and Fama and Macbeth (1973) highlighted the proof of a larger intercept than the risk-free interest rate. After that, the CAPM based

on Basu's empirical studies (1977) found some evidence for common stocks classified on earnings-price ratios. He showed that the future returns on high E/P stocks are higher than those foretold by the CAPM. Banz (1981) includes a size effect, that is, stocks classified in exchange market capitalization average returns on small stocks are higher than foretold by the CAPM. Bhandari (1988) found evidence that high debt-equity ratios are related to returns that are overwhelmingly high on their market betas. Finally, researchers Statman (1980) and Rosenberg, Reid, and Lanstein (1985) proved that the stocks with high book-to-market equity ratios have high average returns that are not captured by their betas. Later, Fama and French (1992) confirmed the evidence given by researchers such as Reinganum (1981), Stambaugh (1982), and Lakonishok and Shapiro (1986). He was able to show that the relationship between return and beta for common stocks is even lower after the sample period is used in the early empirical work on the CAPM. The estimate of the beta premium, however, is clouded by the statistical ineffectiveness (a large standard error). Kothari, Shanken, and Sloan (1995) tried to resuscitate the Sharpe – Lintner CAPM by showing that the weak the relation between return and beta is just a chance result. However, the strongest proof, the other variables that obtain variation in expected return missed by beta, makes this argument irrelevant.

Other researchers have examined the correlation between expected return and the beta coefficient. Michailidis, Tsopoglou, Papanastasiou, and Mariola (2006) tested the CAPM on the stock market in Greece. They showed that in contrast to the basic hypothetical models, a high expected return does not expect a high level of risk. Choudhary and Choudary (2010) also came to this conclusion by examining the stock market in India. There is also an example that confirms the main settings of the model, in particular, by research carried out on the stock market in Italy (Canegrati, 2008). Trifan A.L. (2009), who conducted research in the stock market in Romania in 2009, showed that the regression model has no statistical significance, and the results of this examination do not give specific evidence against the CAPM.

2. Methodology

In this part, we examined the CAPM practicing regression equation method in the ASE. The capital asset pricing model (CAPM) could be written as follows:

$$\mathbf{E(Ri) = Rf + \beta i(Rm - Rf)}$$

Where:

E(Ri) = the expected return on assets i;

Rf = the risk-free rate calculated as the average of the interest rates on government treasury bills:

Rf = 7.04% The Government treasury bill yields were taken from Central Bank of Greece website. http://www.bankofgreece.gr/

βi = Cov(Ri Rm)/ σ2(Rm) the volatility (risk) of the asset „i" related to the market portfolio M;
Rm = the expected return on the market portfolio M;
Rm Calculate the Arithmetic mean the Athen Index Compos average return during the period from 1988 to 2013.
Rm = 9.8487%
Rm – Rf = the excess return over the risk-free rate return. The risk premium for bearing one unit of beta risk;
Starting at the closing prices have resulted from weekly returns:
Rt = ln(Pt/Pt-1) using the approximation ln(1+x) ≈ x. when x⟶0

The beta coefficient is an index of unverifiable (systematic) risk. Betas for different stocks may be ranked to compare the systematic risk of the stocks. We can see the interpretation of coefficient Beta (β) in Table 1.

Table 1. Interpretation of coefficient Beta (β)

Beta	Direction of changes in security's return in comparison to the changes in market return	Interpretation of β meaning
$\beta_i > 1$	The same as market	Volatility (risk) of stock is higher than market risk
$\beta_i = 1$	The same as market	Stock's volatility (risk) is equal to market risk
$\beta_i < 1$	The same as market	Stock's volatility (risk) lower than market risk
$\beta_i = 0$	There is no relationship	Stock's risk is not influenced by market risk
$\beta_i < 0$	The opposite from the market	Stock's volatility (risk) lower than market risk but in the opposite direction

Data selection

The study applies to the CAPM on the Athens Stock Exchange (ASE) data with the aim of interpreting and considering the utility of the standard estimates. The research on the CAPM standard carried in it the common stocks of 32 companies belonging to flourishing industries in the Greek economy, including telecom, software, construction, infrastructure, finance, and banking, listed on the Athens Stock Exchange (ASE). A series of weekly data were used for the econometric analysis. For this reason, the collected data were weekly closing prices of common stocks traded on the Athens Stock Exchange. This data was taken from www.investing.com, a financial website. The study period was from June 01, 2009 to December 31, 2013. In addition, the database of the Athens Stock Exchange (ASE) served as a data source on the closing prices for each company; that is, its weekly market reports helped to evaluate those companies. The number of observations for each company was 238. ASE Composite (General) was used as a proxy for the market portfolio. The market return was taken from the Share Price Index of the ASE Composite (General). This

data, in turn, was taken from the investing.com website. The empirical testing of the CAPM model was carried out using the software package EViews and the MS Excel spreadsheet program.

3. The empirical test of the CAPM model

The following is the estimate of the CAPM regression equation. The values for alpha and beta coefficients and other statistics measures are presented in the table 2.

Table 2. CAPM – Estimated Coefficients and Statistics for Time Series. The Entire Period (June 2009 – December 2013)

Symbol and companies name		Coefficient	Standard Error	t-statistic	R^2	Adjusted R^2	P (value)	F (significant)
Aegean Airlines (AGNr)	Alpha	0.00280	0.00302	0.92652	0.10213	0.09833	0.35512	4.72969E-07
	Beta	0.32891	0.06348	5,18116				
Athens Medical (AMCr)	Alpha	0.00132	0.00440	0.29961	0.34478	0.34200	0.77826	1.58966E-23
	Beta	1.02938	0.09237	11.14381				
Athens Water (EYDr)	Alpha	0.00316	0.00292	1.08342	0.37176	0.36910	0.27973	1.27617E-25
	Beta	0.72529	0.06137	11.81740				
Attica Bank (BOAr)	Alpha	0.00112	0.00759	0.14795	0.31877	0.31588	0.88251	1.94272E-21
	Beta	1.67667	0.15955	10.50858				
Autohellas (AUTr)	Alpha	0.00412	0.00325	1.26648	0.22010	0.21680	0.20659	1.98522E-14
	Beta	0.55733	0.06829	8.16115				
Bank Of Piraeus (BOPr)	Alpha	-0.00002	0.00757	-0.00248	0.39563	0.39307	0.99803	1.28076E-27
	Beta	1.97764	0.15911	12.42934				
Centric Hold (DESr)	Alpha	0.00056	0.00588	0.09612	0.28684	0.28382	0.92351	4.54848E-19
	Beta	1.20304	0.12348	9.74276				
Corinth Pipe (CORr)	Alpha	0.00497	0.00384	1.29311	0.45171	0.44939	0.19724	1.22578E-32
	Beta	1.12592	0.08075	13.94385				
Elval (VAL)	Alpha	0.00498	0.00385	1.29340	0.34660	0.34383	0.19714	1.35907E-23
	Beta	0.90575	0.08095	11.18861				
Euro Reliance (EREr)	Alpha	0.00490	0.00380	1.29177	0.20009	0.19670	0.19770	4.13093E-13
	Beta	0.61305	0.07979	7.68338				
Folli Follie (HDFr)	Alpha	0.00536	0.00390	1.37665	0.24361	0.24041	0.16992	5.10398E-16
	Beta	0.71371	0.08186	8.71837				
Fourlis Hld (FRLr)	Alpha	0.00256	0.00491	0.52027	0.33667	0.33386	0.60337	8.16281E-23
	Beta	1.12968	0.10322	10.94448				
Frigoglass (FRIr)	Alpha	0.00319	0.00341	0.93405	0.30800	0.30506	0.35123	1.25742E-20
	Beta	0.73547	0.07176	10.24885				

Table 2 – continued.

Symbol and companies name		Coefficient	Standard Error	t-statistic	R^2	Adjusted R^2	P (value)	F (significant)
Gek Terna (HRMr)	Alpha	0.00358	0.00407	0.88106	0.48361	0.48142	0.37918	1.00596E-35
	Beta	1.27077	0.08548	14.86660				
Grivalia Properties REIC	Alpha	0.00239	0.00296	0.80774	0.12706	0.12336	0.42005	1.54025E-08
	Beta	0.36501	0.06228	5.86088				
Halcor (XAKO)	Alpha	0.00254	0.00417	0.60929	0.42304	0.42060	0.54292	5.18312E-30
	Beta	1.15150	0.08754	13.15448				
Hell.Exchanges (EXCr)	Alpha	0.00404	0.00287	1.40991	0.55957	0.55770	0.15988	6.56816E-44
	Beta	1.04343	0.06026	17.31580				
Hellenic Telec (OTEr)	Alpha	0.00406	0.00350	1.16110	0.48290	0.48071	0.24678	1.18239E-35
	Beta	1.09150	0.07352	14.84564				
Hygeia (HYGr)	Alpha	-0.00130	0.00453	-0.28766	0.37119	0.06988	0.77386	8.60116E-26
	Beta	1.13081	0.09527	11.87015				
Intracom Hold (INRr)	Alpha	0.00108	0.00430	0.25186	0.47708	0.47486	0.80137	4.45968E-35
	Beta	1.32669	0.09041	14.67345				
Intralot (INLr)	Alpha	0.00004	0.00388	0.01085	0.30548	0.30254	0.99135	1.93726E-20
	Beta	0.83168	0.08163	10.18841				
J. & P. Avax (AVAr)	Alpha	0.00202	0.00343	0.58826	0.45132	0.44900	0.55692	1.33372E-32
	Beta	1.00354	0.07203	13.93287				
Kleeman Hellas (KLEr)	Alpha	0.00310	0.00379	0.81791	0.18577	0.18232	0.41423	3.47436E-12
	Beta	0.58417	0.07961	7.33793				
Lamda Develop (LMDr)	Alpha	0.00262	0.00400	0.65569	0.15429	0.15070	0.51266	3.33897E-10
	Beta	0.55152	0.08405	6.56162				
Marfin Invest (MRFr)	Alpha	-0.00041	0.00523	-0.07843	0.47372	0.47149	0.93755	9.5259E-35
	Beta	1.60229	0.10993	14.57498				
Metka (MTKr)	Alpha	0.00391	0.00267	1.46560	0.43008	0.42766	0.14409	1.2082E-30
	Beta	0.74901	0.05613	13.34509				
Mytilineos (MYTr)	Alpha	0.00456	0.00260	1.75623	0.68615	0.68482	0.08035	2.56356E-61
	Beta	1.23998	0.05459	22.71468				
Natl. Bank Gr (NBGr)	Alpha	-0.00212	0.00589	-0.35932	0.46983	0.46758	0.71968	2.28204E-34
	Beta	1.79150	0.12388	14.46159				
Nireus Aqua (NIRr)	Alpha	-0.00030	0.00385	-0.07701	0.38463	0.38202	0.93868	1.09118E-26
	Beta	0.98394	0.08101	12.14528				
Public Power (DEHr)	Alpha	0.00408	0.00404	1.01019	0.43830	0.43592	0.31344	2.15603E-31
	Beta	1.15256	0.08493	13.57021				
Sidenor (SID)	Alpha	0.00059	0.00408	0.14367	0.46019	0.45790	0.88588	1.93205E-33
	Beta	1.21673	0.08578	14.18413				
Techn Olympic (OLYr)	Alpha	0.00059	0.00408	0.14367	0.46019	0.45790	0.61055	3.52031E-10
	Beta	1.21673	0.08578	14.18413				

The results of the empirical test on the CAPM model

The results, which estimated beta coefficients from the table 2 above, range from 0.3289 to 1.9776. We can notice that all the stocks of α intercepts are positive except those of five securities. This shows that the high-risk securities earned more on average over this time than the projections of this asset pricing model. As a result, these results illustrate the great deviation from the standard model of the CAPM.

Based on a confidence coefficient level of 95%, we move on to our t-test. According to statistics, a confidence level of 95% gives a t-statistic value equal to1.96 . A special case of the t-test occurs if we test the hypothesis in which a parameter equals zero: Ho: Bi=0. If this hypothesis is rejected, then we conclude that the regression has a significant value for explaining the regression; if the hypothesis is not rejected, the regression has no significant explanatory value. According to this rule, the t-statistics is less than 1.96[3]. Given our hypothesis condition that the intercept is equal to zero, if the t-statistics is higher than 1.96, our hypothesis rule does not work here, and the CAPM model is rejected for the ASE.

