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USING DIFFERENT METHODS FOR SUPPLIERS RATING

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Abstract

This diploma thesis deals with use of modern methods of analysis and modelling for evaluation of suppliers and evaluation of offers. The theory of fuzzy logic is used in this work. Next, the created model is compared with the evaluation model that is currently used in the company.

Abstrakt

Diplomová práce se zabývá využitím moderních metod analýz a modelování pro hodnocení dodavatelů a výběr optimální nabídky. V této práci je využito teorie fuzzy logiky. Dále je vytvořený model porovnán se současným modelem hodnocení zákazníků.

Key words

Quality management system, supply management, fuzzy logic, Microsoft Excel, suppliers' evaluation, evaluation of offers.

Klíčová slova

System management jakosti, řízení nákupu, fuzzy logika, Microsoft Excel, hodnocení dodavatelů, hodnocení nabídek.

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STATUTORY DECLARATION

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Brno, 31th August 2011

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Bc. Filip Hala

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Introduction

Quality system is about how to effectively manage your own business, it doesn't matter on scope of business or how big it is. [20]

ISO quality management system passed through big expansion in Czech Republic. First it was required by foreign business partners, so it was a kind of competitive advantage. But then it became a necessity.

Almost every business in the Czech Republic has implemented ISO 9000 quality management system. The main reason was the need to increase credibility that was required by trading partners from both private and public sector [20, p.6]. However, in many cases it becomes just a formal mark that has no real impact on driving business. This minimal efficiency is caused by minimal requirements for the process of data collection and evaluation [18, p.9]. This is the main problem of ISO 9000, because data collection and evaluation has higher requirements on knowledge about procedures and methods and it also creates more costs [17, p.10].

So, ISO quality management is not a guarantee of quality in our environment. That is the reason why it is necessary to evaluate suppliers of a company in the most fairly and accurate way to have the right picture and data. But every company is not only evaluator, but also evaluated.

Except for the first and the last links in the chain, everybody is a supplier and a purchaser. [16] Every company needs not only to evaluate their suppliers to avoid problems in supply, but also to have clear processes, because it is evaluated by their own customers.

A world trend for large enterprises is to manage only those activities that have strategic importance for the company, and manufacturing of all the other components is entrusted to other enterprises and bought from them [16, p.21]. Many companies have to decide if whether to make or to buy. Quality purchasing can lower costs not only when companies decide to buy, because raw resources have to be bought when they want to make it themselves.

Fuzzy set approaches are suitable to use when the modeling of human knowledge is necessary and when human evaluation is needed [9]. According to this statement, fuzzy logic is an interesting tool for evaluation of suppliers.

Fuzzy logic can be used to solve various case studies, such as a choice for obtaining bank loans, evaluation of bank customers who want to get a loan, selection of insurance, car, employee etc. [2, p.41]. In company environment it can be used for various rating models and various management decisions.

Problem definition and objectives of work

The main purpose of this thesis is to create rating model of suppliers on the basis of fuzzy logic and to apply that model on Ondřejovická strojírna a.s. The company has already implanted the rating model, but the company management considers it as being without a contribution. Company operates in the area of mechanical engineering and a large part of production costs are material costs, and driving of suppliers can save company costs. The secondary purpose is to compare existing suppliers rating model with purposed one.

To fulfil these purposes, there are partial objectives to be followed:

- Accomplish literature review
- Describe the company Ondřejovická strojírna
- Analyze current rating model
- Apply created rating model on suppliers of the company
- Interpret results of the comparison

The basic data are gained from internal documents of the company, websites of the company and suppliers, professional literature and additional sources.

The diploma thesis is divided into three main parts. First, theoretical bases of suppliers' evaluation models and fuzzy logic are explained. In the second part, the current evaluation model is described. And in the third part, new evaluation models based on fuzzy logic are created and applied, and new evaluation models are compared with the current one.

The proposed evaluation models should replace the current evaluation model used in the company.

1 Theoretical foundations

The rating of suppliers has a significant impact on driving business. This chapter aims to describe this impact on the company, different ways of rating, bases of the fuzzy logic, and ISO quality management that modifies rating of suppliers. There is used contemporary academic knowledge.

1.1 Reasons to valuation of suppliers

1.1.1 Purchasing

Purchasing is an important activity within an organization. Purchasing can be described as all operations within an organization that have a purpose to obtain all resources that are necessary for realization of company's targets [8]. It's important to follow how company's resources are used. The basic task of purchasing is to effectively ensure that a company will have all the necessary materials, raw resources and goods in necessary quantity, quality, in the right time and place [8]. Steps to fulfillment of this task are researching of potential suppliers, deciding about an optimal supplier, arrangements and supply conditions. It is also necessary to set up a long-term and mutually beneficial supplier-buyer relationship, also concerning the area of quality, reliability and flexibility in execution of contracts [8]. However, the reality was often different. In many cases, internal customers¹ pointed out what was right. Purchasing is the key role, because it ensures reliable supplies, but it was not with the lowest costs [11]. Nowadays, companies are increasing their expenditure for purchasing and lowering expenditure for labor. That's why the function of purchasing is becoming more important [11]. But you don't need to have a large enterprise to save money by quality purchasing.

Lambert, Stock and Ellram [11] say that it is hard to offer better quality than company obtains from its suppliers. Problems with quality or time of delivery have a direct impact on quality or availability of goods and services, if the company does not

¹ Internal customers are persons or company departments that communicate with purchasing department.

hold a large amount of supplies [11]. But large amount of supplies brings more costs and also bounds equity that could be used for other things [8].

1.1.2 Strategic tasks of purchasing

The strategic task of purchasing is to obtain sources by manners that support strategic targets of a company. Purchasing can contribute to strategic targets of company in many ways, because it exceeds company borders [11].

Strategic tasks of purchasing according to Lambert, Stock and Ellram [11] are:

- Contacts with external environment

Contacts with company suppliers can bring important information about new technologies, materials and services and changes in market conditions. Obtaining this information can help to modify company strategy to use new market opportunities.

- Driving systems and relationships with suppliers

Improving relationships with suppliers can also assure success of a company. If suppliers are involved in the development of a new product, it can save a lot of time.

- Relation to other company departments

All company departments are dependent on purchasing, from supply of information to supply of materials. If employees of purchasing department are well informed, they can better predict and support the needs of the company.

Moreover, efficient driving of purchasing usually means purchase of high quality supplies, and higher quality of supplies decrease the probability that customers will return products because of their low quality.

1.1.3 Purchasing risks

As it was mentioned before, purchasing process ensures necessary resources for the company. Because of importance of these resources and their specifications or availability on market, it is connected with some risk. This risk is connected with

purchasing, when there transaction in progress and it has a subjective character. The size of this risk is affected by following factors:

- Periodicity of transaction (first, continuous or modified purchase)
- Characteristics of purchasing market (stability and homogeneity)
- Importance for customer (common, important or strategic purchase)
- Characteristics of selling market (innovations, competitive position of purchaser, market development)

[12]

So, when we have determined where the risk is created, we identify four basic types of transactional risks, listed below. Awareness of these risks allows analysis and reduction of these risks. The supplier should also be involved in the process of risk reduction.

- Technical risks: purchaser's ability to specify needs, compatibility of different technical specifics and technologies, quality of the product and its keeping on the same level...
- Risk connected with availability of products and services: compliance of delivery time, precision of deliveries...
- Risk connected with using products and services by purchaser: need of supervision, speed of complaint process, training of purchaser's employees...
- Financial risks: price, payment terms, relation between purchasing and total costs for input, price evolution...

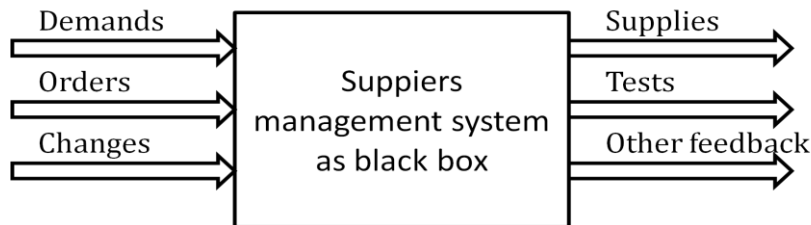
[12]

1.1.4 Supplier and his role

We need to know our suppliers. We can think of a supplier as of our partner, ally or enemy. But in every case we need to know where their advantages, their weaknesses, targets are, and which mistakes they are making. It's necessary to grab all the information about them and evaluate it properly. Important is not only information about the product, price payment and delivery conditions, but also information about the company itself, especially about their sales management. And when the supplier is

chosen, both partners should inform each other about fulfillment of agreements, about defects, changes in manufacturing and sales. [21]

Purchase in past ensured that supplies will be delivered according to the requirements, and “suppliers management system was like “black box””² [16, p.24]



Picture 1 - Suppliers management system as black box [16, p. 25]

Orders and other information created information inputs, order agreement, supplies and other information created information outputs and everything between inputs and outputs was unknown and customer had no way to find out how it works inside the partner company. This is changing, but many managers still have problems with opening of this black box [16].

According to Nenadál (2006), managers consider key success factors as:

- Quality – ability to fulfill requirements of customers, legislation and other stakeholders
- Time – ability to fulfill requirements as fast as possible
- Costs – ability to fulfill requirements with lowest cost consumption
- Employee knowledge – the higher the knowledge is, the higher speed and lower cost consumption is achieved.

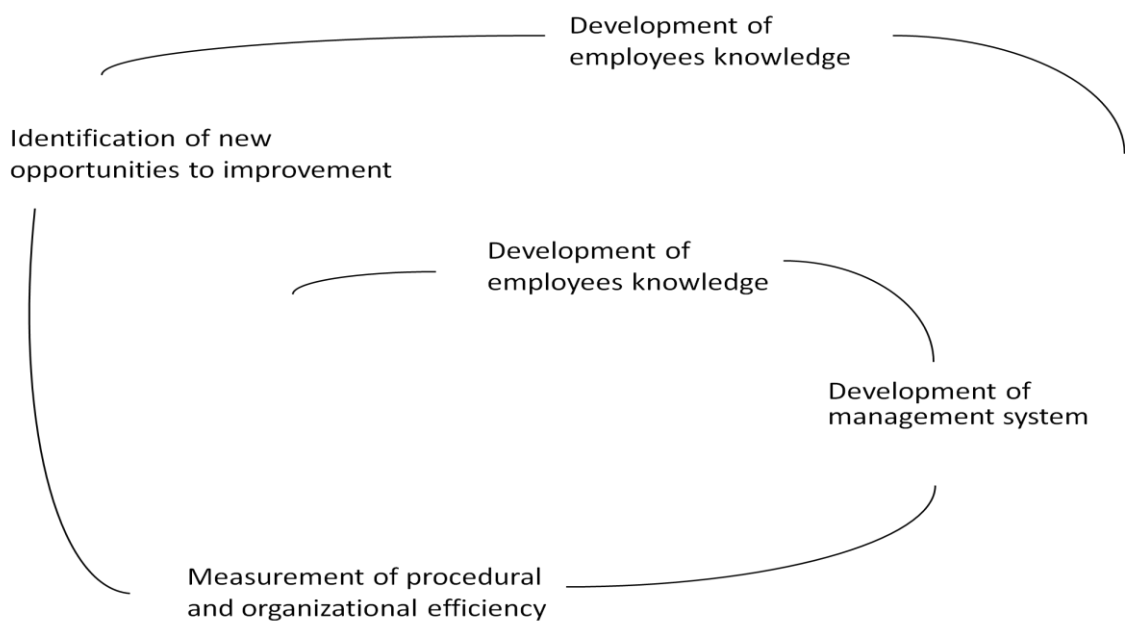
These key success factors are important for both supplier and purchaser. Both are pressed to improve these factors by their stakeholders. They have to:

- Develop knowledge of employees, to
- Improve management system based on the new knowledge, thus
- Increase efficiency of single processes and whole efficiency, to

² Own translation of “Sám systém managementu však připomínal pověstnou “černou skříňku”.”

- Look for new opportunities to improve processes and activities, including technological and organizational innovations, because
- They need to permanently increase abilities to supply market with quality products as fast and as cheap as possible.

It looks like we returned to the beginning. However, this evolution is a spiral and every turn of the spiral means a new level of efficiency, as can be seen on the following picture [16].



Picture 2 - Spiral of increasing efficiency of organizations [16, p .27]

1.1.5 Choice of supplier

The choice of supplier is an important decision and it isn't easy, it is necessary to include a number of criteria, such as purchasing mix and internal and external factors. The choice of supplier has an impact on efficiency and in long term also on strategy, because it affects costs, supplies, quality of products and therefore profit. The choice is a difficult process that consists of two phases – gaining a large amount of data and communication with the supplier [22]. The purchasing process is made more difficult if material is purchased on international markets or is bought from an international subsidiary. However, resources or components are bought from abroad because they are cheaper or more easily available. [11]

But the choice of right supplier has immediate and long term effects on customer service that is provided. The choice of supplier should be a formal, documented process. [11]

A traditional form of processing this information is by comparing offers, when we exclude offers with low quality and with long delivery time. Then we compare offered amount, price and type of units [21].

According to Tomek and Hofman [22], we have three groups of criteria for choosing a supplier. These are criteria related to products and services, criteria related to price and conditions of contract, and lastly, criteria related to supplier and his image, goodwill and behavior in negotiating and realization of supplies.

According to these criteria we can choose one or more suppliers, it matters how these suppliers fill our criteria. Also, it is more advantageous to buy from more sources, because this way a company is not dependent on one supplier. But when we decide to buy, we have to continue collecting information about current and potential suppliers and compare them, either to find a new promising supplier or to discard an old one that is not satisfactory. [22]

Advantages from the right choice of supplier can be significant. Savings in logistics costs has a direct impact on profit, because it creates a bigger margin per product and also lowers the amount of supplies, saving investments into them.

1.1.6 Driving relationships with supplier in five phases

Lambert, Stock and Ellram [11] identified five phases of purchasing process, where relationships with suppliers are driven. This process goes from the identification of purchasing need to continuous evaluation and final control.

1. Preparation phase – in this phase there is a formation of the need to buy a specific product, and, if necessary, a team to manage this purchase is created
2. Identification of potential suppliers – the second phase is about setting up criteria of choice and identification of potential suppliers according to these criteria

3. Survey and selection of supplier – in this phase, potential suppliers are contacted and evaluated based on available information, then the supplier is chosen
4. Relationship establishment – recording and comparison of expectations and contacts with supplier, a lot of attention is dedicated to it and quick feedback is provided
5. Relationship evaluation – in this phase there needs to be decided how to continue with our relationship based on recorded experience. We can continue on the same level, we can limit it or cancel it, or we can build and extend our relationship.

