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INTRODUCTION

Together with the enormous informatisation of the society, and the emergence of Industry 4.0, the amount of data and information generated is growing, and there is increasing pressure to use an increasing amount of knowledge by businesses and their employees. The necessary of rapid and correct decision-making in enterprises becomes a key factor in gaining a competitive advantage. Thanks to these trends, there are various systems that make it easier to work with knowledge. To input this knowledge into the system, it is necessary to process and transform a lot of data and information that they no longer need to process by employees. The transformation of data and knowledge into knowledge is a complex process that requires knowledge of decision-making processes, continuity and context between information. With constant employee fluctuations and rising demands for employee expertise, such systems become important components of competitive businesses (Kramarova et al., 2017). Such a system of knowledge at the sales department with a great deal of everyday decisions can save a lot of time for employees and increase the implementation of the company's plans.

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STATUS AT THE SALES DEPARTMENT IN PRODUCTION ENTERPRISE

The sales department is one of the most important departments in manufacturing plants (Fusko et al., 2018). It ensures communication with customers and depends on the skills and knowledge of the employees which contracts will be accepted into the company. It can be said that the way in which the business will profit depends on the decisions made by the department. A production system model is used in production facilities as shown in Fig. 1. (Medvecká et al., 2017).

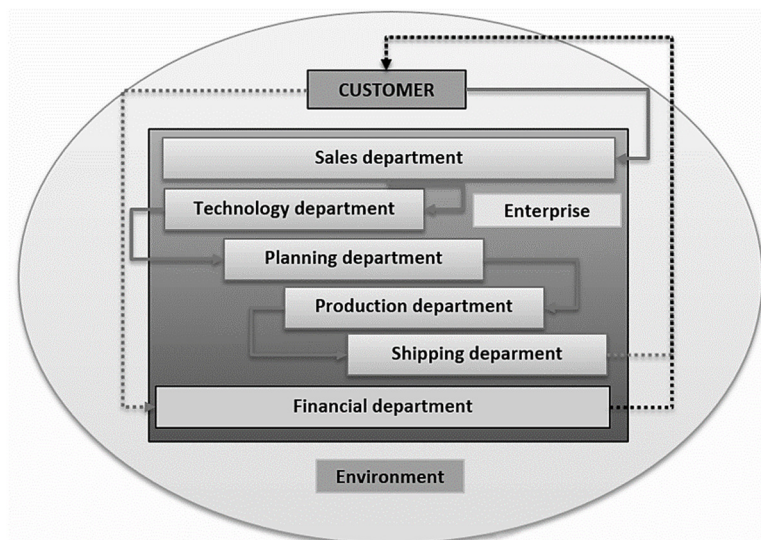


Fig. 1 Structure of the production enterprise

The model of the production system is divided by into these phases (Fusko et al., 2017):

- The customer is in contact with the **sales department** or the sales representative of the company, resulting in the acceptance of the order to the company.
- The order received by the merchant is further processed on the basis of an order, and **the planning and purchase** of the material takes place as follows: according to the customer's requirements, the product will be made, what material will be used and in which date will be product produced.
- **Production department** according to instructions, the product on planned machines, with the planned manufactures in the required quantity, at the required date and according to the technological process.
- The goods produced by the consignment are packaged according to the customer's requirements on **shipping department** and then dispatched according to the instructions with the company.
- **The customer** receives the required goods, in the required quantity, quality, and at the agreed price to be paid by the agreed date of the business.
- **The finance department** receives the "split" payment and, in the form of wages, appraises the individual employees in the departments.