The table above illustrates the numbers derived using the CAPM model; they are proven to be applicable to the portfolios, according to the t-statistic values. We can see all the portfolios that are lower than 1.96 based on our hypothesis rule, and the CAPM model is rejected in the ASE. Another key relationship between the t-statistic values and the P values in statistics gives us an insight into the CAPM model. In this case, in the confidence level of 5%, when the P values are higher than 0.05, then the intercept should be equal to zero. If they are higher than 0.05, the CAPM model does not hold in the ASE, as the null hypothesis does not hold. The R-square, a practical measure that ranges from 0 to 1, gives the percentage of the total variance of that market risk; the remaining percentage is non-market risk. In addition to this, the R-square that measures the proportion of variation in the dependent variable, the explanation of which is given by the help of the independent variable, is also calculated for the 32 stocks. However, the R-square values, as seen in this table, are also very low. In the CAPM context, R-square measures the market (systematic) share of the total risk. However, it should be noted that $1\text{-}R^2$ is the proportion of total risk that is specific (unsystematic risk). It is obvious that the systematic part of the risk fails to explain the special stock's risk premium due to a small value of R-square (R^2). Now, considering all the above-cited conditions, we can show the evaluations of coefficient of determination and standard error of the regression in Table 3.

[3] The value „2" is roughly equal the critical value of examinations of t-distribution for a two-sided hypothesis, a significance level of 5% (or a confidence level of 95%), and a large number observations relative to the number of regressions. In our case, the exact number is 1.96

Table 3. Evaluations of coefficient of determination and standard error of the regression

Number	Symbol	R^2	Standard error of the regression	Number	Symbol	R^2	Standard error of the regression
1	AMCR	0.34478	0.06775	17	XAKO	0.42303	0.06421
2	BOPR	0.22010	0.05009	18	FRIR	0.30799	0.05263
3	CORR	0.28683	0.09057	19	GRIR	0.12705	0.04568
4	DESR	0.28683	0.09057	20	HRMR	0.48360	0.06270
5	VAL	0.34659	0.05938	21	INRR	0.47707	0.06632
6	AGNR	0.10213	0.04656	22	NIRR	0.38462	0.05942
7	AUTR	0.22010	0.05009	23	DEHR	0.38462	0.05942
8	BOAR	0.31876	0.11703	24	KLER	0.45132	0.05283
9	ERER	0.20009	0.05852	25	MTKR	0.43007	0.04117
10	EYDR	0.37175	0.04502	26	NBGR	0.46982	0.09087
11	FRLR	0.33667	0.07571	27	OLYR	0.15391	0.07372
12	HYGR	0.37383	0.06988	28	SID	0.46018	0.06292
13	EXCR	0.55956	0.04420	29	AVAR	0.45132	0.05283
14	HDFR	0.24361	0.06004	30	LMDR	0.15428	0.06165
15	INLR	0.47707	0.06632	31	MRFR	0.47371	0.08064
16	OTER	0.48290	0.05393	32	MYTR	0.68615	0.04004

The table represents that the relations between beta and expected return measured by the linear correlation coefficient are positive and rather weak in all companies. That means that all the companies' stocks have their variation in excess return fairly explained by the excess return on the market index. This equation applies in cases where there are fairly efficient betas explaining the correlation between market risk and return.

Table 3 shows the adjusted R^2s, which are all positive and show a significant linearity in the model. Adjusted R^2s range from 0.68615 to 0.0698 for stocks between 1 and 32, which means that the return volatility can be attributed to fluctuations in the market return by only 69% and 7%, respectively. Apart from this, the adjusted R^2 shows that the independent variable of the market premium can explain 0.68615 of variation in stock, which is the dependent variable of 0.55956. The second variation for stock two is the variation of 0.48360 for stocks three and so forth. It continues in that manner because of the relationship between the returns on the securities and the return on the market. The standard deviation of the average weekly returns and the standard deviation of the residuals appear to be quite small in all the stocks. Subsequently, the t-test significance is the crucial value that helps us accept or reject the null hypothesis in the examination. That is the hypothesis about the significance of the model. It is important to hold on a significance level of 5% if the F-test significance is lower than 0.05. Therefore, we may conclude that there is a linear interdependence between the independent and the dependent variables. In this case,

whether to accept or not is the matter of the rejection of the null hypothesis. That is, if the F-test is higher than 0.05, then we accept that, but there is no interdependence between the variables. Table 2 illustrates that all portfolios at F-test significance values are higher than 0.05, which means (> 5% → Ho). For this reason, the initial hypothesis, in which the evaluated regression model is not statistically significant in all portfolios, is accepted. After all stocks had been tested, we concluded that the regression model CAPM is not only representative but also not statistically considerable in all stocks, which makes the possibility of applying the CAPM model in these markets very questionable. Hence, the coefficient of linear correlation measures the relationship between beta and expected returns. The results illustrate that a weak relationship has been established. The CAPM model's main prediction that an investor requires the compensation in the form of the risk premium only for the market risk and not for the unique risk is rejected here. However, the reason for the rejection of this assumption may be that we study stocks individually, not the portfolios in which the unique risk is eliminated in the individual stocks. However, the return of the unique risk is not eliminated, and this contributes towards the returns that investors demand on individual stocks.

Summary and Conclusion

To sum up, we can confirm that after testing the CAPM model, it is evident that the model was not adequate for evaluating the data in the Athens Stock Exchange market during the period between the 1st of June 2009 and the 31st of December 2013. The evidence discussed above does not completely lead us to a conclusion that the CAPM is absurd, since only stocks were included in the analyses. The market portfolio holds all the capital assets. According to the CAPM theory, the higher the asset risk (beta), the higher the expected rate of return will be for all assets that lie on the SML. The tests confirm the validity of beta as a measure of risk using regression analysis, and it was found that higher returns do not mean a higher beta linear on the SML. For this reason, it is not a valid measure of risk in these markets. Also, the conditions of the CAPM, in which the intercept is equal to zero and there is a higher positive expected return for bearing risk in the capital markets, are rejected. The large value of residual error also shows that the non-market factors (the unique factors) also contribute towards an asset's excess returns. The standard CAPM model is rejected owing to the fact that a number of factors are rough estimates; that is, incomplete information is available in the markets. Besides this, investing in the individual stocks rather than in the portfolios is another reason under consideration. We take results into account in the case where the CAPM model is not applied. Thus, the results show that the CAPM model is rejected in the Athens Stock Exchange. If the CAPM model were accepted in the Athens Stocks Market, managers could be able to analyze the cost of equity, which constitutes a major component in the cost of

capital. In our view, the other alternative models are established in the Athens Stocks Exchange market, such as APT, GCAPM, ICAPM, and CCAPM.

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IMPORTANCE OF 6S+1 SYSTEM IN LEAN THE MANAGEMENT AND TOTAL PRODUCTIVE MAINTENANCE ON THE EXAMPLE OF A TEXTILE INDUSTRY COMPANY

Abstract

In the article evaluation results of the state of the problems associated with the lack in the system of 6S in one of local textile factory were presented. Achieved results allowed drafting the project to implement the concept improvements 6S+1 step by step. For the purposes of studies conducted by the author 6S+1 were created, where „1" means safety as the additional step which isn't seventh S. The safety a step, which in the Lean Management and TPM is crucial.

JEL Classification Code: **L15, M53**.

Keywords: 6S, Safety, TPM, Lean Management, Standardization, Compatibility, Training.

Introduction

The main TPM goal is to keep the continuous maintenance. TPM endeavors to reduction in the amount of the breakdown and the size of losses which focuses on correcting, machines quality, maximization the effectiveness of the equipment through the comprehensive system of precautions prolonging the life-span of productive facilities, as well as on the active role of employees and their team work, incessant innovations and improvements, creating customers satisfaction and market competitiveness. (Lewandowski, 2008, p. 145). The TPM appellation was defined and used for the first time by Japan Institute of Engineers Plant in 1971 (Nakajima, 1989).

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TPM philosophy stand above eight pillars determined by Nakajima. To implement the TPM tool, Nakajima also proposes the guide – 12 steps grouped in four stages – preparation, implementing the admission, the TPM introduction and stabilization. There were some attempts to implement other guides, action plans and methods of carrying out the TPM plan. However, the Nakajima guide is the standard. The guide is described in a book published by Cambridge, Productivity Massachusetts Press. (Nakajima 1988). For example the guide explains, the eighth step – drawing up the independent program of the plant maintenance. This step is brought into effect in seven steps: preliminary cleaning, preventive measures at the source of problems, norms of cleaning the lubrication, the general inspection, the autonomous inspection, the organization and order and the truly independent maintenance. In the Table 1 all twelve steps were presented.

Table 1. TPM implementation guide

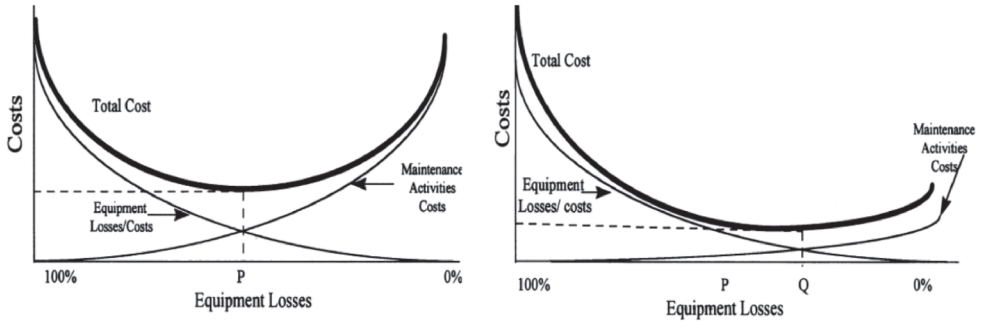
Level	Action
1. Preparation	1. Introduce top management
	2. Promote education and create campaign presenting TPM
	3. Create activity promoting TPM
	4. Set the base of the TPM politics and goals
	5. Formulate the master plan for TPM development
2. Implementing the admission	6. Stop the TPM starting point
3. TPM introduction	7. Improve the effectiveness of every accessory
	8. Draw the independent program of the maintenance up
	9. Draw up the planned program of holding for the maintenance department
	10. Conduct the training in order to improve operations and abilities of the maintenance
	11. Draw up the program of the early equipment concerning the management
4. Stabilization	12. Well implemented TPM raises its level

In order to achieve the overall machines effectiveness, TPM deals with the elimination of six heavy losses which are main obstacles in achieving the TPM goal: losses of the downtime attributable to the equipment failure and the preliminary regulation; speed losses are initiated by idleness, small stops, and slowing downs (Nakajima 1988).

1. Economical aspects of TPM

Fredendall and other scientists describe two alternative views concerning the plant maintenance costs (Fredendall, Patterson, Kennedy, Griffin, 1997, p. 15). These views are described on Drawing 2. The cost curve on the left represents what Fredendall

and other call the classic approach where the identification of the optimal repairs level is the manager role. On the other hand, the curve on the right side represents the new approach where the manager role is to lower the repair costs so that zero losses of the equipment would be profitable. Which means, that production managers should aim to balance the needs to reduce production costs caused by equipment failures. They make it with so-called preventive running costs (Gosavi, Murray, Tirumalasetty, Shewade, 2011, vol. 23.). The bottom line shows productions and separates what is „the best from the rest" (Mishra, Anand 2009, p. 47–77).