1.1.7 Benefits of long-term partnership

To point out benefits of a partnership between a supplier and a purchaser, we should firstly describe a relationship that is built on distrust. According to Nenadál [16], this relationship has these options:

- The purchaser threatens the supplier with ending their business relationship for every failure, even if it is a coincidence
- Communication is mostly a dictation of purchasers requirements, so suppliers feel like servants that have no rights
- The supplier is living in permanent uncertainty and instead of investing into employees' knowledge and improvement of processes they create reserves for future problems, and this makes that they come more likely
- No investment into employees decreases the ability to be competitive
- A supplier that doesn't want to get out of supply chain can lower prices, with a vision of improvement in the future – but it will only make its problems bigger
- Financial instability of the supplier threatens the purchaser, even more if there is no adequate replacement, so these problems will hit the purchaser

When the supplier cannot meet its commitments in time, the purchaser has a problem with the fluency of processes; quality is decreasing so the purchaser's ability to

meet its commitments will be threatened. But if relationships are developed based on partnership, it can have positive impacts, such as:

- The purchaser can offer long-term contracts as a positive motivation
- Suppliers that are not in permanent uncertainty will invest into employees and processes that will increase offered quality
- Suppliers will save costs of seeking new purchasers, so they can offer lower prices without threatening their economic situation
- Both sides may not realize that their cooperation, communication and effort will create a strong partnership

[16]

Lambert, Stock and Ellam [11] describe other advantages of long-term partnership, such as:

- Customer service: long-term partnership will improve the timing of deliveries, it will lower paperwork for clearing orders, lower exact content of deliveries, improve the reliability of deliveries or improve the processes.
- Market advantages: Partnership can lead to obtaining market advantages, such as entering new markets, easier sales promotion, advantages in price and product (cooperated development of a new product or a merger of benchmarks), advantages in easier market coverage, easier access to new technologies or innovation potential.

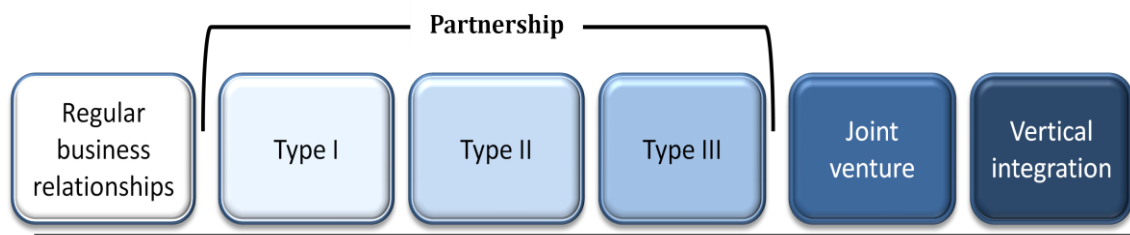
However, all those positive impacts cannot be reached in short term or immediately, but it is a long, hard work – they need to solve problems without emotions, suspicion, blaming and avoid moving economic costs only to the other side. Purchasers should care about the quality of relationships, because it results in the quality of supplies. [16]

1.1.8 Partners and suppliers relationships

“Partners can be suppliers of products, service providers, technological and financial institutions, governmental and non-governmental organizations or other

interested parties. Partners can contribute with any type of resource, as agreed and defined in a partnership agreement.” [7, p. 18]

Relationships between organizations can have many forms, from regular business relationships, which consist of single or multiple transactions, to vertical integration of two or more companies. Most of relationships mean just two companies doing business transactions with one another in the long term, but where is no reason for mutual cooperation of these companies. [11]



Picture 3 - Types of partnership [11]

This is what we call regular business relationship – when the business transaction ends, the business relationship ends. Then there are three types of partnership:

- Type I: Involved organizations recognize each other as business partners and they coordinate their planning and production on a limited scale. This partnership usually has a short-term target and contains only one part of an organization.
- Type II: Involved organizations are moving from coordination to integration of their processes. This partnership has a long-term target and many parts of organizations are involved in the relationship.
- Type III: In this type of partnership there is a significant integration between partners. Both participants look at each other as an extension of their own organization. It is not typically common that this relationship expires at a predetermined date.

[11]

The second strongest relationship is joint venture, where one partner owns a part of the other partner. The last and strongest is vertical integration. However, well

managed partnership can bring similar advantages as joint venture or vertical integration. [11]

Partners and organization are still independent, but mutually beneficial relationship enhances their capabilities to create value. Organizations should consider a partnership, where suppliers can invest in and share profits or losses. It is necessary to consider some issues, such as provision of information for partners to maximize their contributions, support of partners, in terms of providing them with resources, sharing of profit and losses with partners, and improving the performance of partners. [7]

All partners share an environment, and in that environment acts support factors of partnership. There are four of them:

- Compatibility of companies: both companies can put the emphasis on company culture in the meaning of compliance with obligations, consistence of intention or taking care about stakeholders' interests, and business in the meaning of consistence of strategic planning and targets of companies, obligation to partnership or preparedness to change.
- Philosophy of managing and their methods: companies can harmonize their philosophies of management, for example structure, managing according to TQM, support from the top management, types of employees' motivation or importance of teamwork.
- Mutuality: will of management to consider their partner's point of view, express targets, sharing financial information and system integration
- Symmetry: companies will cooperate and adapt key factors that affect their partnership, such as market share of business area, financial strength, productivity, brand name or technologies.

[11]

If both companies have realistic, it will be helpful to form a partnership. How deep partnership they should establish depends on the strength of potential benefits and supporting factors. If they are strong, companies can establish the third type of partnership, and if it is weak, they should stay in a common business relationship. [11]

According ISO 9004 [7], an organization should establish and maintain processes to identify, select and evaluate its suppliers and partners to continually

improve their capabilities and to ensure that the products or other resources they provide meet the needs and expectations of the organization. It is necessary to consider their contribution to the organization's activities and ability to create value for organization and its partners, their potential for continually improving their compatibilities, the enhancement of capability that can be achieved through co-operation with suppliers and partners, the risks associated in the relationships with the suppliers and partners. Organization, hand in hand with suppliers and partners, should continually improve the quality, price and delivery of products provided by suppliers and also own management system of periodic evaluation and performance for regular feedback.

Lambert, Stock and Ellam [11] pointed out that to have a partnership is not always an advantage. Partnership should be built for potential benefits and support factors that exist in a certain situation. If these factors are not strong enough, an attempt to form a strong partnership will have negative impact. However, if companies realize that a partnership has a reason, then their next step should be forming that partnership. This is done by using elements of partnership. These elements are processes and activities that are implemented and driven by management in the whole life of a partnership. Every partnership has some basic elements, but the way of implementation is different. Types of these elements are planning, common operative management, communication, sharing of risks and profit, trust, investment etc. [11]

No matter what kind of relationship is established, it is always necessary to evaluate the efficiency of relationships, and if necessary, change them. For an efficient evaluation, it is necessary to establish correct benefits and measure their efficiency. These indicators can become standards for partnership evaluation. Feedback on critical factors is also necessary, mainly for actualization of state of benefits, support factors and partnership's elements. [11]

1.2 Valuation model according to quality management

1.2.1 Basic requirements for ISO Quality management

“The adoption of a quality management system should be strategic decision of an organization.” [6, p.11]

Management needs to be sure what processes, with regards to the character of the organization, and products will be included into ISO 9001. Basic requirements on the management system are:

- Definition of processes that are necessary for quality management
- Links between processes must be identified
- Identification of criteria and methods that are necessary for effective managing and processing of these processes
- All resources and information necessary for processing and monitoring processes must be provided
- Processes have to be monitored, measured and analysed.
- Activities that are necessary to achieve planned targets must be implemented and these processes must be continuously improved

[17]

“Where an organization chooses to outsource any process that affects product conformity to requirements, the organization shall ensure control over such processes. The type and extent of control to be applied to these outsourced processes shall be defined within the quality management system.” [6, p.16]

Standard ISO 2009 is focused on managing sustained success of organization that means the ability of organization to achieve and maintain its objectives in the long term. To achieve this ability it is necessary to consistently meet the needs and expectations of its interested parties over the long term. [7]

As can be seen on next picture, ISO 9004 uses a wider look on quality management than ISO 9001. It addresses needs and expectations of all interested parties and provides a way for continual improvement of organization’s performance [7]

Xenie Lukozsová [12] describes 8 elements that should be included in quality management according to ISO 9004. The elements are:

1. Clear definition of purchasing requirements
2. Choice of suitable suppliers
3. Quality assurance agreement
4. Agreement about verification methods
5. Agreement for solving conflicts in quality
6. Planning of incoming goods inspection
7. Managing of goods inspection
8. Records about goods quality from **an** inspection

Also, it is helpful to divide bought resources into three groups that help to correctly set up the level of required quality. Company should have different requirements on a supplier of direct material than on a supplier of office paper. Three groups are enumerated below:

1. Supplies for product that needs high attention.
2. Supplies that have direct influence on final quality of product.
3. Other supplies, such as office supplies, that have no impact on final quality of products.

[12]

1.2.2 Evaluation according to ISO quality management

As mentioned before, quality of supplier has direct impact on quality of the final product. The ability to deliver supplies in required quality and required time and the ability to cooperate on realization of efficient processes of purchasing are very important. According ISO 9004, the process of managing suppliers must contain:

- Evaluation of current experience with the supplier
- Comparing of supplier's efficiency with his competitors
- Exploring the level of quality of bought product, its price, possible delivery time and size, supplier's reactions on a problem

- Running an audit of the system for quality evaluation of suppliers and evaluation of their potential ability to provide supplies in required time according to the timetable
- Preference check about the supplier and available information about him
- Evaluation of supplier's financial health and ability to survive throughout the planned time of cooperation
- Evaluation of reaction to questions, offers or tender
- Evaluation of supplier's services, ability to install product and evaluation of compliance from last cooperation
- Evaluation of supplier's knowledge about legislation and other regulations and their compliance
- Evaluation of supplier's logistic abilities including locations and sources
- Evaluation of supplier's market position and its recognition in public

[12]

However, every company creates its own list of requirements for evaluation of suppliers. ISO standards can give only guidance for creating these requirements. Jurová [8] suggests that supplier's evaluation should be a result of:

- Expert estimation of a team or responsible person
- Scoring evaluation
- Consideration of calculation result of criteria, that could be quantified and evaluated
- Combination of these three points

Jurová [8] also suggests three evaluation criteria: quality, price and reliability that are evaluated in different weight, where:

- Quality is the proportion of faultless deliveries from last thirty deliveries
- Price is the average price of last thirty deliveries
- Reliability is the sum of delayed days in delivery time in last thirty deliveries

Nenadál et al [15] provides more criteria, than listed before:

- Price
- Quality of supplies
- Conditions of delivery
- Flexibility of supplier's reaction
- Level of supplier's communication
- Supplier's financial situation
- Range of supplier's accompanying services, for example transport or warranty
- Supplier's distance
- Supplier's market share
- Total costs of supplies

Many offers looked very attractive with regard to price, but in the end they ended as a very bad investment, because low quality of supplies caused additional costs for repairs of differences, sorting and other. Therefore there exists cost of supplies that can be defined as purchaser's total costs related to quality of particular supply. [15]

$$UVZ = C_d + DV_Q \quad (K\check{c})$$

Where UVZ is total cost of supplies

C_d is offered price of supply

DV_Q are additional costs that are caused by level of quality of supply

[15, p. 98]

Mizuno [13] specifies factors of supplier's evaluation more accurately. Quality is determined by level of defects, customers' complains, evaluation points of quality, price is determined by discount, effectiveness of ensuring value in amount of money and reliability of supplies should be evaluated according to management, financial situation of the company, working conditions and future perspective. Equal importance should be given to supplier's quality system, how good its manufacturing abilities are or what are its efforts into developing new products.

Lambert, Stock and Ellram [11] pointed that there is no best method or approach for all organizations, but it's important to use consistent methods to keep the process

objective. Firstly, is necessary to create a list of all potential suppliers of purchased items. Next, it is important to create a list of factors according to which the suppliers will be evaluated. But before the evaluation starts, it is necessary to determine the relative importance of each factor according to specific situations and conditions in a company. Then, a weighted evaluation of each factor will be performed by multiplication of supplier's evaluation and importance of a factor. The sum of point evaluation will be used for comparison with other suppliers. Higher sum of points shows that a supplier fits the requirements and specifications of the company better.

If a rating scale for both factor importance and factor efficiency is used, the result can vary from 1 to 25. Mark 5 shows the best efficiency or the highest importance, mark 1 shows the weakest efficiency or the lowest importance. For importance, mark 0 should be also used as no importance, but for every segment there can be a slightly different importance and when zero is used, it can bring the need for a different score board for different segments.

Table 1 - Example of supplier evaluation [11, p. 335]

Supplier	Factor	Efficiency points	Importance points	Weighed result
A	Quality	5	4	20
	Price	3	2	6
	Reliability	4	2	8
	Time of delivery	4	5	20
	After sale service	2	1	2
Result of supplier A				56
B	Quality	2	4	8
	Price	5	2	10
	Reliability	3	2	6
	Time of delivery	1	5	5
	After sale service	3	1	3
Result of supplier B				32
X	Quality	4	4	16
	Price	4	2	8
	Reliability	3	2	6
	Time of delivery	5	5	25
	After sale service	2	1	2
Result of supplier X				57

When we have evaluated suppliers, we need to create some categories of suppliers. ISO standards have no specification for any categorization, so every company has to create its own categorization. The only inspiration was found in Nenadál at al. [14], and was extended with a supplier that cannot be evaluated because of low amount of information. However, to create an evaluation table, final information about evaluation criteria are needed, so only categories of suppliers can be created here.

Table 2 – Supplier’s evaluation

A	Fully qualified supplier, suitable to start or continue a business relationship with
B	Partially qualified supplier, acceptable to start or continue a business relationship with
C	Low qualified supplier, acceptable for a single transaction, but not to start or continue a business relationship with
D	Inconvenient supplier for a single transaction or a business relationship
X	Not enough information for evaluation of a supplier

Nenadál at all [14] provides some formulas that are not very demanding on data mining, so they can be used in almost every situation. Recommended formulas are targeted on the quality of supplies, delivery dates and costs of supplies, and are provided below:

1. Formula of supplier’s quality U_{QD} :

$$U_{QD} = P_n w_n + P_o w_o + P_z w_z \quad [\%]$$

Where P_n is the proportion of differences in a particular supply

2. Proportion of differences in a particular supply P_n :

$$P_n = \frac{O_n}{O_c} * 100 \quad [\%]$$

Where O_n is a different part of supply

O_c is the complete supply

3. Proportion of late part of the delivery

$$P_o = \frac{O_o}{O_c} * 100 \quad [\%]$$

Where O_o is the volume of late delivered supply

O_c is the complete supply

4. Proportion of other unfulfilled commitments

$$P_z = \frac{O_{nz}}{O_{cz}} * 100 \text{ [%]}$$

Where O_{nz} is the number or amount of unfulfilled commitments of the supplier

O_{cz} is the number or amount of other commitments connected to a particular supply

5. Weight of particular elements of evaluation

$$w_n + w_a + w_z = 1$$

[14, p. 144]

From the system of formulas it can be seen that a higher value of U_{QD} means worse efficiency of a supplier. Evaluation according supplier's efficiency can look as follows:

Table 3 - Evaluation of efficiency on base of suppliers quality index [14, p. 145]

Value of supplier's quality index U_{DQ}	Evaluation of supplier's efficiency
0-1%	Fully qualified supplier for future supplies
1,01-2%	Conditionally qualified supplier for future supplies
>2%	Inconvenient supplier for future supplies

There is a number of indicators that can evaluate supplier's financial health. For purposes of this thesis there are chosen two: Gearing ratio and Credibility index.

