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ICT in Czech companies: business efficiency potentials to be achieved.

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1. Introduction

During the last years, particularly after the Czech Republic joined European Union new opportunities and challenges for Czech companies appeared. The level of collaboration and co-operation in neighboring regions substantially increased. The new business opportunities that appeared due to increased business with companies in “old” EU countries enabled increased knowledge of best practices used there and caused rationalization leverage effects in many Czech companies. This situation causes new needs in information and communication technologies (ICT). Information and communication technologies in Czech Republic follow general trends in IT infrastructure, usage of network, Internet trading and other technologies, however open issues concerning business efficiency improvement due to ICT still remain. In this paper based on Czech statistic authority data published in the years 2007, 2008 [1], [2], [3] an analysis of possible potentials will be presented. Short comparison of process modeling and value-chain modeling and their advantages for process optimization will then be presented and ideas how to make use of the potentials defined will be proposed.

2. Development in the last years

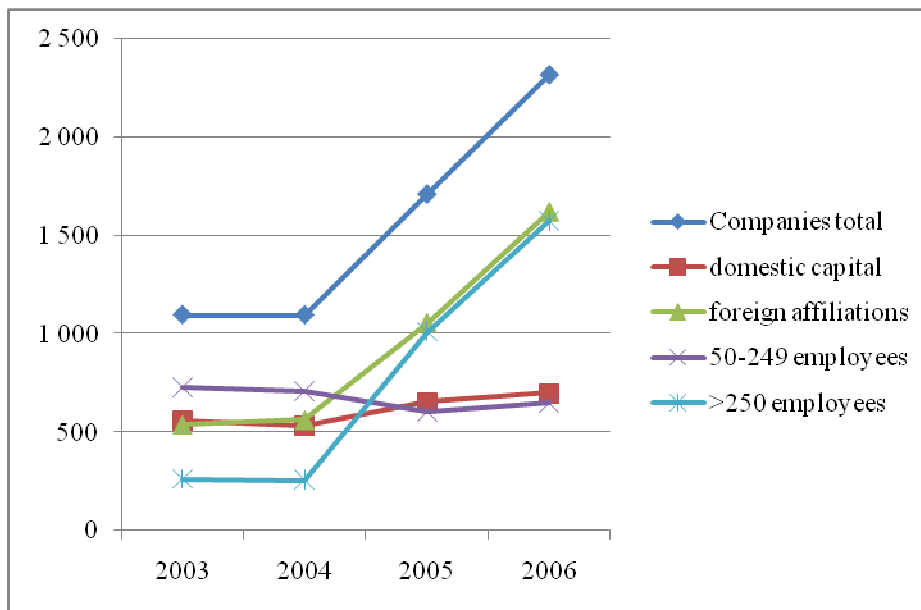
It can be generally stated that the new business potentials should be supported by communication infrastructure enabling Internet marketing, business and communication tasks. On the other side, new business methods still often collide with internal organization limits. First of all, some statistic data will be presented to illustrate the current state in Czech Republic.

2.1. Investments in ICT and IT personnel development

The investments in ICT follow the general development of Czech GNP in the last years. Fig.1. presents total ICT investments in large Czech companies with more than 50 employees in the years 2003 - 2006. It shows an interesting picture. In the companies owned by domestic capital the investments are stagnating, while large companies and foreign affiliations have made large investments in the years until 2006. The ratio of ICT investments to investments in the processing industry has followed the exponential trend of the investments in the industry and changed from 4% in the early nineties up to 10, 6% in the years 2005 – 2006 as presented in Fig. 2. In the same time the IT personnel ratio to the total employment did not follow the trend of the investments. (See Fig. 3.)

