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Effective Usage of Implementing ICT in Small- and Medium-sized Enterprises[1]

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Abstract

The goal of this scientific paper is to investigate specifications of SME in ICT implementation and to identify processes in small- and medium-sized enterprises with concentration on their ICT departments according to the used methodologies. To narrow down the feasibility of using information and communication technologies in SME and to define how the process documentation can help these companies to properly select and subsequently effectively implement ICT.

Key words

ICT, SME, processes, implementation

JEL Classification: O31

Introduction

The fact that information is the most important strategic resource, which each company must process, is gaining more and more importance thanks to the advancing globalization and turbulences on the market. In order to collect, analyze, create and distribute information within the organization, usage of information and communication technologies is practically essential. Therefore, the dependence of business processes on information technology is continually deepening. Each organization undergoes certain evolutionary stages. These stages are mostly visible in the form of processes realization, which is carried out by the company. By the identification and documentation of established business processes it is possible to determine which ICT (when implemented and used) would be the most beneficial and effective for the company. However, both theory and practical experience show that when a company begins to understand its processes as a tool for its continual improvement and increase in profit, it captures the existence of these processes in some form of company´s documentation. Detailed, material (electronic) process documentation is practically required in large companies, but in the segment of small- and medium-sized enterprises (SME) the situation is different. The intention of this paper is to discover the needs, limitations and possibilities of ICT effective usage in small- and medium-sized enterprises and to identify the process side of ICT departments in SME.

[1] The topic stated in this paper is the part of research task solution Vega no.1/0205/14 *The perspective of dynamic service companies existence in the SR in context of applying principles of the Innovation in the Union initiative* resolved at the Faculty of Commerce of the University of Economics in Bratislava

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1 Methodology

The primary target of this paper is to investigate the specifications of SME in ICT implementation and to identify processes in small- and medium-sized enterprises, in which the implementation and usage of ICT is effective. In order to accomplish this, the following research questions were constructed:

- What are the main specifications and critical processes[3] of SME in relation to the usage of ICT?
- What is the appropriate documentation level that captures business processes (of a company in the defined segment), so the efficient implementation of ICT would be possible?
- What are the needs and limitations of ICT departments in the sector of small- and medium-sized enterprises, what are the possibilities of implementing ICT in SME and which exact processes can be carried out via ICT or electronically?

The following methods were used to fulfill the target:

When processing original theoretical-methodological basis, the method of secondary sources analysis with further domestic and international provenance information sources (based on which deductions and continuous partial conclusions are formulated) was used.

Several methodologies, such as the Gartner model, the Capability Maturity Model Integration (CMMI) and the Information Technology Infrastructure Library (ITIL – the collection of the best IT service management practices), were used to identify the level of business processes.

Based on partial analytical findings (stemming from the secondary quantitative observation data), business processes of small- and medium-sized enterprises (in which the usage of ICT brigs the most significant effect for the benefit of the companies) were identified by using synthesis method.

2 Results of the work and discussion

The usage of ICT in large companies is common and nowadays required for an efficient operation. On the other hand, the situation in SME is different. The supply of ICT solutions for this segment is considerably limited, SME have limited financial and human resources (Duan et al., 2002). However, there are not only resources barriers, but the insufficient ICT skills and knowledge are also ones of the greatest challenges, which all of the European countries – for example Great Britain, Poland and Portugal – face (Houghton & Winkhofer, 2004). Therefore, it is necessary to approach the topic of ICT in SME very sensitively, in order to reach their most efficient usage.

[3] Processes that ensure protection of company´s assets are necessary for continuous performance of the company and secure fulfillment of liabilities.