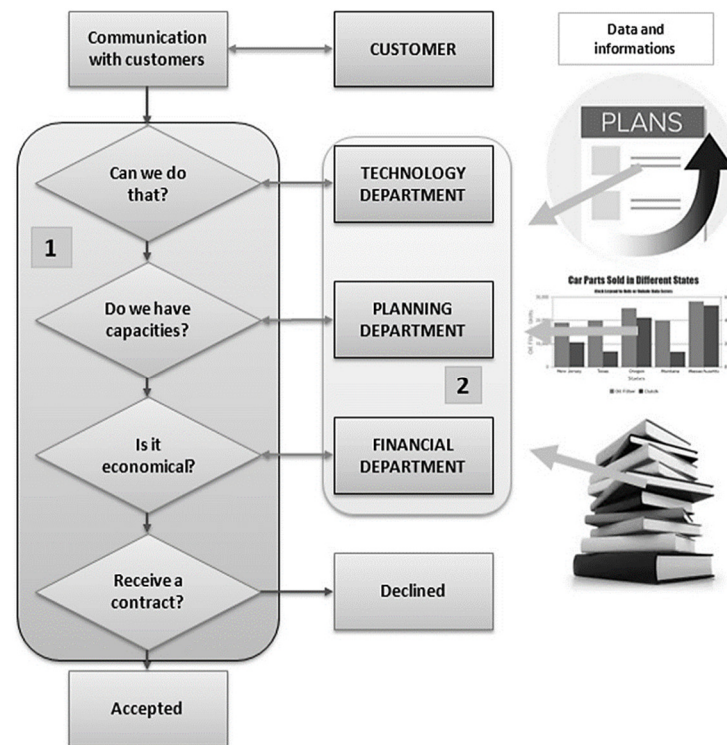


Fig. 2 Decision-making processes at the sales department

In day-to-day decisions (Fig. 2), employees at sales department are forced to decide based on acquired knowledge (Stefanik et al., 2017). Information and data are gained by communicating with other departments and workers, possibly using their own experience, or by the rules set out by the firm in the form of regulations, technological procedures, and the like (Micieta et al., 2018). By Gregor et al. (2017) employees in this department must make decisions quickly, correctly and profitably.

The decision of the trader has several variants of decisions that link the observed shortcomings. By Daneshjo et al. (2018) the shortcomings were mainly due to insufficient use of knowledge in this department:

- Adoption of a contract that the company is unable to produce: in the correct quantity, quality, and to the required date, is the result of the various complaints that have to be borne financially by the enterprise.
- Acceptance of a contract whose price is appreciated by the cheapest machines (the customer receives a favourable price which he accepts in most cases), but the contract is produced on other more expensive machines, with a deficit in the amount to be paid by the customer and the amount for which the contract was made.
- Adoption of several orders, with similar production processes, thus rendering the production process ineffective (some machines do not manage to produce, while some do not have to produce).
- Adoption of a large number of orders from a small percentage of profit for the enterprise.

This results in receiving orders without impact and controlling its true profitability. By Micieta et al. (2015) this problem can be caused by several factors: production is feasible through multiple processes, the impact of more condensed production

capacities that are less expensive, etc. Fig. 3 illustrates the increasing demands for the necessary knowledge and knowledge of the staff of the sales department with the decreasing repeatability of production by Krajcovic et al. (2014).

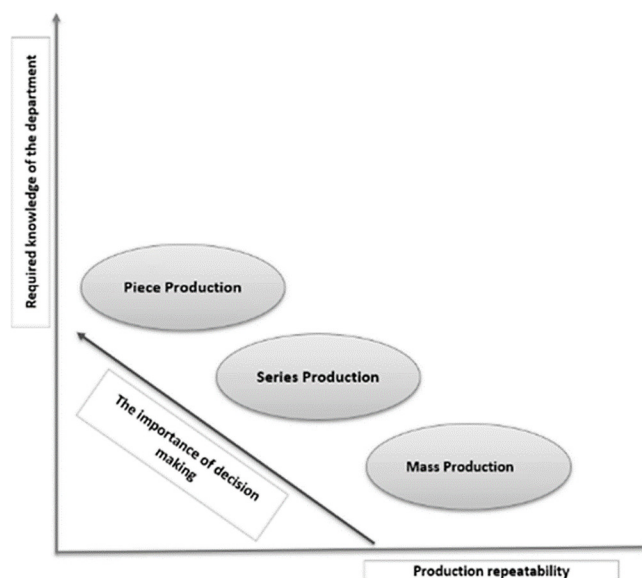


Fig. 3 The requirement for knowledge at the sales department depending on the type of production

