METALLURGICAL INDUSTRY RISK MANAGEMENT

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Abstract
Paradigm of risk management was explored in Europe during 1970s, by making a combined approach to risk financing and risk control. This established a new pinpoint on the concept of total risk cost. Organizations found out that many risks they face are insurable. In result, businesses were forced to find tools and techniques helping them in the process of risk management. This eventually led to establishing fundamentals of a few specialist areas in risk management; specifically risk management over projects, operations, and energy. The article describes risk management in the Polish metallurgical companies.

Keywords: metallurgy, management, risk, Poland.

1. INTRODUCTION
Managing businesses during and after economic downturns poses additional challenges for managers. Following the downturn two issues need to be addressed – how to explore new opportunities and how to prepare for the next crisis. Both questions refer to risk and risk management. Metallurgical companies need to design and implement risk management strategies to survive and create value for their stakeholders. This article provides for an overview of research studies of industry specific risk factors.

2. RISK CONCEPT
Risk is traditionally defined as a combination of probability of an event and its consequences, which are usually negative.

Current risk management practices identify five types of risk:

• Pure risk (related to operations of various corporate functions);
• Market risk (changes in prices of commodities, exchange rates and return on investment rates);
• Default risk (probability of corporate default);
• Operational risk (employee errors and fraud);
• Liquidity risk (unable to pay liabilities as they become due).

3. RISK MANAGEMENT
Modern corporate risk management is defined as a set of financial or operational activities that maximize the value of a company or a portfolio by reducing the costs associated with cash flow volatility. [1, 2]

Risk management is a relatively new corporate function. Academic research and subject courses started to appear in the developed countries in 1960s. Throughout the XX century risk management was to some extent associated with the use of market insurance to protect individuals and companies from various losses associated with accidents.[3] As soon as managers started to identify potential risk factors it became clear that in most cases insurance coverage is costly and incomplete. Until 1980s risk management in industrial companies was limited “pure risk” as opposed to “financial” risk. [4] While pure risk could be managed by
different functions in the company financial risk can only be managed at corporate level. Also in 1980s fast growing derivatives markets provided new tools to insure risk.

It wasn’t until the turn of the century when a series of corporate scandals (e.g. Enron, Worldcom) forced rapid introduction of restrictive practices and disclosure requirements in the International Financial Reporting Standards. In the United States Sorbanes Oxley and risk management governance rules of the New York Stock Exchange were introduced. The crisis in 2007 proved that either the measures or their application were inadequate.

In developing countries risk management has been rapidly introduced at the turn of the century together with major changes in financial institutions and markets. The system that failed in 2007 in developed countries is even less stable in developing countries. A growing share of metallurgical production capacity and markets are currently located in developing countries. Risk analysis should also take into account distribution and supply channels.

Dealing with risk requires that risk management be viewed as part of dynamic, repetitive processes. There are three distinct phases to successful risk management. These include [5]:

- Risk identification: both internal and external to the operation;
- Risk analysis: using any of a variety of techniques and;
- Risk response: based on the identification and analysis, a response to the risk can be formulated prior to the problem occurring.

Risk analysis and quantification are difficult in mining industries. Various methodologies have been applied over time and continue to evolve as understanding of the overriding uncertainties increases [6]. It is also worth to remember that risk management process is not only about avoiding loss exposure but also about identifying opportunities [7, 8].

The overall size of the operation and/or deposit need not be a reason not to adopt risk management methodologies. In fact, because of the greater element of risk in metallurgy the need to begin applying such techniques is critical to ensure success. [9]

4. MANAGING RISK IN METALLURGICAL ENTERPRISES

Metallurgy covers a range of industrial activities including metal recycling, foundry (in foundries, mills and smelters), manufacture of raw products through rolling mills, processing of raw products into semi-finished products, finished goods for industry and equipment manufacturing.

When analysing the factors underlying the current competitive performance of the European steel industry various elements must be considered. The factors are divided into business conditions; input factors, e.g. the cost of labour and raw materials; process factors, such as choice and utilization of technologies; output factors such as access to markets and overall performance measured in profitability; and performance in international markets; and last, but not least, demand for steel products, including market prospects. In addition, the individual companies’ overall strategies towards ensuring their competitive advantages are of course integrated parts of the industry’s competitiveness. All this translates into cash flow generated by companies. Risk management attempts to reduce the costs associated with cash flow volatility.

