# Impacts of the Using of Advanced Technologies for Management

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*Abstract* — In this article readers can found describes the issue of using Advanced Manufacturing Technologies in companies doing their business in the Czech Republic. Parts of this article are the economic indicators of Net Profit, Sales, Equity, Assets, Added Value per Employee and Profit per Employee, which have been subjected to detailed examination in the horizon of the time period years 2007-2010. This study was supported by research conducted on a sample of 131 companies. Collected data were explored mainly by correlation analysis. The aim of this article is to identify the relationships and dependence between economic indicators and the number of Advanced Manufacturing Technologies implemented in the companies. In addition to that, it was intended to study the level of contribution these technologies can bring to a company. Also were tested hypotheses about connections between using Advanced Technologies and Added Value per Employee and Profit per Employee. There has been established low to moderate dependence between the use of Advanced Technologies and economic results of a company. Thus the Advanced Manufacturing Technology can to some extent contribute to better economic results, but they also represent great burden in the company´s budget. Therefore the use of these technologies should be properly considered and planned by management.

*Keywords* — Advanced Manufacturing Technologies, AMT, Added Value per Employee, Assets, Correlation, Equity, Net Profit, Profit per Employee, Sales.

## I. INTRODUCTION

Nowadays when majority of companies are still dealing with impacts of the economic crisis are founded new solutions and business strategies. In this article authors try to find the correlation between quantities of implemented Advanced Manufacturing Technologies in the selected companies

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and the level of Net Profit, Sales, Equity, Assets, Added Value per Employee and Profit per Employee in the years 2007-2010. All selected companies have business units in the Czech Republic.

## II. WHAT IS ADVANCE MANUFACTURING TECHNOLOGY?

As the Advanced Manufacturing Technologies (AMT) can be considered all available production technology currently used in companies that support the operation of the company in terms of production, control, decision making and administration. According to companies´ evaluations were for the purposes of research included the following Advanced Manufacturing Technologies. The most commonly used technologies based on research results are:

- CNC (Computer Numerical Control) – This is a locally programmable machine with its own minicomputers. CNC is very often part of other supporting technologies such as CAD and CAM [1], [2].
- CIM (Computer-Integrated Manufacturing) – CIM includes complete integration of all computer systems and consolidates all information flow from management, accounting, corporate finance, products designing, manufacturing and logistics operations. The system can be extended to companies of suppliers and customers. They are usually integrated by technology CAD, CAM, CAE, CAPP, and CAQ [2].
- WF (Workflow) – This is a management process and workflow activities and documents across the enterprise [2].
- TQM (Total Quality Management) – The objective of TQM is the supply of products and the quality of service satisfying the customer at the right time and at the right price. The content of this management system is included in the international standard of quality management and ISO 9000 [2].
- JIT (Just-in-Time Manufacturing) – This is a method based on the idea of streamlining the supply chain by eliminating inventory and delivery of materials just in time to production [2].
- MIS (Management Information Systems), EIS (Executive Information Systems), BI (Business Intelligence) – The terms of decision support systems are usually generally understand as the

interactive computer systems that help the management to use data and models to solve unstructured problems [3], [7].

o MIS (Management Information System) is a system to support the decision making function in the organization. The purpose of MIS is to determine and efficiently provide, what management needs to know [7].

o The task of EIS (Executive Information System) is decision making support. EIS provide complex analysis of trends, access to internal and external data and further prediction, which serves for new view on the data structure [7].

o BI (Business Intelligence) is an architecture of operational and decision-support applications and databases that provide easy access to business data. These applications facilitate multidimensional analysis, data mining, forecasting, business analysis and other activities [3].

- CRM (Customer Relationship Management) – CRM is a business strategy focused on active management of relationships with customers at all contact points with the purpose of establishing mutually a beneficial long term relationship. Usually is CRM supported by company´s internal information systems and software [5]. Readers who are interested in further details the CRM systems and business strategy are advised to look at researches by Němeček [12] and [13], where are comparing overall turnover and trading income of selected companies in the Czech Republic depending on implementing technology CRM. Other research by Němeček [21] readers can find how much the companies are using CRM through the technology Cloud Computing.

- SCM (Supply Chain Management) – These systems include processes that use scientific knowledge and experience to improve the ways in which the company seeks and provides resources and raw material [2].