COLLECTION OF DATA AND INFORMATION IN COMPANY

The monitored enterprise is more involved in piece production. Trader knowledge requirements are high in businesses. The amount of data and information will not get unbundled on time, and many orders are outdated or rejected by customers. All deficiencies arising from bad decisions of employees at the sales department were observed in the company.

By analysing non-production processes at a selected production plant, it has also been found that there are reserves in the sales department processes, the consequence of which is that the planned profit is not achieved even though production is fully exploited (Table 1).

Table 1
The ratio of production to expected profit

Month	% extent of key devices	% fulfilment of the planned profit
6/2018	97	81
7/2018	98	83
8/2018	91	76
9/2018	87	73
Average	93.25	78.25

The table shows that despite the production, there was no profit as planned. We can say that the production mix was not suitable for a given period, and the employees of the sales department took orders that were not the most profitable for the business. If employees had the right knowledge at the time, they could accept contracts that would be more profitable. Fig. 4 shows percentage of orders received over the reference period.

Orders in the monitored enterprise

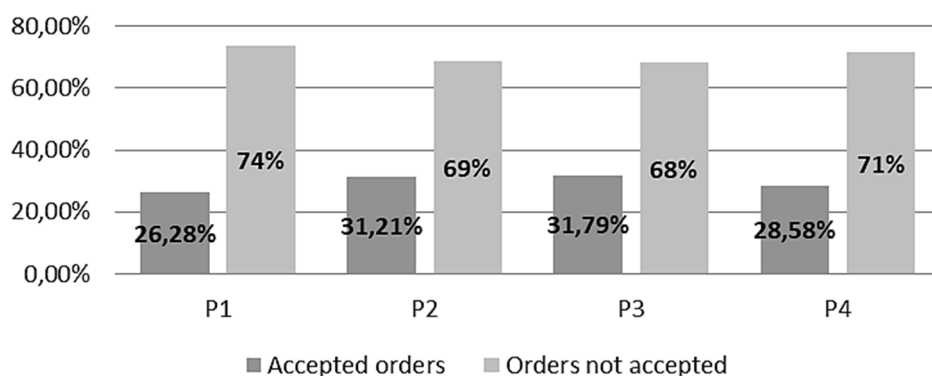


Fig. 4 Percentage of orders in last three years in company

The observed deficiencies stemmed mainly from insufficient use of knowledge in this department (Fig. 5):

- Acceptance of a contract that the company fails to provide - at the correct amount, quality and time required - results in complaints that the enterprise must bear financially.
- Adoption of a contract, the price of which is calculated on the cheapest machines (in most cases, the customer receives a favourable price), but the contract is executed on other more expensive machines, with the difference in costs being paid by the enterprise.
- Adoption of many orders, with similar manufacturing processes, thus rendering the production process ineffective (some machines do not manage to produce, while some do not have to produce).
- Adoption of many orders from a small percentage of profit for the enterprise.