Picture 1. Preventive running costs by Fredendall

2. The productivity measurement tools

Productivity studies answer to a question whether money for TPM were well spent. (Ravishankar Burczak De Vore 1992, p. 85–89). For example, studies conducted in Eastman Tennessee estimate the six-month return on investment in TPM. Benefits from the efficiency improvement (of manufacturing capacity) achieved assigned TPM rate of about 8 million dollars annually. Other studies conducted in Limited Thomas Bolton show that the company afforded £200,000 frugalities with opportunities cost above £1,000,000. Studies conducted in Great Britain showed that the predicted TPM cost amounted £400,000 with benefits of the over £2 milion. What's more, the production volume was increased by the 40% and costs of overtime hours were reduced by 40% (Ireland Distances 2001, p. 183–192). Studies conducted in Italy showed that Italian factories have started investing $41,900 with the annual return $47,800 which is 11 monthly payback period (Pareschi Regattieri Ferrari Personage 2002, p. 350–358). A company producing semiconductors received reducing running costs by the 20%. The last case shows that in one of Indian companies benefits were achieved on the level of Rs 80 million. (Ahuja Khamba 2007, p. 338–352).

A very interesting issue is in what way these companies calculated above economic benefits. Exploring this issue Groote says that the productivity must be determined according to relative values (Groote, P. 1995, p. 4–24) Therefore, he presents rela-

tions between running costs for calculating financial benefits from TPM. Following equation 1 presents these relations.

$$\textbf{Economic indicator} = \frac{\textbf{Direct maintenance cost}}{\textbf{Production added value}}$$

Equation 1. Relation between costs for calculating financial benefits

Direct running costs include: workforce cost, material costs, freelance works for subcontractors cost and overheads, but the production added value determines the total production cost minus the raw materials cost. By using the added value rather than the total production cost important hesitations are being eliminated inside the company and among companies because of raw materials price fluctuations (Groote, P. 1995, p. 4–24). This relation joins total direct running costs with the time unit.

On the other hand, Kwon & Lee explain that participation of the profit in the OEE maintenance (Overall Equipment Effectiveness) for Total Equipping Effectiveness on the level 0.01 raised in the given period of time may be calculated by multiplication increase product value eligible for sale through the participation profit per unit.,

However the effect of the share obtained by raising OEE by 1 per cent is a result of the sum

The added profit participation + saved production cost.

Gosavi and the others present two statistical models created for maintenances optimization in in respect of costs and budgets. One of them is called Renewal-Theoretical Model where the probability of the model is based on a time between the maintenance and the time period between failures. Equation 6 describes how this probability appeares on each side-prevention and the failure (Gosavi Murray Tirumalasetty Shewade 2011, vol. 23)

$$E(R) = C_r \cdot P(X < T) + C_m \cdot P(X \geq T) = C_r \cdot F(T) + C_m \cdot F(T)$$

where: E(R) describes the expected cost in one cycle; C_r is an expected cost of one repair; C_m is the expected cost of one efficient action concerning the maintenance; X is random variable presenting the time in case of the system failure; F(T) distribution function (CDF) with X.

Other approach is presented by Lyu & Chen. They drew the model of the maintenance turbine. The base for their model is presented in the following equation (Lyu, Chen, 2008)

$$C_{PM} = C_{PP} + C_{PE}$$

where: C_{PM} is the maintenance cost, C_{PP} is running costs of the work and C_{PE} is running costs of material.

3. 6S+1 System

6S system is one of the most important TPM tools, which assists TPM is the 6S System. It comes from the Japanese concept. They are 6 simple rules – tools which let to improve processes applied on workstations. Applying 6S improves the effectiveness of work processes, limits the waste and prevents from making mistakes. It is possible to apply 6S in every company – production and service ones. The 6S system. consists of six steps which are introduced at the company in the right order, which means that, after the introducing the first S it is possible to implement the second, third, fourth, fifth and finally the sixth step. 6S System must be implemented in the constant way, because it is the process which brings proper order, but is also implementing the organizational culture in the company, thanks to involvement and responsibility of employees.

6S System experienced the alteration. At first it came from 5S, but Japanese stated that in the long term the implemented system was ineffective and it was necessary to introduce the next sixth S, in order to implement persevering in intentions which will allow to support the system in the longer perspective. The safety must be an integral part of 6S. The Japanese concept didn't assume additional, seventh S as a safety, as in Japanese mentality on each of stages a high pressure is put both on the health and safety at work.

In Poland amongst many environments an opinion that the health and safety at work is area not-requiring the big knowledge and abilities rules, and the expenditure on the improvement in the safety state is an unnecessary expense. However this opinion isn't true, because employee usually meets a lot of dangers, and costs associated with accidents are often very high. It is often associated also with reputation loss. Therefore the appropriate knowledge of employees and warning principles which are stated by the law, as well as the competent organization of workstations are extremely important in terms of the safety in a production process. In table 2 the number of people who had accident at work in 2012–2013 was described.

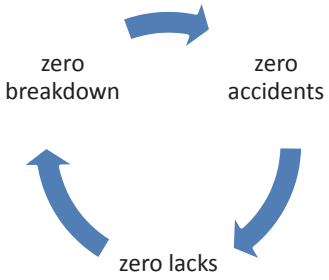
Table 2. Injured in accident at work according to accident effects, sex and a number of days of the incapacity to work caused by these accidents according to the section of both chosen departments and groups

Year	Total	In accidents			A number of days of the incapacity to work	
	Total number of accidents	Death	Heavy	Light	Total number of days	Per 1 injured person
2012	91 000	348	602	90 050	3 288 573	36,3
2013	88 267	276	529	87 462	3 120 036	35,4

Source: *GUS*: http://stat.gov.pl/obszary-tematyczne/praca-wynagrodzenia/warunki-pracy-wypadki-przy-pracy/wypadki-przy-pracy-w-2013-r-,3,16.html

In Poland costs of accident at work are in amount of 15.6 bn PLN which is 2.1% of GDP. To compare expenditure on the education is 0.8 % of GDP.

For the purposes of the article 6S+1 was created where „+1" means the safety as the additional step but it isn't the seventh S. This step was given because the safety in the TPM context is crucial. The TPM base is: „zero breakdown", „zero gaps" and „zero accident at work" (Brzeg, 2006,) what for the presented system is essential. The scheme is shown on picture 2.



Picture 2. Purpose of TPM

Source: own study based on the subject literature

Author carried out research in one of companies of the textile industry. They concerned the possibility of applying the concept organized according to TPM principles in the company. The research purpose was visualizing the 6S+1 project as a base of the Lean the Management and TPM implementation. Identified problems were divided into four areas, and associated with: lack of 6S, the state of the health and safety at work assessment (HSW), fire safety and production machines. In the article was described one area associated with the 6S lack. Summarizing the area research described actions were established in order to eliminate observed and stated incompatibilities.

A proposal to apply the non-pay motivation system for the crew in order to keep assumptions 6S+1 was included in the project.

4. System 6S as the implementing base of Lean Management and TPM

During preparation for implementing the TPM program there are necessary actions to be taken in following three principal areas (Lewandowski, 2008, p. 154):

- all company employees education, starting from Top Management, and finishing at the linear employees just to change their point of view about what the effective system of the production constitutes,
- establishing a system which will base all actions at implementing on team work,
- starting actions from implementing 6S., like tidying the existing state by removing unnecessary things, cleaning the company and management visualizations.

The TPM appellation comes from Japanese incipient words to the letter S, which mean:
- Seiri (selection),
- Seiton (systematization),
- Seiso (cleaning),
- Seiketsu (standardization),
- Shitsuke (self-discipline),
- Shibo (persevering in intentions).

One of lean managing concepts in manufacturing company is a Lean Management concept. For the first time the Lean appellation was used and invented by scientists from Massachusetts Institute of Technology in Boston (Womack Jomes Roos 2008, p. 123–124). The Lean Management is a concept, thanks to which a following organization can achieve an established results improvement in the lead time, prices and product qualities areas. Keeping the present and new clients are the fundamental assumptions of the Lean concept, since customers are a guarantor of generating profits by the company. In Poland the Lean notion appeared at the nineties for the first time. Since then many enterprises have made much effort in order to establish principles of the lean production rules in their organization. At the Lean concept a „waste" and „value added" are the fundamentals.

The value added is determining the value added in the customer 's assessment. If the benefit raising the total utility of a product according to the consumer is fulfilled it leads the customer to pay the required price for the product. Using place, time, stores can be components of the added value. In most of companies the added value determines 10% of total cycle of ordering for the delivery (Christopher M., 1998, p. 181–182).

Non added value are these activities which consume reserves without creating the added value. The entire company or the whole supply chain are the most frequent places of appearing the NAV. (Christopher M., 1998, p. 181–182). These activities aren't affecting on increase in number of the product or services in the customer opinion. (Blaik, 1996, p. 153–154).

There are 7 major phenomena of waste, mainly:
- overproductions, i.e. too high production in relation to needs, what leads to storing which means extra costs,
- expectation, i.e. queues of not-moving materials, ineffective use of employees,
- the exaggerated transport, i.e. unnecessary parts, materials, people, or information transfers,
- wrong transferring, i.e. crossing requirements put by the recipient
- exaggerated storing, i.e. the unjustified exceeding requirements supplies' level,
- the unnecessary movement, i.e. the bad labour organization caused by the lack of ergonomic solutions,
- gaps, i.e. mistakes in the production, the clerical work and distribution, also passing on defects into next positions. (Oritz Chris A, 2010, p. 27–28).

The Lean appellation comprise from 3 elements. The first one is the Lean Thinking philosophy (Womack J.P, Jomes D.T, Roos D., 2008, p. 123–124). The second one is the Lean Management (Skowronek, Sarjusz-Wolski., 2012, p. 56) and the last one is the Lean Manufacturing or Lean (Skowronek, Sarjusz-Wolski., 2012, p. 56).

From the close cooperation of these three meanings depends a correct implementation and developing the company with the Lean concept.

In Lean Thinking philosophy an analysis of everything what regards the company functioning is applicable. It particularly includes working hours machines and devices functions, the activities associated with the planning. The main Lean thinking purpose is eliminating all unnecessary activities in order to keep the appropriate order of carrying them out. Activities must be conducted only once but well. The Lean Thinking concept aims to make the final product cheaper which is carried out more quickly, behind the approval of the crew and increases the company profit.

Lean Thinking is the standard way of thinking in Toyota company, which is the author of Toyota Production System (TPS), giving bases to Lean concept. Lean Thinking is based on 5 rules:

- Rule 1: Determining elements adding the value to a product or service from customer's point of view.
- Rule 2: Identification of the value stream for every products family. The value stream shows the sequence of processes starting from raw materials to the final customer or from the new product concept to releasing it on the market. The so-called bottleneck which is imposing its productivity as the peak performance of the whole chain is a weak point of this stream. And so a visualization of the stream's value is essential in order to remove bottlenecks (Goldratt i Cox, 2000 p. 114).
- Rule 3: Providing the uninterrupted value flow.
- Rule 4: Production adaptation to actual customers needs.
- Rule 5: Permanent activity improvement aimed to eliminate all waste (Bicheno, 2000a, 2000b; Czerska, 2002a; Wasik, 2002).

Lean Manufacturing (lean production) – based on straight and transparent organizational structures, concentrated on the optimal use of the available resources to manufacture the product. Lean Manufacturing concentrates on eliminating all signs of the waste in production processes in order to increase the participation of the so-called value added in the process.

5. Examined company's characteristics

The examined company has been on the market for over 135 years. It's not the only company in Europe producing products A and B. The manufacture tradition of products doesn't only stamp the best quality, but also the uniqueness and the classical but also modern design.

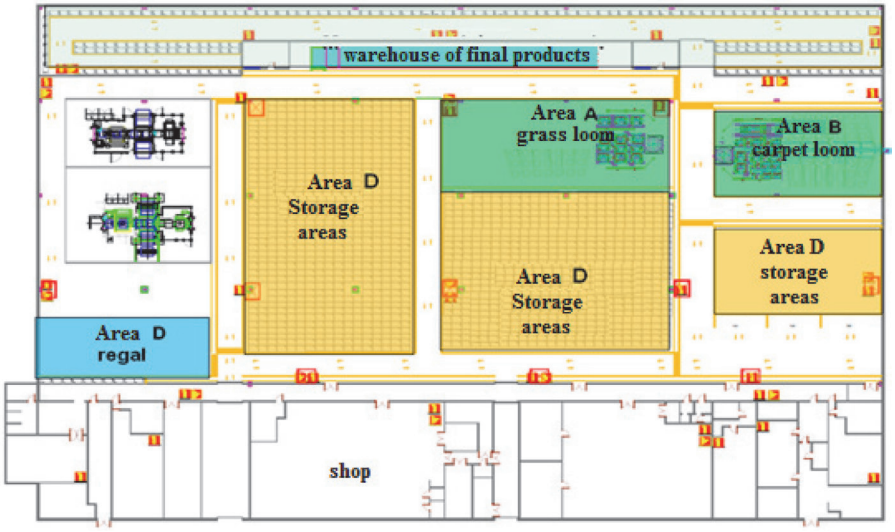
Its mission is to be a domestic leader in products A sale together with the best quality of B products in order to ensure the best service and the flexibility in the realization of customers' needs.