- EAP (Enterprise Application Portals), EIP (Enterprise Information Portals) – The terms are referred to the Internet or intranet site that serves as a gateway to the information sources in an enterprise [2].

Furthermore the research includes these advanced manufacturing technologies, which are used less by companies from the survey:

- AGV (Automated Guided Vehicles) are computer-controlled transport vehicles and unattended transporters. They are used mainly for warehouse transportation, order picking, assembly line

services, etc. [9].

- AI (Automatic Inspection) is the automation of steps in the control procedure, which shortens production time, increases product quality and saves costs [6].

- Robotics (Robots) is a variety of programmable multi-function production units, which can process the raw materials better and more efficiently [4].

- FMS (Flexible Manufacturing Systems) is a group of several programmable machines, which are connected by automatic material handling system and controlled by a central computer [20].

- RFID (Radio Frequency Identification) is a technology that uses electromagnetic signals. It is able to completely replace bar codes [4].

- AMHS (Automated Material Handling System) is a very flexible solution for transportation, storage and supply management at manufacturing premises [4].

- MC (Manufacturing Cells) are composed of small groups of workers and machines. They are arranged in the direction of production flow [2].

- DW (Datawarehouses) are usually a part of enterprise information system. It includes data from various information sources [3].

- APS (Advanced Planning and Scheduling) is a system for advanced planning, scheduling and logistics optimization [19].

- MRP 1 (Materials Requirements Planning) is a technology used to determine the needs of material and its timely supply [6].

- MRP 2 (Manufacturing Resource Planning) is a technology used for planning and inventory management, which had also integrated product orders, business plan, sales, budget constraints and production capacity [6].

- ERP (Enterprise Resource Planning) represents a large software group designed to integrate the majority of business's processes and organization's transactions and to facilitate real-time planning, production, human resources management, financial management, logistics and customer response [6].

- CI (Competitive Intelligence) is a system that provides searching, collecting, analyzing and distribution of knowledge about products, customers, competition and other aspects needed for management support. CI should identify opportunities and threats of the market in advance. Thus its users should get a competitive advantage [3].

- E-learning is usually a form of distance learning based on the use of Web technologies.

- E-C (E-Commerce) is focused on purchasing and selling products and services over the Internet.

### III. METHODOLOGY AND AIMS OF RESEARCH

Basic data for this research was obtained through a questionnaire survey. The aim of research was comparison of the Net Profit, Sales, Equity and Assets for all companies that participated in the survey. The obtained sample of companies was divided into two reference groups of manufacturing companies. The first group was made up of companies that use AMT. The second reference group was composed of companies that do not use any of the below-mentioned AMT (see Chapter II.). The monitoring of companies took place in term of four years (2007, 2008, 2009 and 2010).

#### A. The Survey

The questionnaire, which was created by Mr. Hynek and Mr. Janeček [2], [15], and their research team [14], [16], is consisted of five parts. The first part was focused on the use of AMT. The second and third part was designed to evaluate and measure the benefits of these technologies. The fourth part of the questionnaire was focused on performance evaluation and managers views on the AMT. The last part of the questionnaire addressed the issue of corporate performance as a whole.

To select the sample of respondents was used the database of companies Albertina - Creditinfo Czech Republic, Ltd. [8]. Further information was obtained from publicly available sources, especially from the Commercial Register and the companies´ web sites.

Companies were included in the research, if meet the following criteria:

1) The subject of their business is a manufacturing activity.
2) The company has more than 50 employees.
3) The company can be contacted by e-mail and it has in the database of Creditinfo recorded most of the required economic characteristics.

In the sample of respondents there were companies with 50-99 employees represented by 61,8%, companies with 100-499 employees represented by 30,1% and companies with 500 or more employees represented only by 8,1%. Enterprises that had fewer than 50 employees were not included in the survey. These differences in the composition of respondents are reflected in the intensity and character of the use of AMT.

The questionnaire together with the covering letter was sent by post to the companies, which were previously selected on the basis of the criteria. The return of questionnaires was further supported by e-mail and, where was it necessary, also by phone requests. The final rate of return, however, despite these efforts was around 11,7%. The acquired questionnaires and responses in them were registered and entered into the database.

#### B. Acquisition of Data

Basic data which were detected about the technologies used or unused in the companies, were obtained through the questionnaire:

- company´s name,
- advanced manufacturing technologies that are used in the company,
- comments and pieces of knowledge of managers.