Reasons for not accepting an order

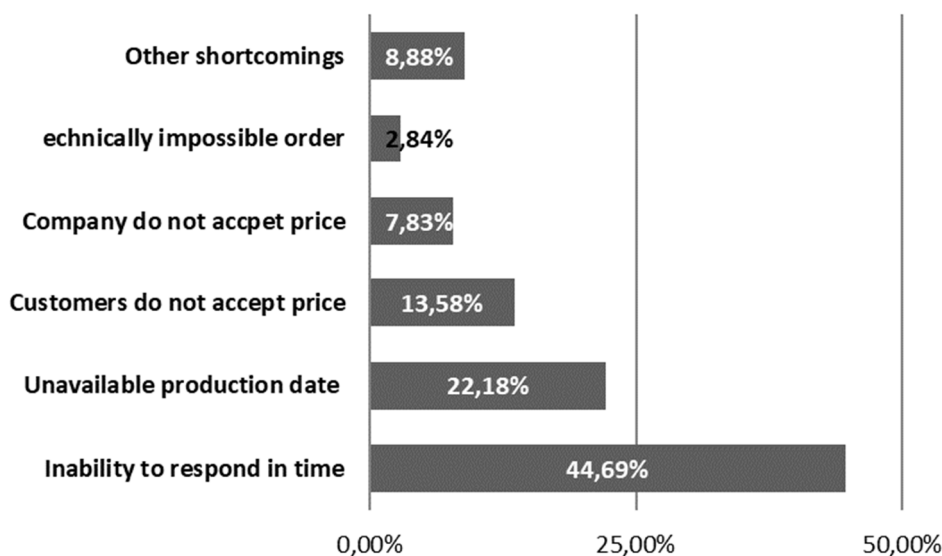


Fig. 5 Percentage of orders in last three years in company

Addressing the shortcomings is to create a knowledge system for the business department that will increase the profitability of businesses. The knowledge system assumes:

- **Define Manufacturing Representatives:** Classify products according to specific features (type of production, technology, directional technology) and merge them into production representatives.
- **Data and Information Collection and Arrangement:** Analyse data and information in a manufacturing enterprise related to the production of individual manufacturing representatives.
- **Transforming information into knowledge:** Creating a matrix of knowledge, individual irrelevant knowledge, and their impact on the profitability of production representatives.
- **Creating a rule:** Using a knowledge system to find a rule that determines the correct ratio of the individual manufactures, it will suggest a more profitable mix of the business mix.
- **Design a control system:** Once a rule has been introduced, introduce an IS with a control mechanism that would not only assist traders in deciding and accepting orders, but will avoid accepting orders that do not comply with the rule.

This article focuses on the process of transforming information into knowledge. To create a proposed knowledge system, it is necessary to analyse all the data and information that the employees of the sales department use in day-to-day decision-making. Fig. 6 shows process of transforming data into knowledge.

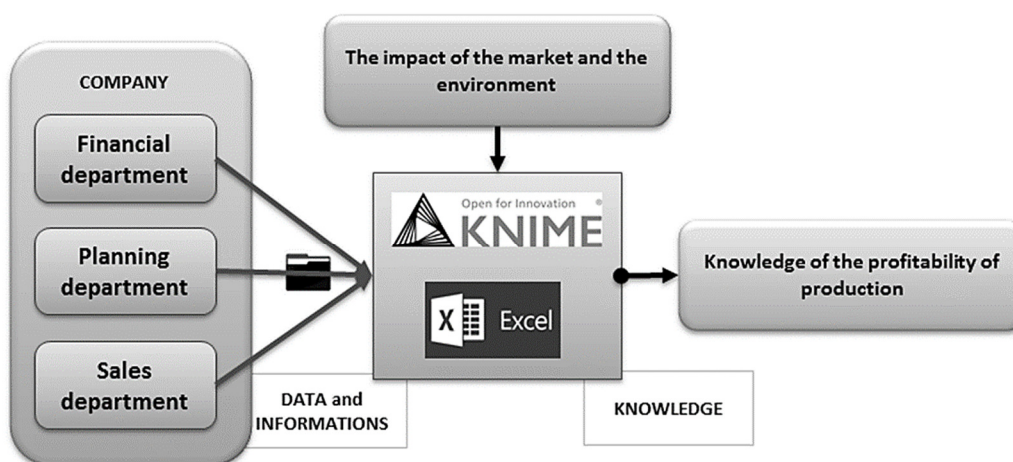


Fig. 6 Transforming data into knowledge using software solutions

Transformation of the data was done by looking for a link between individual information and then processing in one of two software solutions. The analysis revealed important data from these departments:

- **Financial department:** Data about the prices of individual products, profits, and costs. It is important to create product groups and to determine the impact on the profits of individual groups. Using these data, it is possible to find out which product type is the most advantageous. However, the data do not show any other context related to the quantity produced or the date of acceptance of the contract, which have a high share in the profitability of the product itself at a given time. With the

data we were able to determine a key indicator profit ratio of each product. This key indicator is the ratio between the profit and the cost of the product, making the key indicator higher the product more profitable (Fig. 7).

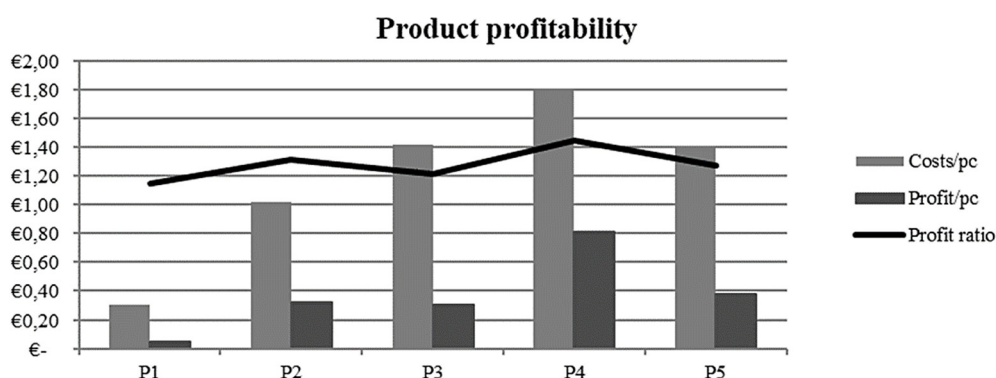


Fig. 7 Graph of knowledge gained from the finance department

- **Planning department:** Information from this department will allow us to find the link between the indicator (profit ratio) and the volume of the order. Each product has a volume interval when the product's profitability is the highest, and vice versa. By determining this interval and calculating its volume impact on a key indicator, we can assign the most profitable volumes to individual products (Fig. 8).

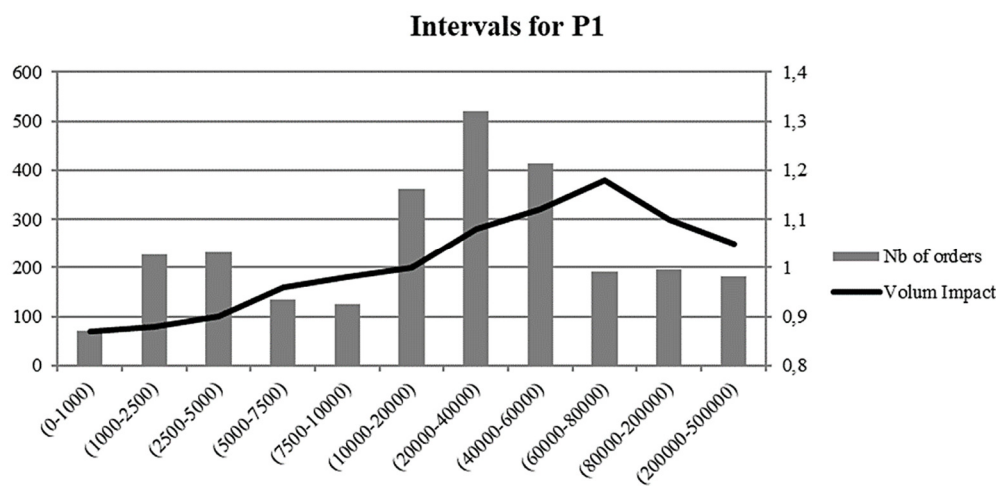


Fig. 8 Demonstration of knowledge from the planning department

- **Sales department:** Data in the sales department will show a link between the number of requests from the customer and the number of orders received. The result will be knowledge about demand for company products. Together with market data and environment the date impact factor of the selected product will be created in that month. Fig. 9 shows when there is the greatest demand for products, which actually raises the impact on their profitability.