The company has got two strategic goals:

– in the area of production and distribution of A products and deepening the attendance in the widely comprehended Polish market.
– in the area of production B products is to build the position of the leading technologically producer of above average quality of such products in Europe.

Considering products character which requires the flexible approach to individual customers' needs, the Company has modern machines park steered by the first-class computers. Such park gives the possibility to manufacture A products with custom sizes, as well as design and make this product according to individual projects. The company is also a producer of the first B product in the world for mass and decorative applications made in the modern technology.

Most production processes in the Company are processes developed by the former company which was taken over after the bankruptcy. Along with the bankruptcy of the old company also employees were taken over. At new-incurred units they set about to restructuring measures. In picture 3 an area of the entire unit with the division into areas was described. Area A and B shows production machines for A and B products along with intermediate storage areas intended for raw materials. Area C is a finished goods warehouse where final goods of both products are storage. Areas D these are intermediate storage areas and the bookshelves intended for the raw material, palettes and other materials needed for the production.



Picture 3. Division of examined company into areas
Source: own study based on disclosed data by company.

6. The identified problems associated with the lack of 6S

Under study of individual positions irregularities associated with 6S were established. They apply the following:

- Seiri (selection),
- Seiton (systematization),
- Seiso (cleaning),
- Seiketsu (standardization),
- Shitsuke (self-discipline),
- Shibo (persevering in intentions).

Revealed irregularities were included in the table 3, where in the first column the arrangement contains the identified problems associated with 6S, in the second column it was established, what requirement hadn't been met, and the third column determines which S regards the problem. Each of identified problem is backed up additionally with the photograph, which shows a state on a following workstation or its environments.

Table 3. The identified problems associated with the lack of 6S

The identified problems associated with the lack of 6S Considers:	Unfulfilled requirements	Which S regards the problem	Date of removing the irregularity
Ladders, brushes, shovel don't have their place	Closet is missing	Standardization	According to the schedule of 6S project implementation
			

Table 3 continued.

The identified problems associated with the lack of 6S Considers:	Unfulfilled requirements	Which S regards the problem	Date of removing the irregularity
By the machine threads from yarn, hose left about and other kinds of waste	One should clean waste left about and establish the plan of cleaning individual places on the factory floor and appoint responsible employees	Cleaning	To be removed immediately
 			
Forklift trucks aren't inspected before each use for their cleanness, inspecting chains, entering moto hours, a brake isn't applied after each use.	Each forklift truck should have its own ring binder with the form containing information who inspected the cart before the use, what defects were noticed, as well as who cleared the machine.	Cleaning	According to the schedule of 6S project implementation
 			

Table 3 continued.

The identified problems associated with the lack of 6S Considers:	Unfulfilled requirements	Which S regards the problem	Date of removing the irregularity
Not signed intermediate storage areas for production material, packages containers, palettes.	All materials should be storage on the properly signed intermediate storage areas	Standardization	According to the schedule of 6S project implementation
 			
Blocked level crossing in the finished goods warehouse, finding the lack of the access to materials, goods and finished products placed on shelves.	The warehouse doesn't have closely determined storage places of materials and that is why they're situated in any place.	Standardization	According to the schedule of 6S project implementation
			

Table 3 continued.

The identified problems associated with the lack of 6S Considers:	Unfulfilled requirements	Which S regards the problem	Date of removing the irregularity
General mess on areas, lack of signed intermediate storage areas, not signed containers, accidental storage places.	Lack of designated layouts for empty containers and other packages.	Standardization	According to the schedule of 6S project implementation
  			

Source: Own study based on disclosed data by company.

The identified problems associated with 6S don't have their legal requirement because the Polish law doesn't specify, that the organization must have order in areas, must be systematic, as well as disciplined whether standardized. Requirements of 6S should result from domestic needs and the respectable behavior which shouldn't just be codified but exist. Unfortunately it doesn't result from above photographs that in the company employees and the top management accept natural needs of order, cleanness, regularity and self-discipline.

7. Implementing the improvement concept

Project 6S+1 as the base of the Lean Management implementation and TPM in the examined company, leads to better labor organization in four production areas including following four aspects.

- removing the identified problems associated with the health and safety at work.
- removing the identified problems associated with the fire protection.
- introducing TPM cards into machines (weaving looms, vehicles) including: cleaning, inspections, lubrication and screwing.

A proposal to apply the non-pay motivation system for the crew in order to keep assumptions of 6S+1 is included in the project. As mentioned earlier the article describes only a project of implementing 6S+1 on the factory floor and in warehouses.

Main assumptions of 6S+1implementation is preparing individual stages. On a very start of the project it is necessary to deal with preparatory action. The main aim of preparatory action is preparing employees to accustom them with the tool. Employees should be trained from the Lean scope, their competence and individual assignments should be established. At the beginning it is necessary to establish the leader and members for the entire project, as well as to draw the project budget and train the entire team in the 6S subject. Choosing the consultancy firm which will be overseeing the entire project as well as giving technical support, is a next stage. After conducting these two stages the implementation schedule should be prepared. It will let to plan to conduct the action in time. To make the 6S+1 tool function and be held in the long term it is necessary to plan the motivation system. After elaborating the motivation system the company should be divided into areas, and then pass to trainings for all employees being involved in a project. The table 4 describes preparatory action for 6S+1implementation.

Table 4. Preparatory action for 6S+1implementation

Preparatory action	
Stages	Actions
Establishing the policy of method 6S+1 implementation	– training for the top management concerning Lean – fixing establishing terms of reference and tasks on the top management rung regarding 6S+1 methods – appointment of project leader, and assisting team – elaborating budget intended to the project – training the leader and the assisting team to support their work in 6S+1 matter
Choosing consulting company	– collecting offers from consulting companies – choice of the company – signing contracts with the chosen company
Preparing the implementation Schedule	– drafting the preliminary version of implementing plan – determining and approving the scope of works within the 6S+1 programme
Elaborating the motivation system	– preparing the motivation system for employees – announcing principles of the system
Dividing the Company into areas	– drafting organizational maps of the Plant – diving the whole Plant into areas – drawing up a map with the division into areas
Oragizing a training for the whole crew	– establishing the schedule of the training for the entire crew – organization of the training (booking the room, catering, arrangements of the schedule – conducting the training, collecting the declaration to leaders

Table 4 continued.

Preparatory action	
Stages	Actions
Choosing area leaders	– verification of candidates by master, the project leader and engineers – choice of leaders in the agreement with the executive committee of individual areas
Organizing a training for leaders	– establishing the schedule of the training for all leaders – organization of the training (booking the room, catering, arrangements of the schedule) – conducting training including the principles associated with the health and safety at work
Training for persons carrying and participating in patrols	– verification of candidates by master, the project leader and engineers – choice of leaders in the agreement with the management
Training for persons carrying and participating in patrols	– verification of candidates by master, the project leader and engineers – choice of leaders in the agreement with the executive committee of individual lines
Organizing a training for leaders	– establishing the schedule of the training for all leaders – organization of the training (booking the room, catering, arrangements of the schedule) – conducting training
Training for persons carrying and participating in patrols	– verification of candidates by master, the project leader and engineers
Training for persons carrying and participating in patrols	– auditing on the area of the entire unit – a visualization of the current state should facilitate comparing changes caused in the future – notice that patrol members ought to obey the rules health and safety at work in their areas

Source: Own study based on own analyses.

After conducting preparatory stages, proceed to action associated with the implementation and the step one should be done as shown in the table 5. All employees before the access to the project should receive handouts in order to get acquainted with the 6S tool. Conducting the action of red cards is a next stage in order to ultimately remove unnecessary objects from workstations and areas to storage or garbage places. Next stage is a patrol action which has to appoint members for inspection which ultimately is supposed to check functioning actions which are already done. Auditing with the consultancy company support is a stage finishing implementing the first step in order to summary the first step.

Table 5. Preparatory action for implementing step I

Preparatory action	
Stages	Actions
Preparing and handing out handouts concerning step I	– hanging information on noticeboards – preparing information guides about 6S+1 – handing out short guides for leaders' files – preparing forms of the one thematic lessons – conducting the one thematic lesson
Red cards action	– preparing the specimen of red cards – drawing up the „schedule of the elimination" form – defining criteria of the of objects usefulness on positions – defining criteria of marking dangerous objects with area red cards – filling stickers in and pasting them on unnecessary objects – removing unnecessary objects from positions and moving them to the storage or garbage places
Patrol actions	– preparing the patrol checklist of 1-st step – preparing the patrols schedule – establishing patrol members – short briefing for patrol members with discussing the patrol sheet – conducting patrols according to the rules – visualization of patrols results on the notice board
Auditing the 1-st step	– preparing the checklist for the certification of the 1-st step – auditing by internal auditors with help and assistance of consultants from the outside company – visualization of results on notices board

Source: Own study based on own analyses.

After conducting stages from step I proceed to action associated with implementing step II should be done as shown in the table 6. Like in the first step at the beginning all workers should receive handouts in order to read stages of the second step. The 2-nd step is the organizational action associated with areas division, finding places for individual positions and tools, as well as describing places movement. Next stages like in the first step concern the patrol action i.e. setting the patrol members according to arrangements and visualising the results on the board. Step II implementation ends with conducting the Step II certification audit and displaying results on the relevant board.

Table 6. Preparatory action for implementing step II

Preparatory action	
Stages	Actions
Preparing and handing out handouts concerning step II	– hanging information on noticeboards – preparing information guides about 6S+1 – handing out short guides for leaders' files – preparing forms of the one thematic lessons – conducting the one thematic lesson
Implementing step II	– establishing the code of colours for horizontal markings – establishing the standard of descriptions – dividing the space of the plant by painting bordering lines and describing with appropriate sign – finding places for particular positions and tools elements – marking and describing all position elements
Patrol actions including the aspects associated with health and safety at work	– preparing the patrol checklist of step II – preparing the patrols schedule – establishing patrol members – short briefing for patrol members with discussing the patrol sheet – conducting patrols according to the rules – visualization of patrols results on the notice board
Auditing the 2-nd step	– preparing the checklist for the certification of step II – auditing by internal auditors with help and assistance of consultants from the outside company – visualization of results on notices board – minute patrols for the safety composed Specialist for H&SW and the area representative

Source: Own study based on own analyses.

After conducting stages from step I and II proceed to action associated with implementing step III should be done. Like in the first two steps at the beginning all workers should receive handouts in order to read stages of the third step The third step is organizational action associated with establishing the schedule of cleaning areas, conducting a thorough cleaning and including these activities in everyday employees duties. The last stages in step III is auditing by designated employees and visualization of results on a relevant board. A table 7 describes the III step. It ends by conducting the additional audit by the consultancy firm which after the audit will prepare the right report with remarks for the management.

Table 7. Preparatory action for implementing step III

Preparatory action	
Stages	Actions
Preparing and handing out handouts concerning step III	– hanging information on noticeboards – preparing information guides about 5 S – handing out short guides for leaders' files – preparing forms of the one thematic lessons – conducting the one thematic lesson
Implementing step III	– establishing the range of activities – creating the cleaning schedule – preparing things which will be need for cleaning (detergents, mops, sweepers, cotton waste, vacuum cleaners) – conducting a thorough cleaning – including cleaning in everyday duties
Patrol actions	– preparing the patrol checklist of 3-rd step – preparing the patrols schedule – establishing patrol members – short briefing for patrol members with discussing the patrol sheet – conducting patrols according to the rules – visualization of patrols results on the notice board
Auditing the 3-rd step	– preparing the checklist for the certification of the 1-st step – auditing by internal auditors – visualization of results on notices board
External audit	– conducting the external audit by the consulting company – preparing the report for the management including the health and safety at work state

Source: Own study based on own analyses.