Subsequently there were traced the information concerning Net Profit, Sales, Equity and Assets of the companies in the database Albertina, the database of company Creditinfo Czech Republic Ltd. [8]. Data that could not be found in that database has been traced from the website of the Czech Commercial Register and the websites of individual companies. Data collection was conducted in the years 2010 and 2011. Profit and added value were allocated on the number of employees due to adjustment differences in sizes of the companies and easier comparisons between the samples.

For better comparability of the data was into the financial indicators Net Profit, Sales, Equity, Assets, Added Value per Employee and Profit per Employee of the companies included the inflation. Inflation in the Czech Republic in years 2007-2010 was follows:

- in year 2007 was inflation 2,8%,
- in year 2008 was inflation 6,3%,
- in year 2009 was inflation 1,0%,
- and in year 2010 was inflation 1,5%.

#### C. Business Performance Indicators

Net profit represents the amount of money remaining after all operating expenses, interest and taxes have been deducted from a company's total revenue in given financial period of time. Net income is one of the most closely followed numbers in finance, and it plays a large role in ratio analysis and financial statement analysis [22]. It is calculated as:

$$net\ profit = revenue - cost\ of\ goods\ sold - overheads - interest\ payable$$

Sales are total financial amount collected for goods and services provided by a company. Equity is the amount of funds contributed by the owners of the company plus the retained earnings or losses [23]. Assets are resources with economic value that a company controls with the expectation that it will provide future benefit. The indicator records the monetary value of the assets owned by a company [24].

One of the main motivations to implementing information technology into a company is an effort to increase labour productivity; therefore an indicator "Profit per Employee" was also selected for this study. According to Lowell [25] it is suitable proxy for the return on intangibles and since it requires no adjustment for accounting conventions, it can be easily used to benchmark against comparable results of other companies. It was calculated as:

$$profit\ per\ employee = \frac{net\ profit}{number\ of\ employees}$$

Added value is the positive difference between sales prices of goods and purchasing prices of materials needed to produce these goods. Added value per employee is then calculated as bellow [26]:

$$added\ value\ per\ employee = \frac{operating\ profit + wages}{number\ of\ employees}$$

According to Sveiby [27] "Added value per employee" is a better measure of ability to produce than turnover or profit per employee, because turnover may be heavily influenced by commissions or by goods and services that just go straight through the company. It is also better than profit for purposes of comparison because profit figures are relatively easy to manipulate. Measuring value added per employee and comparing the result with previous years and other companies can get a good appreciation of how company´s ability to produce and generate profits develops.

### D. Composition of the Sample

The sample consists of 131 companies, which are divided into two reference groups. The first group consists of 99 companies using AMT. The second group consists of 32 companies that do not use any AMT.

The business activity of all 131 companies is the manufacturing activity. The highest incidence of covered companies is in 7 industries: Wood Industry, Electro-technical Industry, Chemical Industry, Food Industry, Automotive Industry, Building, Engineering and group Other, which captures the remaining industries that were represented by fewer than three occurrences. The composition of all industry is shown in the Figure 1.
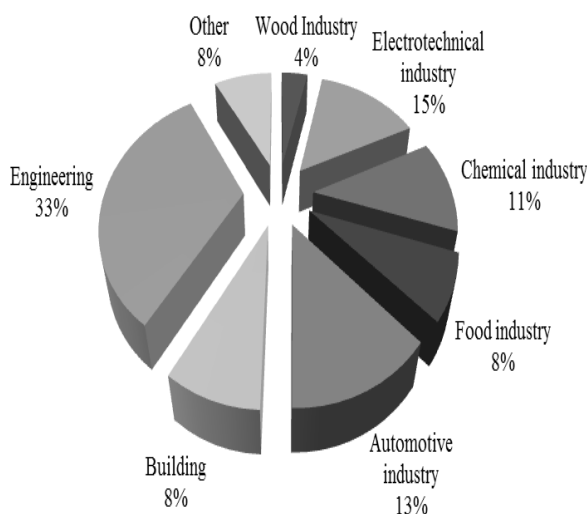


Fig. 1 Distribution of Companies in Different Sectors
Source: Own processing.

### E. Determination of Aims

Aims of this paper are divided to four parts marked as A1, A2, A3 and A4.