2.1 Specifications of SME and ICT

General advantages of small- and medium-sized enterprises include flexible responses towards changes, innovativeness, creation of new job opportunities, resistance against economic recession, focus on marginal and local markets, quick acceptance of entrepreneurial decisions, personal contact with customers, capital undemandingness of entering the market and spatial closeness towards the consumers (Vojík, 2007). Among disadvantages of small- and medium-sized enterprises one could include limited capabilities of employing experts in administration and management activities, limited possibilities of obtaining benefits from the production range, less favorable working conditions and higher work intensity, limited resources for advertising and propagation, complicated access to loans and capital, absence of the most advanced technology, lack of financial resources for development and research, unfair competition from the side of large enterprises, small chances in governmental tenders, etc. The simplicity of organizational structure in small- and medium-sized enterprises relates to formality of relationships in such type of company, which are considered as rather informal. The formal system of planning and managing does not exist, planning is done mostly operationally. Priority is put on sufficient sales of products or services, which ensure income required for the survival of the company (Kubálková, 2006). Similarly, the owner/entrepreneur managing his/her company on personal direct communication also adds to the informal management. This culture is irreplaceable in the daily management, i.e. in operational management. However, in strategic economy of the organization its justification is lost. Strategic management represents a managerial approach, which is focused on directing organization towards success both, in the present and in the future. It combines planning, realization and evaluation and also integrates concepts from strategic and operational planning, quality and efficiency improvements (Slávik, 2009). Strategic decision-making should not be based on internal belief or intuition, but on proven information and data, using analytical methods. Within this field, it is possible to derive a key difference between large companies and the segment of small- and medium-sized enterprises. Small- and medium-sized enterprises do not possess information and knowledge, and mostly employ basic experts, rarely with some economic education (mechanics, programmers, bakers, etc.). Therefore the strategic management of a small- sized enterprises takes place only accidentally or not at all. However, it is the company strategy which determines strategy of information technologies, requirements, financial resources, etc. (Voříšek, 1999).

At the moment, a company represents an economic unit, which cooperates with its partners, and whose goal is to satisfy the needs of customers. All activities in connection with the realization of a certain output for the customer or to support the operation of the company are defined as a process. There are many solutions for automatization, support and efficiency of business processes using communication and information technologies, ranging from specialized products that are focused on characteristic activities support to enterprise[4] solutions of prominent companies, which cover requirements of the whole company, including decision-making support and fulfilment of legislative needs (Frajtová & Michalíková, 2008).

[4] Established ICT term – solutions for the smallest customers (SOHO), for small customers (SMB), for large customers (enterprise) and solutions for niche companies

According to the research published in Computerworld[5], approximately 60 to 80% of small- and medium-sized enterprises have their own information technology department. The size of the information technology department is in the most of the cases directly proportional to the company size. The employee counts of these departments are in the range of 10 people, however most often it is 5 employees. As stated in the mentioned research, local companies employ fewer employees in the information technology field than companies in the ownership of foreign subjects. A very important attribute of the information technology department in small- and medium-sized enterprises is who holds the position of the IT manager and where in the organizational structure this position is placed. There are some companies, in which the position of IT manager is taken by the owner/administrator of the company. A large percentage of companies does not have an IT department at their disposal, which means that they do not have an employee working in the IT field. The issue of information technologies in such companies is resolved by more advanced users, or by utilizing outsourcing. The IT manager is often subordinated to business or financial director, which means that he/she is not the part of senior management or the board. However there are many cases in which this description does not apply. An example can be a wireless connection provider where IT constitutes more than a half of the company (Remr, 2005).

The employees of information technology departments in small- and medium-sized enterprises are in more difficult position than employees in large enterprises. It is due to the fact that IT specialists in small information technology departments are in charge of wider field of information technologies. Usually, one employee manages network, server and station administration, and simultaneously acts as user support and carries out application code modifications[6]. With such number of activities, it is not possible to get deeper into the field, and it causes decrease in the quality of the work carried out.

Budget limitations often do not allow obtaining the best available technologies, which limits the personal development of the employees. This is proven also by the small amount of educational trainings in small- and medium-sized enterprises. In some companies, regular employees of information technology department are assigned activities subjected to the IT manager.

Employee positioning can also have a negative influence on the performance of information technology department. Many small- and medium-sized enterprises cannot compete with large enterprises in terms of offered salary. As a result, work is being carried out by less competent employees, or highly qualified employees who fulfil the delegated tasks very fast and spend saved time on non-work related projects. These employees often tend to be problematic, especially in communication with the manager or external environment of the company. Among advantages arising from the company size is for example the fact that almost all IT specialists have sense of overall architecture of company IT. Another advantage is informal communication with IT users.

Antlová (2009) states, that main limitations for procurement and implementation of ICT are internal problems of the companies. These problems are insufficient number

[5] Digital ICT daily newspaper and a company involved in ICT topics (expert articles, researches, etc.)

