

## EFFECTS OF ENTERPRISE RISK MANAGEMENT (ERM) IMPLEMENTATION. A COMPARATIVE CASE STUDY IN THE CONDITIONS OF THE POLISH ECONOMY

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**Abstract:** The main purpose of this paper is to assess the effects of the implementation of a holistic Enterprise Risk Management system in the context of financial stability and performance (in the short term) and the company's value (in the long term). The paper uses a case study covering two large Polish enterprises operating in high risk international environment in the mining and chemical industry. The results of the conducted research have shown that, in enterprises with a very high risk exposure and a low level of flexibility (high dependence on the State Treasury – the owner), the effectiveness of ERM implementation is limited and does not always translate directly into the financial result and company value.

**Keywords:** risk management, effectiveness and efficiency of risk management, Enterprise Risk Management.

### 1 Introduction

Risk is an indispensable element accompanying every business decision. Most often, it is associated with the possibility of an unforeseen threat which will cause the result of the decision taken to be worse than expected. Therefore, risk has a negative impact on the effects of activities undertaken in the enterprise. The aggregated effects of risk resulting from multiple materialized threats cause, in the short term, a decrease in the financial result of the company and, in the long run, may contribute to the slowdown of development and decrease in value for all stakeholders.

Bearing in mind the above circumstances and negative connotations of risk, enterprises are still looking for effective and efficient methods of risk management. The purpose of these methods is to reduce the likelihood of occurrence of threats or reduce losses related to their materialization, which enables the company to maintain the planned level of financial performance and prevent the loss of company value in a strategic perspective. Regardless of the methods used, risk management must be a planned process organized in a thoughtful way. It must also be constantly improved and modernized due to the intensification of threats and the appearance of new, previously unknown dangers (e.g. cybercrime). In effective management, it is also important to include all employees in the implementation of this process and to make them aware of its significance for the company's operations (Acosta, 2018; Arena et al., 2017).

The most advanced form of risk management at present are holistic systems referred to as Enterprise Risk Management. Their purpose is to organize the entire risk management process and reduce the impact of risk on the performance of the entire organization (Wróblewski, 2011).

A. Lienenberg and R. Hoyt defined the ERM system as an integrated approach to risk management, allowing management of a wide range of threats faced by an organization. According to A. Moulbroek, integrated risk management is associated with the identification and assessment of risk, and then building the strategy of the entire organization in terms of managing this risk (Bromiley et al., 2015).

An ERM system is implemented in a sustainable manner at all levels of the organization. Thanks to this, an enterprise can improve the decision-making process, collect information in a more effective way and, consequently, improve the entire management process (Bromiley et al., 2015). In order for the ERM system to function in the best possible way, it is necessary to identify and divide roles between its stakeholders (Jonck-Kowalska, 2019; Callahan and Soileau, 2017). Units responsible for improving and supervising the risk management process in

a given enterprise are created in its structure. The correct functioning of the system is supervised by the so-called Chief Risk Officer, to which individual units of the enterprise submit regular reports (Towers, 2014).

The ERM system consists of three dimensions: structure, management and process, and the ERM process itself is divided into 5 stages (Shad and Lai, 2015):

1. risk identification,
2. risk analysis,
3. risk assessment,
4. risk mitigation,
5. risk monitoring.

To identify risk, lists of possible internal and external threats are created. They are the basis for risk analysis and assessment, as a result of which the risk is selected in terms of probability of occurrence and possible losses caused by this occurrence. The threats considered to be the most serious are those that are the most likely to cause the most serious losses. The risk management activities of an enterprise focus on their mitigation. Typical methods used to mitigate the effects of risk materialization include risk transfer in the form of insurance or establishing economic cooperation (Jonck-Kowalska, 2019), as well as prevention in the form of tangible security measures, such as fire-fighting equipment or anti-burglary protection. The last element of risk management is continuous monitoring of the effects of this management (Meidell and Kaarbøe, 2017), which allows to obtain information on the effectiveness and efficiency of actions taken to protect the enterprise against threats. The results of this monitoring are the basis for improvement activities of ERM systems. Thanks to the use of these systems, the planned financial result and systematic growth of company value should proceed as planned and without interruptions (Florio and Leoni, 2017).