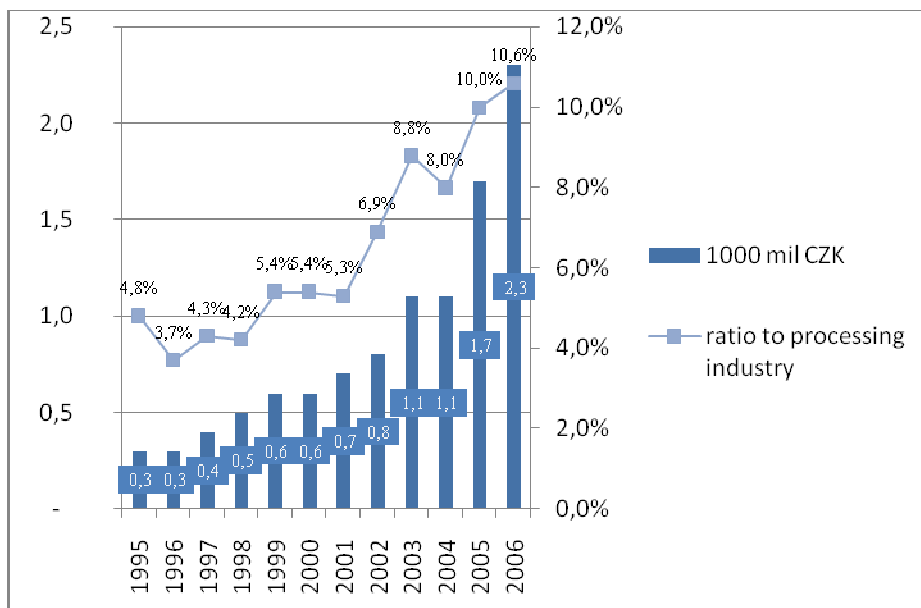
There was a rapid personnel decrease in the year 2004 which was compensated in the last two years. However, the increase was caused mostly by technical worker while research (analysts and programmers) ratio decreased. This could be an indication that preparation and deployment of new systems still has large potentials to be exploited. To achieve this, not only large multinational owned data and call centers are needed, but also development and programming organization should be put into operation concentrating on newest architectures and technologies.

Fig.1: Investments in ICT – large Czech companies



Source: adopted from CSU 2008 [2], [3].

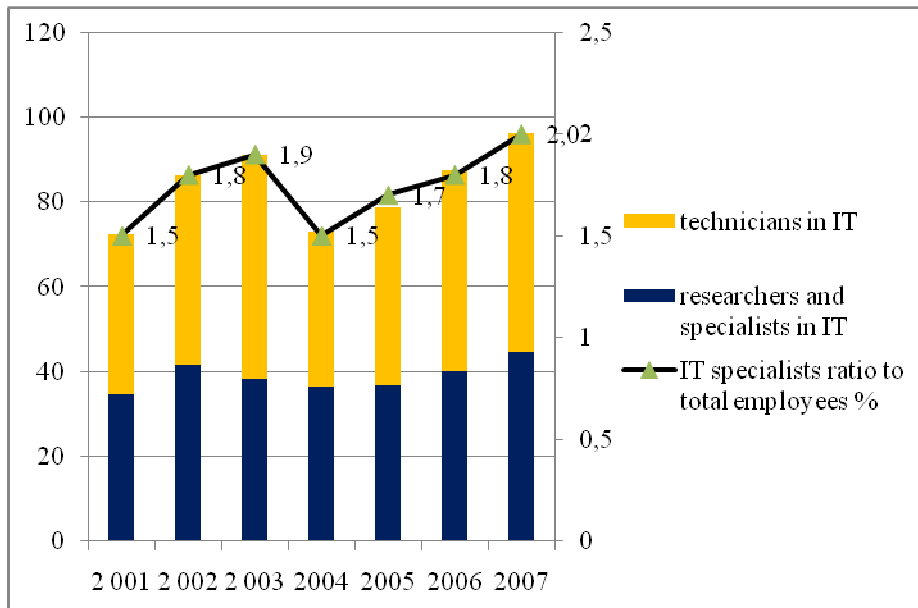
Fig. 2: Investments in ICT: development since 1995



Source: adopted from CSU 2008 [2], [3].

The ICT supported applications did not develop fully in accord with ICT investment trends. A large discrepancy can be seen between the infrastructure development and electronic business, namely purchases and sales over Internet analyzed in chapter 2.3.

Fig.3: Structure of IT personnel and its ratio to total employees in Czech Republic



Source: adopted from CSU 2008 [2], [3].

2.2. Level of communication infrastructure and its security

The communication infrastructure among Czech companies is mostly executed by Internet. The exceptions to this rule are backbone networks of large, mostly multinational companies which use international data communication provider services. The communication speed needed is achieved mostly due to ADSL usage, as presented in Table 1.