A1: Determination of correlation between the quantity of implemented advanced technologies and the level of Net Profit in years 2007-2010.

A2: Determination of correlation between the quantity of implemented advanced technologies and the level of Sales in years 2007-2010.

A3: Determination of correlation between the quantity of implemented advanced technologies and the level of Equity in years 2007-2010.

A4: Determination of correlation between the quantity of implemented advanced technologies and the level of Assets in years 2007-2010.

Another aims of this paper are determinations the development of economic indicators for companies that use and do not use AMT. To realize the objectives were determined following research assumptions A5 and A6. Assumptions A5 and A6 are made based on expected benefits of the use of advanced manufacturing technologies, which should result in competitive advantages of these companies, which should achieve better economic indicators than companies that do not use AMT.

A5: Profit per employee is higher for companies using advanced manufacturing technologies than the profit per employee of companies that do not use any technology in their activities in years 2007-2010.

A6: Added value per employee is higher for companies using advanced manufacturing technologies than added value per employee of companies that do not use any technology in their activities in years 2007-2010.

### F. Used Statistics Method

The collected data were explored by correlation analysis to determine the dependency between the use of the advanced technologies and economic results of the companies. Specifically the Pearson correlation method was used at a significance level of 5% (2-tailed). Calculations were performed in IBM SPSS Statistics 19. The data were also analysed through frequency, mean, standard deviation and percentages of response.

Correlation examines the intensity of dependency between the monitored variables. The dependency can be both positive and negative. When the correlation coefficient is between 0 and 0.1, it shows that there is no correlation. When the correlation coefficient range is between 0.1 and 0.3, it is called low degree of correlation, when the coefficient range is between 0.3 and 0.7, it shows moderate degree of correlation and when the

correlation coefficient range is above 0.7, it is called high degree of correlation [9], [10].

To test assumptions A5 and A6 were used statistical method for testing hypotheses about the compliance of two diameters. Hypothesis which validity is verified is called the null hypothesis H0. Against the null hypothesis is always built an alternative hypothesis H1. Statistical tests are procedures that are checked the null hypothesis. On this basis the hypothesis are accepted or rejected. Parts of the testing are two values: Test Criterion (TC) and Critical Value (CV). If is consider the one sided hypothesis testing, it is necessary to determine the interval of acceptance and interval of rejection. If the value of TC is in the interval $(-\infty; CV]$ occurs that is not rejected H0. If the TC is in the interval $(CV; \infty)$ it leads to rejection of H0 and acceptance of H1 at 1% significance level [10]. Significance level means that is less than 1% that is rejected H0 although it should not be rejected. $\mu 0$ = diameter of companies using AMT, $\mu 1$ = diameter of companies not using AMT.

## IV. RESULTS OF RESEARCH

The aim of the research was to find out if the number of implemented advanced technologies correlates with economic results of a company. The results of the analysis for aims A1, A2, A3 and A4 are summarized in the Table I.

TABLE I
RESULTS OF ANALYSIS

| Number of Advanced Technologies | | Net Profit (th. EUR) | Sales (mil. EUR) | Equity (th. EUR) | Assets (th. EUR) |
|---|---|---|---|---|---|
| 2007 | Pearson Correlation | 0.156 | 0.364 | 0.147 | 0.165 |
| | Mean | 2079.22 | 24.54 | 13744.24 | 24050.32 |
| | Standard Deviation | 11471.94 | 72.75 | 70517.85 | 113852.03 |
| 2008 | Pearson Correlation | 0.123 | 0.358 | 0.139 | 0.156 |
| | Mean | 1770.63 | 24.23 | 14859.62 | 25520.88 |
| | Standard Deviation | 11487.58 | 71.21 | 76945.55 | 121478.81 |
| 2009 | Pearson Correlation | 0.067 | 0.301 | 0.135 | 0.158 |
| | Mean | 1518.84 | 23.19 | 16054,15 | 270.10 |
| | Standard Deviation | 12257.96 | 72.85 | 77168.89 | 119407.76 |
| 2010 | Pearson Correlation | 0.169 | 0.306 | 0.167 | 0.159 |
| | Mean | 2097.56 | 15.33 | 17935.20 | 39680.21 |
| | Standard Deviation | 12506.66 | 70.51 | 106706.43 | 252236.96 |

Source: Own processing.