The research conducted by A. Lienenberg and R. Hoyt indicated that the implementation of the ERM system in an enterprise affects its performance and value (Hoyt and Liebenberg, 2011). Analysis of data from 275 insurance companies has shown that enterprises that implemented a holistic risk management system increased their value.

These enterprises also less frequently used financial leverage and operated in a more transparent manner.

Bearing in mind the above conclusions and observations, the main purpose of this paper is to evaluate the implementation of ERM in two Polish companies listed on Warsaw Stock Exchange. Initial analysis of the number and scope of ERM implementations conducted among all listed companies showed that the number of implementations was the highest in industries highly exposed to risk, such as: energy, fuel, mining and chemical industries, which is why we decided to choose our cases for study from this group. The first studied company operates in the chemical industry and is the second largest producer of nitrogen and multi-component fertilizers in Europe. The other of the analyzed enterprises is the largest European coal company extracting coking coal supplied to coking and metallurgical plants. They are, therefore, very large companies, operating on the international market, and thus exposed to numerous and intense sources of risk. In the further part of the paper, the research methodology and results are presented, and then conclusions on the effects of using ERM systems and the directions of their further improvement are formulated. The analysis carried out in this paper contributes to conclusions concerning new industries and economic regions to research into the investigated field of study.

## 2 Materials and methods

As it has already been mentioned above, the main purpose of risk management is to prevent threats that may expose an enterprise to a deteriorated financial performance and/or loss of value. Therefore, in the course of the conducted research, these parameters were used to assess the effectiveness of ERM system implementation in the examined enterprises, whose level and variability over time before and after changes in management systems was studied. The key research problem in this case was to determine whether the implementation of ERM system contributed to stabilizing or improving the company's financial performance and value. The case study was used in the analyses, which enabled detailed presentation of the scope of ERM in both companies and the risks covered by it. Additionally, the following statistical measures of differentiation were used to assess the level of risk: dynamics indexes, standard deviation and coefficient of variation. In the short-term research perspective, the risk was assessed in the context of changes in the net financial result. In the long-term perspective, the market value of the examined enterprises expressed in the form of the exchange rate was used.

The next research stages included:

- defining the characteristics of the activity of the industries and enterprises studied,
- describing the ERM systems implemented, taking into account the identified risks and actions aimed at limiting them,
- assessment of changes in financial performance before and after ERM implementation,
- assessment of changes in company value before and after ERM implementation,
- formulation of final conclusions regarding the effectiveness of ERM implementation and directions of further research.

## 3 Results

### 3.1 Characteristics of the examined enterprises and implemented ERM systems

Jastrzębska Spółka Węglowa S.A. is the largest producer of hard coking coal and a major coke producer in Europe. What is more, the company is engaged in the extraction of coal for energy purposes in the Upper Silesian Coal Basin. It also has its own coking plants, which allows it to partially implement further stages of coke production, thereby reducing production and market risk.

Jastrzębska Spółka Węglowa (JSW SA) implemented a holistic risk management concept in January 2013. The purpose of the adopted ERM system was, first of all, to identify potential risk factors and all incidents that may have a negative impact on the functioning of the entire capital group. The comprehensive corporate risk management system at JSW SA consists of two basic documents, valid throughout the entire group: *Capital Risk Management Policy and Procedure*, which are updated on an ongoing basis, when necessary, and contain information on all risks significant for the functioning of the enterprise. The last ERM system update took place in 2017.

The description of the system's operation emphasizes the fact that risk management is a continuous process, shaped by the influence not only of the changing economic reality, but also changes in individual risks affecting the business objectives of the enterprise. Therefore, risk management covers all organizational structures and areas of activity, i.e. operational, strategic, financial, commercial, legal and regulatory issues. In JSW SA, the ERM system is supported by a dedicated IT tool.

Both potential and actual operational threats are systematically identified and subsequently reported to management board members, the audit committee, the supervisory board and stakeholders. In accordance with the subsequent stages of the ERM process, the control and assessment of the effects of the

undertaken activities is carried out, and then potential corrections are introduced to the risk management process in order to increase the efficiency of its operation.