Table 1: ADSL Internet connections in %

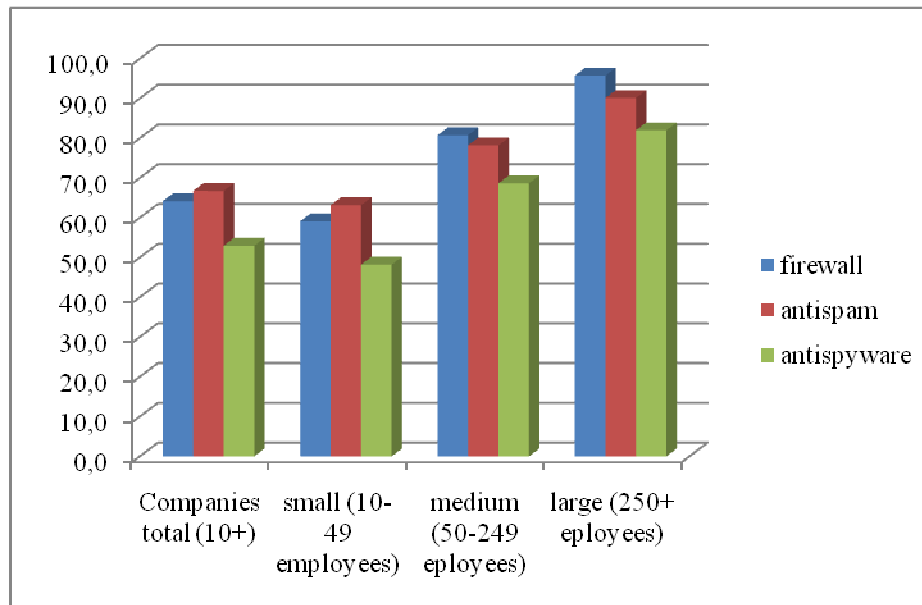
	2003	2004	2005	January 2007
Total [1], by size	7,0	30,2	36,3	45
Small (personnel 10-49)	6,6	28,7	36,1	73,7 *
Middle (personnel 50-249)	9,0	34,3	37,1	88,3 *
Large (personnel more than 250)	7,0	42,7	38,2	95,22 *

Source: adopted from Czech statistic authority (CSU) [1], * - high speed total, no channel specification.

On the other side, security issues had to be solved with increased intensity and investments. Security measures are treated as an integral part of systems on all levels independently of the company size. Usage of various security means usage in the last years is presented in Fig.4. Unfortunately, security concepts in small and middle sized companies are still not fully used and mostly solved ad hoc. As the security is a part of many international standards, new standardization topics emerge. IT security standards can differ country by country depending on local legislation. An increasing part of cross border business among small and middle sized companies can be accomplished over Internet. Hence, there is a

challenge to harmonize general IT security standards and local legislation at least in new and neighboring EU countries.

Fig.4: IT security means used (%) in Czech companies



Source: adopted from CSU 2008 [2], [3].

2.3. Electronic business development.

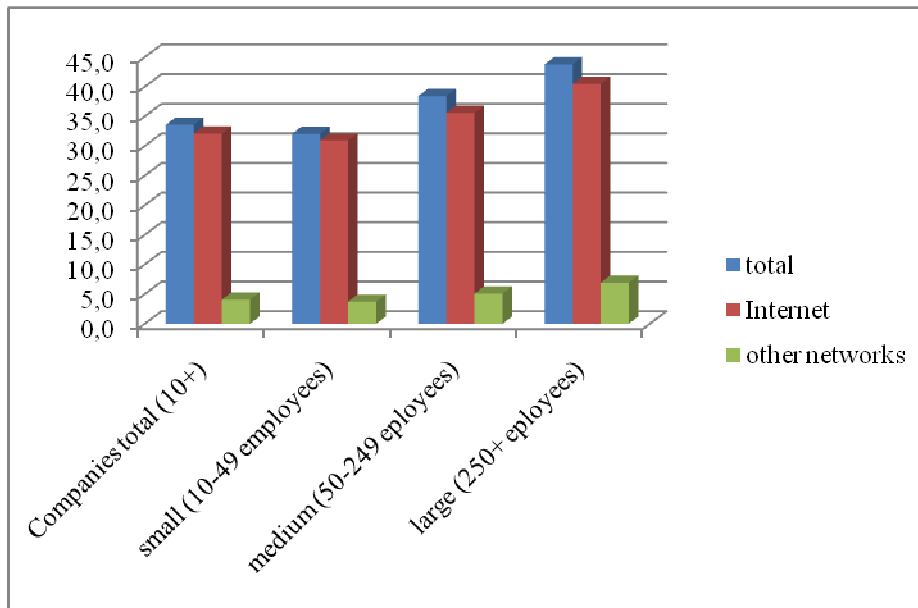
Small and middle sized companies profit from EU membership by using cross border co-operation. As an ideal means of doing business, electronic commerce mostly over Internet can be made use of. Electronic business development in Czech companies during the last years is presented in figures 5 to 8.

It can be seen that there still exist substantial potentials. As an example of this potential the EUROSTAT statistics can be used. So, e.g. in Denmark, 35% of the companies has been doing business over Internet in 2005, the EU 25 average is 15% while in Czech Republic the average reached only 11,1%. It is interesting that substantially more companies used electronic purchase (Fig.5) than electronic sales (Fig.6).