After conducting stages from steps I-III proceed to action associated with implementing step IV should be done. Like in the 3 steps at the beginning all workers should receive handouts in order to read stages of the fourth step. The 4-th step includes the organizational actions must standardizes earlier stages as shown in Table 8. The fourth step is to develop clear and legible standards to limit diversifying in areas and facilitate limiting of all deviations from standards. The 4-th step is ended by patrol actions and auditing to certification of the 4-th step.

Table 8. Preparatory action for implementing step IV

Preparatory action	
Stages	Actions
Preparing and handing out handouts concerning step IV	– hanging information on noticeboards – preparing information guides about 6S+1 – handing out short guides for leaders' files – preparing forms of the one thematic lessons – conducting the one thematic lesson
Implementing step IV	– Workstations at the unit will be standardized ultimate which will facilitate noticing all inconsistencies – Drawing up the standard operating instruction which will limit the diversity and increase the predictability – Workers training in standards – Creating methods of visual inspection, thanks to which it is possible to establish model standards and procedures in relation to tagging, describing, using colours, codes and the line methods – Establishing standards concerning notices board – Establishing standards concerning health and safety at work
Patrol actions	– preparing the patrol checklist of 4th step – preparing the patrols schedule – establishing patrol members – short briefing for patrol members with discussing the patrol sheet – conducting patrols according to the rules – visualization of patrols results on the notice board
Auditing the 4th step	– preparing the checklist for the certification of step IV – auditing by internal auditors – visualization of results on notices board

Source: Own study based on own analyses.

After conducting stages from steps I-IV proceed to action associated with implementing step V should be done. Like in the 4 steps at the beginning all workers should receive handouts in order to read stages of the fifth step. The 5th step summary of implementation of the entire 6S method, as well as establishing measures which will access efficiency and effectiveness of the implementation as shown in Table 9. The 5-th step is ended by patrol actions and auditing to certification of the 5-th step.

After conducting stages from steps I-V proceed to action associated with implementing step VI should be done, as shown in table 10. Workshops, patrol actions, audits and a Review of the top management which must be closely associated with supporting the system elements are stages of the sixth step.

Table 9. Preparatory action for implementing step V

Preparatory action	
Stages	Actions
Preparing and handing out handouts concerning step V	– hanging information on noticeboards – preparing information guides about 6S+1 – handing out short guides for leaders' files – preparing forms of the one thematic lessons – conducting the one thematic lesson
Implementing step V	– Drawing up action which will keep results already achieved – 6S+1 method promotion – Drawing up the advanced trainings system – organising workshops improving issues from 6S+1 scope, where additionally issues associated with the Labour Code will be brought up – updating notices board with results of applying 6 of S+1 method
Patrol actions	– Preparing the patrols schedule of all implemented steps – Establishing patrol members, conducting patrols according to the rules – visualization of patrols results on the notice board
Auditing 6S+1 method	– Preparing the checklist for the certification of the entire method – auditing by internal auditors with help and assistance of consultants from the outside company – visualization of results on notices board
External audit	– conducting the external audit by the consulting company – The audit must sum up implementing 6S+1 method on the whole plant area and determine improving actions for the coming time
Determining measures	– establishing measures which will access efficiency and effectiveness of the implementation 6S+1 method to monitor effects

Source: Own study based on own analyses.

Table 10. Preparatory action for implementing step VI

Preparatory action	
Stages	Actions
Workshops	– A participation in improving workshops organised on the plant area is every employee duty
Patrols	– Conducting patrols of implemented steps systematically, which must keep the current state with particular reference to health and safety at work. Patrols „minutes for the safety"
Audits	– Annual auditing to improve the system and the evaluation of his functioning
Top management review	– Elements associated with 6S method and the health and safety at work should be attached to the top management review

Source: Own study based on own analyses.

In order to carry out implementing 6 of S+1 method carrying out above stages step by step described is needed. It isn't possible to implement the system unsupported by the top management. They should participate by introducing each step so that they can supervise progress of works on each of stages. Practical interpretations of elements 6S+1 were presented in the table 11.

Table 11. Practical interpretation of 6S+1 elements

6S+1	Goal	Improvements	Realization
1S SEIRI	Streamlining the process, the cost cutting	– Reducing the stock – Better use of the working place – Preventing losing objects	– Sorting the thing for needed and unnecessary – Removing unnecessary things – Cleaning working places from hampering things
2S SEITON	Streamlining the process (increase in the efficiency and effectiveness)	– Shortening the time of searching for needed things – improvement in safety	– Due arranging all things needed for fast use – Shortening the time of preparation the working place
3S SEISO	Increase in the efficiency of machines, keeping devices clean	– The maintenance and improvement in machines efficiency – Keeping a workstation clean, simple to check – Fast information about damage – Improvement in the workplace – Elimination of accidents causes	– Kepping machines clean – Keeping neat and safe conditions
4S SEIKETSU	Increase in safety and reduction of industrial pollutants	– Drawing up procedures determining the processes	– Following all principles applicable in a company (procedures, instruction, orders, edicts)
5S SHITSUKE	Increase in the awareness and the morale	– fewer mistakes from the inattention – Acting according to the decision – Streamlining internal communications – Improvement in human relationships	– Self-control – Cooperation in the team problem solving – Proceedings according to decisions
6S SHIBO	Keeping achievements of implementing 5S. so that activities performed by employees are their „deep love"	– Achieving the perfect state of processes in the company	– Motivating employees for dense warning procedures accustomed in five steps
6S+1 SAFETY	Work safety for the entire 6S course	– Zero accidents, zero gaps, zero breakdowns	– In each 6S step

Source: Urbaniak M., *Zarządzanie jakością. Teoria i praktyka*, Wydawnictwo Difin, Warszawa 2004.

Japanese men stated that applying 5S in the long term was less and less effective. It results from the fact that employees are surrendering to the routine and the quality of their work with time is decreasing. That's why the sixth S from Japanese SHIBO was introduced, what in the literal translation means „deep love". In our language a translation was accepted as „persevering in intentions" which is just the sixth S purpose.

Particular attention in the sixth S should be paid on motivating employees for dense following procedures implemented in five steps. The root and significance of motivating employees in processes of the work are basic management component. Motivating is essential for the success of every undertaken completion. Apart from salary for employees implementing this venture the motivation system which will allow to implement every venture in the most perfect way should be predict.

6S being the base of Lean Management and TPM implementation in each organization one should remember that sixth „S" is persevering in intentions what means 5S must be maintenance constantly.

In order to reach the motivation system should be drawn up in the organization. It's a well-known fact that only salary isn't a sufficing way to achieve desired work effects. Employees apart from salary expect meeting other needs which result from their character. So employees motivation is needed so that they can meet their needs. This issue has its reflection in motivation theories.

Conclusion

Described analysis was performed based on real data obtained during studies of a Polish textile company. Study results show that many irregularities exist in the examined company which can be eliminated during implementing a suggested project. Considering meaning and the role of 6S+1 system in Total Productive Maintenance it is possible to state explicitly that the project implementation will increase the safety. We should also notice that the company certainly isn't only, in which system 6S+1 should be introduced. It is possible to say, that developed system 6S+1 is a chance for many companies in Poland to improve the work processes efficiency during qualifying the waste, the prevention of making mistakes as well as reducing the number of accident at work. Because of sensitive data and the company good author doesn't reveal its name.

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ECONOMIC ANALYSIS OF POLISH SME SECTOR SITUATION IN THE PERIOD OF ECONOMIC SLOWDOWN

Abstract

According to economic theory in the post-industrial economy based on the knowledge, the main importance have small enterprises. Therefore, in this article were taken attempts to assessment of the SME sector in Poland in the years 2004–2012 paying particular attention to the sub-period of the economic slowdown. In the article for the assessment of this problem there were mainly used quantitative indicators as: number, survivability, decrease, liquidation of enterprises and also the qualitative share in the GDP creating as also the structures according to the area of their activities.

JEL Classification Code: **D22**.

Keywords: small and medium enterprises, economic slowdown, assessment indicators.

Introduction

The purpose of this publication is to show the impact of the economic slowdown on the quantitative state of the SME sector in Poland. Efficient operation of the enterprise in these times, where we meet mostly with a market economy depends on many factors. The success of an economic subject depends on the kind of goods and also services, which they can offer to potential purchasers, from that how the management system functions moreover, a significant impact on efficient functioning of the enterprise has a selection of appropriate sources of financing business activity. Selec-

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tion of appropriate sources of funding gives the enterprise the opportunity to carry out both operating activity, as well as investment (see: Fetisovová 2012, pp. 73–90). Despite such important factors, there is an incredibly important aspect of the economic situation in the country and its surroundings, which acts on the functioning of enterprises. Enterprises' profitability does not depend only on the material factors of production but is based on indefinable difficult to measure or even to name immaterial means of production and labor (see: Majer 2014, p. 80).

Nature and importance of small enterprise

Along with Polish accession to the European Union there have been made changes to Act on freedom of economic activity of 2nd July 2004. These changes have been introduced for act of the Polish National Parliament from 26th November 2004 (see: Ustawa o swobodzie działalności gospodarczej). The Act contains a definition of micro, small and medium enterprise. The definitions of the above mentioned enterprises are in accordance with the being in force canons in the area of the EU. There are three basic factors that determine which category could be qualified for a particular enterprise. These factors are (see: Piasecki 2007, pp. 86–87):

– annual turnover value;
– amounts in the assets balance;
– size of employment.

On the basis of the above criteria the Act distinguishes between three types of enterprises:

– micro enterprises;
– small enterprises;
– medium enterprises.

Micro enterprises belong to the economic entities that employ no more than 9 employees on a yearly average. The company's turnover does not exceed a year in zlotys an equivalent of 2 million EUR. Talking about a turnover it is thought about net revenues from sales. To micro enterprises there are also included those entities which compiled total assets balance at the end of the reporting year did not exceed the equivalent of 2 million EUR. The above conditions must be realised together and at least during one year in the past two years. On the other hand, when a company operates for less than a year on the market then its annual net turnover from the sale, as well as size of employment is determined on the basis of the data documented by entrepreneur for the previous period.

Small enterprises in accordance with the contents of Act on freedom of economic activity employ on a yearly average less than 50 employees, while their net income from the sale of goods, products and services does not exceed the PLN equivalent of

10 million EUR, and the total assets balance of the unit, which has been compiled at the end of the reporting period has not exceeded a value equal in PLN of 10 million EUR.

Medium enterprise is defined pursuant to the Act as an entity which in at least one year of the last two years average employed during the year less than 250 employees, and its net income has not exceeded the equivalent in PLN of 50 million EUR. Regarding the total assets of its balance compiled at the end of the financial year it may not exceed PLN equivalent of 43 million EUR. Moreover, in the case of micro, small and medium enterprises there are important some reservations that cause that the enterprise cannot be qualified to one of three of their kinds, where it is not considered as micro enterprise where entrepreneurs other than small ones, the Treasury or the territory autonomy entity have:

- more than 25% of the contributions, shares in the company;
- the right to more than a 25 percent of share in the profits;
- more than 25% of the votes in the general meeting of associates (shareholders).

For a small enterprise is not considered a unit in which the conditions above mentioned are fulfilled, relating to micro enterprise. Similarly, in the case of medium enterprise, with the difference that the above conditions relating to contributions to the company, the shares in profit and the number of votes at the general meeting of associates concern besides the Treasury, territory autonomy entities, small entrepreneurs they also include medium entrepreneurs. The table below illustrates vividly previously discussed criteria for the division of enterprises according to the Act on freedom of economic activity.