Gearing ratio is a ration of equity and loans. The greater the debts' proportion to equity, the greater the risk that a company will have problems with paying loans. This ratio should be less than 70%. [10]

$$\text{Gearing ratio: } \frac{\text{Loans}}{\text{Liabilities}} \times 100 \text{ [%]}$$

Credibility index is an arithmetic average of the number of points obtained in the various ratios. Selected ratios and selected extreme acceptable values are the basis for calculation of the financial health. Ratios with zero must be omitted from the calculation. [5]

$$\text{Credibility index: IB} = \frac{1}{6} \times \left(\frac{A}{a} + \frac{E}{e} + \frac{L}{l} + \frac{P}{p} + \frac{T}{t} + \frac{U}{u} \right) \text{ [points]}$$

Where:

Profitability indicators	A – Return on total capital
	a – Average interest rate
	E – Return on equity
	e – Average taxable interest rate on loans
Liquidity indicators	L – Operating prompt liquidity
	l – More than one
	P – Coverage of inventory by working capital
	p – Less than one
Stability indicators	T – Debt coverage
	t – Much less than one
	U – Interest coverage
	u – Much more than one

[5]

There are four health zones where a company belongs according to the outcome of the credibility index. These health zones are strong health, good health, weak health and fragile health. These zones are described in the table below:

Table 4 - Zones of financial health [4, p. 198]

A - Strong health	Credibility index is greater than 1,5, return on equity is greater than 1,5 and other indicators are greater than 1,0	Strong health insures the company in case of serious business failure or external threat.
B - Good health	Credibility index is between 1,4 and 1,0 and operating liquidity is greater than 1,0	Good health insures the company at an intermediate level. The closer to strong health, the stronger the resistance to threats.
C - Weak health	Credibility index is between 0,9 and 0,5 and operating liquidity is greater than 1,0	In weaker health, temporary operational problems can cause financial problems.
D - Fragile health	Credibility index is less than 0,5 point	With fragile health the company is vulnerable to financial distress.

1.3 Valuation model according to fuzzy logic

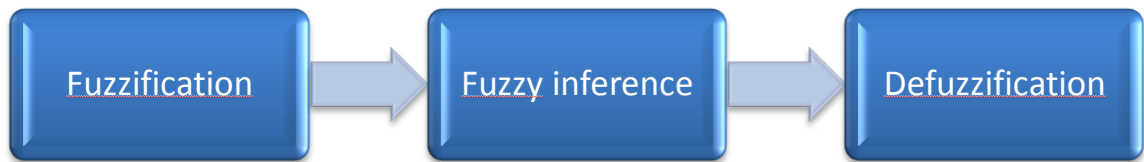
1.3.1 Fuzzy logic

“Fuzzy logic has two different meanings. In a narrow sense, fuzzy logic is a logical system, which is an extension of multivalued logic. However, in a wider sense fuzzy logic is almost synonymous with the theory of fuzzy sets, a theory which relates to classes of objects with unsharp boundaries in which membership is a matter of degree. In this perspective, fuzzy logic in its narrow sense is a branch of FL. Even in its more narrow definition, fuzzy logic differs both in concept and substance from traditional multivalued logical systems. ... The basic ideas underlying FL are explained very clearly and insightfully in Foundations of Fuzzy Logic. What might be added is that the basic concept underlying FL is that of a linguistic variable, that is, a variable whose values are words rather than numbers. In effect, much of FL may be viewed as a methodology for computing with words rather than numbers. Although words are inherently less precise than numbers, their use is closer to human intuition. Furthermore, computing with words exploits the tolerance for imprecision and thereby lowers the cost of solution.” [23]

1.3.1.1 *How fuzzy logic works*

“The theory defines the set, as a collection of elements of certain properties. The element then belongs to the set or not (0 or 1). It means that only two states are possible. Later the theory of fuzzy logic was created by Zadeh in 1965, which determines “how much” the element belongs to the set (there variable x and its belonging to the set is marked $\mu(x)$ and it is defined in the interval from 1 to 0; where 0 means total non-membership and 1 full membership). The use of rate of membership corresponds better to the practice. So the fuzzy logic measures the certainty of how much the element belongs to the set.” [1, p. 5]

Dostál [1] subscribes 3 fundamental steps, from which fuzzy logic consists, as can be seen on following picture: fuzzification, fuzzy inference, and defuzzification.



Picture 5 - Decision making process by means of fuzzy logic [1, p.5]

The first step, fuzzification, means the transformation of numerical values into linguistic ones. The variable usually has from three to seven attributes. The degree of membership of attributes is expressed by a mathematical function. The types of membership functions used in practice are Λ , π , Z and S , showed in the picture below. These attributes and membership functions concern input and output variables. [1]



Picture 6 - Types of membership functions Λ , π , Z and S [1, p.5]

Fuzzy inference defines the system behaviour by means of the rules of the type IF, THEN, WITH. The conditional clauses create this rule, which evaluates the input variables. These conditional clauses have the known form: [1]

„If state is IN_a and IN_b , ... IN_x or IN_y ... then the state is OUT with weight s , where the value s is in the range $\langle 0,1 \rangle$.” [1, p.6]

$\langle IF \rangle IN_a \langle AND \rangle IN_b \dots \dots IN_x \langle OR \rangle IN_y \dots \dots \langle THEN \rangle OUT \langle WITH \rangle s$

Formula 1 - Evaluation rule [1, p.6]

These fuzzy rules represent expert systems. Each combination of attribute values that inputs into the system and occurs in the condition IF THEN WITH represent one rule. Then is necessary to determine the degree of supports for each rule – it is the weight of rule in the system. Weight of rules can be changed during optimization process of the system. For the part of rules behind IF it is necessary to find corresponding attribute behind the part THEN. [1]

Defuzzification means the transformation of numerical values to linguistic ones. The purpose of defuzzification is the transformation of fuzzy value of output variable in such a way to present verbally the result of fuzzy calculation. During the consecutive

entry of data the model with fuzzy logic works as an automat, there can be a lot of variables on the input. [1]

“The fuzzy sets theory was specifically designed to mathematically represent uncertainty and vagueness and to provide formalized tools for dealing with the imprecision intrinsic to many problems. There are two main characteristics of fuzzy systems that give them better performance for specific applications:

- Fuzzy systems are suitable for uncertain of approximate reasoning, especially for the system with mathematical model that is difficult to derive
- Fuzzy logic allows decision making with estimated values under incomplete or uncertain information.” [9, p.1]

1.3.1.2 The applicability of fuzzy logic

Fuzzy logic can be applied to many decision-making processes, for example manufacturing management or risk management. In perspective of manufacturing management, fuzzy logic can help to improve the efficiency of manufacturing from the point of view of material and time. Risk management tries to minimize danger of failure or losses that can endanger economy of a company or can cause an end of a business.

The target of a company is to get the best possible economic result, so it is necessary to lower the danger of losses or failure. Risk is caused by lack of information and lack of knowledge, use of inappropriate, unreliable or unverified data, by use of inappropriate methods or by influence of random processes. Risk can be classified according to type or area:

- Risk according to type can be categorized into business and clean, systematic and unsystematic, internal and external, influenced and uninfluenced, primary and secondary, risk of preparation and risk of realization
- Risk according to area can be classified to political, economy, financial, suppliers, manufacturing, purchasers, technological, information, law, environmental, human factor, higher power and so on. [3]

Fuzzy logic can be implemented into many areas. For example in company management, fuzzy logic can be used for:

- Choice of a new employee,
- decision of an investment,
- decision making
- whether to buy a property,
- where to take a loan,
- to whom provide a loan,
- where to open a bank account etc.

Fuzzy logic is also used in economy, such as:

- Data mining
- Timeline forecasting

But fuzzy logic is used in many other ways, not only in economy and manufacturing. Rydval [19] shows some of those applications:

- Fuzzy control in Japanese subway – automatic control of lines
- Camera with automatic search for a central focusing point (Minolta)
- ABS, engine control, engine idling and air conditioning
- Fuzzy SQL (Omron)
- Assistance in finding and identifying the perpetrator profile system
- Palmtop Kanji designed for handwriting recognition
- Correction of errors in foundry equipment for plastic products (Omron)

However, “fuzzy logic is not a cure-all. When should you not use fuzzy logic? The safest statement is the first one made in this introduction: fuzzy logic is a convenient way to map an input space to an output space. If you find it's not convenient, try something else. If a simpler solution already exists, use it. Fuzzy logic is the codification of common sense — use common sense when you implement it and you will probably make the right decision.” [23]

1.3.1.3 Microsoft Excel

Office application Excel is an effective tool for analyzing, sharing and information management that helps to make more informed decisions. [24]

Excel is an application created for data management in many efficient ways, like creating pivot tables, graphs, and also contains many formulas for working with data. For working with Fuzzy logic a state and transformation matrix is used. These matrices will be used in supplier's evaluation model.

1.3.2 Evaluation according to fuzzy logic

According to the previous chapter, evaluation of a supplier is a way of avoiding risks, connected with quality, time of delivery and many others. As it was mentioned before, Lambert, Stock and Ellram [11] suggested a model of evaluation with relative importance of each used factor according to specific situation and conditions of the company. In the table below a relative importance of factors is suggested according to fuzzy logic.

Table 5 - Description of the input state matrix

	I.	II.	III.	IV.	V.
	Quality	Price	Reliability	Time of delivery	After sale service
1	0 - 0,1%	15-17	0	3 - 5	1 - 2
2	0,1 - 1%	18 - 25	1	6 - 8	3 - 5
3	<1%	26 - 32	2 - 3	9 - 11	6 - 8
4		33 - 40	>3	12 - 14	9-12
5		41 - 50			

As can be seen in Table 4, every factor has some levels for evaluation of supplier's efficiency that are exactly defined and can give a more exact evaluation than vague grades. There is no exact border between grade 5 and 4 in the evaluation according Lambert, Stock and Ellram [11], but in the quality column, we can see proper difference between grades, it is the quantity of defective units from a delivery.

Table 6 - Transformation matrix

	I.	II.	III.	IV.	V.
1	20,0	6,0	10,0	15,0	5,0
2	10,0	12,0	7,0	25,0	3,0
3	1,0	9,0	4,0	20,0	2,0
4		5,0	2,0	5,0	1,0
5		2,0			
	20,0	12,0	10,0	25,0	5,0

In Table 5 there are numerical evaluation factors, where every factor has an amount of points according to range of efficiency. So in Table 5 is decided into what range a factor belongs to, than it is evaluated according to the transformation matrix. In the last row there is maximum amount of points that a supplier can gain for one factor. Every factor has different maximum amount because of different importance to a company. Maximum amount gained for all factors in this case is 72 points.

Table 7 - Input state matrix for supplier A

	I.	II.	III.	IV.	V.
1	1	0	0	0	0
2	0	0	1	0	0
3	0	1	0	1	1
4	0	0	0	0	0
5	0	0	0	0	0

Table 6 is a scoreboard for supplier A, in every column the supplier's efficiency is marked with 1 according to the efficiency range from table 4. According to this scoreboard, the amount of points is taken(?) from table 5. Supplier A gained 58 points from a maximum of 72 points, he gained 80%. Now, it is necessary to have created a rule that decides if 80% is enough for placing an order.

2 Current situation analysis

This part deals with current situation of the company. Firstly, the company is briefly introduced. Secondly, the current evaluation model is analyzed.

2.1 Description of the company

2.1.1 Basic information

Name of company:	Ondřejovická strojírna a.s.
Company headquarters:	Salisov 49, Zlaté Hory
Legal status:	Public limited company
Date of establishing:	01. 02. 2010
Basic capital:	2 000 000 CZK
Identification number of organization (IČO):	290 26 008
Type of business:	Mechanical engineering

2.1.2 History of the company

The company was established on 01. 02. 2010 by a fusion of two companies – Ondřejovická strojírna Ltd and Fagonia Consulting PLC. Ondřejovická strojírna Ltd was founded in November 1993 when the Great privatization happened. History of the factory starts in 1899 when company Hassman and son founded in Ondřejovice. Basic capital written in the Business register is 2.000.000,- CZK, which is divided into 2.000.000 shares valued each at 1,- CZK. The company specializes in producing pressure tanks, calculating and creating documentations. Almost 90% of the company's production is exported abroad, mostly into Russia, Germany, England and the Middle East. The company owns a permission to produce technological products for nuclear power plants and has a monopoly on the manufacture of stuffing-box-less pumps intended for aggressive media. The company operates in chemical, petrochemical,

energy, food, pharmaceutical, metallurgical and water-management industry. According to high technological intensity of produced products, the company is the owner of a wide portfolio of certificates, for example ASME U stamp, ASME U2 stamp, GHOST certificate Razrešenie 2005 RF, ISO 9001 or ISO 18001.

Ondřejovická strojírna is a stable company with a long history that is well known. Every product made in the company is produced as an original. Customer segment of the company consists mainly of permanent and long-term customers.

2.1.3 Performance of the company

Table 8 - Financial indicators

Financial indicators						
	2006	2007	2008	2009	2010	2011
Average number of employees	78	78	78	81	76	
Sales (thousand of CZK)	142 955	216 972	173 527	209 835	66 663	245 000
Net profit (thousand of CZK)	5 074	17 767	18 272	21 506	-26 072	
Added value per employee	417	647	755	981	265	
ROA	6,0%	23,7%	16,2%	11,4%	-15,3%	
Total liquidity	1,32	1,78	1,51	1,26		
Operating liquidity	0,59	0,78	0,73	0,45		

Table 8 above contains financial indicators of the company during the period between 2006 – 2010. Liquidity in both years 2009 and 2010 is caused by a longer financial year because of a fusion of the company. As we can see, the company is stable from the financial point of view. The year 2009 marks the company's historically best performance ever, its profit increased by 15% with a decrease in orders by 11% in comparison with the year 2008. In 2010 the company was hit by the financial crisis that caused a decline in orders of pressure tanks by 42% compared to the year 2009. The total amount of orders remained at the same level, but they were only small orders that didn't cover the overhead costs, so the company suffered a loss. The company also started to build a new manufacturing building, however the starting costs in 2010 were 500.000,- CZK that had a minimal impact on the net profit.

Expectations for 2011 are completely different. Expected sales for this year are 245.000.000,-CZK, out of which 189 mil. CZK represent one order from the company

UNIS PLC. Because of that, the company doesn't think about reducing the production. The company wants to start a second and third stage of building construction.

Future plans for the company are entering a new market, which leads to new investments into welding technologies and working with special materials. The company also negotiates about an entry of a foreign partner, and wants to start looking for new suppliers.

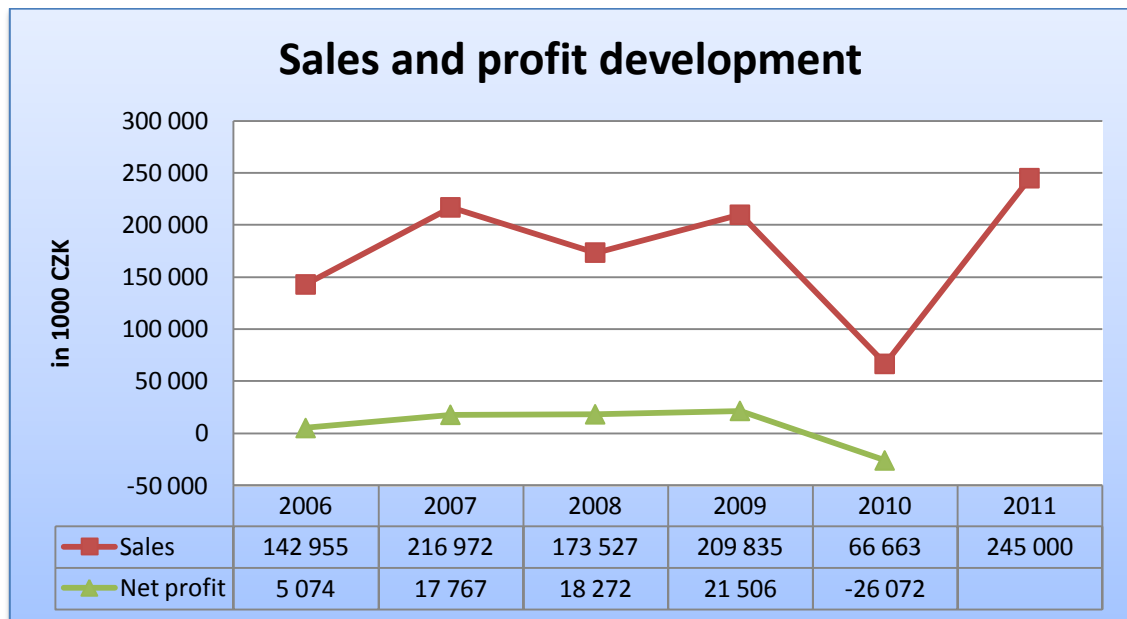


Chart 1 - Sales and profit development

In the chart above the development of the company's sales and profit is graphically described.