The electronic purchase and sales values as a ratio to total values are presented in Fig.7 and Fig.8. It is obvious that the electronic purchase ratio is substantially higher than the electronic sales ratio, especially in small and middle sized companies. There could be several reasons for this situation:

- The software used is not mature enough to support electronic commerce. As presented in Fig. 9, small and middle sized companies using software applications connected to electronic sales represent only up to 50% of all companies. Software applications supporting interconnection between electronic business and production do not exceed 10% in small sized companies and only 30% in middle sized ones.

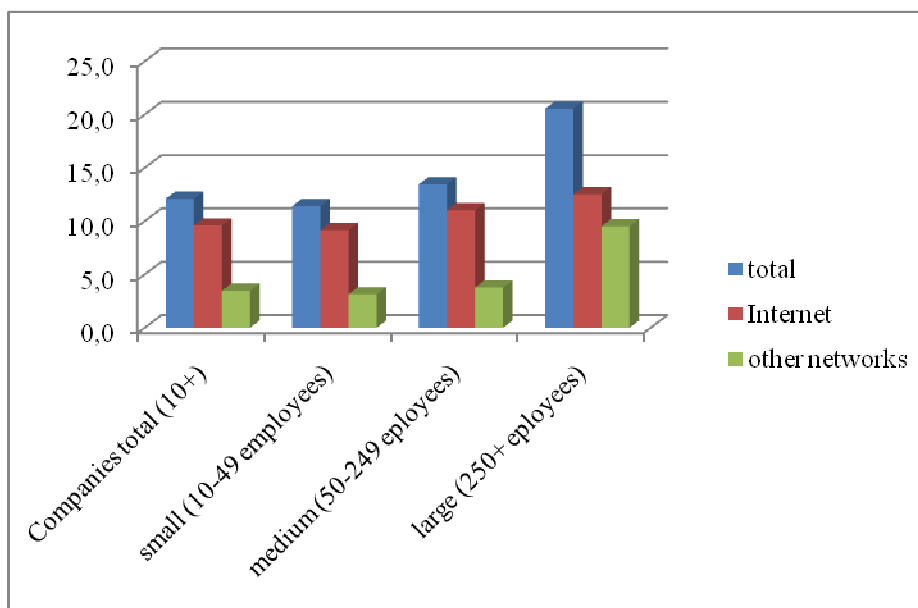
Fig 5: Czech companies using electronic purchase (%) 2006



Source: adopted from CSU 2008 [2], [3].

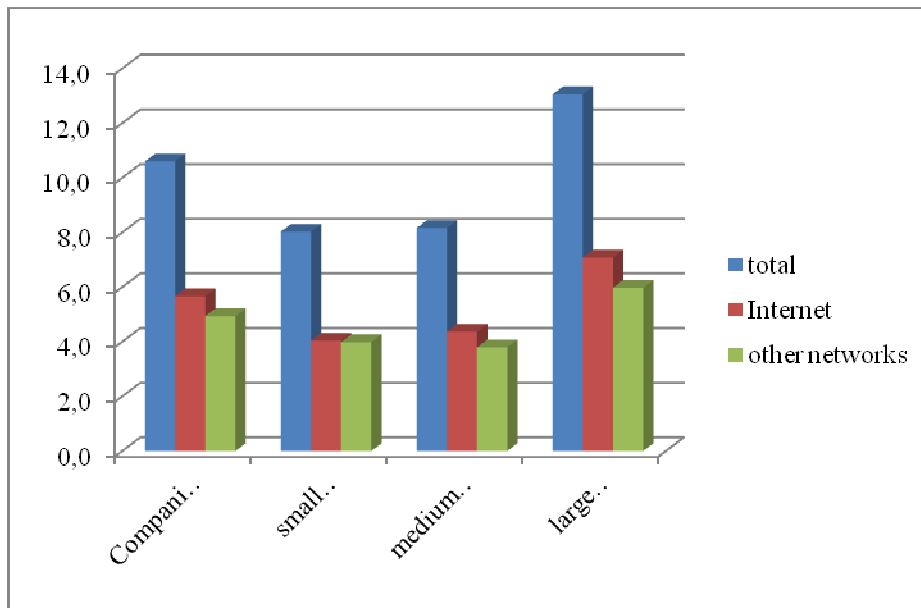
- If there is no mature software application at disposal, supply chain management needed for successful electronic commerce cannot be achieved. The document flow in these companies is not streamlined enough for this.
- There are stove-like applications running in these companies causing double data production, what causes errors and confusions in the management information systems.