Table 1. The criteria for the distribution of enterprises according to the Act on freedom of economic activity of 2nd July 2004

Enterprises	Micro	Small	Medium
Employment	< 10	< 50	< 250
Net revenues	to 2 mln EUR	to 10 mln EUR	to 50 mln EUR
Total assets in the balance	to 2 mln EUR	to 10 mln EUR	to 43 mln EUR

Source: Art. *104 – 106 Act on freedom of economic activity of 2nd July 2004.*

Distinguished in EUR terms such as value of net revenues, total assets balance and the size of employment enable to classify enterprises moreover, these values expressed in EUR are calculated into PLN according to the average exchange rate announced by the Polish National Bank on the last day of the financial year, which has been designated to determine the status of the enterprise.

Economic importance of sme sector

The role of the SME sector is dependent on factors both economic and non-economic. Despite this, the sector in all conditions, regardless of the economic and non-economic factors is essential in the economy of the country for issues such as (see: Piasecki 2007, pp. 100–103):

- creation of new jobs, thereby reduction of unemployment in the country;
- appropriate and rational distribution of resources;
- innovations as well as modernization of industrial structure.

Discussed the first two issues, such as new place of employment and rational allocation of resources is unusually emphasizes in the countries that are at the least grade industrialized and also in developing countries, where it is assumed that the SME sector (see: Skowronek – Milczarek 2010, p. 50):

- using simple production techniques that are at labour-intensive nature absorbs the excess of workforce;
- allows the recruitment of women, immigrants and also young people on a scale much larger than large companies;
- manages more economically and productively, and uses capital economically, the savings as well as other funds;
- cooperates with modern enterprises;
- provides products onto the market, as well as the services of a lower quality, which are generated at lower costs and in many cases sold on credit;
- supports not attractive for large entities specialized markets.

To sum up, the transitions and the associated experiences of countries which are well developed prove that the SME sector fulfills a significant role in the economy, and therefore having a particular impact on economic growth, as well as the employment growth, what is connected with a decrease of unemployment, which is the economic and social problem in many countries. Above that, the SME sector affects the growth of the occurrence in goods market at suitable quality.

The SME sector is an important stimulus to the development of economy, the number of SME enterprises, and also their potential, may be one of the benchmark of the economic growth.

Actual state of sme in Poland

Since the beginning of the political transformation in Poland, the SME sector is an essential factor, generator that drives the economy of our country, thereby contributing to determine the degree and the structure of employment, as also determining the level of social wealth. The number of active enterprises in Poland in the years 2004–2012 describes the following figure.

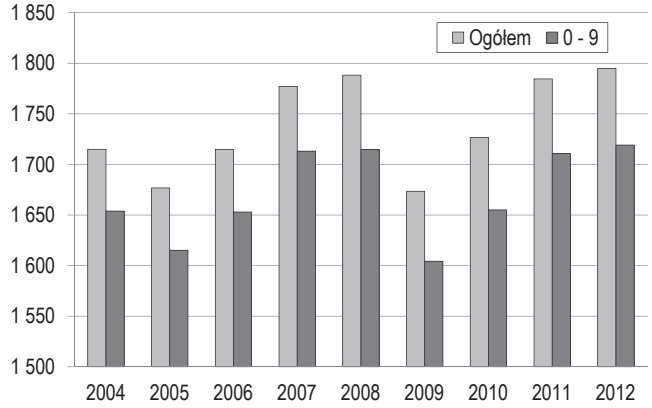

Figure 1. The number of active enterprises in Poland in general and small enterprises in the years 2004–2012 (in thousands)

Source: www.parp.gov.pl

After a period of growth of the number of enterprises active in Poland, which took place in years 2006–2008, there has occurred the essential in 2009, as many as 6% decrease of their number in comparison with the previous year.

In 2010–2011, there has been set down the resurgence of the number active enterprises (by 3.2% in 2010 in comparison to 2009 and by 3.4% in 2011 in comparison with 2010). In 2011, the value returned to the level of the years 2007–2008. In 2012 there has been set down the resurgence of active enterprises in Poland, although the increase was not as dynamic as in previous years.

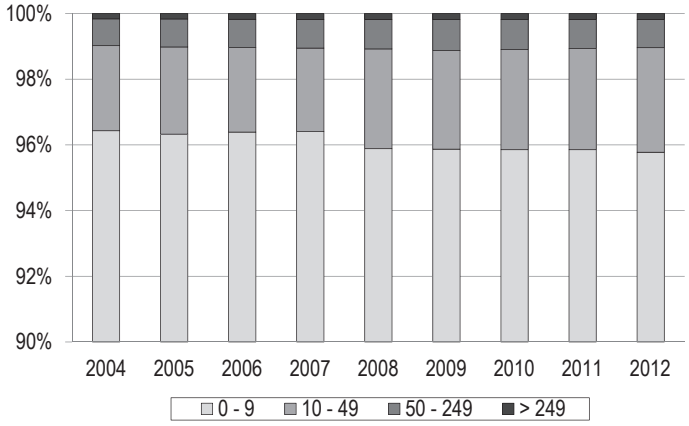

Figure 2. The number of active enterprises in Poland in specific groups by size in the years 2004–2012 (in per cent)

Source: www.parp.gov.pl

Decrease of the number of enterprises active in Poland mainly concerned the smallest subjects, where the number of small companies decreased by 7.5% and 6.4% in the case of micro enterprises. Such occurred situation could be related to the deterioration of the economic situation in the country.

A very important aspect of illustrating the condition of the economy is the number of newly created enterprises. The increase of the number of enterprises indicates Polish economic development, as it is illustrated in the chart below.

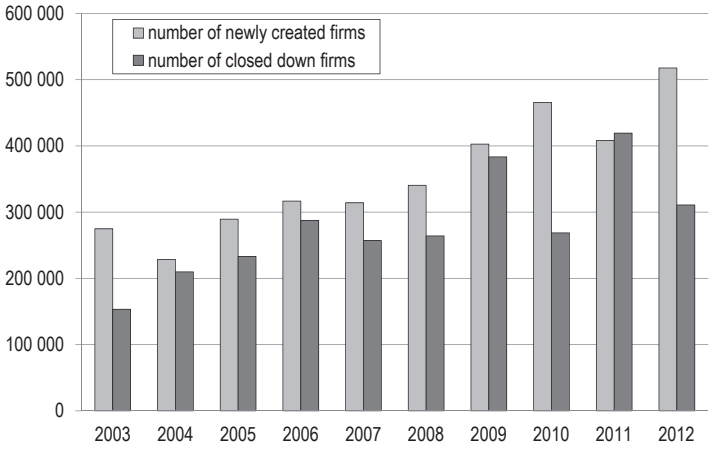

Figure 3. The number of newly created and closed down enterprises in Poland in 2003–2012 (in thousands)

Source: www.parp.gov.pl

Based on the above chart it should be noted that the number of newly created enterprises during the entire period 2003–2012 was higher than those liquidated. However, although both categories displayed the increase tendency, the number of liquidated enterprises grew much faster than the number of newly created economic entities.

Despite the economic slowdown, which took place in Poland in the years 2009–2010, the number of newly established companies has grown dynamically – in 2009 to 404 thousand. (an increase of 18.7% compared with 2008), and in 2010 to 466 thousand (an increase of 15.3% compared with 2009). The negative impact of economic slowdown on the Polish enterprises appeared only in 2011, where there was a significant decrease in the number of newly created companies (up to 408 thousand – a decrease of 12.5% compared with 2010).

This year, the number of liquidated enterprises was also higher than the newly created entities (419 thousand). At the same time, one of the major causes of change in the number of companies could also be carried out verification of the REGON database by GUS31. Another year, namely 2012 brought a certain improvement, because the number of newly registered enterprises has increased and, consequently, exceed-

ed the level of 500 thousand (518 thousand, an increase by 26.8% compared with 2011, and by 11% compared with 2010). In 2012, there was also observed a decrease in the number of enterprises removed from the REGON – up to 311 thousand. The number of liquidated enterprises this year was about a quarter lower than in 2011.

Polish trade structure of small and medium enterprises is shown on the figure 4.

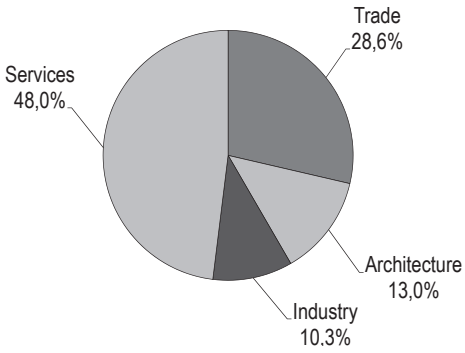

Figure 4. The structure of SME in Poland according to fundamental business area

Source: www.parp.gov.pl

The SME sector carries out mostly service activity (48.0%), trade (29.0%) and also construction (13.0%). Less frequently deals with the industrial activities (10.0%). On the other hand, big enterprises mainly specialise in industrial activity (52.3%), and in much lesser extent than SME are present in services (29.4%), trade (13.2%) or in the construction industry (5.1%). In the industry large companies operate mainly in such areas as industrial manufacturing (in this economic sector operate 47.0% of large subjects), while in the administration and support service activities (8.2%) and in transport and warehouse management (6.2%).

Figure 5. Share in the GDP creating of the groups of enterprises according to working number in Poland in 2012

Source: www.parp.gov.pl

In Poland, enterprises generate about three quarters of Polish gross domestic product (GDP). This result, formed at 73.0% in 2012.

Table 2. Share in the GDP creating of the groups of enterprises according to working number in Poland in 2004 – 2012

Year	GDP in milion PLN	Gross value added (GVA) generated by enterprises [%]						Gross value addend (GVA) of other subjects [%]	Duties and taxes [%]
		Total	Small and medium enterprises (SME)				big		
			Together	micro	small	medium			
2004	923 248	70,50	48,60	31,00	7,60	10,00	21,90	18,30	11,10
2005	983 302	70,30	47,80	31,50	7,40	8,90	22,50	17,80	11,90
2006	1 060 031	70,70	47,80	31,00	7,40	9,30	22,90	17,20	12,20
2007	1 176 737	70,80	47,30	30,40	7,20	9,80	23,50	16,70	12,50
2008	1 275 432	71,10	47,20	29,90	7,40	9,90	23,90	16,50	12,50
2009	1 343 366	72,30	48,40	30,40	7,90	10,10	23,90	16,50	11,10
2010	1 416 447	71,60	47,60	29,60	7,70	10,40	24,00	16,50	11,90
2011	1 528 127	71,80	47,30	29,40	7,80	10,10	24,50	16,10	12,20
2012	1 596 378	73,00	48,50	29,70	7,80	11,00	24,50	15,60	11,40

Source: www.parp.gov.pl

Over the years 2004–2012 there are observed clear increase tendency of enterprises in Poland confirmed by an increase of GDP share of big enterprises, with a simultaneous decrease of the share of smaller (micro companies). In the period 2004–2012 there has occurred an increase in the importance of large companies in GDP generating in Poland (from 21.9% in 2004 to 24.5% in 2012). In the case of small and medium companies, it is difficult to indicate clear tendency, their share in the GDP generating in 2009–2012 varies for medium enterprises at the level from 10.1% to 11.0%, and in the case of small enterprises – from 7.7% to 7.9%. In the group of micro companies in 2009–2012 there is observed a downward trend (from 30.4% in 2009 to 29.7% in 2012), what could have a direct connection with the economic slowdown.

Conclusions

The last years have brought a lot of complications to the Polish State in the economy. After the collapse in 2009, there have appeared the better years 2010 to 2013 with a clear progression. During the economic slowdown there has been observed a temporary reduction in the number of enterprises, as well as the deterioration of the indicators concerning the survivability of enterprises. The negative impact of the economic slowdown in Poland has contributed to the decline in newly created

enterprises moreover, there have been observed an increase in the number of liquidated economic entities. After the strong slowdown in the economy at the end of 2009, and at the beginning of 2010, there appeared a gradual revival of the economy, what was supported by the improvement of foreign economic situation. An improving economic situation resulted in a decrease of the risk of enterprises' activity in the area of economic environment and the improvement of the financial situation of the enterprises. Based on the above considerations we have to claim that the economic slowdown undoubtedly had a significant impact on the functioning of the SME sector.

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RISK MANAGEMENT BASED ON ISO 31000

Abstract

The following article analyzes risk management in enterprises. It is very important to understand the meaning of risk in social and economic categories as well as classifying risk into different categories.