In the organizational structure of Jastrzębska Spółka Węglowa SA, a risk management representative was appointed, who – together with risk owners – collects information about risk, analyzes it and then develops risk response plans. On a quarterly basis, the representative draws up a report on risk monitoring, which is then presented to the management board, the supervisory board and the audit committee.

Grupa Azoty S.A. conducts production, service and commercial activities in the field of engineering plastics, semi-finished products for their production and nitrogen fertilizers. It is one of the most important companies in the chemical industry in Central Europe, operating in the sector of mineral fertilizers, engineering plastics and other chemicals.

At Grupa Azoty SA, the corporate risk management system was implemented also in 2013. Its operation was developed in accordance with the ISO 31000 standard "Risk management – Principles and guidelines" and the COSO II standard "Corporate risk management – Integrated framework". Thanks to the implementation of the system, the "Corporate Risk Management Policy of Grupa Azoty" and procedures defining the stages of the risk management process were adopted. And so, the ERM system implemented in the company consists of the following stages:

1. identification and assessment of risk;
2. establishment and implementation of risk responses and incident response plans;
3. monitoring and reporting of risk levels;
4. including information on risk in decision-making processes;
5. reporting and communication;
6. monitoring and evaluation of the risk management system.

The corporate risk management process takes place at the level of the so-called Grupa Azoty Corporate Center. To improve this process, a steering committee and a team of risk experts were appointed. The steering committee consists of representatives of subsidiaries in which the risk management system has been implemented. The team of risk experts is an advisory body composed of owners of specific corporate risks.

Periodically, risk owners carry out risk identification and assessment in the enterprise. Risk verification is the basis for determining key risks for the enterprise. Moreover, risk owners adopt risk management strategies and analyze risk factors and risk levels on an ongoing basis.

An annual report on corporate risk management is prepared in the company, which contains both a description of key risks and information on risk management methods. In addition, in order to assess the effectiveness of activities aimed at mitigating risks, internal audits of management systems are carried out in subsidiaries.

The above characteristics show that both companies carry out systematic risk assessment and analysis. Risk management results are also monitored, and the conclusions drawn are aimed at improving the implemented ERM. Risk owners and representatives of management and supervisory boards participate in risk management. A difference between these two systems is the appointment of a team of risk management experts at Azoty SA, which certainly helps to look at risk and assess it from a different perspective. The analytical conclusions of this group can therefore be an important source of information in risk management.

The scope of identified risk sources in both enterprises, together with a description of risk reduction activities in both examined enterprises is shown in Table 1.

Table 1: Identified risks and methods for their reduction in Grupa JSW SA and in Grupa Azoty SA

Grupa JSW SA	Grupa Azoty SA
Identified key risks	
market risk, including: price risk, FX risk, risk of changes in cash flow due to changes in interest rates, credit risk, liquidity risk, capital risk, risks related to the social, economic and market environment, risks related to the conducted business activity, environmental risks, legal risks	<p>currency risks</p> <p>interest rate risk</p> <p>price risk</p> <p>risks regarding the price and availability of natural gas</p> <p>risk related to the process of planning and implementation of strategic projects</p> <p>risks related to the need to adapt production processes to new legal requirements, including environmental requirements</p> <p>the risk of a deterioration in the demand-supply balance</p> <p>the risk related to the availability and efficiency of capital and other sources of financing</p> <p>the risk of negative impact of prices used in CO<sub>2</sub> emissions trading on the financial result</p> <p>the risk of major industrial failures or technical failures causing interruptions in the continuity of operations and the operation of key production installations</p> <p>the risk of maintaining the continuity of production and the availability of ammonia at prices guaranteeing profitability of production</p> <p>the risk of implementing tightening EU / local regulations restricting the use of the company's products</p> <p>the risk of non-compliance with the deadlines for the reduction of NO<sub>2</sub>, SO<sub>x</sub> and dust emissions</p>
Actions aimed at reducing risk	
<b>CURRENCY</b>	<b>CURRENCY</b>
Fx Forward transactions, intra-group hedging, transactions, purchase of materials, services and investment goods in foreign currencies, cash flow hedge accounting	natural hedging, currency forward transactions, currency swap, concluding symmetrical FX option structures, such as "currency corridor", or other symmetrical put-call options and the sale of call currency options
<b>INTEREST RATES</b>	<b>INTEREST RATES</b>
ISR transactions	natural hedging, Forward Rate Agreement (FRA) transactions, Interest Rate Swap (IRS) transactions, Currency Interest Rate Swap (CIRS) transactions
<b>CREDIT</b>	<b>TRADE CREDIT</b>
financial collateral from recipients in the form of blank promissory notes, letters of credit and insurance limits	trade credit limit, insurance
<b>PRICE</b>	<b>DETERIORATION IN THE DEMAND-SUPPLY BALANCE</b>