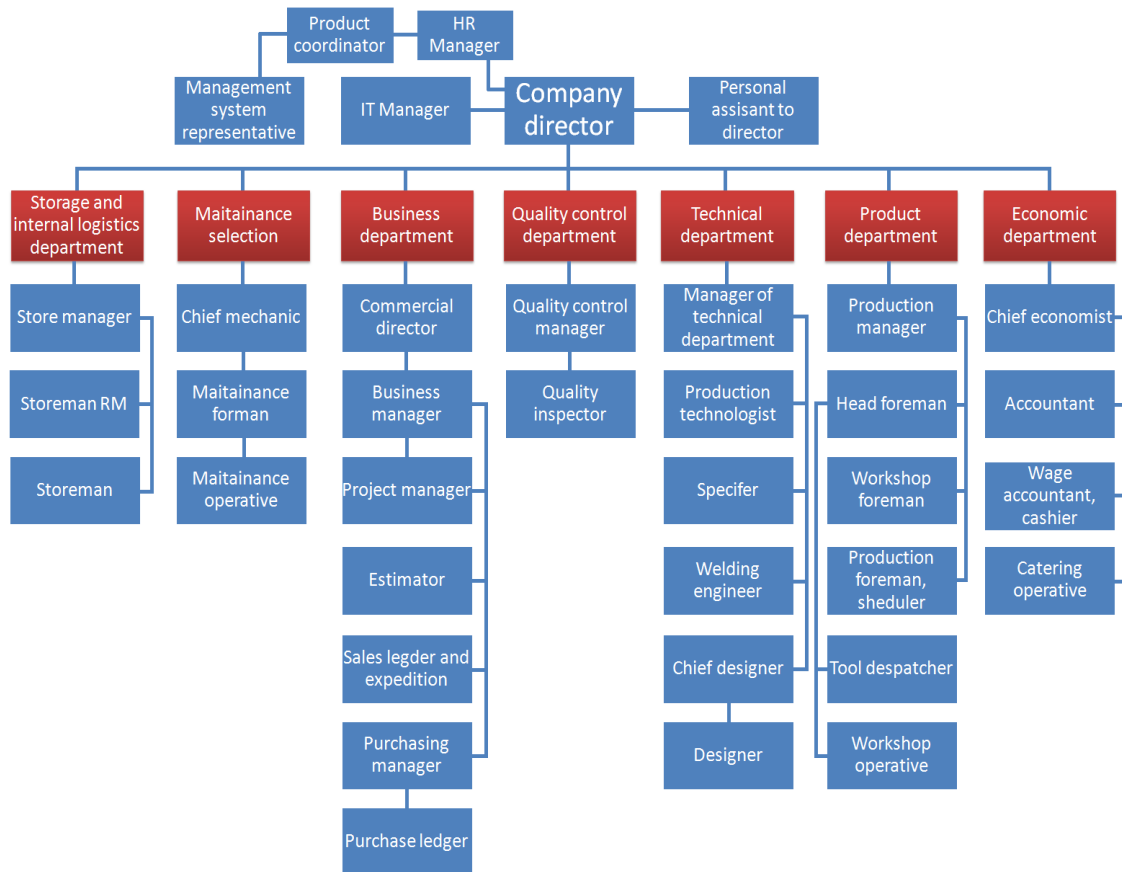
2.1.4 Scope of business

- Locksmith
- Metal processing
- Installation, repairing, inspection and testing of pressure equipment and gas vessels
- Production trade and service not listed in § 1-3 of business law

2.1.5 Organization structure

The statutory body of the company is the Board of Directors that is, up to this date, made up of three members. Chairman and Vice Chairman act together on behalf of the company. Board of supervisors has three members.

Organization structure of the company is displayed in the picture below:



Picture 7 - Organization structure [25]

2.2 Current evaluation process of suppliers in the company

According to the implementation of ISO 9001, where evaluation of suppliers is one of the necessary conditions for obtaining a certificate, the company had to create and implement a process of evaluation. An example of an evaluation paper is included in Appendix 1.

The company divides its suppliers into five groups, according to the type of supplies and services that are provided. These five groups are:

- Suppliers of stainless steel sheets
- Suppliers of arched bottoms
- Suppliers of forgings
- Suppliers of manufacturing services
- Suppliers of machinery service

Evaluation of material suppliers is conducted by the Purchasing Manager, the Production Manager is responsible for the evaluation of suppliers of manufacturing services.

Suppliers' evaluation in the company is performed once per year, and information from business meetings and realized supplies of the period from the last evaluation is used for the evaluation. Evaluation criteria for suppliers are as follows:

- The correctness of an offer or supply as required
- The matching of the material melting on attestation and delivery
- Quality of delivered material and service
- The correctness of packaging
- Compliance with the time of delivery
- Technical ability of the supplier
- Approach to dealing with complaints
- Information about the certification of suppliers

- Compliance with the requirements of EMS³ and BOZP⁴

Scale for the evaluation is from 0 (inconvenient) to 5 (convenient without restriction). The sum of obtained points is divided by the number of evaluation criteria. According to the average score of evaluation, suppliers are divided into five classes:

A – Fully reliable supplier – the average score from 5 to 4.9

B – Reliable supplier – the average score from 4.8 to 3.0

C – Partially reliable supplier – the average score from 2.9 to 1.0

D – Unclassified supplier – new or with low number of data

N – Unreliable supplier – the average score lower than 1.0

The Choice of a supplier is made by the purchaser from suppliers from classes A and B, a supplier from the class C can be taken into consideration under certain circumstances. The purchaser can buy from suppliers that are classified as N only if the supplier is a monopolist and there is no alternative. This purchase has to be approved by the Company Director who also decides about how to ensure the quality of supplies.

Other criteria for this selection are price, distance, transport, payment terms, delivery terms etc.

Selection of new suppliers is based on a comparison of their offers, customer reference, and experience of company's own employees or other companies. Evaluation of new suppliers is carried out after three realized deliveries according to the procedure above.

³Environmental management system

⁴Occupation health and safety

2.3 Disadvantages of recent evaluation process

The current model includes many important criteria that are important for the evaluation. However, there are many other factors that affect the supplier – purchaser relationship and that can influence its quality and duration. There are also no differentiation weights for evaluation criteria, so there is no distinct differentiation in the final results. The evaluation also does not include any information about company efficiency that can predict future problems. Main disadvantages of the recent model are:

- Missing weight differentiation for criteria
- Information about efficiency of the company is not included
- Process of evaluation is carried out once per year

Target of a/the new evaluation method is to eliminate disadvantages of the recent method.

An evaluation model based on fuzzy logic is clearer and quicker than the current method. If used in MS Excel, the model can be expanded and can provide graphical outputs that are easy to follow. It is necessary to train an authorized employee to use Excel and also to maintain fuzzy logic formulas.

3 Proposals and contribution

Firstly in this part, there are created the new evaluation models for rating. Secondly, models are applied on suppliers of the company. Thirdly, evaluation models are compared. In this part is identified contribution and potential weaknesses of new model.

3.1 Evaluation model based on Fuzzy logic

The most suitable way is to create the evaluation model in MS, because the company already uses it, not only for the evaluation model, but also for regular office work, so employees already have the basic skills to use this program. From an economical point of view, MS Excel is also the cheapest way, because the company already has MS Excel, and, for fuzzy logic, there are no additional add-ins or expansions necessary. The created model can be, with little corrections, used for all types of suppliers that the company will need to evaluate.

3.2 The procedure of processing the model based on fuzzy logic

The evaluation model is divided into two parts, because evaluating all the criteria in one model cannot give us the right scope for the decision-making process of buying supplies and services. These two evaluation phases are the evaluation of offers and the evaluation of realized offers.

3.2.1 Evaluation of a delivered offer

The evaluation of delivered offers focuses on realized business transactions according to factors below:

- Quality – this factor means how significant the mismatches were in a delivery, not how many of them the supply contained; divided into five

categories according to how the mismatch can be solved. Quality has second highest weight – 48 points.

- After sale service – supplier’s reaction time to identified issues counted in hours, divided into three categories, and valued by 18 points.
- Reliability – this factor evaluates the correctness of delivery time that is divided according to potential problems that an incorrect delivery can cause. Maximum of points obtained for this is 38.
 - *Delivery a week before the contractual time* – this case does not affect the manufacturing process, but can affect company’s finances when the project is not financed by the company itself
 - *On time delivery* – material is delivered slightly before or on time
 - *Late delivery that does not affect manufacturing* – for work that can be moved or when a project is already late and this will not cause any further delay
 - *Late delivery that affects the manufacturing process* – late delivery causes problems in the manufacturing process, but the company can meet their own delivery time or the supplier assumes responsibility and costs for the caused problem
 - *Late delivery with a serious impact on the manufacturing process* – the company cannot meet the delivery time and the supplier doesn’t assume responsibility and costs for the caused problem
- Material melting on attest and delivery – there are only two options – melting is correct or incorrect, max. score for this is 10 points
- Correctness of packaging – packaging can be correct, can be incorrect but cause no damage or problems, or can cause damage or problems. This factor has a higher value – 58 points.
- Time to solve complaint – time in hours to solve the complaint; time to find a solution, not for a replacement; maximum of obtained points is 28 points.

These factors are used for the evaluation of delivered offers because it is impossible to evaluate them when it is being decided about the right supplier. Entering state matrix is in table 9.

Table 9 - Entering state matrix for evaluation of delivered offers

Entering state matrix						
	Quality	After sale service	Reliability	Material melting on attest and delivery	Correctness of packaging	Time to solve complaints
	I.	II.	III.	IV.	V.	VI.
1	Supply doesn't contain any mismatch	Reaction until 24 hours	Delivery a week before contractual time	Yes	Correct packaging	Reaction until 48 hours
2	Supply contains mismatch usable after repair	Reaction until 48 hours	On-time delivery	No	Mistake in packaging caused no problems	Reaction until 96 hours
3	Supply contains mismatch usable after construction change	Longer reaction time	Late delivery didn't affect manufacturing process		Mistake in packaging caused problems	Longer reaction time
4	Supply contains combination of previous mismatches		Late delivery affected manufacturing process			
5	Supply contains unserviceable mismatch		Late delivery seriously affected manufacturing process			

The matrix has a different amount of points for every evaluation grade. In the first stage, the determination of weight of every single general criterion has been carried out, and it was made in cooperation with the company director. According to the weight of every criterion, the amount of 100 points was divided by the sum of numbers of the criteria and then multiplied for every criterion by its weight. Next, for all categories of each criterion, point scales were determined according to their importance for the company, where the maximum of points is to be given to the category that is the best choice for the company. Setting up these categories and their weight was also made with the company director. The last step was to multiply the amount of points for each category of each criterion by 2. This step shows a bigger difference between each of the

categories. Maximum sum of points that the company can get is 200. The score of each category for each criterion can be seen in the Transformation matrix in table 10 below.

Table 10 - Transformation matrix

Transformation matrix						
	Quality	After sale service	Reliability	Material melting on atest and delivery	Correctness of packaging	Time of solve complaints
	I.	II.	III.	IV.	V.	VI.
1	48,0	18,0	24,0	10,0	58,0	28,0
2	40,0	12,0	38,0	1,0	42,0	20,0
3	34,0	4,0	28,0		12,0	8,0
4	20,0		16,0			
5	4,0		2,0			

For comparison of suppliers' results, four groups are established that are similar to classes that are already used in the company. Membership of each group depends on the percentage proportion of obtained points from the maximum. If a supplier gets less than 50%, then it is evaluated as unreliable. More information about division into groups is in the following table.

Table 11 - Retransformation matrix for evaluation of realized offers

Mark	Percentage of efficiency	Description
A	100 - 95%	Fully reliable supplier
B	94-75%	Reliable supplier
C	74-50%	Partially reliable supplier
D	>50%	Unreliable supplier

Previous matrices are fully prepared to replace the actual evaluation process that already runs in the company. However, when we have evaluated business transactions which had already happened, we can use data from this process to evaluate new offers, to get maximum efficiency from the evaluation model.

3.2.2 Evaluation of offers

An evaluation of potential offers is more important for the company than the evaluation of delivered offers, because we can learn from past transactions, but we cannot make decisions based only on this experience. So, the output of the previous evaluation model is included into this model, but has only limited possibilities to influence this evaluation process. Potential offers will be evaluated based on these factors:

- Price – range between the lowest and the highest price offered is divided into four categories. Because every demand and offer is about a different amount of material, it has no reason to use standard number variance. This variance will be manually changed from this undetermined variance into an accurate variance by using numbers. The lowest price is given 44 points that is the highest possible value.
- Response on demand – speed of reaction on demand, a quick reaction is very important for a company; this is evaluated at? 30 points.
- Correctness according to request – this factor examines whether the offer fulfills the requirements of the company's request. This factor is connected with response on demand, quick and correct offer decrease time and costs connected with creating demand; maximum points obtained for this is 24.
- Offered time of delivery – this factor evaluates the time of delivery that is offered by potential suppliers, the company needs its supplies in a specific time or time range. However, sometimes it is possible to have a delay or supplies can be delivered in advance, but the delivery on requested time has the second highest value – 38 points.
- Certificates – certification has two points of view. Some of the company's customers require specific certifications from all their business partners, in that case a supplier without any certification cannot be chosen. But, for other orders, where these restrictions are not present, the company wants to know whether their potential partner implemented

at least the ISO management system and whether these systems are really followed. If yes, the supplier gets 12 points.

- Information from historical evaluation – At this point, historical data from finished business transactions is evaluated. In this category, data from the previous evaluation model are used. These data are not that much important, but can also affect the final evaluation. Maximum of points obtained from this is 14.
- Index of financial health – This factor evaluates efficiency of the company from a financial point of view, where the number of factors should give us a picture about how strong the company is and to predict possible problems. A company with a low rating can go bankrupt before a delivery of supplies, and that can cause problems to the customer. The highest rating of A is given 20 points.
- Gearing ratio – This ratio shows the percentage describing how big is the part of liabilities which is comprised of foreign money. The higher this percentage is, the lower points the company gets. Moreover, if a company has a percentage of 90% and more, it is a very unstable business partner and it is not recommended to do any business with it. Maximum of obtained points in this category is 18.