Fig.6: Czech companies using electronic sales (%) 2006



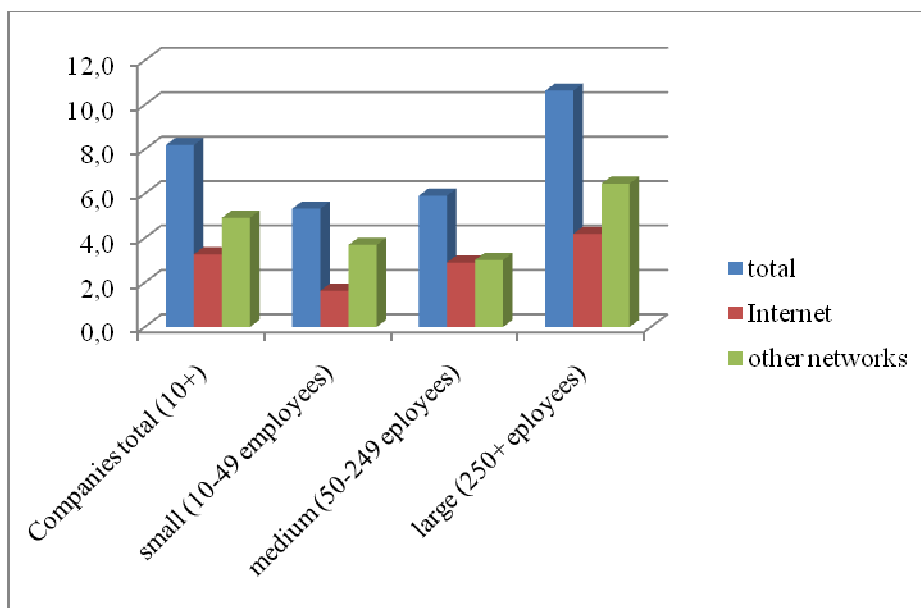
Source: adopted from CSU 2008 [2], [3].

Fig.7: Total value of e-purchase accomplished by Czech companies 2006 (% of total value)



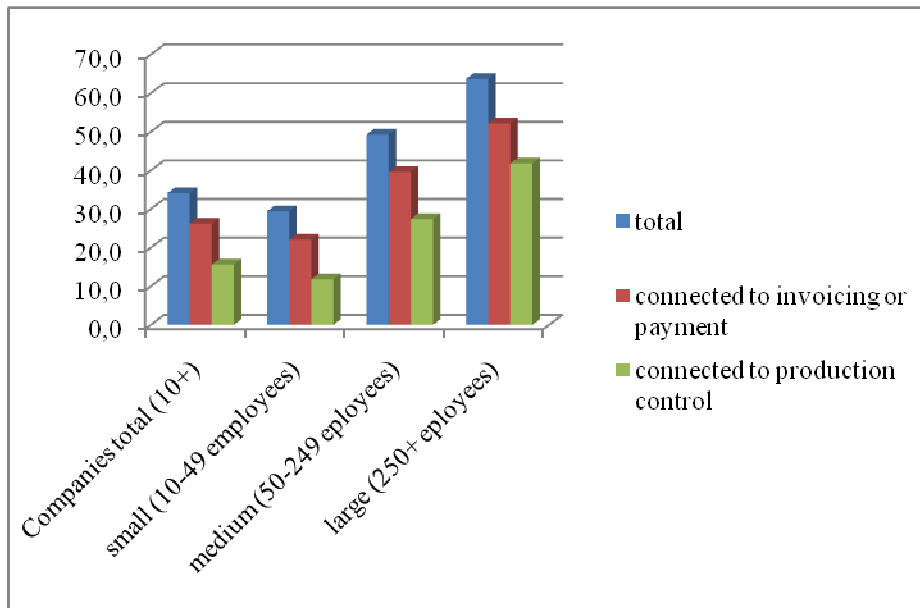
Source: adopted from CSU 2008 [2], [3].

Fig.8: Total value of e-sales accomplished by Czech companies 2006 (% of total value)



Source: adopted from CSU 2008 [2], [3].

Fig.9: Czech companies using software application for order management, January 2007



Source: adopted from CSU 2008 [2], [3].