increase in production and sales volume, change in the production structure to increase sales efficiency, optimization of product sales directions, market monitoring	production cost optimization, expanding the range of products and services offered to customers
<b>LOSS OF LIQUIDITY</b>	<b>ADAPTING PRODUCTION PROCESSES TO NEW LEGAL REQUIREMENTS, INCLUDING ENVIRONMENTAL REQUIREMENTS</b>
additional bond issue, optimization of liability management, savings initiatives and cost reduction, effective liquidity monitoring and reporting, enabling taking preventive actions in the situation of liquidity risk and maintaining an appropriate (minimum) level of available funds for servicing current payments	monitoring of all planned and implemented changes in the legal environment, reduction of energy consumption of processes (reduction of greenhouse gas emissions)
<b>CAPITAL</b>	
monitoring of financial debt indicators	

Source: Own work on the basis of reports of the examined enterprises

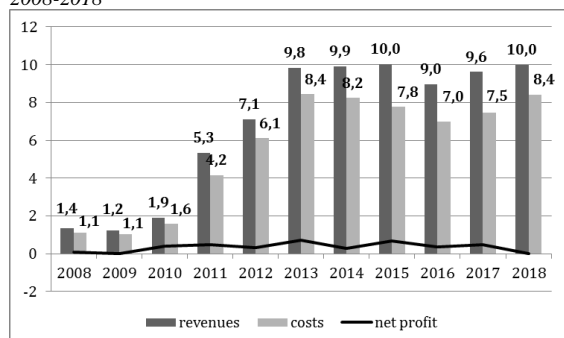
According to the data presented in Table 1, the list of identified risks is more extensive and more detailed in Azoty SA than in JSW SA. The risk catalog in a mining company covers very general categories of risks occurring in practically every enterprise. In Azoty SA, the list includes industry risks, directly related to the company's market situation, such as: the prices of CO<sub>2</sub> emissions, the availability of natural gas or EU regulations stopping or restricting trade in chemical products. It can therefore be concluded that the identification of risks at Azoty SA is more accurate and more adapted to the specificity of the industry.

Despite this difference, the catalog of hedging activities in both companies is rich and adapted to the most serious threats, i.e. currency and market (including price, demand and supply) risk. In addition, JSW SA distinguishes a wide range of instruments for financial risk reduction, which, for many years, has threatened the functioning of mining enterprises in Poland (liquidity risk and the risk related to restricted access to financing sources). It means that JSW SA uses the so-called experience history in risk management and does not underestimate such threats.

### 3.2 Assessment of changes in the financial performance before and after the implementation of the ERM system

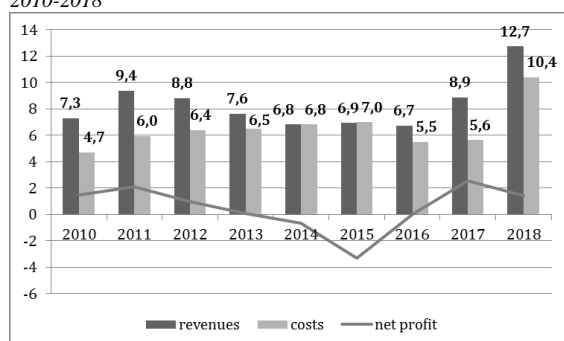
The financial results of both the examined enterprises are shown in Chart 1 and 2.

Chart 1: Revenues, costs and net profit of Azoty SA in the years 2008-2018



Source: own work on the basis of data from both examined enterprises.