The process of point allocation into every category of every criterion is the same as for the evaluation of delivered offers. Importance of criteria was determined with the company director, importance of categories with the company director and the manufacturing manager. Entering state matrix with category description can be seen in table 12, transformation matrix that shows the score for each category is in table 13.

Table 12 - Entering state matrix for evaluation of offers

Entering state matrix								
	Price	Response on demand	Correctness according to request	Offered time of delivery	Certificates	Information from historical evaluation	Index of financial health	Gearing ratio
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
1	Lowest price offered	Less than 2 days	Yes	Delivery by request	Company has ISO certification	A	A	<50%
2	Range between lowest price and average price	Less than week	No	Less than a week after request	Company does not have certification	B	B	50-70%
3	Range between highest price and average price	Less than two weeks		Less than 2 weeks after request		C	C	70-90%
4	Highest price offered	More than 2 weeks		More than 2 weeks after request		D	D	>90%
5							F	

Table 13 - Transformation matrix for evaluation of offers

Transformation matrix								
	Price	Response on demand	Correctness according to request	Offered time of delivery	Certificates	Information from historical evaluation	Index of financial health	Gearing ratio
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
1	44,0	30,0	24,0	38,0	12,0	14,0	20,0	18,0
2	36,0	22,0	8,0	30,0	1,0	10,0	16,0	14,0
3	28,0	14,0		18,0		5,0	12,0	6,0
4	20,0	4,0		4,0		1,0	4,0	2,0
5							2,0	

For the evaluation of offers, a similar percentage variation as for the evaluation of realized offers will be used. Membership of each group depends on percentage proportion of obtained points from the maximum points, so 200 points obtained means 100%. The company should accept an offer with the highest percentage gained. However, if there were many problems with a company's quality in the past, the company can accept an offer with a lower percentage gained, but with a better historical evaluation from past transactions. Information about retransformation matrix is in the table below.

Table 14 - Retransformation matrix for evaluation of offers

Mark	Percentage of efficiency	Description
A	100 - 90%	Very advantageous offer
B	89-75%	Advantageous offer
C	74-50%	Partially advantageous offer
D	>50%	Disadvantageous offer

3.3 Application of the evaluation model

3.3.1 Evaluation of suppliers

Firstly it is necessary to specify company's suppliers. Some significant company's suppliers of stainless steel sheets are listed below.

3.3.1.1 Pragointer-Steel s.r.o

The Pragointer-Steel s.r.o. started operations in 1991. From the beginning, was the company was focused primarily on the selling and distribution of specialty steel products, with a particular focus on flat materials (sheets, rolls, tape) hot and cold-rolled from stainless and carbon steel special grades.

Monitored financial indicators of the company for the financial year 2011 are ROA (5,8%), ROE (6,2%), index of financial health (A) and gearing ratio (24,7%).

3.3.1.2 ThyssenKrupp Ferrosta spol. s r.o.

ThyssenKrupp Ferrosta has been a part of an international group ThyssenKrupp AG since 2003. The Company is one of the most important suppliers of metallurgical materials of all kinds on the Czech market, such as: steel sheets and coils, steel beams, and reinforcing steel bars, steel pipes and sections, stainless and tool steel, professional machining precision tubes for the automotive industry, non-ferrous metals.

Monitored financial indicators of the company for the financial year 2011 are ROA (5,8%), ROE (14,4%), index of financial health (D) and gearing ratio (80,9%).

3.3.1.3 Hasl-nerez special s.r.o

The Company sells products made of stainless steel from EU, offers high quality, short delivery times and good prices.

Monitored financial indicators of the company for the financial year 2010 are ROA (12,4%), ROE (16,9%), index of financial health (A) and gearing ratio (39,2%).

3.3.1.4 MIKRA Metal s.r.o.

The MIKRA Metal s.r.o. was founded in 1992, since 2005 the company has been a member of the Spanish group Irestal. Entrance to the group has allowed the company to make better use the service centres of the parent company Aceros Bergara and to offer customers a flexible approach to coils, accurate tapes and sheets in exact formats including surface treatment and coating a foil. Furthermore, the range of welded pipes from a sister company Inoxidables de Rábade was expanded.

Monitored financial indicators of the company for the financial year 2010 are ROA (4,3%), ROE (18,8%), index of financial health (D) and gearing ratio (83,1%).

3.3.1.5 ArcelorMittal Distribution Czech Republic s.r.o.

ArcelorMittal Distribution Czech Republic s.r.o. is a distribution and service company for the Czech Republic. It offers a wide range of metallurgical material, in scope of required services, a good amount and speed of delivery to its final customers.

ArcelorMittal is the world's leading steel and mining company. Guided by a philosophy to produce safe, sustainable steel, it is the leading supplier of quality steel products in all major markets including automotive, construction, household appliances

and packaging. In 2011, ArcelorMittal had revenues of US\$94bn and crude steel production of 91.9 million tonnes, which represents around 6% of world steel output. Around 35% of ArcelorMittal's steel is produced in the Americas, 47% in Europe and 18% in other regions, including Kazakhstan, South Africa and Ukraine. ArcelorMittal is number one for market position and market share in North and South America, Western Europe, Eastern Europe, CIS and Africa.

Monitored financial indicators of the company for the financial year 2011 are ROA (-9,4%), index of financial health (F) and gearing ratio (135,8%). Because profit and also company equity is negative, the result of ROE is positive (25%), however this indicator is completely useless for this situation.

3.3.1.6 JACQUET s.r.o.

JACQUET s.r.o. is a subsidiary of JACQUET METALS, representing its interests in the Czech and Slovak markets. The company offers services and supplies in areas of cutting pieces of stainless steel, grains of nickel alloys, sheets of stainless steel, logs and pipes of stainless steel, sheets of nickel alloys, logs and pipes of nickel alloys, sheets, blanks, and grains of copper, copper alloys and nickel and forgings. JACQUET is an Established market leader in the distribution of stainless steels and nickel alloys. The brand has expertise in procurement management.

Monitored financial indicators of the company for the financial year 2010 are ROA (12,1%), ROE (18,4%), index of financial health (B) and gearing ratio (62,0%).

3.3.1.7 Felix steel a.s.

The FS GROUP Ltd. Felix steel a.s. is a company engaged in the purchase, storage, treatment and sale of stainless steel materials and other special steels. The main and essential range of stainless steel bars are drawn, rolled (round, flat, square, hexagonal and special profiles of various shapes), sheets, rolls and tape, wire rod in coils, seamless and welded pipes, pipe accessories, hollow rods. Goods mainly from the stainless metallurgical materials correspond to standards ČSN, DIN, ASTM and others.

Monitored financial indicators of the company for the financial year 2011 are ROA (0,3%), ROE (23,3%), index of financial health (D) and gearing ratio (91%).

3.3.1.8 Metal service centre Sp. z o.o.

Metal Service centre is a Polish company that started up in the mid sixties as a company dealing in non-ferrous semi-manufactured products (stainless steel and aluminium) and became a leader firm in a very short time. Nowadays, the company is a part of Pradieri group that operates in trading and processing of metals. Today, Pradieri group follows each phase of metal processing activity: from the unprocessed product to the final one, from the warehouse to the end users. The company offers products made of stainless steel, aluminium, nickel alloy, copper and brass.

Financial indicators of this company cannot be monitored. The only external source with this information was found on a paid site. However, the company should ask its business partner for this information.

Next step is to use the Evaluation model of realized offers to evaluate the suppliers above. From every supplier, three randomly chosen supplies will be evaluated.

3.3.1.9 Evaluation of Pragointer-Steel s.r.o

Efficiency of Pragointer-Steel in the first chosen supply:

- Supply didn't contain any mismatches
- Reaction within 48 hours
- Supply delivered on time
- Material melting on attest and delivery OK
- Packaging was correct
- No filing of a complaint was needed

For the other two supplies, only the results are displayed in tables 16 and 17.

Table 15 - Evaluation of Pragointer's first supply

State matrix						
	I.	II.	III.	IV.	V.	VI.
1	1,00			1,00	1,00	1,00
2		1,00	1,00			
3						
4						
5						

I.	II.	III.	IV.	V.	VI.	Score	Mark
48	18	38	10	58	28	100	A

Table 16 - Evaluation result of Pragointer's second supply

I.	II.	III.	IV.	V.	VI.	Score	Mark
40	12	38	10	58	28	93	B

Table 17 - Evaluation result of Pragointer's third supply

I.	II.	III.	IV.	V.	VI.	Score	Mark
48	12	28	10	58	28	92	B

3.3.1.10 Evaluation of ThyssenKrup Ferrosta spol. s r.o.

Efficiency of ThyssenKrup Ferrosta in the first chosen supply:

- Supply didn't contain any mismatches
- Reaction within 24 hours
- Supply delivered on time
- Material melting on attest and delivery OK
- Packaging was correct
- No filing of a complaint was needed

For the other two supplies, only the results are displayed in tables 19 and 20.

Table 18 - Evaluation of Ferrosta's first supply

State matrix						
	I.	II.	III.	IV.	V.	VI.
1	1,00	1,00		1,00	1,00	1,00
2			1,00			
3						
4						
5						

I.	II.	III.	IV.	V.	VI.	Score	Mark
48	18	38	10	58	28	100	A

Table 19 - Evaluation result of Ferrosta's second supply

I.	II.	III.	IV.	V.	VI.	Score	Mark
48	18	38	10	58	28	100	A

Table 20 - Evaluation result of Ferrosta's third supply

I.	II.	III.	IV.	V.	VI.	Score	Mark
48	18	24	10	58	28	93	A

3.3.1.11 Evaluation of Hasl-nerez special s.r.o

Efficiency of Hasl-nerez special in the first chosen supply:

- Supply contained a repairable mismatch
- Reaction within 48 hours
- Supply delivered late, but didn't affect manufacturing
- Material melting on attest and delivery was differed
- Packaging was incorrect, but caused no problems
- Complaint solved within 48 hours

For the other two supplies, only the results are displayed in tables 22 and 23.

Table 21 - Evaluation of Hasl's first supply

State matrix						
	I.	II.	III.	IV.	V.	VI.
1						1,00
2	1,00	1,00		1,00	1,00	
3			1,00			
4						
5						

I.	II.	III.	IV.	V.	VI.	Score	Mark
34	12	28	1	42	28	73	C

Table 22 - Evaluation result of Hasl's second supply

I.	II.	III.	IV.	V.	VI.	Score	Mark
48	12	28	10	58	28	92	A

Table 23 - Evaluation result of Hasl's second supply

I.	II.	III.	IV.	V.	VI.	Score	Mark
34	12	38	10	58	28	90	A

3.3.1.12 Evaluation of MIKRA Metal s.r.o.

Efficiency of MIKRA Metal in the first chosen supply:

- Supply contained a repairable mismatch
- Reaction within 48 hours
- Supply delivered on time
- Material melting on attest and delivery OK
- Packaging was incorrect, but caused no problems
- Complaint solved within 48 hours

For the other two supplies, only the results are displayed in tables 25 and 26.

Table 24 - Evaluation of MIKRA's first supply

State matrix						
	I.	II.	III.	IV.	V.	VI.
1				1,00		1,00
2	1,00	1,00	1,00		1,00	
3						
4						
5						

I.	II.	III.	IV.	V.	VI.	Score	Mark
40	12	38	10	42	28	85	B

Table 25 - Evaluation result of MIKRA's second supply

I.	II.	III.	IV.	V.	VI.	Score	Mark
40	12	28	10	58	28	88	B

Table 26 - Evaluation result of MIKRA's third supply

I.	II.	III.	IV.	V.	VI.	Score	Mark
40	12	38	1	58	28	89	B

3.3.1.13 Evaluation of ArcelorMittal Distribution Czech Republic s.r.o.

Efficiency of ArcelorMittal in the first chosen supply:

- Supply didn't contain any mismatches
- Reaction within 24 hours
- Supply delivered on time
- Material melting on attest and delivery OK
- Packaging was correct
- No filing of a complaint was needed

For the other two supplies, only the results are displayed in tables 28 and 29.

Table 27 - Evaluation of ArcelorMittal's first supply

State matrix						
	I.	II.	III.	IV.	V.	VI.
1	1,00	1,00		1,00	1,00	1,00
2			1,00			
3						
4						
5						

I.	II.	III.	IV.	V.	VI.	Score	Mark
48	18	38	10	58	28	100	A

Table 28 - Evaluation result of ArcelorMittal's second supply

I.	II.	III.	IV.	V.	VI.	Score	Mark
48	12	24	10	58	28	90	A

Table 29 - Evaluation result of ArcelorMittal's third supply

I.	II.	III.	IV.	V.	VI.	Score	Mark
48	18	24	10	58	28	93	A

3.3.1.14 Evaluation of JACQUET s.r.o.

Efficiency of JACQUET in the first chosen supply:

- Supply didn't contain any mismatches
- Reaction within 24 hours
- Supply delivered on time
- Material melting on attest and delivery OK
- Packaging was correct
- No filing of a complaint was needed

For the other two supplies, only the results are displayed in tables 31 and 32.

Table 30 - Evaluation of JACQUET's first supply

State matrix						
	I.	II.	III.	IV.	V.	VI.
1	1,00	1,00		1,00	1,00	1,00
2			1,00			
3						
4						
5						

I.	II.	III.	IV.	V.	VI.	Score	Mark
48	18	38	10	58	28	100	A

Table 31 - Evaluation result of JACQUET's second supply

I.	II.	III.	IV.	V.	VI.	Score	Mark
40	18	38	10	58	28	96	A

Table 32 - Evaluation result of JACQUET's second supply

I.	II.	III.	IV.	V.	VI.	Score	Mark
48	18	24	10	58	28	93	A

3.3.1.15 Evaluation of Felix Steel a.s.

Efficiency of Felix Steel in the first chosen supply:

- Supply contained a repairable mismatch
- Reaction within 48 hours
- Supply delivered on time
- Material melting on attest and delivery OK
- Packaging was incorrect, but caused no problems
- Complaint solved within 48 hours

For the other two supplies, only the results are displayed in tables 34 and 35.

Table 33 - Evaluation of Felix Steel's first supply

State matrix						
	I.	II.	III.	IV.	V.	VI.
1				1,00		1,00
2	1,00	1,00	1,00		1,00	
3						
4						
5						

I.	II.	III.	IV.	V.	VI.	Score	Mark
40	12	38	10	42	28	85	B

Table 34 - Evaluation result of Felix Steel's second supply

I.	II.	III.	IV.	V.	VI.	Score	Mark
48	12	38	10	58	28	97	A

Table 35 - Evaluation result of Felix Steel's third supply

I.	II.	III.	IV.	V.	VI.	Score	Mark
34	18	28	10	58	28	88	B

3.3.1.16 Evaluation of Metal service centre Sp. z o.o.

Efficiency of ThyssenKrupp Ferrosta in the first chosen supply:

- Supply didn't contain any mismatches
- Reaction within 24 hours
- Supply delivered on time
- Material melting on attest and delivery OK
- Packaging was correct
- No filing of a complaint was needed

For the other two supplies, only the results are displayed in tables 37 and 38.