During critical studies of the available literature, especially the content of ISO 31000 standard as well as projects of unpublished ISO 9001:2015 standard gives readers the possibility to predict changes which can appear soon in the field of management standardization. System solution based on ISO 31000 standard is a new trend in quality management. ISO 31000 can be integrated with the quality management based on ISO 9001.

The implications of this analysis are the foundation to understand the directions in which organizations will be heading for in order to meet the latest standards. It is a new field of study in management which requires popularization and systematization.

The critical studies show that there is a research gap and this article is made in order to eliminate this gap. Due to the fact the that risk management has become a very popular field of discussion involving safety assurance and continuity of operations in enterprises, the authors introduce with the following article a new look based on ISO 31000 and ISO 9001:2015 projects. This new look helps to understand the research area in standardization aspects.

JEL Classification Code: **D290, D810**.

Keywords: ISO, risk management, quality, quality management.

Introduction

Antonio Gramsci issued an explicit statement about the crisis in the early 1920s. He wrote in his personal notes that „the crisis begins when the old dies but the new cannot be born yet" (Bauman 2011, p. 193). It resembles the historical time known

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as interregnum. After the death or king's abdication, the successor to the throne is still not chosen. In the German history there was a period called Grosses Interregnum lasting approximately 20 years. (13th century). Nowadays, the concept of interregnum does not necessarily have to apply to people. It is rather considered to be uncertainty related to people's views. This crisis led to a difficult situation when the previous perception of economy and society appeared to be illusory but the new belief or beliefs have not been established yet. It definitely hinders the stability (but the question is if it is really the point?). The postmodernism which is based on deconstruction and anti-systemic approach compels interest in the world of international business. Liquid modernity, constant mobility, social alienation, aggravating international chaos, turbulence, changing trends, and progressing virtualisation may be found among the examples of macro environment's influence on the organisation's work. It appears that each of the above mentioned factors can be characterised by one common feature, that is, uncertainty. It turns out that one cannot stay indifferent towards uncertainty as it may become the chance to gain a competitive advantage. But it may also become an element determining a failure of even the best „business shark". It is worth to pay attention to the word „may" in the previous sentences as it indicates uncertainty, which is closely connected with probability tools such as statistics or intuition. The purpose of the following article is to analyse the risk concerning the organisation's performance with regard to systemic management (based on ISO 31000 standard) and the place of organisation. It seems that comprehension in particular areas and subdisciplines is inevitable in this case. This type of marketing is categorised by complexity, dichotomy and ambiguity(Lotko 2013, p. 122). These characteristics determine a completely different and new way of perceiving a customer, his preferences and needs. Their changeability and growing customer awareness may be considered risky as well. This applies to both to financial risks including market risk, credit risk, liquidity risk, operational risk (Satyajit 2006, p. 5) and also risk in organizational sense.

1. Organization's environment as a source of risk

Every method of strategic analysis (whether it is SWOT, PEST, stakeholders or other method) oscillates between postulates referring to the future. Its anticipation, or construction is the basis for the strategy of organisation for the upcoming years. Probably, it is almost impossible to set up business according to the principle, „hic et nunc" – „here and now". The most successful world managers demonstrate the skills such as social engineering, prediction and ability of exercising an effective impact. It can be therefore concluded that both for macro scale – the state of the today's economy and for micro scale – the state of a particular company is the result of strategies, views and ideas for the years to come. In other words, the future of the organisation has a considerable impact on the present days. We used to perceive the present day

as a culmination of the past, the result of years of experience. Now, the situation has changed completely as the present day is considered to be the arena for the confrontation between analytics and the outcome of successful ideas. Consequently, only those things that can be easily anticipated are trends nowadays. „The feeling of uncertainty is becoming a capital, which no businessman worthy of the name, will not definitely leave unattended" Bauman 2011, p. 99). The uncertainty can be recorded in the economy in the form of positive or negative phenomena. Therefore, it may lead to the regression and organisation's collapse, or can pave the way to remarkable success. In order to anticipate what indeed may happen, it is worthy to look at it through the prism of the risk.

It is also important to emphasise that the main resource in the era of knowledge-based economy is human. Knowledge experience and skills that materialize in the manufacturing process are a major source of competitive advantage. This concerns especially companies focused on innovation of its own products and services, both in the context of radical innovation as well as incremental innovations. The source of changes both within organization and in its environment are knowledge and creativity of human resources. That is why risk of non-use, or insufficiently use opportunities are faced by companies-innovators. Among many new developments, only a few of them come onto the market as product ready to meet the clients' requirements. Many of them retained on production phase of the product life cycle, usually at the planning or design stage. A lot of innovative ideas can be realized thanks to risk management. It is due to the fact that not always the ingenuity of the inventors is misguided but rather the way of these ideas' materialization is burdened with too much risk. In this context, it is necessary to identify and define the risks in the environment in which the project is to be carried out an innovative product. This allows to eliminated the difficulties are the products' and processes' barrier in the twenty-first century.

Philosophy and risk typology

In the theory of insurance there are two major types of risks. The default risk incurs only the loss or the lack of it. Whereas, the speculative risk can provide some benefits or make you suffer huge loss (Williams & Smith 2002, p. 31). A perfect example of the first type of risk can be the theft of an expensive measuring equipment, after breaking into the company by the thieves. (obviously the measuring equipment is insured). The second type of risk is best illustrated by making an investment, the return of which is uncertain but in the suitable circumstances the investment can bring huge benefits. The statement that the today's world and economy is ruled by risk and uncertainty will definitely not be surprising for anyone. Today's assets of a company may become its liabilities tomorrow. According to Tadeusz Kaczmarek there are 17 types of risks, encompassing insurance, financial, production, legal, ecological, psychological and

sociological sectors (Kasiewicz 2011, p. 42). It is appropriate to emphasise here that taking one risk entails facing a lot more problems. The reason is that they seem to be inseparably linked with one another. For instance, the manager who takes the risk to raise the volume of production, not being aware of the fact that the earlier quantity equalled the maximum value of marginal profit, can lead to excess of goods supply, and to the price decrease. The effects on economy are substantial. These can be financial consequences (decrease in profit), social (the necessity to make people redundant) and psychological consequences (stress connected with making a wrong decision). It means that taking production risk is related to other threats as well. Such way of thinking is confirmed by the new regulations in the field of standardisation. ISO 31000 standard was published by International Organisation for Standardisation in 2009. It deals with risk management – the rules and guidance for development of management system. It enables to estimate various types of risk, methods of avoiding and reducing risk. This significant document was translated and published by Polish Committee for Standardization in 2012. More and more authors dealing with the issue of quality management become interested in risk analysis. Some of the methods of Total Quality Management refer to the assessment of the risk level (e.g. FMEA analysis). The issue is highly important in relation to the amendment to ISO 9001 standard, to be held in 2015. The authors draw attention to the fact that the most significant change will be to include the risk issue in the canon of quality management.

Introduction to risk management

A. Koźmiński puts forward a peculiar definition of management, as „a journey through the chaos"(Koźmiński 2011, p. 56). The most appropriate person to arrange this chaos is the manager. Thus, all his activities are undertaken on „the very thin ice" – that is on a constantly changing economy and society desiring novelties. In order to overcome those difficulties it seems prominent to develop a pragmatic set of instruments to manage the influence of uncertainty on a particular organisation. The same logic is followed by ISO 31000 standard issued from 2009, where the uncertainty is considered to be risk. It affects especially the objectives of organisation, and can result in either positive or negative departures from expectations. Therefore it is impossible to adopt a single universal approach towards dealing with it.

The abovementioned standard lists the following alternatives:

1. Avoiding risk by refraining from undertaking any actions and discontinuation of activities determined to entail any level of risk.
2. Taking or increasing the risk in order to achieve objectives.
3. Removing the source of risk.
4. Change in likelihood (what is particularly interesting, the standard does not use the word *probability* as it is often narrowly interpreted as a mathematical term).

5. Change in consequences (consequences of the occurrence of the event which may influence organisation's objectives).
6. Sharing risk with other party or parties.
7. Risk retention based on a deliberate decision (PN-ISO 31000 2012, p. 225).

However, in order to choose the right option or options, management risk needs to be considered in a systemic manner. It may facilitate taking key decisions by managers as well as being a toolbox of concrete actions facing the uncertainty.

The fact that the standard distinguishes two management areas should not be ignored. It is illustrated by two different terms – risk management – referring to architecture of management system and – managing risk – relating to a specific action (individual). Thus, this architecture of management system can be applied to a particular risk.

Setting Risk Management Framework

Every public, private or cooperative company, association, group or the natural person may become a potential user of ISO 31000 standard. The foundation of management system, which is based on the abovementioned standard, is designing, implementing, monitoring, reviewing and continually improving risk management framework. The risk management framework should be embedded within the organization's overall strategic and operational policies and practices. Furthermore, establishing such a framework enables integrating the system with governance, organisational structure and overall management system. The detailed elements of framework (including the numbers of specific standards) are illustrated in figure 1.

The success of risk management „depends on the efficacy of the framework", as it is the foundation of the process of risk management, which is composed of (numbering consistent with the standard):

5.2 Communication and consultations.
5.3 Establishing the context (external and internal factors taken into account in risk management).
5.4 Risk assessment.
5.4.2 Identification of risk.
5.4.3 Risk analysis.
5.4.4 Risk evaluation.
5.5 Risk treatment.
5.6 Monitoring and review.

It is recommended that any activity connected with the above process and its critical components be identified for recording information. Any protocols give rise to the improvement of overall process as well as techniques and tools that should be used.

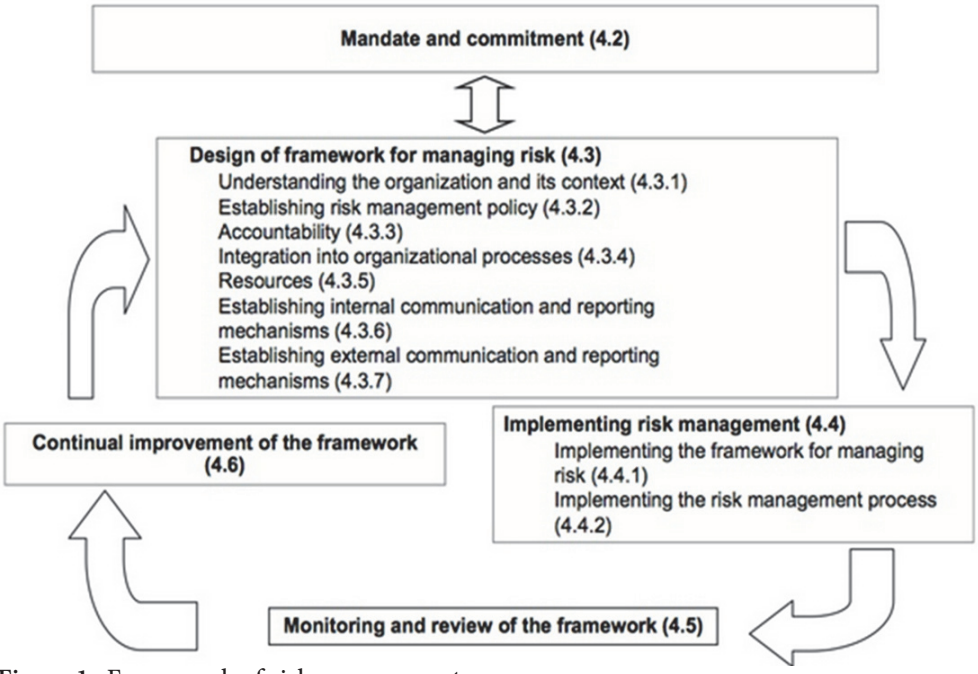

Figure 1. Framework of risk management

Source: self-study

In addition to, in economy there are so-called alternative risk transfers (ART), which relate to more than to capital markets management. In ART the integrated risk can be limited or even reduced due to risk control. Control Utility is also used in risk management based on ISO 31000, as I quality management system based on ISO 9001 (Culp 2005, p. 369).