Chart 2: Revenues, costs and net profit of JSW SA in the years 2010-2018



Source: own work on the basis of data from both examined enterprises.

The data presented in Chart 1 and 2 shows that JSW SA is characterized by a higher volatility of the financial result over time than Azoty SA, which generally means higher exposure to risk (Jonek-Kowalska, 2014). The coefficient of variation of this company's result in the entire covered period is over 318%, while in Azoty SA it approximates to 68%. The high variability of the results is also confirmed by the dynamics presented in Table 2.

Table 2: Changes in the financial results of Azoty SA and JSW SA

	Years				
	2009	2010	2011	2012	2013
Azoty SA	-105.01%	10,815.45%	24.50%	-36.81%	126.30%
	Years				
	2014	2015	2016	2017	2018
	-62.85%	161.02%	-45.78%	30.30%	-98.44%
	Years				
JSW SA	2009	2010	2011	2012	2013
	n/a	n/a	40.19%	-53.07%	-91.68%
	Years				
	2014	2015	2016	2017	2018
	-899.37%	-399.98%	-100.13%	57,299.07%	-44.22%

n/a – no data, company listed on the Warsaw Stock Exchange since 2011

Source: own work on the basis of data from both examined enterprises.

It should also be noted, that in Azoty SA the net profit was only negative in 2009. In other periods, the company generated profits. On the other hand, in JSW SA financial losses were recorded in two years: 2014 and 2015. While analyzing the variability of the financial result in the context of ERM implementation in 2013, it can also be stated that in Azoty SA, after the implementation of the risk management system, the amplitude of fluctuations in financial results has clearly decreased. In JSW SA, financial results were still largely unstable.

The financial results of the examined companies described above are influenced by two key components: sales revenue and production costs of the products and materials sold. The first one is a reflection of external risk, because it is shaped by market conditions. The other is connected with internal risk because it concerns the production resources used by the company. The parameters characterizing the variability of these components are presented in Table 3.

Table 3: Arithmetic mean, standard deviation and coefficient of variation for revenues and costs of Azoty SA and JSW SA

Azoty SA			
Parameter for:	Arithmetic mean [in PLN thousands]	Standard deviation [in PLN thousands]	Coefficient of variation [in %]
sales revenue	6,838,309	3,555,033	51.99%
production costs	5,570,712	2,897,185	52.01%
JSW SA			
Parameter for:	Arithmetic mean [in PLN thousands]	Standard deviation [in PLN thousands]	Coefficient of variation [in %]
sales revenue	8,356,737	1,807,080	21.62%
production costs	6,542,178	1,512,367	23.12%

Source: own work on the basis of data from both examined enterprises.

The data presented in Table 3 shows that revenue and costs were characterized by higher variability in Azoty SA than in JSW SA (Jonek-Kowalska and Turek, 2017). This means that both external and internal risks were higher in the chemical company, despite the final lower variability of the financial results presented above. The high variability of financial results at JSW SA was therefore not directly related to the variability of revenue and costs, but resulted from a small difference between the revenue and costs observed in particular in the years 2013-2016. It should be noted that, in the covered period, revenue decreased systematically in JSW SA, due to the increase in market risk (downturn) and costs increased due to pressure on the increase in wages related to the good situation on the coking coal market in 2010-2012. The simultaneous increase in external and internal risk caused risk accumulation at JSW SA, which translated into significant fluctuations in financial results, which was a direct result of simultaneous materialization of both risks. In Azoty SA, changes in revenue and costs were synchronized over time and proportional, which ultimately enabled stabilization of financial results over time and caused losses only in one period.

### 3.3 Assessment of changes in market value before and after the implementation of the ERM system

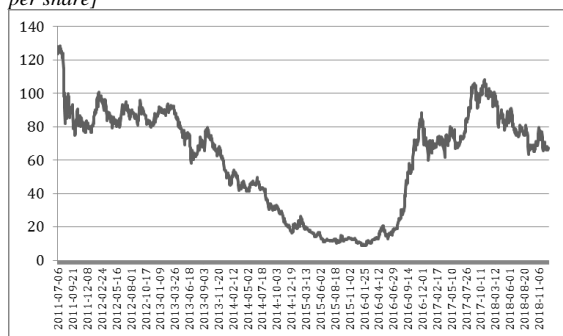
As it has been mentioned before, in the next stage of research, the market value of both enterprises was used to assess the implementation of the ERM system. And so, in Chart 3 and 4 its changes in time for Azoty SA and JSW SA are shown.