Table 36 - Evaluation of Metal Service's first supply

State matrix						
	I.	II.	III.	IV.	V.	VI.
1	1,00	1,00	1,00	1,00	1,00	1,00
2						
3						
4						
5						

I.	II.	III.	IV.	V.	VI.	Score	Mark
48	18	24	10	58	28	93	B

Table 37 - Evaluation result of Metal Service's second supply

I.	II.	III.	IV.	V.	VI.	Score	Mark
48	18	38	10	58	28	100	A

Table 38 - Evaluation result of Metal Service's third supply

I.	II.	III.	IV.	V.	VI.	Score	Mark
48	18	28	10	58	28	95	A

3.3.1.17 Results of evaluation

Data for supplier's evaluation will be gained from the evaluation matrix above. All these data are saved with a created macro to a database, from which it will be taken and analyzed by a pivot table. The pivot table will create average values from the recorded data. Average values for every single criterion can be seen in the chart below.

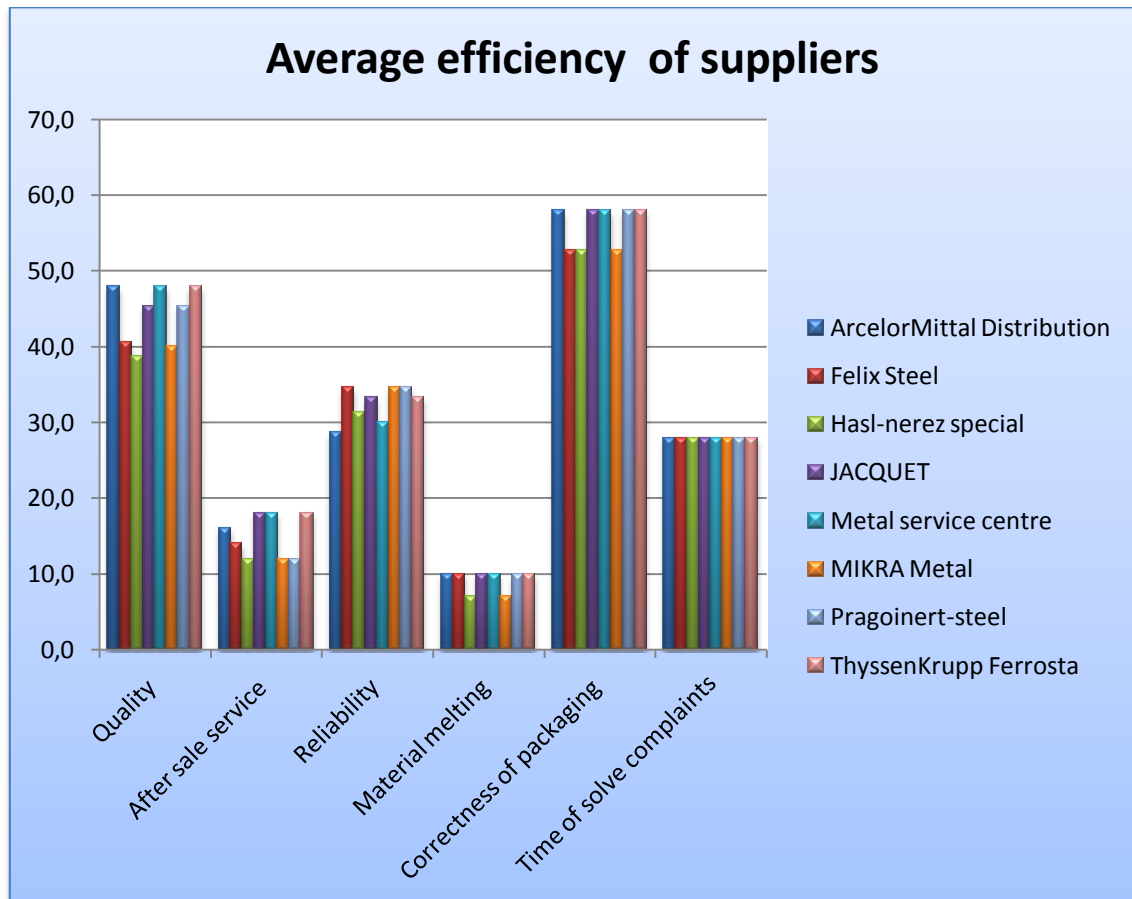


Chart 2 - Average efficiency of suppliers

As can be seen from recorded business transactions, all companies have the same time efficiency in solving a complaint. Correctness of packaging and material melting shows only a few differences caused by single failures in these criteria. But, there can be seen many differences in efficiency in quality, after sale service and reliability. In the following chart, the final evaluation of company's suppliers can be seen.

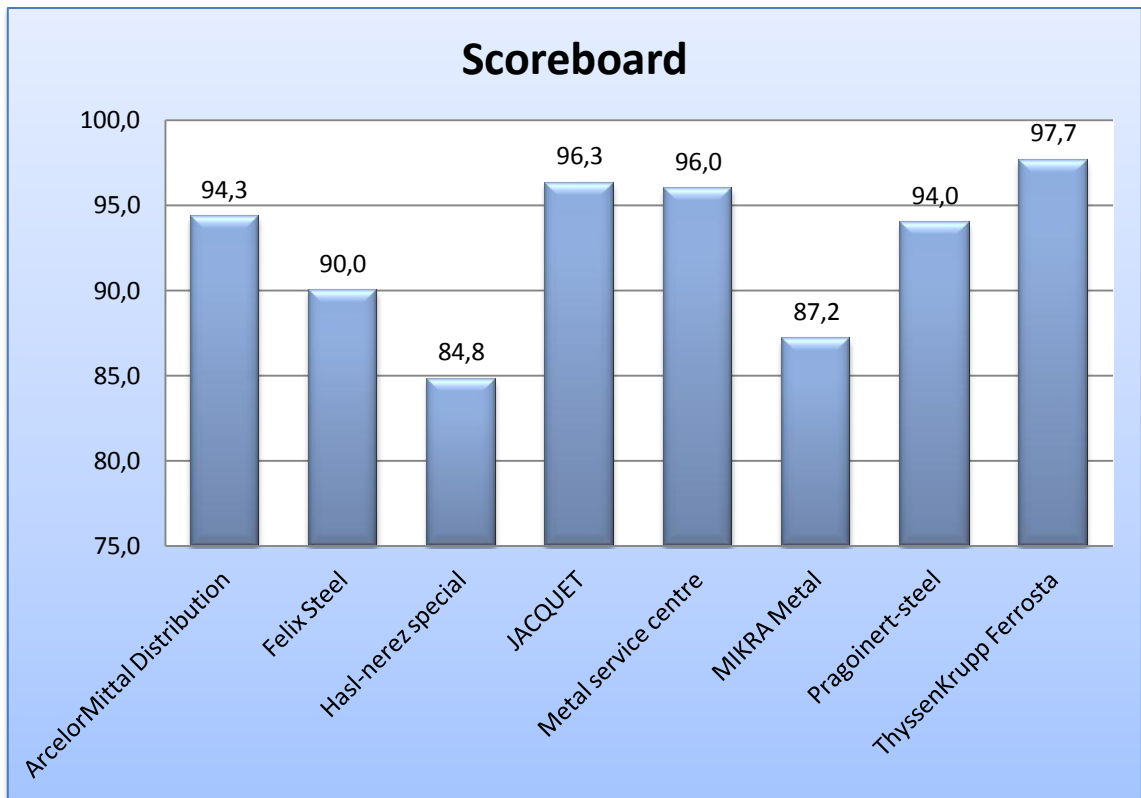


Chart 3– Scoreboard

As it can be seen in the chart, the best result from the evaluation belongs to ThyssenKrupp Ferrosta, closely followed by JACQUET and Metal Service Centre. In the end, these three suppliers are given the mark A, all the other suppliers have less than 95 percent and more than 80 percent, so they have been given the mark B. If we compare this result with the currently used evaluation model and its result, ThyssenKrupp Ferrosta has the best rank in both models. JACQUET also has the same position, but the third in the current model, Hassl-nerez special, is in the last position in the new model. The other suppliers have also changed their positions. So it can be seen that valuation based on recorded results can bring more accurate results than evaluation made once per year.

3.3.2 Evaluation of offers

The decision about which offer should be accepted is carried out by the purchasing manager. However, offers are chosen based on a mix of delivery and payment terms, price and expected quality without any concrete measurement.

In the first quarter of 2012, the company sent out a demand for 5 pieces of plates of stainless steel. They got back offers from Felix Steel, ThyssenKrupp Ferrosta, Metal Service Centre, ArcelorMittal, JACQUET and Hasl-nerez Special.

3.3.2.1 Felix Steel

- Offered price: €2763,46 (70468,23Kč)
- Response on demand: 1 day
- Correctness according to request: OK
- Offered time of delivery: 7 – 10 days
- Requested certification: Yes
- Historical evaluation: B
- Index of financial health: D
- Gearing ratio: 91%

Table 39 - Evaluation matrix of Felix Steel's offer

Felix Steel								
	Price	Response on demand	Correctness according to request	Offered time of delivery	Certificates	Information from historical evaluation	Index of financial health	Gearing ratio
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
1	0,0	1,0	1,0	0,0	1,0	0,0	0,0	0,0
2	0,0	0,0	0,0	0,0	0,0	1,0	0,0	0,0
3	1,0	0,0		1,0		0,0	0,0	0,0
4	0,0	0,0		0,0		0,0	1,0	1,0
5							0,0	
	28	30	24	18	12	10	4	2
							64	C

Offer of Felix Steel got 128 points out of 200, which sums up to 64%.

3.3.2.2 ThyssenKrupp Ferrosta

- Offered price: €2490,- (63 495,-Kč)
- Response on demand: 1 day
- Correctness according to request: OK
- Offered time of delivery: 7 – 14 days
- Requested certification: Yes
- Historical evaluation: A
- Index of financial health: D
- Gearing ratio: 80,1%

Table 40 - Evaluation matrix of ThyssenKrupp Ferrosta's offer

ThyssenKrupp Ferrosta								
	Price	Response on demand	Correctness according to request	Offered time of delivery	Certificates	Information from historical evaluation	Index of financial health	Gearing ratio
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
1	0,0	1,0	1,0	0,0	1,0	1,0	0,0	0,0
2	1,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
3	0,0	0,0		1,0		0,0	0,0	1,0
4	0,0	0,0		0,0		0,0	1,0	0,0
5							0,0	
	36	30	24	18	12	14	4	6
							72	C

Offer of ThyssenKrupp Ferrosta got 142 out of 200 points, which makes 72%.

3.3.2.3 Material Service Centre

- Offered price: € 2357,88 (60 125,-Kč)
- Response on demand: 0 days
- Correctness according to request: OK
- Offered time of delivery: 6 – 7 days
- Requested certification: Yes
- Historical evaluation: A
- Index of financial health: Unknown
- Gearing ratio: Unknown

Table 41 - Evaluation of Metal Service Centre's offer

Metal Service Centre								
	Price	Response on demand	Correctness according to request	Offered time of delivery	Certificates	Information from historical evaluation	Index of financial health	Gearing ratio
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
1	1,0	1,0	1,0	0,0	1,0	1,0	0,0	0,0
2	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
3	0,0	0,0		1,0		0,0	0,0	0,0
4	0,0	0,0		0,0		0,0	0,0	1,0
5							1,0	
	44	30	24	18	12	14	2	2
							67	C

Because there is no available public information on economic efficiency of this supplier, and the company has no information of its own about it at this time, the supplier got the lowest possible amount of points for the Index of financial health and Gearing ratio. The offer of the company Metal Service Centre got 134 out of 200 points, which makes 67%.

3.3.2.4 ArcelorMittal Distribution

- Offered price: 76 941,-Kč
- Response on demand: 2 days
- Correctness according to request: OK
- Offered time of delivery: 14 days
- Requested certification: Yes
- Historical evaluation: B
- Index of financial health: F
- Gearing ratio: 136%

Table 42 - Evaluation matrix of ArcelorMittal Distribution's offer

ArcelorMittal Distribution								
	Price	Response on demand	Correctness according to request	Offered time of delivery	Certificates	Information from historical evaluation	Index of financial health	Gearing ratio
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
1	0,0	1,0	1,0	0,0	1,0	0,0	0,0	0,0
2	0,0	0,0	0,0	0,0	0,0	1,0	0,0	0,0
3	1,0	0,0		1,0		0,0	0,0	0,0
4	0,0	0,0		0,0		0,0	0,0	1,0
5							1,0	
	28	30	24	18	12	10	2	2
							59	C

The Offer of ArcelorMittal Distribution got 118 out of 200 points, which makes 59%.

3.3.2.5 JACQUET

- Offered price: € 2 886,62 (73 602,81,-Kč)
- Response on demand: 1 day
- Correctness according to request: OK
- Offered time of delivery: 14 days
- Requested certification: Yes
- Historical evaluation: A
- Index of financial health: B
- Gearing ratio: 62%

Table 43 - Evaluation matrix of JACQUET's offer

JACQUET								
	Price	Response on demand	Correctness according to request	Offered time of delivery	Certificates	Information from historical evaluation	Index of financial health	Gearing ratio
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
1	0,0	1,0	1,0	0,0	1,0	1,0	0,0	0,0
2	0,0	0,0	0,0	0,0	0,0	0,0	1,0	1,0
3	1,0	0,0		1,0		0,0	0,0	0,0
4	0,0	0,0		0,0		0,0	0,0	0,0
5							0,0	
	28	30	24	18	12	14	16	14
							78	B

The offer of JACQUET got 156 out of 200 points, which makes 78%.

3.3.2.6 *Hasl-nerez special*

- Offered price: 70 120,- Kč
- Response on demand: 1 day
- Correctness according to request: OK
- Offered time of delivery: 7 – 14 days
- Requested certification: Yes
- Historical evaluation: A
- Index of financial health: D
- Gearing ratio: 39%

Table 44 - Evaluation matrix of Hasl-nerez Special's offer

Hasl-nerez Special								
	Price	Response on demand	Correctness according to request	Offered time of delivery	Certificates	Information from historical evaluation	Index of financial health	Gearing ratio
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
1	0,0	1,0	1,0	0,0	1,0	0,0	1,0	1,0
2	0,0	0,0	0,0	0,0	0,0	1,0	0,0	0,0
3	1,0	0,0		1,0		0,0	0,0	0,0
4	0,0	0,0		0,0		0,0	0,0	0,0
5							0,0	
	28	30	24	18	12	10	20	18
							80	B

The offer Hasl-nerez Special got 160 out of 200 points, which equals to 80%.

3.3.2.7 Evaluation of offers

The output of evaluation matrices is going through the retransformation matrix, showed above in table 14. According to this matrix, an evaluation of offers can be seen below: In table 45 offers sorted by their reached percentage can be seen and a graphic visualisation of single offers can be seen in chart 4.

Table 45 - Retransformation matrix for evaluation of offers

Final evaluation		
Hasl-nerez special	80%	B
JACQUET	78%	B
ThyssenKrupp Ferrosta	72%	C
Metal Service Centre	67%	C
Felix Steel	64%	C
ArcelorMittal Distribution	59%	C



Chart 4 - Evaluation of offers

As we can see, four companies didn't reach 75% of points, and it means that those are only partially advantageous offers. Offers from JACQUET and Hasl-nerez

reached over 75% of points, so they are advantageous offers marked with a B. No offer reached 90% and more, which means a very advantageous offer.

The difference between the only two advantageous offers is only 2%, which means that they are almost equally effective. If we look into the history of evaluation of suppliers, we will see that the company JACQUET has better results than Hasl-nerez. If the difference between those two offers was greater, the recommended offer would be from Hasl-nerez. However, JACQUET is a more reliable supplier, so based on the result of Evaluation of offers and Evaluation of suppliers the offer from JACQUET is recommended.