Risk management as another step to quality management

An increasing interest in creating new areas of study in the management process can be observed. As a consequence the libraries are packed with books dealing with subjects of time, emotion, knowledge, culture, talent, conflicts and value management. It is probably impossible to gain sufficient knowledge and become a specialist in every single management area. Therefore, it seems threatening that risk management will be somehow neglected and taken with a pinch of salt. That is why, it is justified to consider risk management as a next step to quality management. ISO 9000 standard from 2005, defines quality as, "the degree to which a set of inherent characteristics fulfils the requirements"(PN-EN-ISO 9000 2006, p. 3.1.1). Hence defining risk, as a degree to which a set of characteristics (referring to the consequences in external and/or inter-

nal context, e.g. environmental, social or economic context) may contribute to either satisfying or not satisfying customer needs and expectations, is absolutely necessary. Such perception (which is not directly mentioned in ISO 31000 standard) leads to a situation when risk management system has a complementary function to the quality management system. Those people who are responsible for the quality in various organizations demonstrate exceptional abilities. Probably is it due to the fact that they can use the uncertainty to improve or remove any imperfections. Risk management system seems to be the perfect instrumentation in this case. Furthermore, there are some crucial components inseparably connected with risk in ISO 9001 standard. In the Table 1 the above mentioned components are shown.

Table 1. Some of the risk components in ISO 9001 standard from 2009

ISO 9001 standard from 2009	Comments
4.1 General requirements	Defining processes, we establish criteria and adopt methods necessary to ensure a proper course and monitoring of the process. It may turn out to be completely pointless without taking into account threats and risks connected with this process.
5.6 Management review	The review should contain assessment of improvement and changes that need to be implemented in quality management. Any proposals for changes should be assessed with regard to their influence on quality. The assessment of effectiveness and efficacy of processes should include possible threats in every process.
6.2 Human resources	Implementing this requirement we provide required qualifications, and manage the risk connected with people, including all stakeholders.
6.3 Infrastructure	Taking into account infrastructure, which have an impact on the product requirements, may ensure risk management connected with infrastructure.
7.2.2 Review of requirements related to the product	The requirement to review the contract/order before signing and specifying detailed principles of its execution reduces the risk of not meeting requirements (including legal aspects).
7.3.7 Control of design and development changes	It is necessary to assess the results of changes in the delivered product.
7.4 Purchasing	Criteria of selection and systematic assessment of suppliers reduces the risk of sensitivity of organization to suppliers and partners' actions.
7.5 Production and service provision	Controlled production reduces the risk of rejection of a non-compliant product.
8.2.1 Customer satisfaction	Monitoring customers perception is an essential part of risk identification connected with customers dissatisfaction, loss of good reputation, complete picture of organization, the loss of market share.
8.2.2. Internal audit	Internal audit should identify operational risk.
8.5.3 Preventive action	Eliminating the causes of potential inconsistencies is the result of risk assessment.

Source: self-study

A further argument are speculations that risk management will be embedded in the latest ISO 9001 standard from 2015. The basic requirement of this standard is the necessity to define internal and external issues referring to mission and vision, that should influence the capacity to accomplish objectives of quality management system. In this context risk analysis is responsible for effectiveness of the whole system. Besides, it is necessary to define the degree of customer satisfaction if the products do not fully meet his or her requirements. This analysis allows seeing quality in a new light – not as a balance between product features and customer needs, but as a dynamic indicator used to prevent situations in which customer could be dissatisfied (Kobylińska 2014, p. 214).

Conclusion

There are many publications about risk management but it has not been still fully described. Each discussion has a contribution in its popularization as well as it systemizes it into one coherent area of knowledge. Uncertainty is its elementary concept but on the other hand discussion about uncertainty is uncertain. ISO 9001:2015 standard hasn't been published yet. The content of ISO 9001:2015 standard can be only speculated or concluded from projects. That is why it is essential to prepare a good foundation to understand the new standard and adopt organizations to risk analysis in relation to their goals.

The following conclusions were achieved thanks to critical studies of literature:

- A rising interest trend can be observed in the field of risk management, which are in the content of the latest standards as well as in the projects of unpublished ISO 9001:2015.
- The issue of risk does not limit itself only to financial role but also it is identified in the field of human resource management, infrastructure, projects realization and the level in which the projects were realized as a final product.
- International Organization for Standardization spots the possibility on reducing risk which is make up to help ensuring both during production (for workers) and also during their consumption (clients).
- ISO 31000 contains a ready-made model solving problems linked to risk appearing. Thanks to ISO 9001:2015 analysis, ISO 31000 can be regarded as a preparatory tool in context of introduction ISO 9001:2015 as soon as it will be published.

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Joanna Bach Głowińska
Inteligentna przestrzeń. Trzeci wymiar innowacyjności (*Intelligent space. The third dimension of innovation*)
Wydawnictwo Oficyna a Wolters Kluwer business, Warsaw 2014 p. 302, ISBN 978-83-264-3193-7

'The nineteenth century was a century of large empires, the twentieth century was a century of states and the twenty-first century will be a century of cities' – claimed Wellington E. Webb mayor of Denver. And doubtless he was quite a few rights because at the beginning of the present century urban population exceeded number of people who live in rural areas. It is estimated that almost 180 thousand people move to cities every day what gives – 60 million every year in the scale of the globe. There are more than 10 million inhabitants in already twenty two cities. So, the future is for smart cities ('Gates of the country' conference, which took place 22nd November 2012 on the National Stadium in Warsaw).

The title of the monograph is quite inspiring and actual when there is not any field where intelligent solutions do not infiltrate from the surrounding reality. The author explains that the third dimension of innovation is a new culture of a human placed in the smart space. It should be understood in such a way that human's creativity in relation to surrounding him reality in material dimension are interconnected and interact with each other.

In relation to the above mentioned statement appears a question: why the smart space is just the third dimension of the innovation? The answer on this question in content of the monograph is a little bit dispersed. Hence, the short synthesis which explains this problem is prepared based on the reviewed thesis. The first dimension of the innovation has a form of dynamic process, where old technologies are replaced by new ones. The second dimension of the innovation concerns increase of customers' satisfaction by continuous improvement of goods or services' quality. The third dimension of innovation is a consequence of functioning people and organisations in the context of their social relations with the environment. It is also confirmed by research of the creative class and compatible factors of territorial units' development which are understood in a multidimensional way and at the same time intelligently. The factors are identified as 3 x T, what means: technology, talent and tolerance.

Construction of the reviewed thesis is as follows. In the first chapter titled 'Ideas of the smart development and a smart city as a dimension of innovation' the author indicates that the dimension of innovation is a derivative of the sustainable development supplemented by participa-

tion, innovative technologies, integrated planning and so-called green economy what leads to the smart city.

As factors of development of the smart city there are listed:

- employment customised to a global and local complementarity;
- development database based on mobility and modern environmental technologies with optimisation of urban processes;
- complementary place benefits based on environmentally friendly technologies and so-called soft factors embedded in local environment;
- knowledge resources in the form of intelligent society.

In this chapter we can find recommendation of intelligent development and integrated planning as instruments of urban space renovation. In the final conclusion the Author reaches the inference that present-day cities become more efficient, transparent in management and interactive participation of the residents in city life makes in real time thanks to using ICT technologies.

In the second chapter titled 'Recommendations of Europe 2020 strategy in the context of differentiation of the European cities' development' mentioned the UE cities face challenges:

- natural (climatic changes, access to energy);
- economic (competition of Asia, America, Europe);
- social (aging of population, waves of migration).

Answer on the challenges is cohesion policy in the European dimension. Accordingly, the city should be planned in such a way to be able to meet creating of a friendly climate to live for people and its development should be directed and controlled.

Next, in the third chapter there were analysed processes of suburbanization of Western European and Polish cities and it follows from them that the processes are inevitable regardless on their geographical localisation. Finishing considerations on this topic the Author asks important questions which can be a subject of further research. Why do mobile people including representatives of the creative class consider living outside a city? Does quality of life in residential environment is crucial from a modern man's point of view? What is the impact of innovation on the external environment?

The fourth chapter considers innovation issues in the urban space. It is the EU's growth strategy for the next decades included in the Europe 2020 and hence it is so important. In the changing world the European Union needs intelligent and balanced economy which promotes social including. The Author builds based on so-called 'innovative diamond' (Darso 2003) which presents contractual space between the following parameters: relations and ideas as well ignorance and knowledge and Maslow's pyramids of needs in traditional approach (Maslow 1943); and modern (Riisom, Sorensen 2009) under which it is operated during dynamic innovative process.

And finally the fifth chapter describes a new idea of intelligent space of creativity stimulation in urban spaces. Although not every person has predispositions to creativity it can be stimulated by appropriate actions. Checking if the mentioned actions concerning the urban

space can be found in today's European cities or in actions of the intelligent development promoted in the Europa 2020 strategy will allow to finally verify usefulness of the intelligent space's idea to stimulate innovation.

The monograph is accompanied by preface of Mayor of Gdansk which indicates that in managing of a modern city it is necessary to responsibly manage environmental resources, coordinate implementation of new technologies in continuous cooperation of society, science and business world and influence on innovative of its inhabitants. It is the message of the practitioner who successfully manages the metropolis from several cadences.

In the introduction on page number 19 the Author put thesis that about intelligent space as the third innovative dimension can be said only when the below three emotional premises are together:

- feeling of previous human needs as a customer and consumer is fulfilled,
- human feels a need of co-feeling towards surrounding him reality;
- internal human predispositions to creativity are stimulated.

Explaining the arguments included in the above discussion it should be asked a question: vision or reality? Nowadays we hear very often about smart cities, effective solutions for urban areas, possible savings and improvement of quality of citizens' life. In connection with it more specific questions raise: What actions should be taken to create a smart city? Where are risks and where are material benefits? How much time is needed to show the intelligence to the inhabitants? We have to know answers on the questions to start construction aiming towards the smart city. Accordingly, what are specific expectations associated with it.

Firstly, there are financial savings reached by effective innovative solutions and optimised by management of municipal services.

Secondly, it is improvement of appearance of our cities through using of such solutions like exchange of street lighting aiming to savings of energy due to use of the LED technology, moreover shaping of landscapes, well maintained street-cleaning functions, effective maintenance of roads and careful waste collection.

Thirdly, increase of employment, ensuring stability of employment though concluding long-term contracts and practicing the obligation of improvement of elicitations of young people being in difficult situation.

As the fourth there are interactions with the residents through communication in real time with using popular smartphones, informing city's maintenance services in real time about all problems occurring in the city. Involvement of the residents is very important because it makes possible learning their real feelings.

As the fifth it is using of alternative sources of energy and transport such as energy from obtaining wastes, means of transport driven differently than using traditional fuels.

Sixthly, there is attracting private investors to co-operation in the context of long-term projects to obtain help in realising the mentioned projects and minimizing of financing provided by local governments what will influence on improvement of budgets' structures of our cities.

As the seventh it is opening of our cities for the same quality of services as it was observed in the leading cities of Western Europe, such as London or Birmingham in the Great Britain where it is carried out extensive monitoring with using performance indicators. To understand where are potential savings it is enough to do analysis of various services provided to the city.

There is a large challenge for Polish cities consisting of catching up at least the European top of smart cities. We hope that opportunity to do this will be in the new EU's programming period in 2014 – 2020. As a rule, Brussels is to support first of all innovations and entrepreneurship. It means that less money will be spent in 'concrete'. As experts note, in the next 2014 local elections maybe residents will not so much recon up current mayors from intelligence solutions which community implements or not. However, within a few years this aspect can be decisive. Therefore, governments should seriously consider the topic of the smart cities and constantly search capabilities to finance such projects because according to some opinion of the experts the smart cities brings two main benefits – increases quality of life and at the same time decreases costs of its further functioning.

The monograph is not an easy in reception because it contains many generalisations and specialised vocabulary. For this reason the Author includes a glossary of terms occurring in the elaboration to facilitate the reading. It is directed to government and local administration's employees dealing with implementation of the Europa 2020 strategy's recommendations and practitioners designing in the public space. It can be also interesting for researchers involved in region science and spatial planning of cities.

Wojciech Sońta