In year 2007 the correlation coefficient between the number of advanced technologies in a company and its Net Profit is $r(125) = 0.156$, indicating low degree of positive correlation. Similar level of correlation is shown for Equity $(r(125) = 0.147)$ and Assets $(r(125) = 0.165)$. Different result came in correlation between the use of advanced technologies and Sales, the correlation coefficient is $r(125) = 0.364$ which means moderate degree of positive correlation.

In year 2008 the overall results are slightly lower for all economic indicators; it could be due to the global economic crisis, which broke out in late 2008. For Net Profit is $r(125) = 0.123$, indicating very low degree of correlation. For both Equity $(r(125) = 0.139)$ and Assets $(r(125) = 0.156)$ is the level of correlation low, similar to previous year. In 2008 Sales show a moderate correlation $r(125) = 0.358$ with the number of advanced technologies implemented.

In year 2009 were the effects of the economic crisis stronger, as seen among other on progressive decrease of average Net Profit. The correlation between the use of advanced technology and Net Profit fell to $r(125) = 0.067$, which is negligible. In this year the degree of correlation remained low for both Equity $(r(125) = 0.135)$ and Assets $(r(125) = 0.158)$. The correlation results for Sales dropped to $r(125) = 0.301$ - the lowest limit of moderate degree of correlation.

In year 2010 the average results of the economic indicators begin to return back to their original level, before the economic crisis stroke. The correlation degree slightly rose for all monitored indicators. The level of correlation between the number of the implemented advanced technologies and Net Profit is low again: $r(125) = 0.169$. Nearly the same level of correlation $r(125) = 0.167$ is shown for Equity. The similar results occurred also at Assets $(r(125) = 0.159)$. Thus the degree of correlation was low for both indicators. For Sales the results remained similar to the previous year, correlation coefficient is $r(125) = 0.306$, indicating once again moderate degree of correlation.

The research results for assumptions A5 and A6 are summarized in the Table II. and in the Table III.

Table II. is table in which summarized data are collected from a survey with inflation included. Table III. is processed by statistical calculations of the acceptance and

rejection of hypotheses about the compliance of two diameters.

During the verification the assumption A5 is possible to see in the Table III. that in 2007 confirmed the assumptions, which rejected the null hypothesis and accept alternative hypothesis. The view to the Table II. shows a big difference between profit per employee for companies having AT and not having AT. Between 2008 and 2009 failed to confirm the assumption of a higher profit per employee for companies having the AT, where in both years the difference between the two groups, both negative and low, which is not at 1% significance level statistically meaningful. The year 2010 is the year when we have confirmed the assumption A5, as shown in the Table III. The difference in profit per employee this year is almost 2,645 EUR, which is a noticeable difference, which clearly confirms the A5.

Assumption A6 for higher added value per employee for companies having advanced technologies are able to confirm the entire period 2007-2010. The highest differences were measured between 2007 and 2010, the years that have not been negatively affected by global economic crisis. Between 2008 and 2009 the difference in measured values although smaller, but at 1% significance level is clearly rejected the null hypothesis and adopted alternative hypothesis, see Table III.

## V. CONCLUSION

It was established that for Sales the average correlation for years 2007-2010 is $r(125) = 0.332$, indicating a moderate degree of positive correlation. For other economic indicators (Net Profit, Equity and Assets) there was only weak correlation with the number of used advanced technologies – the values oscillated around $r(125) = 0.150$. Fluctuations in the economic performance, especially in 2009, were considerably affected by the economic crisis.

From the view of A5 and A6 the pursuit of companies that participated in research on the use of advanced technologies managed to find a relationship between profit per employee and the use of advanced technologies, as well as the relationships between added value per employee and the use of advanced technologies. Unfortunately, the period was unexpectedly affected by global economic crisis that affected the financial performance of all companies in all sectors of the economy. Overall, all the assumptions confirmed in years 2007 and 2010.

The year 2007 was quite a normal year, compared to 2010, which marked the start of a new economic growth, when the companies managed to reduce costs while increasing sales volume. The year 2010 is from the perspective of the most

TABLE II
PROFIT AND ADDED VALUE OF COMPANIES USING AND NOT USING ADVANCED TECHNOLOGIES

|  | 2007 | | 2008 | | 2009 | | 2010 | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Profit per 1 employee | Added value per 1 employee | Profit per 1 employee | Added value per 1 employee | Profit per 1 employee | Added value per 1 employee | Profit per 1 employee | Added value per 1 employee |
| Use AT | 6100,8 | 23419,2 | 6139,2 | 23462,4 | 3523,2 | 21600 | 7387,2 | 27907,2 |
| Do not use AT | 3508,8 | 12633,6 | 6374,4 | 17616 | 4060,8 | 15120 | 4742,4 | 17092,8 |

Source: Own processing. The numbers are in Euro.