[6] User support means elimination of computer malfunctions, help with applications directly at work, consultations with workers and possibilities of work improvements.

of employees with satisfactory knowledge, financial and also often family problems. The barriers to effective adoption of ICT are:

1. Technological (security problems, insufficient infrastructure).
2. Organizational (management style, insufficient financial resources).
3. Resulting from surrounding environment (lack of market knowledge).
4. Individual (lack of knowledge, personal relationships).

The research question no. 1 – what are the main specifications and critical processes of SME in relation to the usage of ICT – can be answered in the following manner: the main specifications include simplicity of organizational structure, informality of relationships, owner´s direct personal management, practically no strategical management (carried out only operationally based on owner´s belief and intuition), no or small ICT department and management of ICT departments is usually carried out directly by the owner. As critical processes can be according to Porter (2007) considered these primary activities of the company:

- logistics,
- manufacturing operations,
- marketing and sales,
- services.

2.2 Identification and integration of IT processes into the operation of SME

The extent of detailed documentation of business processes, as well as the extent of processes defined in this way, which are integrated into company´s operation, determine the process maturity level. A higher level of process maturity is usually not achieved in SME. The reason for the limitations can be for example a lack of human resources. Several methodologies are used to determine the maturity of processes in the field of information technologies, where the most well-known are Capability Maturity Model Integration (CMMI)[7] and the Gartner[8] company methodology. CMMI represents an approach for process improvement. It attempts to show the organizations necessary parts of an effective process.

CMMI model

The CMMI model is available in gradual and continual form. The gradual form defines five levels of process maturity. The model is based on a set of the best practices[9] from around the world. Apart from innovating the company processes by its gradual application, it also allows comparing achieved process levels among several companies. It leaves the selection of certain improvement in accordance with the entrepreneurial intent in the hands of the organization, minimizes risks and allows comparing the ICT processes. Every process level is defined by using five fields: goal, binding steps, possible steps, scope and audit (Kay, 2005).

[7] CMMI is the abbreviation for „Capability Maturity Model Integration". CMMI represents principles, rules and reliable methods, which lead to increase in quality of business processes

[8] The Gartner company is the leader in ICT research and an advisory company

[9] The best, or the most reliable practice. The term is usually used for reliable methods, processes or management methods, by which several organizations reached positive and measurable results

The 1st level: entering – process can be characterized as chaotic, only a few processes are defined and the success depends on personal determination of certain individuals.

The 2nd level: organized – a certain process procedure is maintained, which is required for repeated successful realization of business processes.

The 3rd level: defined – processes are documented and integrated into the activity of the organization.

The 4th level: qualitative – detailed information about the progress of processes are collected and measurements of their performance take place. Processes and indicators are understood, managed and audited within the whole organization.

The 5th level: optimized – continual improvement of processes is enabled thanks to quantitative feedback of the data from the process and innovative ideas (CMMI, 2007).

Among the most difficult transitions between individual levels are the transition from second to third level and the transition from fourth to fifth level. The critical difference between the second and the third level is mostly in the processes description and its extent. The second level contains descriptions for an exact project, in higher levels there are descriptions of processes as a part of organizational files. These are subsequently modified, according to the needs of an exact project. The precision of process descriptions is also an important difference. The third level processes are strictly defined and more proactively used as a result of knowing the relationships of individual processes, their products and services. The critical difference between the fourth and the fifth level of the process is the focusing of the processes on the result quality. The fourth level is concentrated on the specifications of process reasons and on the estimation of process finalization, although the result does not have to be sufficient to fulfil the set goals. This can be secured by processes on the highest fifth level, which apart from aforementioned points also declare the fulfillment of process goals.

Gartner model

The Gartner Company has several different process maturity models, which are more ICT processes and ICT departments oriented, in contrast to the CMMI methodology, which is more applicable. Gartner models are applicable to exact business processes. An example is the maturity of project management, information technology processes, information technology purchasing or information technology infrastructure and operations management. The Gartner Company defines six levels of ICT process maturity. The definition is described from the ICT department point of view of, which primarily provides ICT services, both internally and externally. The definition stated below is also applicable for companies that provide ICT services[10].