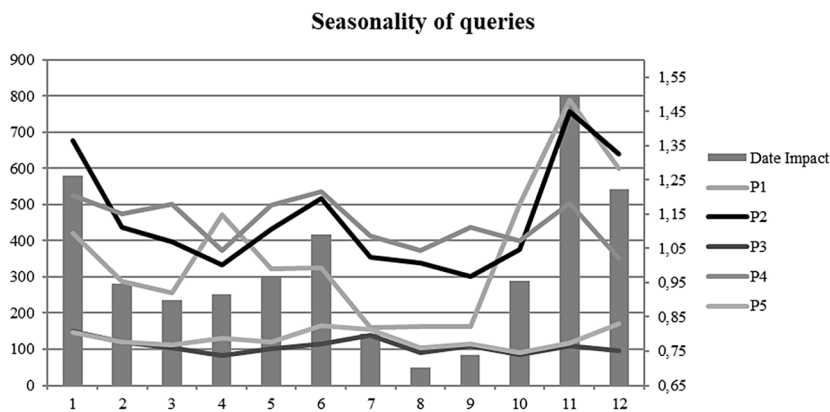


Fig. 9 Demonstration of knowledge from the sales department

By processing all data and information using the KNIME data mining software, we then calculate the main profitability index of each product. The result will be the determination of the most profitable products for selected months in the desired size range. Such transformed data and information are transition phases in the creation of knowledge system rules (Fig. 10).