TABLE III
TESTING OF ASSUMPTIONS A5 AND A6 - H0: $\mu1 = \mu1$; H1: $\mu1 > \mu1$

| Year | Critical Value | Profit per 1 employee | | | Added value per 1 employee | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Test Criterion | H0 | H1 | Test Criterion | H0 | H1 |
| 2007 | 2,61388 | 5,56300 | Rejected | Accepted | 4,93214 | Rejected | Accepted |
| 2008 | 2,61388 | -0,24589 | Not rejected | Rejected | 4,57453 | Rejected | Accepted |
| 2009 | 2,61388 | -0,92661 | Not rejected | Rejected | 3,12178 | Rejected | Accepted |
| 2010 | 2,61388 | 7,08262 | Rejected | Accepted | 6,23877 | Rejected | Accepted |

Source: Own processing.

successful year of research, the differences between companies using advanced manufacturing technologies is clearly the highest.

The year 2008 is year when the crisis broke out, which was reflected in the financial results of companies monitored, confirmed only when the assumption A6 is related to higher added value per employee at companies using AT. The year 2009 was the worst year in the research. In this year was the global economic crisis in the boom, which resulted in gross influence of the results of all investigated companies. Although the results for 2009 within assumptions A5 is negative, the data obtained can point to an entirely different result, and the result reversed when it became clear that during the ongoing global economic crisis is profit per employee higher in companies that do not have any AT.

It can be simply said, that: "Companies that do not use any advanced technologies, could achieve higher profits than firms that use advanced technology" or "The less technology the company uses, this leads to higher profits per employee in the economic crisis.", but it is not so easy, because Added Value per employee showed, that companies using AT have this indicator higher and it showed that using AT brings higher Added Value. The main reason for this finding will be high costs of acquiring the advanced technologies, which is reflected in the results of the management companies and it decreases the Profit.

It could be also said that the use of certain advanced technologies in enterprises contributes to better economic performance of the companies. Particularly in companies with higher turnover that tend to have more complex and demanding management, so they can fully use the potential of advanced technologies to optimize their activities and make them more efficient. However, the correlation is not very strong and therefore significant influence of other factors on business performance can be expected.

The research results did not reach the expected level, but it can also be caused by the global economic crisis that hit the economies of all countries and caused losses in all sectors of economies. Previous research [7], [17], showed that judging by financial results, the crisis had larger negative impact on companies using advanced technology than on those who did not implemented them. Other research [18] showed using advanced technologies and identification clusters of advanced technologies in commercial banks. However the overall economic performance results were still better in companies using advanced technology. One reason for a stronger downturn caused by the crisis in these companies could be due to greater burden on the budget from previous purchases of the technology.

Therefore, it will be interesting to continue this research in the years that are not affected by any crisis and better enable us to verify our assumptions.

## REFERENCES

[1] P. Fořt, T. Mikšík, & P. Novák,: "Když se řekne PLM," 5. 12. 2010, from web DesingTech: http://www.designtech.cz/c/plm/kdyz-se-rekne-plm.htm.

[2] J. Hynek, V. Janeček,: "Evaluation of the Benefits of Advanced Technologies", orig. "Hodnocení přínosů vyspělých technologií", Hradec Králové: Gaudeamus, 2009.

[3] L. T. Moss, S. Atre,: "Business Intelligence Roadmap", Addison-Wesley. Boston. 2003.

[4] Seznam zkratek v IT. 5. 12. 2010, from web: bpsoft.cz: http://bpsoft.cz/cz/seznam-zkratek-ve-svete-informacnich-technologii/.

[5] F. Buttle,: "Customer Relationship Management", Elsevier, Oxford, 2009.

[6] D. E. O'Leary,: "Enterprise Resource Planning Systems", Cambridge University Press, Cambridge, 2002.

[7] E. Oz,: "Management Information Systems", Cengage Learning. Boston, 2009.