3.4 Comparison of evaluation models

As the company already has a model for evaluation of suppliers, the company management and also the person responsible for the evaluation process see the current supplier's evaluation process having any added value, only as a necessary part for ISO quality management system. Disadvantages of the recent system were first mentioned in chapter 4.3., they are:

- Missing weight differentiation for criteria
- Information about efficiency of a company is not included
- Process of evaluation is carried out once per year

Other disadvantage of the current system was mixing of different types of criteria into one model for evaluation of customers and their offers. Potential disadvantage of the new model is also resistance of employees to change.

3.4.1 Missing weight differentiation for criteria

To eliminate missing weight differentiation for criteria, it was sufficient to base the evaluation model on fuzzy logic, because fuzzy logic works with different weight for each criterion. Weight of criteria would be different for every company, and in a number of companies it could be different even for every offer. However, weight of criteria in this evaluation model was set up in cooperation with the company management, so it is applicable to all segments of the company's suppliers. Thanks to

this, the company now has a unified tool for evaluation of suppliers' efficiency and also evaluation of offers from suppliers.

3.4.2 Missing information about efficiency of a supplier

Every supplier has a different efficiency, and although conditions are often different, weak efficiency marks a supplier as potentially dangerous business partner for many reasons, for example the supplier can stop its business before delivering supplies. The company may not lose money from this situation (for example from payment before or advance payment), but missing supply will negatively affect manufacturing process and get the company into trouble. To avoid this situation, two criteria for efficiency were added into the evaluation model: Index of financial health and Gearing ratio. Gearing ratio considers the amount of company debts; Index of financial health considers company efficiency and some other points of view. This information will be updated once per year, when companies publish their efficiency reports. However, companies from abroad that have no subsidiary in the Czech Republic have no duty to publish their annual reports in our country, so the company needs to ask their business partners for this information or annual report. Their partners can naturally disagree, but reluctance to information providing can mean that the partner has something that he wants to hide. This makes the company an unreliable business partner, and the company should trade with it only if it has a monopoly for goods required. However, it is unnecessary to run the evaluation for monopoly suppliers, because bad efficiency of such supplier cannot lead to change.

3.4.3 Bad periodicity of the evaluation model

A really weak point of the current evaluation model is almost zero periodicity of evaluation and with it connected low objectivity. For the evaluation, accurate measurements were not used. Vague measurement values from the original model were replaced by accurate criteria that strongly define into what category an employee has to put "1" to get a proper evaluation. If all deliveries are evaluated, it will give the company enough information for true and accurate evaluation of suppliers of the company. If every delivered supply is recorded in the database of supplies, the company can store data as relevant for two years and then erase them. Two years old history gives

the company enough information bases and also gives suppliers a chance to improve their efficiency, because old partial failures will be erased. However, not every supply should be recorded. For small supplies, for example less than 5.000 Kč for material items, the evaluation can be considered lost time that will give no real added value – or in case some mistakes occur, this unimportant supply can damage the evaluation of a supplier. Nevertheless, setting up a border of unimportant deliveries for evaluations, if there are any, has to be done by the company management itself.

3.4.4 Mixing of different types of criteria

The current evaluation model evaluates a number of criteria that evaluate not only suppliers' efficiency, but also criteria that would be better usable for an evaluation of offers or criteria that have no relation with suppliers' efficiency. So, two different evaluation modules for evaluation of suppliers were created: the evaluation of suppliers' efficiency as a core evaluation process that is necessary for the company, because it is a part of ISO quality management system, and the evaluation of offers from suppliers for improvement of the process of choosing the right offer. The original suppliers' evaluation model had nine criteria; this number was cut to six. These criteria are enough for an evaluation of suppliers' efficiency, if the right process of data recording is followed. The rest of the criteria were expanded with a new point of view and additional criteria for the evaluation of offers. The evaluation of offers is the next step of evaluation of suppliers, because only suppliers' efficiency is not the sufficient ground for running business transactions.

However, there are situations that cannot be evaluated strictly according to any evaluation model. A supplier can be reliable for a long time, and good efficiency from the past can hide a number of failures. So, the company has to follow results from past transactions to find uncover the whole picture of efficiency. Also, if a supplier's failure has a critical impact on the company's manufacturing processes, the evaluation model based on recording of efficiency may not be strongly affected. In that case, the company should cancel business relationships with the supplier. The supplier can get company's trust back, but this is a decision that belongs to the company management.

3.4.5 Resistance of employees to changes

As it was mentioned before, resistance of employees can be a significant disadvantage for the new evaluation model. Meetings with the purchasing manager and the production manager showed potential resistance to changes:

- Unwillingness to learn new procedures
- Unfriendly environment

Both managers accepted the need of a new evaluation model for obtaining better and more truthful information, but the evaluation model was still too user unfriendly and the whole procedure too difficult. To eliminate these disadvantages, the whole process was simplified down to a small number of single steps.

The first is the evaluation of realized offers. At first, the transformation matrix is hidden, because this table was market marked as confusing. The whole page is modified as a simple document, as can be seen in Appendix 6. With icon “-“ the transformation matrix will be packed and will not confuse users. The table that begins with “Enter company name” is the only area that the user fills with “1”. If it is filled in correctly, the matrix will calculate the efficiency of a supplier for a realized offer. With a click on the button “Save data”, the record will be saved into a database by using a macro. This macro will not only save the record, but also update linked pivot tables. Continuous results are visible on the chart on the next page of Excel sheet.

The second is the evaluation of offers. The transformation matrix is also hidden to avoid confusing users. As can be seen in Appendices 7 and 8, this evaluation model is more complex than the evaluation of realized offers. To minimize the number of actions, some information in the evaluation model is supplemented via formulas. Historical evaluation, Index of financial health and Gearing ratio are filled in according to compliance of suppliers name using “vlookup” formula. Moreover, when the table List of companies is filled, names are filled into headers of evaluation tables. Also according to this list of names, evaluation criteria listed above are filled in. Tables with efficiency for these criteria are situated on the right side of the sheet, where the pivot table that shows details of efficiency of orders is also situated. This list also includes a macro button that cleans columns that should be filled by the user for evaluation. The last is the table with final evaluation of offers. The model now supports evaluation of up

to 12 offers. A possible danger is that a company's name has to be written in the same way all the time, even an additional gap in the end of the name will cause the model to stop working.

4 Conclusion

I chose the topic of this diploma thesis to be the creation of an evaluation model based on fuzzy logic and comparison with the existing evaluation model, because I was interested in opportunities fuzzy logic offers and I gave myself an objective to use it in practice. As an object of application I chose the company Ondřejovická strojírna a.s., because of our close cooperation on a number of school projects and my bachelor's thesis. From this past experience I have knowledge about company processes.

The main purpose of my diploma thesis was to study advanced methods of analysing and modelling and use the knowledge gained to create a suppliers evaluation model based on fuzzy logic and to apply this model on Ondřejovická strojírna. For this case, as an example, three randomly selected deliveries from suppliers of stainless steel sheets should have been used.

After the initial analysis of needs and current status in the company it was decided, that instead of one matrix for the evaluation of suppliers according to number of criteria, two models will be created; one for the evaluation of suppliers themselves and one for the evaluation of incoming offers. Other information consulted with the company management concerned setting up criteria and their point value, importance of single criteria and access to relevant data necessary to create these evaluation models.

After collecting all relevant information for this model, evaluation models were created in MS Excel. With use of created tools, the evaluation of suppliers' efficiency according to three randomly chosen realized business transaction carried out. Information about transactions was provided by the purchasing manager. Then the evaluation of offers for delivery of stainless steel sheets was made. Information about these offers was also provided by the purchasing manager.

With 96,3%, JACQUET s.r.o. was evaluated as the most efficient supplier. The second best company was Metal Service Centre sp. z o.o with 96%. Results from the new evaluation model showed different results than the original model, where ThyssenKrupp Ferrosta was the best company with 4,9 points out of 5. Results from new model bring a more accurate evaluation, because they are based on analysis of realized transactions, not only on opinion and experience of the purchasing manager.

The offer from Hasl-nezer special s.r.o. was identified as the most advantageous offer with 80% of obtained points. JACQUET s.r.o. got only a bit worse result with 78%. Both offers were classified as class B. The third offer has 72%, class C. First two companies didn't offer the lowest prices; the offer from JACQUET had the second highest price.

Company JACQUET s.r.o was chosen as a supplier for this contract. This decision was based on better results from the historical evaluation.

The secondary purpose of this thesis was to compare the existing suppliers rating model with the proposed one. The new evaluation model designed for the company eliminates significant disadvantages of the existing model, which are missing weight for evaluation criteria and missing criteria for efficiency. This model is designed to eliminate the main disadvantage which is low periodicity of the evaluation process. However, elimination of this disadvantage strongly depends on human factor. The evaluation model is designed for a continuous evaluation, but resistance of the purchasing manager and other responsible employees can reduce benefits of these models.

To lower the risk of resistance, the evaluation model was designed to be as user friendly as possible. The production manager cooperated on the visual part of the model. Main concerns were about automation of the evaluation system. Based on these comments, two macros were created– one to prepare an evaluation field, the second to save the evaluation of a realized offer. Other modifications concerned automatic filling of criteria: Gearing ratio, Index of financial health and Information from historical evaluation. Also tables, charts and the hidden transformation matrix are details that should make working with this evaluation model more comfortable.

Work on this thesis has given me a lot of interesting experience with a number of opportunities that are offered by MS Excel, new information about fuzzy logic, about how the suppliers in a small company are chosen and how ISO quality standards are upheld held and considered.

This thesis was made for Ondřejovická strojírna as a new tool for evaluation of suppliers of the company and their efficiency. The evaluated group of suppliers in this work is suppliers of stainless steel sheets, but it the model was created to be usable for

all groups of suppliers that commonly trade with the company. However, the model can be modified and used according to the company's needs for evaluating offers, for example, of new machinery equipment. An advantage of the company is in the fact that employees have skills in MS Excel, so the company doesn't need to have any additional expenditure for training their employees. MS Excel also gives comprehensible and clear information for employees and the company management as a base for decision making.

As a conclusion of this diploma thesis, it can be said that I created a functional tool which will help the company to evaluate their suppliers in a more efficient way, and also to evaluate offers from them. I have fulfilled the objective of the work by achieving this goal.

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Appendix 1: Evaluation of suppliers of stainless steel sheets

Hodnocení dodavatelů nerezových plechů 2011

Kategorie dodavatelů

Kategorie A - plně spolehlivý dodavatel
 Kategorie B - spolehlivý dodavatel, ojedinělé reklamace
 Kategorie C - částečně spolehlivý dodavatel s kolísavou úrovní jakosti
 Kategorie D - nezařazený dodavatel (nový nebo s malým množstvím dat)
 Kategorie N - nespolehlivý dodavatel

Bodové hodnocení jednotlivých kategorií **K**

Kategorie A - průměr bodového hodnocení 5 - 4,9 b
Kategorie B - průměr bodového hodnocení 4,8 - 3,0 b
Kategorie C - průměr bodového hodnocení 2,9 - 1,0 b
Kategorie D - průměr bodového hodnocení 0,9 - 0,0 b
Kategorie N - průměr bodového hodnocení -

Hodnocená kritéria

- 1) Správnost nabídky nebo dodávky dle požadavku
- 2) Souhlasnost tabyby materiálu na atestu a dodávce
- 3) Kvalita dodávaného materiálu
- 4) Správnost balení dodávky
- 5) Technická zdatnost dodavatele
- 6) Dodržení termínu dodávky
- 7) Přístup k reklamacím
- 8) Informace o certifikaci dodavatele
- 9) Plnění požadavků EMS a BOZP

Stupnice hodnocení

- 0 - dodavatel je naprosto nevyhovující, jeho dodávání O.S. je nepřístupné
 1 - dodavatel je nevhodný pro účely O.S., je použitelný pouze výjimečně pro méně náročné zakázky s podmínkou, plná kontrola dodávek
 2 - dodavatel je vhodný pro méně náročné dodávky s maximální kontrolou dodávek
 3 - dodavatel je vyhovující pro potřeby O.S., nutná stálá přebírka dodávek ÚŘJ
 4 - dodavatel je vyhovující v plném rozsahu dodávek, nutná kontrola atestů
 5 - dodavatel je vyhovující v plném rozsahu dodávek pro O.S. bez jakýchkoli výhrad, nutná kontrola atestů

	1	2	3	4	5	6	7	8	9	K
1 PRAGOINTER	5	5	5	4	5	4	5	4	5	4,7
2 FERROSTA	5	5	5	5	5	4	5	5	5	4,9
3 Hasl	4	5	5	5	5	4	5	5	5	4,8
4 ING.Martin Ulman	4	4	5	4	4	4	4	4	5	4,2
5 Mikrametal	5	4	5	4	5	5	5	4	5	4,7
6 Arcelor	5	5	5	4	5	3	5	4	5	4,6
7 Jacquet	5	5	5	4	5	5	4	5	5	4,8

Hodnocení prováděno dle směrnice č. S-6/09 ze dne 1.2.2009

Vyhotoveno: 19.9.2011



Appendix 2: Evaluation of suppliers of arched bottoms

Hodnocení dodavatelů klenutých den 2011

Kategorie dodavatelů

- Kategorie A - plně spolehlivý dodavatel
 Kategorie B - spolehlivý dodavatel, ojedinělé reklamace
 Kategorie C - částečně spolehlivý dodavatel s kolísavou úrovní jakosti
 Kategorie D - nezařazený dodavatel (nový nebo s malým množstvím dat)
 Kategorie N - nespolehlivý dodavatel

Hodnotovací kritéria

- 1) Správnost nabídky nebo dodávky dle požadavku
- 2) Souhlasnost tabvy materiálu na atestu a dodávce
- 3) Kvalita dodávaného materiálu
- 4) Správnost balení dodávky
- 5) Technická zdatnost dodavatele
- 6) Dodržení termínu dodávky
- 7) Přístup k reklamacím
- 8) Informace o certifikaci dodavatele
- 9) Plnění požadavků EMS a DOZP

Bodové hodnocení jednotlivých kategorií K

- Kategorie A - průměr bodového hodnocení 5 - 4,9 b
 Kategorie B - průměr bodového hodnocení 4,8 - 3,0 b
 Kategorie C - průměr bodového hodnocení 2,9 - 1,0 b
 Kategorie D - průměr bodového hodnocení 0,9 - 0,0 b
 Kategorie N - průměr bodového hodnocení -

Stupnice hodnocení

- 0 - dodavatel je naprosto nevyhovující, jeho dodávání O.S. je nepřístupné
 1 - dodavatel je nevhodný pro účely O.S., je použitelný pouze výjimečně pro méně náročné zakázky s podmínkou, plná kontrola dodávek
 2 - dodavatel je vhodný pro méně náročné dodávky s maximální kontrolou dodávek
 3 - dodavatel je vyhovující pro potřeby O.S., nutná stálá přeбіrka dodávek ÚŘJ
 4 - dodavatel je vyhovující v plném rozsahu dodávek, nutná kontrola atestů
 5 - dodavatel je vyhovující v plném rozsahu dodávek pro O.S. bez jakýchkoli výhrad

	1	2	3	4	5	6	7	8	9	K
1 AFFLERBACH	5	5	5	5	5	4	5	5	5	4,9
2 KONIG - DE	5	5	5	5	5	5	5	5	5	5,0
3 WEISSTALER - DE	4	4	4	4	4	4	4	4	5	4,1