As a result of consolidation in the European steel industry relatively few companies account for a large share of the steel production. This indicates the presence of entry barriers for new companies - most likely caused by high capital requirements and economies of scale. Apart from foundries and the casting industry, large, multinational companies dominate the steel industry, albeit to a lesser extent than in other sectors. [10, 11]

Risk management should take the form of a simple process starting from defining possible risk factors, through implementing risk mitigating measures, analysis and adjustment to implementation and control (Fig. 1).
Kennedy, Harris and MacRae [12], based on prior research by Merrow [13, 22], Bell [14], Barshop [15] and Wallgrove [16], identified three industry specific risk factors, namely:

- Metallurgical processes with solid feed stock carry a higher level of technical risk than similar projects treating nonsolid raw materials.
- Technical risk is larger in projects treating natural as opposed to pre-processed feeds.
- New technology risk adds to the existing high technical risk prevalent in metallurgical processes.

Other studies indicate different areas of possible industry specific risk exposure:

- Widespread use of chemical agents in various metallurgical processes creates health and environment related risks.
- In current, global supply chains economy, underdeveloped infrastructure can create risks for metallurgical industry in some (key) geographical regions.
- Metallurgical industry is highly dependent on financial market changes. Low profitability increases dependence on low interest rate financing. Global economy increases the risks related to foreign currency exchange rates. Risks related to current turbulent financial markets shouldn’t be ignored.

Metallurgical companies use various chemical agents on regular basis for surface treatments and cleansing operations. Although we have not found comprehensive industry risk studies in this field, studies related to individual agents seem to indicate growing concern of researchers, authorities and general public. Currently metallurgical industry is under pressure to replace highly toxic chromium VI, which is used in chrome plating, welding and cutting of materials and in paint industry. Chrome VI inhibits corrosion (stainless steel) and allows for producing of a shinier, more appealing polish in metals. [17]

In 2012 Weik [18] observed that natural disasters still pose a serious threat to global supply chains in metallurgical industry. Growing production capacity in Asia and South America created the need for global transportation channels and some countries have inadequate infrastructure to service the growing needs. Weik refers to Brazil however similar problems can be found in many other countries.

The problems of financial institutions and financial markets during the latest downturn affected entire economies and therefore shouldn’t be perceived as industry specific. Some parts however seem to indicate that on average metallurgical industry companies are operating at low profitability ratios forced by fierce competition. This coupled with indebtedness leads to potential liquidity problems and high dependence on

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**Fig. 1 Methodology for process problem solving**

Source: M. Kennedy, C. Harris, A. MacRae, Risk-weighted cash flow, Metalurgy and Materials, Vol. 3, Nr 3.
low interest rate financing. An increase in financing cost can put many (especially small and medium size companies) in financial difficulties. [19]
Risk factors, their nature and related studies are summarized in Table 1.

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<th>Risk factor</th>
<th>Nature</th>
<th>Studies</th>
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| Natural vs. preprocessed materials | Use of natural raw materials in feed implies lower productivity (compared to processed materials) | Merrow [13]  
Bell [14]  
Saniuk, Saniuk [20]  
Saniuk, Saniuk, Witkowski [21]  |
| Solid vs. non solid materials       | Use of solid materials in feed implies lower productivity (compared to non solid materials)     | Merrow [22]                                                                                  |
| New technology     | Use of new technology (and related risks) determine the success of many projects  | Various studies related to individual advances.  
Barshop [15] and Marais [24]  
Wallgrove and Butler [16] |
| Infrastructure needs | Poor infrastructure can impact the supply of raw materials, semi-finished and finished products | Weik [18]                                                                                  |
| Use of chemical agents | Safety and environment hazard related to inventory and use of various chemical agents | Various studies related to individual agents.  
e.g. Paustenbach, Finley, Mowat and Kerger [23] |
| Financial         | Comparably low profitability ratios of metallurgical industry companies and exposure to foreign currency risks and derivative markets increase the dependence on financial markets (and their risks) | Pomykalski [19]                                                                           |

Table. 1 Industry specific risk factors, their nature and related research

The list of potential industry specific risk factors is probably not limited to the ones listed above. Further research is necessary to identify and measure other potential risk factors. It is interesting to note that studies should take into account various markets and countries as global supply chains seem to impact risk in this industry.

5. CONCLUSIONS

This discussion realized in current paper creates a platform by describing the characteristics of the sector and dealing with risk management issues in particular. The overall aim was to suggest possible risk factors, which, in turn could lead to successful risk management practices in metallurgical companies. We conclude that:

- Not all risks can be eliminated at reasonable cost therefore companies have to identify and manage risk.
- Metallurgical companies should assume an integrated approach to risk including financial risk.
- Industry specific risk factors include those related to materials used (natural, solid), new technology, infrastructure needs, use of chemical agents and financial.
- Risk analysis should take into account global supply chains and specificities of developing countries.
- Further studies in this area are necessary to identify industry specific best practices in risk management.
REFERENCES