Chart 3: Share price of Azoty SA in the years 2008-2018 [in PLN per share]



Source: own work based on the data from the portal money.pl

Chart 4: Share price of JSW SA in the years 2008-2018 [in PLN per share]



Source: own work based on the data from the portal money.pl

The share price of Azoty SA fluctuated in the covered period between PLN 10 and PLN 110 per share. JSW SA's share prices ranged from PLN 10 to PLN 130 per share. The price difference for both companies reflected significant risk related to the operation of these enterprises in traditional industries, strongly dependent on the decision of the owner (State Treasury). Nevertheless, after the implementation of ERM system, the value of Azoty SA shares has been growing, and the value of JSW SA shares has been falling, which may mean that the system implemented in the chemical company is effective and the solution used in the mining company is ineffective. The development (downward) trend of the share price for both companies has been synchronized since the beginning of 2017, which is largely related to the political situation in Poland and the change of government.

Higher effectiveness of ERM implementation at Azoty SA is also confirmed by an analysis of market value of both companies, the results of which are presented in Table 4.

Table 4: Average market value, its standard deviation and coefficient of variation before and after ERM implementation at Azoty SA and JSW SA

Azoty SA		
Parameter	Before ERM implementation	After ERM implementation
Arithmetic mean [in PLN]	21.98	66.60
Standard deviation [in PLN]	11.65	15.82
Coefficient of variation [in %]	53.00%	23.76%
JSW SA		
Parameter	Before ERM implementation	After ERM implementation
Arithmetic mean [in PLN]	88.97	52.87
Standard	10.16	29.49

deviation [in PLN]		
Coefficient of variation [in %]	11.42%	55.78%

Source: own work based on the data from the portal money.pl

The average share price of Azoty SA went up after the implementation of ERM, which indicates an increase in company value, and in the case of JSW SA it decreased, which means a loss of company value. In the first company, the coefficient of variation of the share price also decreased visibly, which confirms its stabilization in time and lower risk. In JSW SA, the coefficient of variation increased almost five times, which, in turn, confirms the increase in risk, despite the implementation of the ERM system.

#### 4 Discussion

The implementation of comprehensive risk management systems is a multi-stage and complex task, which is why it usually takes place in large enterprises, which, due to the multiplicity of risks, require increased protection, and which can afford to implement the ERM system. In the analyzed cases, the implementation concerned two listed companies owned mostly by the State Treasury and took place in 2013. In Azoty SA, in the short term it contributed to the stabilization of financial performance and in the long term it contributed to the increase in the market value of the company. Nevertheless, the observed risk reduction was accompanied by rational adaptation of costs to revenue, changing under the influence of market conditions (reasonable response to risk).

Such an approach was not observed in the second of the examined companies – JSW SA, where social and political priorities contributed to unsynchronized changes in revenue and costs, as well as the accumulation of internal and external risks during a market downturn. As a result, financial results deteriorated and the value of the company decreased over time. The observed changes indicate the ineffectiveness of the ERM system in JSW SA.

#### 5 Conclusions

It may be concluded from the obtained research results that the effectiveness of ERM implementation and operation depends on many factors, including, to a large extent, the rationality of decisions taken by company executives. All methods and systems provide data and information necessary to make a decision, but the final response to the risk, its scale and direction depend on the human factor, which significantly affects the level of protection against risk.

Therefore, the effectiveness and efficiency of ERM systems must also be considered in the human dimension, including the wider context of this dimension, such as political and social factors.

The present research includes only case studies, hence its scientific value is limited. Nevertheless, it should be emphasized that a well thought-out ERM system adapted to the specificity of the company (Azoty SA) combined with the rationalization of executive decisions may positively affect the level of risk, although, as it is generally known, it is shaped by a variety of external and internal factors. Therefore, it is difficult to confirm the unambiguity of the research results received in this regard. Nevertheless, they enable better understanding of the mechanisms of risk materialization and protection against risk.

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