Hodnocení prováděno dle směrnice č. S-6/09 ze dne 1.2.2009

Vyhotoveno: 19.9.2011

 **ONDRSTROJ**
 Ondřejovická strojírna, a.s.
 Salisov 49, 793 76 Zlaté Hory
 IČ/ 29026008 DIČ/ CZ29026008
 [7]

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Appendix 3: Evaluation of suppliers of forgings

Hodnocení dodavatelů výkovků 2011

Kategorie dodavatelů

- Kategorie A - plně spolehlivý dodavatel
 Kategorie B - spolehlivý dodavatel, ojedinělé reklamace
 Kategorie C - částečně spolehlivý dodavatel s kolísavou úrovní jakosti
 Kategorie D - nezaražený dodavatel (nový nebo s malým množstvím dat)
 Kategorie N - nespolehlivý dodavatel

Bodové hodnocení jednotlivých kategorií K

- Kategorie A - průměr bodového hodnocení 5 - 4,9 b
 Kategorie B - průměr bodového hodnocení 4,8 - 3,0 b
 Kategorie C - průměr bodového hodnocení 2,9 - 1,0 b
 Kategorie D - průměr bodového hodnocení 0,9 - 0,0 b
 Kategorie N - průměr bodového hodnocení -

Hodnocená kritéria

- 1) Správnost nabídky nebo dodávky dle požadavku
- 2) Souhlasnost taby materiálu na stělu a dodávce
- 3) Kvalita dodávaného materiálu
- 4) Správnost balení dodávky
- 5) Technická zdatnost dodavatele
- 6) Dodržení termínu dodávky
- 7) Přístup k reklamacím
- 8) Informace o certifikaci dodavatele
- 9) Plnění požadavků EMS a BOZP

Stupnice hodnocení

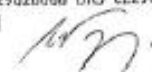
- 0 - dodavatel je naprosto nevyhovující, jeho dodávání O.S. je nepřístupné
- 1 - dodavatel je nevhodný pro účely O.S., je použitelný pouze výjimečně pro méně náročné zakázky s podmínkou, plná kontrola dodávek
- 2 - dodavatel je vhodný pro méně náročné dodávky s maximální kontrolou dodávek
- 3 - dodavatel je vyhovující pro potřeby O.S., nutná stále přítomka dodávek (ŘJ)
- 4 - dodavatel je vyhovující v plném rozsahu dodávek, nutná kontrola stělu
- 5 - dodavatel je vyhovující v plném rozsahu dodávek pro O.S. bez jakýchkoli výhrad, nutná kontrola stělu

	1	2	3	4	5	6	7	8	9	K
1 H.V. Trial	5	5	5	5	5	5	5	5	5	5,0
2 Kolmeder	5	5	5	4	5	4	5	4	5	4,7
3 Ferrari	5	4	5	4	5	4	4	5	5	4,6
4 MEMIT	5	4	5	4	5	4	5	5	4	4,6
5 Galperl	5	4	4	5	5	4	5	5	5	4,7
6 Szabadai kft.	4	4	4	5	5	5	5	5	5	4,7

Hodnocení prováděno dle směrnice č. S-008 ze dne 1.2. 2009

Vyhotoveno: 19.9.2011

 **ONDRSTROJ**
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 IČ/29026008 DIČ/ CZ290
 [7]



Appendix 4: Evaluation of suppliers of manufacturing services

Hodnocení dodavatelů služeb pro rok 2011

Kategorie dodavatelů

- Kategorie A - plně spolehlivý dodavatel
 Kategorie B - spolehlivý dodavatel, ojedinelé reklamace
 Kategorie C - částečně spolehlivý dodavatel s kolísavou úrovní jakosti
 Kategorie D - nezařazený dodavatel (nový nebo s malým množstvím dat)
 Kategorie N - nespolehlivý dodavatel

Hodnocené kritéria

- 1) Správnost nabídky nebo dodávky dle požadavku
- 2) Správnost dodávky výstupní dokumentace, protokolů atd.
- 3) Kvalita dodávané služby
- 4) Správnost balení a expedice dodávky
- 5) Technická způsobilost dodavatele
- 6) Dodržení termínu dodávky
- 7) Přístup k reklamacím
- 8) Informace o certifikaci dodavatele
- 9) Plnění požadavků EMS a BOZP

Bodové hodnocení jednotlivých kategorií K

- Kategorie A - průměr bodového hodnocení 5 - 4,9 b
 Kategorie B - průměr bodového hodnocení 4,8 - 3,0 b
 Kategorie C - průměr bodového hodnocení 2,9 - 1,0 b
 Kategorie D - průměr bodového hodnocení 0,9 - 0,0 b
 Kategorie N - průměr bodového hodnocení -

Stupnice hodnocení

- 0 - dodavatel je naprosto nevyhovující, jeho dodávání O.S. je nepřijatelné
 1 - dodavatel je nevhodný pro účely O.S., je použitelný pouze výjimečně pro méně náročné zakázky s podmínkou, plná kontrola dodávek
 2 - dodavatel je vhodný pro méně náročné dodávky s maximální kontrolou dodávek
 3 - dodavatel je vyhovující pro potřeby O.S., nutná stále příjemka dodávek ÚŘJ
 4 - dodavatel je vyhovující v plném rozsahu dodávek, nutná kontrola protokolů
 5 - dodavatel je vyhovující v plném rozsahu dodávek pro O.S. bez jakýchkoli výhrad

	1	2	3	4	5	6	7	8	9	K	
1 GAMA BOUDA	5	5	4	5	5	5	4	5	5	4,8	B
2 Širaneč	4	4	4	5	3	5	5	2	4	4,0	B
3 VÍTKOVICE ZKUŠEBNA	5	5	4	5	5	4	5	5	5	4,8	B
4 FK SYSTÉM	5	5	4	5	4	5	5	5	5	4,8	B
5 WAPA	5	4	4	5	5	4	5	3	4	4,3	B
7 COLORSPOL	5	5	4	4	4	5	5	4	4	4,4	B
8 PILA KRNOV	5	5	4	5	4	4	4	4	4	4,3	B
9 ROMOTOP	5	5	4	5	4	5	4	5	5	4,7	B
10 ZOO Brno-ve	5	5	5	4	3	5	5	4	4	4,4	B

Hodnocení prováděno dle směrnice č. 5-6/10 ze dne 1.12.2010

Vyholoveno:

10.1.2012

Zpracoval:

Pavel Bořky

Podpis:



Appendix 5: Evaluation of suppliers of machinery service

Hodnocení dodavatelů materiálu (údržba) 2011

Kategorie dodavatelů

- Kategorie A - plně spolehlivý dodavatel
 Kategorie B - spolehlivý dodavatel, ojedinělé reklamace
 Kategorie C - částečně spolehlivý dodavatel s kolísavou úrovní jakosti
 Kategorie D - nezařazený dodavatel (nový nebo s malým množstvím dat)
 Kategorie N - nespolehlivý dodavatel

Bodové hodnocení jednotlivých kategorií K

- Kategorie A - průměr bodového hodnocení 5 - 4,9 b.
 Kategorie B - průměr bodového hodnocení 4,8 - 3,0 b.
 Kategorie C - průměr bodového hodnocení 2,9 - 1,0 b.
 Kategorie D - průměr bodového hodnocení 0,9 - 0,0 b.
 Kategorie N - průměr bodového hodnocení -

Hodnocená kritéria

- 1) Správnost nabídky nebo dodávky dle požadavku
- 2) Kvalita dodávaného materiálu
- 3) Pružnost při dodávce
- 4) Správnost balení dodávky
- 5) Technická zdatnost dodavatele
- 6) Dodržení termínu dodávky
- 7) Přístup k reklamacím
- 8) Informace o certifikaci dodavatele

Stupnice hodnocení

- 0 - dodavatel je naprosto nevyhovující, jeho dodávání O.S je nepřístupné
- 1 - dodavatel je nevhodný pro účely O.S., je použitelný pouze výjimečně pro méně náročné zakázky s podmínkou, písná kontrola dodávek
- 2 - dodavatel je vhodný pro méně náročné dodávky s maximální kontrolou dodávek
- 3 - dodavatel je vyhovující pro potřeby O.S., nutná stálá přebírka dodávek ÚŘJ
- 4 - dodavatel je vyhovující v plném rozsahu dodávek, nutná kontrola atestů
- 5 - dodavatel je vyhovující v plném rozsahu dodávek pro O.S. bez jakýchkoli vyhrad

	1	2	3	4	5	6	7	8	K
1 Halamka s.r.o.	5	5	5	5	5	5	5	5	5
2 Petr Václavík	5	4	5	5	5	4	5	5	4,75
3 Břetislav Tomáš	5	5	4	5	5	5	5	5	4,875
4 Stanislav Židek	5	5	5	5	5	4	5	5	4,875
5 Welcon	5	5	5	5	5	5	5	4	4,875
6 Kover s.r.o.	5	5	5	5	4	4	5	5	4,75

Hodnocení prováděno dle směrnice č. 5-6/09 ze dne 1.2. 2009

Vyhotoveno: 5.8.2012

Appendix 6: Evaluation of realized offer

Entering state matrix						
	Quality	After sale service	Reliability	Material melting on attest and delivery	Correctness of packaging	Time to solve reclamation
	I.	II.	III.	IV.	V.	VI.
1	Supply doesn't contain any mismatch	Reaction until 24 hours	Delivery week before contractual time	Yes	Correct packaging	Reaction until 48 hours
2	Supply contain mismatch usable after repair	Reaction until 48 hours	On-time delivery	No	Mistake in packaging caused no problems	Reaction until 96 hours
3	Supply contain mismatch usable after construction change	Longer reaction time	Late delivery didn't affect manufacturing process		Mistake in packaging caused problems	Longer reaction time
4	Supply contain combination of previous mismatches		Late delivery affected manufacturing process			
5	Supply contain unservisable mismatch		Late delivery seriously affected manufacturing process			

Transformation matrix						
	Quality	After sale service	Reliability (delay)	Material melting on attest and delivery	Correctness of packaging	Time of solve reclamation
	I.	II.	III.	IV.	V.	VI.
1	48,0	18,0	24,0	10,0	58,0	28,0
2	40,0	12,0	38,0	1,0	42,0	20,0
3	34,0	4,0	38,0		12,0	8,0
4	20,0		16,0			
5	4,0		2,0			
						200,0

Enter company name						
	I.	II.	III.	IV.	V.	VI.
1				1,00		1,00
2	1,00	1,00	1,00		1,00	
3						
4						
5						
						1

	I.	II.	III.	IV.	V.	VI.	Score	Mark
Enter	40	12	38	10	42	28	85	B

Check:

Appendix 7: Evaluation of offers (left side of the screen)

Evaluation of offers									
Entering state matrix									
	Price	Response on demand	Correctness according request	Offered time of delivery	Certificates	Information from historical evaluation	Index of financial health	Gearing ratio	
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	
1	60 126 Kč	Less than 2 days	Yes	Delivery by request	Company has ISO certification	A	A	<50%	
2	60 127 - 68 333 Kč	Less than week	No	Less than week after request	Company does not have	B	B	50-70%	
3	68 334 - 76 940 Kč	Less than two weeks		Less than 2 weeks after request		C	C	70-90%	
4	76 941 Kč	More than 2 weeks		More than 2 weeks after request		D	D	>90%	
5							F		
Transformation matrix									
	Price	Response on demand	Correctness according request	Offered time of delivery	Certificates	Information from historical evaluation	Index of financial health	Gearing ratio	
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	
1	44,0	30,0	24,0	38,0	12,0	14,0	20,0	18,0	
2	36,0	22,0	8,0	30,0	1,0	10,0	16,0	14,0	
3	28,0	14,0		18,0		5,0	12,0	6,0	
4	20,0	4,0		4,0		1,0	4,0	2,0	
5							2,0		
	44,0	30,0	24,0	38,0	12,0	14,0	20,0	18,0	200,0
Felix Steel									
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	
1		1,0	1,0		1,0	0,0	0,0	0,0	
2						1,0	0,0	0,0	
3	1,0			1,0		0,0	0,0	0,0	
4						0,0	1,0	1,0	
5							0,0		
	1	1	1	1	1	1	1	1	1
									1
	OK						64	C	
ThyssenKrupp Ferrosta									
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	
1		1,0	1,0		1,0	1,0	0,0	0,0	
2	1,0					0,0	0,0	0,0	
3				1,0		0,0	0,0	1,0	
4						0,0	1,0	0,0	
5							0,0		
	1	1	1	1	1	1	1	1	1
									1
	OK						72	C	
Metal Service Centre									
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	
1	1,0	1,0	1,0		1,0	1,0	#N/A	#N/A	
2						0,0	#N/A	#N/A	
3				1,0		0,0	#N/A	#N/A	
4						0,0	#N/A	#N/A	
5							#N/A	#N/A	
	1	1	1	1	1	1	0	0	0
									0
	ERROR						0	Not Used	

Appendix 8: Evaluation of offers (right side of the screen)

Mark	Percentage of	Description
A	100 - 90%	Very advantageous offer
B	89-75%	Advantageous offer
C	74-50%	Partially advantageous offer
D	>50%	Disadvantageous offer

Final evaluation		
Felix Steel	64	C
ThyssenKrupp Ferrosta	72	C
Metal Service Centre	67	C
ArcelorMittal Distribution	59	C
JACQUET	78	B
Hasl-nerez special	80	B
0	0	Not Used
0	0	Not Used
0	0	Not Used
0	0	Not Used
0	0	Not Used
0	0	Not Used
0	0	Not Used

Index of financial health	
Pragoinert-Steel	A
ThyssenKrupp Ferrosta	D
MIKRA Metal	D
ArcelorMittal Distribution	F
JACQUET	B
Hasl-nerez special	A
Felix Steel	D
Enter company name	F
Enter company name	F
Enter company name	F
Enter company name	F
Enter company name	F

Gearing ratio	
Pragoinert-Steel	0,24743854
ThyssenKrupp Ferrosta	0,80949826
MIKRA Metal	0,83060881
ArcelorMittal Distribution	1,35780525
JACQUET	0,62046069
Hasl-nerez special	0,39170933
Felix Steel	0,9100492
Enter company name	0
Enter company name	0
Enter company name	0
Enter company name	0
Enter company name	0
Enter company name	0

Historical evaluation	
Felix Steel	B
ThyssenKrupp Ferrosta	A
Metal Service Centre	A
ArcelorMittal Distributi	B
JACQUET	A
Hasl-nerez special	B
0	D
0	D
0	D
0	D
0	D
0	D

Average efficiency of suppliers							
Company name	Quality	After sale service	Reliability	Material melting	Correctness of packaging	Time of solve reclamation	Score
ArcelorMittal Distribut	48,0	16,0	3,0	10,0	58,0	28,0	94,3
Felix Steel	40,7	14,0	3,0	10,0	52,7	28,0	90,0
Hasl-nerez special	38,7	12,0	3,0	7,0	52,7	28,0	84,8
JACQUET	45,3	18,0	3,0	10,0	58,0	28,0	96,3
Metal service centre	48,0	18,0	3,0	10,0	58,0	28,0	96,0
MIKRA Metal	40,0	12,0	3,0	7,0	52,7	28,0	87,2
Pragoinert-steel	45,3	12,0	3,0	10,0	58,0	28,0	94,0
ThyssenKrupp Ferrost	48,0	18,0	3,0	10,0	58,0	28,0	97,7