3. Summary of data analysis

Summing up the presented data, following hypotheses can be formulated:

- The ICT development in Czech companies follows the general GNP trend in the last years.
- The investments ratio in ICT compared with processing industry rises what should affect the ICT applications supporting electronic business.
- The Internet connection speed demand is probably saturated.
- The infrastructure state of the art even in small Czech companies enables to expand ERP and CRM systems, however
 - The companies with domestic capital, especially the small ones (10 – 50 employees) do not follow the trend set by the large companies, foreign affiliations and companies with foreign capital.
 - There are still large potentials in electronic business area.
- Comparison of general ICT expansion to relatively flat development of Internet business leads to following conclusions:
 - Middle and large companies invested mostly in technology and/or ERP systems.
 - Electronic business needs up-to-date supply chain management, streamlined workflow and document management to achieve success, what needs investments in organization and workflow research.
 - As the investments in ICT research in companies with domestic capital do not follow the general trend, this could be the reason why the potentials offered by present state of technology are not sufficiently taken advantage of.

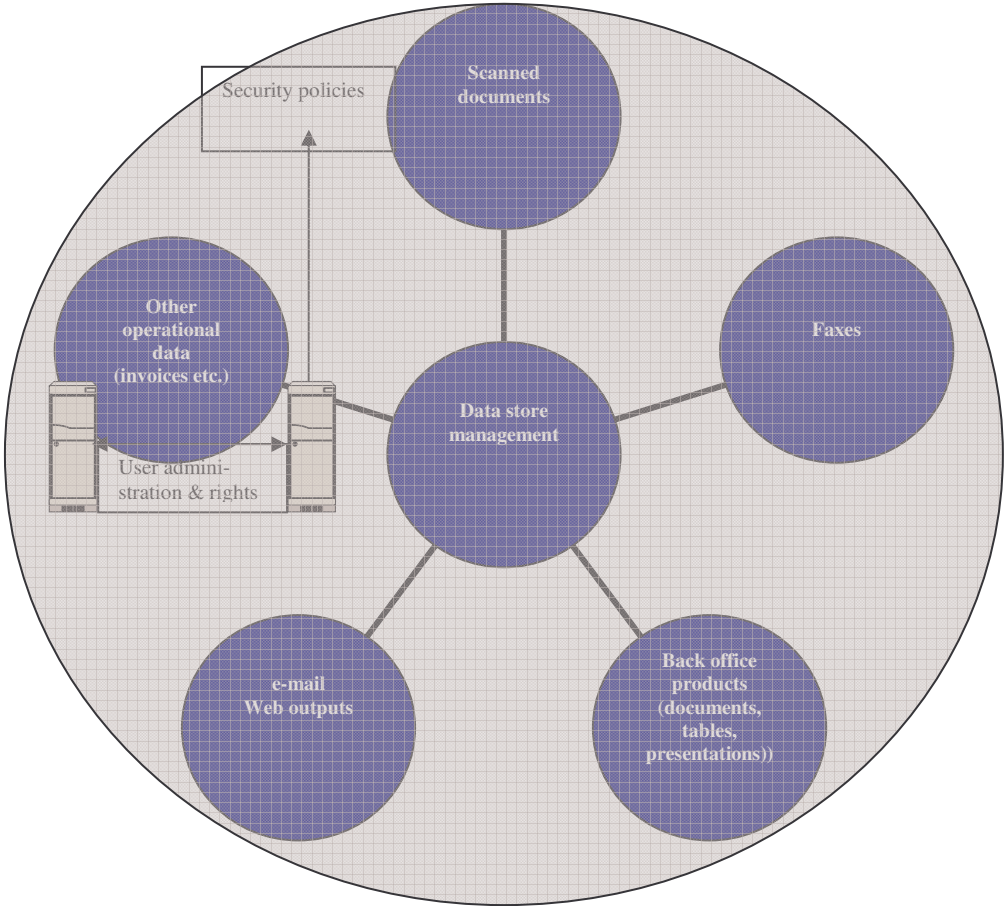
4. Workflow and Value system approach to leverage the business potentials

As stated hereinabove, one of the reasons why the electronic business ratio rises relatively slowly is the state of the workflow and document management, especially in

smaller companies with domestic capital. The basic functions of document management system can be listed as follows:

- Mail office (input of both electronic and paper documents)
- Document scanning and their transformation into electronic form
- Document indexation and/or bar code identification
- Electronic document workflow including its assigning to relevant internal service
- Full text document lookup
- Interconnection to back office services
- Archiving, printing and document shredding services
- Security services.