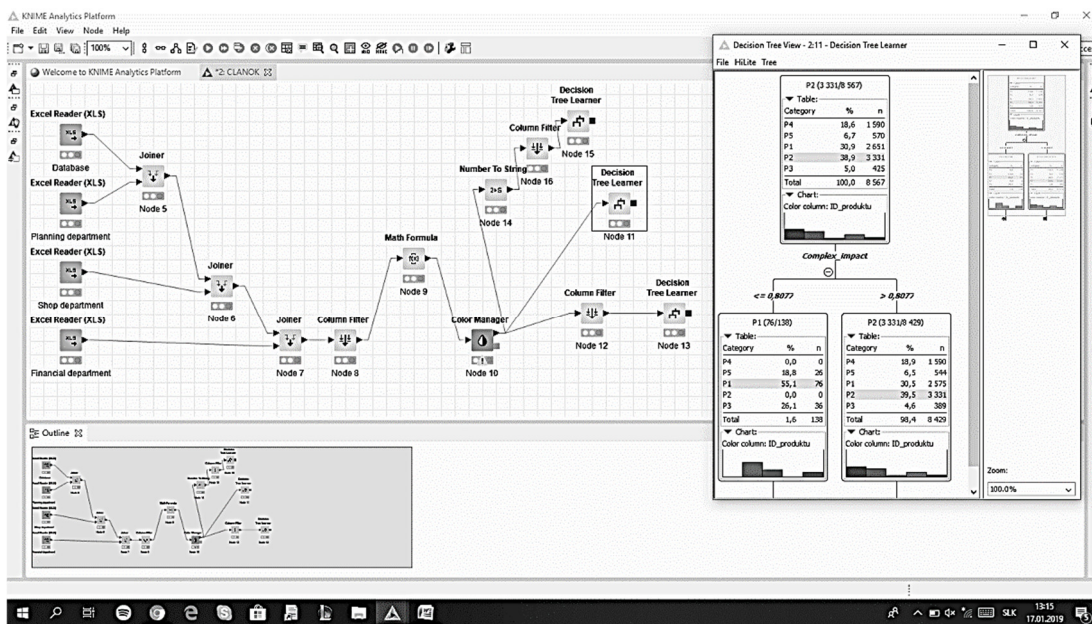


Fig. 10 Preview of data mining in KNIME software

CONCLUSION

By describing and analysing decision-making processes, shortcomings emerged at the sales department. The article described the necessary data and information to the decision-making process of the sales department in the manufacturing company to make right and profitable decisions, for company. The processed data and information in the enterprise were broken down by the departments from which they were obtained. From the necessary data from the finance department, contracts were divided into five groups of products to which profit impact was allocated. Subsequent to the allocation of the impact on profit, searches have been made for information from the sales department. Data processing has determined the effect of dates on the profitability of individual products. The impact of order size and product profitability

has been found in the planning department. With these impacts, the main profitability index can be calculated. By searching for the context and transforming the data and information, the necessary knowledge for the proposed knowledge system was created to facilitate the decision making of the employees in the sales department.

ACKNOWLEDGEMENTS

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REFERENCES

- Daneshjo, N., Rudy, V., Štofková, K., Mareš, A., Kováč, J., Jahnátek, A., Krivosudská, J., Šmajda, N. and Rusnák, J. (2018). Intelligent industrial Engineering - Innovation potential. San Antonio: FedEx Print & Ship Center.
- Fusko, M., Rakyta, M., Krajčovič, M., Dulina, L., Gašo, M. and Grznár, P. (2018). Basics of designing maintenance processes in Industry 4.0. *MM Science Journal* 3, pp. 2252-2259.
- Fusko, M., Rakyta, M. and Manling, F. (2017). Reducing of intralogistics costs of spare parts and material of implementation digitization in maintenance. In: *Procedia Engineering*, 192, pp. 213-218.
- Gregor, T., Krajčovič, M. and Więcek, D. (2017). Smart connected logistics. In: *Procedia Engineering*, 192, pp. 265-270.
- Krajčovič, M., Plinta, D. (2012). Comprehensive approach to the inventory control system improvement. In: *Management and production engineering review*, 3, pp. 34-44.
- Kramárová, M., Dulina, L. and Čechová, I. (2017). Forklift workers strain of Spine at industrial logistics in depending on human work posture. In: *Procedia Engineering*, 192, pp. 486-491.
- Medvecká, I., Biňasová, V. and Kubinec, L. (2017). Planning and performance evaluation of the manufacturing organizations. In: *Procedia Engineering*, 192, pp. 46-51.
- Mičieta, B., Ďurica, L. and Biňasová, V. (2018). New solution of abstract architecture for control and coordination decentralized systems. In: *Tehnicki Vjesnik*, 25(1), pp. 135-143.
- Mičieta, B., Biňasová, V. and Haluška, M. (2015). System for support the design and optimization of reconfigurable manufacturing systems. In: *MM science journal*, 3, pp. 542-546.
- Štefánik, A., Grznár, P. and Mičieta, B. (2017). Tools for continual process improvement - Simulation and benchmarking. In: *Annals of DAAAM for 2003 & Proceedings of the 14th International DAAAM Symposium: Intelligent Manufacturing & Automation: Focus on reconstruction and development*, pp. 443-444.

Abstract: Modern age is associated with massive deployment of information technology in businesses that are forced to work with a wealth of data and information. Businesses are trying to make the most effective use of knowledge not only from real data, but they often have to rely on their employees' knowledge. Increasing fluctuation of employees and the resulting outflow of knowledge will force businesses to increasingly make use of knowledge management. The article describes the process of looking for the context and the implications of selecting contracts to transform them into information and knowledge on the example of a real business. The verified process is transformed into a design of knowledge system, which results in the recommended generated rule for selecting sales department orders to ensure profitability for the business.

Keywords: industrial engineering, knowledge, knowledge system, sales department