[8] Database Creditinfo-Firemní monitor, on DVD by Creditinfo Czech Republic, Ltd., Praha, 2010.

[9] K. Čebišová,: "Use of Information Technology for Financial Management in Czech Enterprises", In: Problems of Management in the 21st Century 2011. Vol. 1, 2011.

[10] J. Kubanová,: "Statistické metody pro ekonomickou a technickou praxi", Bratislava. Statis, 2008.

[11] J. Němeček, K. Čebišová, J. Hribik,: "Porovnání ekonomických ukazatelů u firem v závislosti na využívání vyspělých technologií", In: Hradecké ekonomické dny 2011, Vol. 1. Hradec Králové: Gaudeamus, 2011.

[12] J. Němeček,: "CRM and Income Trading of Selected Companies", orig. "CRM a výsledky hospodaření vybraných firem", In: Journal of Competitiveness. Zlín: Univerzita Tomáše Bati ve Zlíně Fakulta managementu a ekonomiky, 2011, pp. 75-81, ISSN: 1804-171X (Print), ISSN: 1804-1728 (On-line).

[13] J. Němeček,: "CRM and Competitiveness of Selected Companies", orig. "CRM a konkurenceschopnost vybraných firem", In: Národná a regionálna ekonomika VIII. Košice: Technická univerzita v Košiciach, 2010, pp. 693-700, ISBN: 978-80-553-0517-2.

[14] J. Hynek, V. Janeček, L. Svobodová,: "Problems Associated with Investment in Advanced Manufacturing Technology from the Management Point of View", WSEAS Transactions on Systems, Vol. 8, No. 6, June 2009, pp. 753-762

[15] J. Hynek, V. Janeček,: "Selected Problems of Advanced Manufacturing Technology Projects Adoption", WSEAS Transactions on Systems, Vol. 6, No. 4, April 2007, pp. 787-794

[16] L. Svobodová, J. Hynek, V. Janeček,: "Advanced Manufacturing Technology: Anticipated and Realized Benefits", In: International Conference on Applied Computer Science, Malta 15.-17.9.2010, WSEAS Press, pp. 508 – 517

[17] L. Svobodová,: "Advanced Manufacturing Technology Utilization and Realized Benefits", In: International CSCC Multiconference, Corfu July 14-17, 2011, WSEAS Press

[18] I. Soukal, M. Hedvičáková,: "Retail Core Banking Services E-banking Client Cluster Identification," In: Procedia Computer Science Journal. volume 3. [s.l.] : Elsevier, 2010. s. 1205-1210. ISSN: 1877-0509

[19] J. Němeček, K. Čebišová, J. Hribik,: "Advanced Technology for Management Support", In: Recent Researches in Applied Informatics. Prague, WSEAS Press, 2011, pp. 251-254, ISBN: 978-1-61804-034-3.

[20] J. Hribik,: "Evaluation of Using Advanced Manufacturing Technologies and Cluster of Advanced Technologies", In: Recent Advances

in Manufactuing Engineering. Barcelona, WSEAS Press, 2011, ISBN: 978-1-61804-031-2

[21] J. Němeček, L. Vaňková,: "CRM and Cloud Computing," In: Recent Researches Applied Informatics. Prague, WSEAS Press, 2011, pp. 255-259, ISBN: 978-1-61804-034-3

[22] Investing Answers. Net Income. Retrieved 5. 10. 2011, from http://www.investinganswers.com/term/net-income-808

[23] Investopedia. Equity. Retrieved 5. 10. 2011, from http://www.investopedia.com/terms/e/equity.asp#axzz1bnAn6wft

[24] Investopedia. Asset. Retrieved 5. 10. 2011, from http://www.investopedia.com/terms/a/asset.asp#axzz1bnAn6wft

[25] Lowell, L. B. The new metrics of corporate performance: Profit per employee. McKinsey Quaterly, Issue 1. 2007. Retrieved 30. 4. 2011, from
http://www.interknowledgetech.com/profit%20per%20employee.pdf

[26] Savas, O., Ozer, G., Karadal, H. Added value per employee as a financial performance indicator. Retrieved 5. 10. 2011, from http://www.emu.edu.tr/smeconf/englishpdf/Article_11.PDF

[27] Sveiby, K. E. Measuring Competence. 2001. Retrieved 5. 10. 2011, from http://www.sveiby.com/articles/MeasureCompetence.html

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