Fig.10: Document management data structures



Source: own

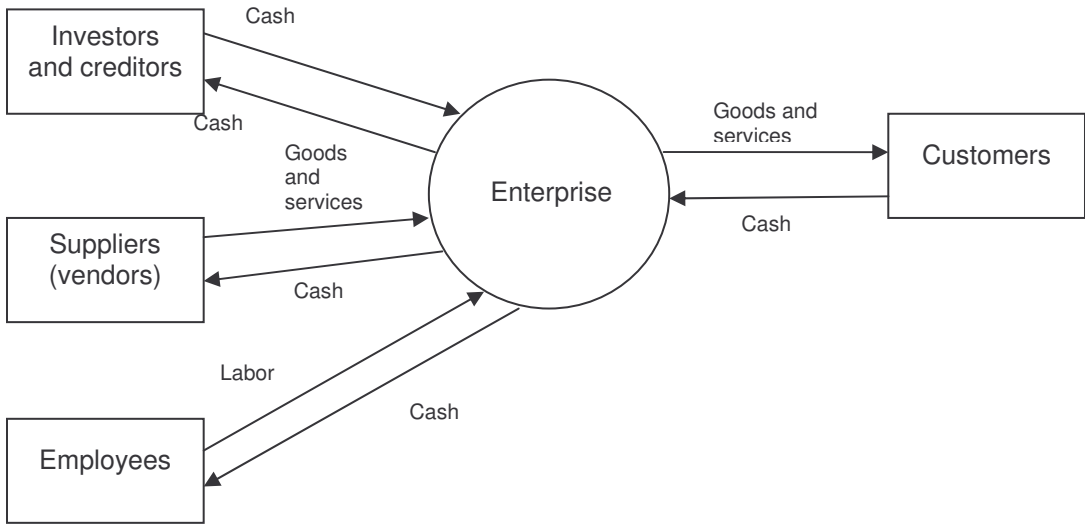
Data structure types of document management system are presented in Fig.10. Apart from effective data organization well functioning security system is needed. Modern data security concepts combine user management and security policies. This combination results in flexible and transparent system organization. On the other side, relatively complicated issue of compromise between security, including user rights, personal and company data protection and the system business flexibility is needed. A combination of document management and workflow systems using universal and understandable user interface, intelligent forms web technologies in company portals is a real challenge for next years.

The greatest challenge identified is the process and workflow optimization. To streamline workflow, document management supporting nearly seamless integration crossover the functional areas is of greatest importance. Moreover, process optimization can run into difficulties due to cross-organization functionalities of new IT architecture concepts like Service Oriented Architecture, WEB2 concepts and other methods and means. Such technologies need company management engagement and support what sometimes leads to internal political problems hindering quick deployment.

Document management and workflow streamlining is usually based on process modeling techniques resulting in some form of process re-engineering, Process modeling is known enough.[4],[6],[7], [8]. However, in our opinion it is not always sure that by using individual process modeling to streamline the enterprise processes the information flows can be optimized. Having the cross-functionality in mind, we should concentrate on common constructs depicting situations in most of enterprises and try to find common patterns.

Alternatively to process oriented approach value – flow patterns analysis in the enterprise can be used. What can be understood under value- flow? In Fig. 11 a general enterprise value system is presented. The enterprise is producing goods and services to customers and receives cash in the value of the goods and services delivered. Working capital (cash) coming from the investors or creditors, goods and services from the vendors and labor, both purchased from the suppliers and employees are needed for this process.