The 0 level: survival – no practices are defined,

The 1st level: awareness – resources for information technology infrastructure and operations management are determined,

[10] The given group includes companies according to SK NACE rev. 2: section J – information and communication services, divisions 61 and 62

The 2nd level: involvement – sufficient resources are allocated, attempts to define informal ICT service level agreements are made,

The 3rd level: proactivity – the ability to make a prognosis of information technology services needs and to provide the capacity required,

The 4th level: aligned with services – the company is capable of fulfilling contractual commitments, has formally defined Service Level Agreement (accurate and measurable parameters, e.g. service provision timescale),

The 5th level: partnership – ICT department recommends selected ICTs which bring innovations for the company as well as new products and services transformation of the organization and for new services and products entering the market (Scott, 2008).

Management of ICT processes in the company

The connection of process maturity and ICT is important in two fields. The first refers to the possibility of implementing ICT in the company in case the company defines its processes, implements them in its operation and is willing to advance to one or two higher levels. The second then identifies the chosen ICT for the achieved process maturity level, and documents the business process changed by the chosen ICT. During the implementation of ICT into the company, the company´s maturity as such is also very important. Several companies, such as Hewlett-Packard and Pink Elephant have their own special methods for judging the applicability of ICT into companies. These methods should help companies to understand their current situation and also determine how much time and work will the company need for the transformation. In reality, it is not possible to move by more than two levels of process maturity within one project. This is due to certain inflexibility of people, technologies and systems, which has to be overcome. The aim of these methods is:

- Evaluation of information technology service administration processes, their comparison with processes of the best companies in the field and highlighting any shortcomings,
- Establishment of formal benchmarks, in order to measure company´s processes,
- Identification of potential shortcomings in the performance of critical parts of infrastructure,
- Provision of help with the focus on priority field of information technology service improvement, supply of higher market value and decrease of expenses,
- Evaluation of management efficiency of supplier practices,
- Successful support of new technologies and applications,
- Provision of sufficient reasons for information technology service management to the business department,
- Training of workers in the field of information technology service management (Hewlett-Packard, 2005).

The research question no. 2 – What is the appropriate documentation level that captures business processes (of a company in the defined segment), so the efficient implementation of ICT would be possible– can be answered in the following manner:

for the implementation, and later efficient usage of ICT, it is necessary that the company is capable and willing to reach the third level of process maturity.

2.3 The needs and limitations of ICT departments in SME

Naming and consequential implementation of business processes enable to select ICT in the best possible manner, in order to increase company operation in the most effective way. The implementation of processes is related to its documentation, allowing to view the whole process and also making possible its future optimization. In small- and medium-sized enterprises, in which ICT does not yet represent a guarantee of success even though they are dependent on it, according to the ITIL[11] defined Service Level Management[12] and Financial Management[13] processes seem to be the most important. Similarly important are also the fields of involving strategy or impacting governance[14]. The needs of companies dealing with ICT are on a lower level, which approaches an operational or tactical level. They also require strategic fields. However, the processes such as Incident Management[15], Problem Management[16], Change Management[17], Release Management[18], Availability Management[19], Service Continuity Management[20] and Capacity Management[21] are more critical for them. The characterized processes are used when managing ICT processes, however, they can also be applied to other business processes.

Projects connected with direct implementation of processes are often expensive and time-consuming. Sometimes even the largest companies do not have experts with sufficient practical expertise and knowledge and therefore they are forced to pay consultants and specialists. Furthermore, the processes are often supported by various software systems, which are also financially demanding. Both, the costs of procure-

[11] The abbreviation ITIL (Information Technology Infrastructure Library) represents a collection of the best practices from the ITSM (IT service management) field

[12] The management of provided service level describes the service level agreements and subsequent ensuring of their observance

[13] Financial management is used to describe budget making processes, accounting and charging types in the organization

[14] Governance includes defining the roles and responsibilities of employees ensuring the management of the company

[15] Incident management ensures that in case of incident (malfunction, problem) the operation is restored as fast as possible and the impact on the company is minimal

[16] Problem management proactively prevents the occurrence of problems and attempts to proactively preempt problems. A problem is practically an incident with a greater impact on the company, or a repeating incident.

[17] Change management is a process responsible for administration of all changes. The primary target of the process is to evaluate the change and to ensure that it has the smallest impact on interrupting the activities of the company

[18] Release and implementation management is a process, which is responsible for planning, scheduling, testing and implementation of releases (program version, e.g. version no. 1). This process is mainly used in ICT in software operation.

[19] Availability management defines, analyses, measures and improves all aspects of service availability and at the same time ensures that the whole infrastructure, processes tools, roles, etc. are adequate to the agreed goals of service level for availability criterion. The term is mainly present in IT services.

[20] This process is related to the capability of the organization to continually provide predetermined and agreed minimal ICT service level for the security of commercial processes in case of regular ICT services outage

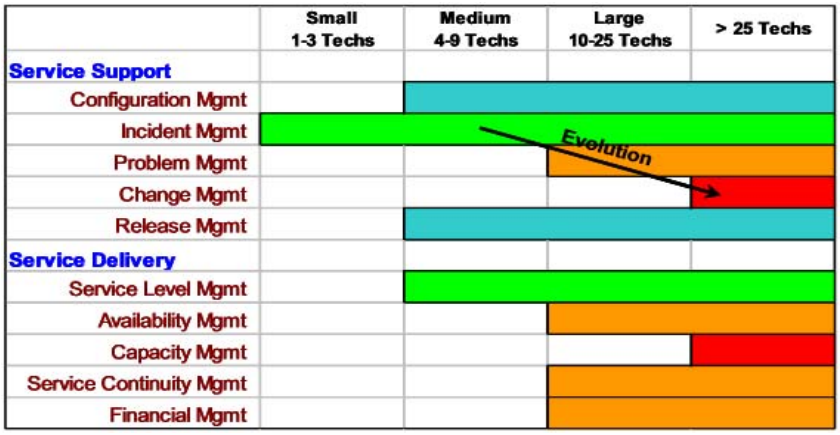
[21] Capacity management is a process responsible for the company having capacities which enable to secure and reach agreed business requirement in terms of economical possibilities of the company.

ment and operation accompanying the implementation of ICT into company processes are often higher than the company´s established budget for ICT investments.

In information technology departments of small- and medium-sized enterprises one employee in the information technology department is in charge of the whole operation connected to end stations of users. This in the ITIL terminology represents Incident Management. Due to time insufficiency, caused by a large amount of tasks for a small amount of employees of ICT departments, it is not possible to expect activities in the area of for example, Capacity Management.

In small information technology departments it could be economically more viable to purchase another server that would maintain service operation, rather than to be engaged in planning of possible outages capacities and subsequent recovery of the services. However, it is important to take into account the impacts of such step, especially in the smallest companies. One of the possibilities is to change the approach for planning of capacities only in the situations when the technical secure of service recovery (e.g. by purchasing backup serves) is not possible or a sufficient number of ICT workers is available and can flexibly intervene or recover the service when needed (Desiano, 2006). Table 1 documents the scale of process implementation according to the size of the ICT department of SME, compiled according to the best practices of ITIL v3 (version/edition 3) A group of companies belongs to the category of small- and medium-sized enterprises, however, Desiano and expert study from 2006 carried out by Numara Software[22] Company do not identify the classification of companies more precisely. The processes mentioned below are oriented primarily on companies ICT departments, however, these processes also interfere directly with company management and thus influence their whole operation and effectivity.

Tab. 1 ICT processes of IT departments in SME according to ITIL best practice



Source: Desiano, 2006, according to best practice ITIL

According to Desiano Implementation of Incident Management into the environment of small- and medium-sized enterprises should also not be difficult.

[22] The leading world provider of IT services and integrated IT solutions. The company was acquired by the BMC Software, Inc. in 2012.

Incident Management is based on proactive approach towards incident occurrence identification (errors or problems). Mapping tasks of Incident Management onto specific workers is also comparatively simply solvable, and it can be modified in such way that the member of the first[23] and the second[24] line of support will be represented by the same person. The best choice could be an IT manager, since he/she already has the competences required for the management of workers or suppliers. In case that the company has functioning Service Level Management, it will be necessary to integrate it with Incident Management. By improving Incident Management, the integration with database of known problems and errors should take place, along with the integration of the configuration administration system. This integration, however, requires a process-mature organization.