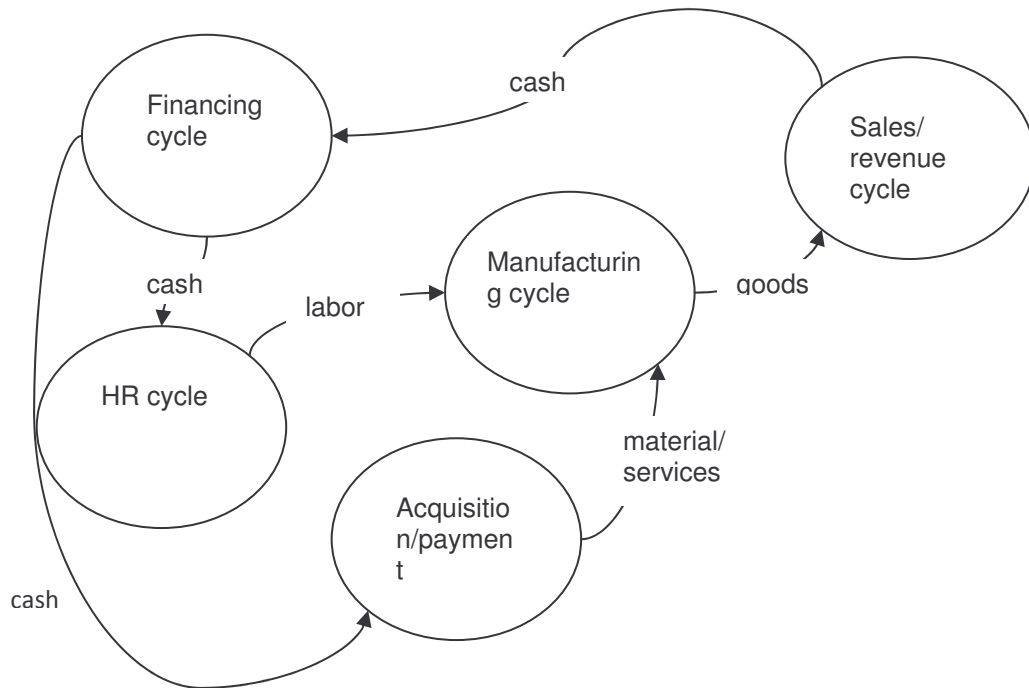
Fig. 11: Enterprise value system



Source: Dunn, Cherrington, Hollander 2005 [5]

This general value system can be expanded into more specific value chain shown in Fig.12. The company is producing goods during conversion (manufacturing) process. Resources like raw materials, tools, third party services etc. are needed to accomplish the conversion. They are obtained and paid for during the acquisition/payment process. In the manufacturing also human resources are needed to produce and supervise the process. Labor is procured and paid for in the human resources and payroll processes. The payments are effected by finance process. The money for the payments is collected from revenue (sales) process.

Fig 12: Generalized value chain model of a company



Source: Dunn, Cherrington, Hollander 2005 [5]

Continuing the expansion down to the process level processes not from the workflow but from the value point of view can be modeled. Following this way several basic transaction cycles of a company can be defined. These transaction cycles presented in a form of business patterns, bearing enterprise value system and value chain in mind represent common patterns independently of the company organization. On the last (lowest) decomposition level the tasks actually performing the transactions can be identified bringing the value-chain method close to the process approach again. Nevertheless, a more general perspective can be obtained by using the value approach, as the basic cycles and relations are principally the same for all transaction types all over the company. Using common transaction types and pattern brings principal possibility to introduce common used modules and services which are the base of the SOA architecture. In this sense process oriented approach limitations can be overcome and some potentials and challenges mentioned hereinabove used and met.

5. Conclusions

The analysis of data published by Czech statistics authority shows that the investments in ICT follow the general rise of Czech GNP in the last years. However, the ICT development differs by the company size and its owner. In the same time the IT personnel ratio to the total employment did not follow the trend of the investments. The infrastructure state of the art even in small Czech companies enables to expand ERP and CRM systems, however the companies with domestic capital, especially the small ones (10 – 50 employees) do not follow the trend set by the large companies, foreign affiliations and companies with foreign capital. There are still large potentials in electronic business area.

Security issues had to be solved with increased Internet usage intensity and investments. Unfortunately, security concepts in small and middle sized companies are still

not fully used and mostly solved ad hoc. As the security is a part of many international standards, new standardization topics emerge. IT security standards can differ country by country depending on local legislation. There is a challenge to harmonize general IT security standards and local legislation at least in new and neighboring EU countries

The greatest challenge identified is the process and workflow optimization. To streamline workflow the document management supporting nearly seamless integration crossover the functional areas is of greatest importance. Such integration needs company management engagement and support what sometimes leads to internal political problems hindering quick document management and workflow deployment.

Document management and workflow streamlining is usually based on process modeling techniques resulting in some form of process re-engineering. It is not always sure that by using individual process modeling to streamline the enterprise processes the information flows can be optimized.

Alternatively to process oriented approach, value – flow patterns analysis in the enterprise can be used. More general perspective can be obtained by using the value approach, as the basic cycles and relations are principally the same for all transaction types all over the company. Using common transaction types and pattern brings principal possibility to introduce common used modules and services which are the base of the SOA architecture. In this sense process oriented approach limitations can be overcome and some potentials and challenges mentioned hereinabove used and met.

Abstract

The paper deals with business potential analysis based on the data published by Czech Statistic Authority (ČSÚ). It shows that the infrastructure state of the art even in small Czech companies enables to expand ERP and CRM systems, trading over Internet, Supply Chain Management and other new trends. Internet security is here of greatest importance, however it cannot be seen as major obstacle for new trading methods. The greatest challenge identified is the process and workflow optimization. To streamline workflow the document management supporting nearly seamless integration crossover the functional areas is of greatest importance. Moreover, process optimization can run into difficulties due to cross-organization functionalities of new IT architecture concepts like Service Oriented Architecture, WEB2 concepts and other methods and means. In this paper the value flow approach is shortly mentioned as an alternative to process modeling and workflow approach. Value oriented methods can overcome the process oriented approach limitations.

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Key words:

ICT infrastructure, Business processes, Process modeling, Document management, Value chains, Business semantics

JEL classification: L15, L23, M11, O21.

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