One of the most important processes – Service Level Management, whose goal is the definition, documentation, agreement, monitoring, measurement, reporting and revision of the level of services provided, securing and improving the communication and relationships with customers and businesses, securing specific and measurable information technology service targets, monitoring and improving customer satisfaction with the quality of services provided, securing definite service level expected by the customers and securing proactive measurement for the purposes of service level improvement - is easier to implement in the environment of small- and medium-sized enterprises than in the environment of large companies. The advantage is mainly the informality of communication and the organizational culture. Service Level Management does not require any special software tool for its operation and can be operated by a singular worker. In the field of contract-making processes, especially with external entities in the sector of small- and medium-sized enterprises, it is necessary for the company to realize whether it is in its abilities to measure the level of provided services. It is important for the company to have such monitoring tools, which could verify the availability even during outages and unavailability of ICT. The monitoring is pointless in some situations due to economic expenses which exceed the value of the service provided. All this must be rationally considered and regularly verified (Cartlidge, 2007).

Configuration Management[25] process, which checks and provides information about relationships and activities forming the company information technology infrastructure, can be implemented with certain limitations. The limitations are given by a large number of assets, or by demandingness of the process. Another limitation stems from key competences which require a comparatively big involvement of a certain employee. There can also be problems within the technological field, since the software tools required for the support of this process are financially demanding.

The main limiting factor for small- and medium-sized enterprises in the field of ITIL process support software is mostly its size and price. This problem arises due to the lack of effort from large companies offering this software to understand the differences between the segment of small- and medium-sized enterprises and the segment

[23] Term used in ICT. 1st level support (first line) describes the activity of the workers, who are tasked with service recovery and malfunction removal. Usually within the time of 10 minutes.

[24] Term used in ICT. 2nd level support (second line) describes the activity of the workers, who are tasked with service recovery and malfunction removal. They are deployed for more complicated problems, malfunctions.

[25] Configuration management is a process responsible for ensuring that the assets required to provide services are appropriately under control and that precise and reliable information about these assets are available at the times and locations required.

of large companies. Among the most famous products is the software for large installations especially from the works of HP Software, IBM Tivoli, CA, Microsoft, etc. Small- and medium-sized enterprises can therefore look for products in smaller suppliers, who realize these aspects and try to adapt their products to this segment. Among these suppliers are for example ProcessWorx, Numara Software, etc. Similarly there are software products, which primarily are not designated for ICT process support, but they can be used for this activity. Currently numerous open source[26] projects exist, which create tools for business and ICT processes support (SourceForge, 2014).

According to ITIL v3 mentioned processes can be practically applied to all SME companies that have ICT departments or utilize ICT, or are planning to utilize it. The company is able to choose and subsequently manage ICT more efficiently after implementing mentioned processes. There is also the advantage of outsourcing. If the company does not have its own ICT department, there is a possibility to simply approach potential suppliers and thus secure outsourcing.

The research question no. 3 – What are the needs and limitations of ICT departments in the sector of small- and medium-sized enterprises, what are the possibilities of implementing ICT in SME and which exact processes can be carried out via ICT or electronically? – can be answered in the following manner: the most common limitations of ICT departments are insufficient number of human resources and finances. There is a relationship between the needs and the limitation. This means that each mentioned limit also creates a need for the company. From the process point of view it is possible to practically carry out all processes that support production and services of the company via ICT or electronically.

Conclusion

It can be concluded that in general SME concentrate ICT support on supplier value chain. They focus on optimization of order-production-supply processes, i.e. primary activities, but support activities (procurement, HR management, company infrastructure, technological development) are not sufficiently developed/secured considering the size structure. The close connection of all independent activities and their connections together with the integration of ICT into the company processes can lead to competitive advantages.

Before implementing ICT in the company, it is necessary to recognize processes of the company and also the fact that all the processes are sufficiently documented on advanced level. Companies that will not identify these processes will most likely not be capable of selecting and efficiently using ICT. Therefore, one of the significant factors of proper selection of ICT, its efficient implementation and subsequent usage, is, based on the chosen methodology, the documentation and according to that definition of individual business processes.

The research shows that SME, employing three ICT employees at most, have the Incident Management process documented and defined, which describes how the ICT department should proceed with for example, malfunction removal or with resolution

[26] It is computer software with open source code. Its procurement costs are usually very low.

of different problems. The given process can be applied also outside of the ICT department, for example it can describe the method of resolving customer claims. The companies with four to nine ICT employees are able to implement Configuration, Release and Service Level Management. A certain size of ICT infrastructure, which requires documentation and definition, is assumed in these processes. The given processes can be documented by the company producing ICT, but also by a company that only uses ICT. SME with ten to twenty-five ICT employees implement processes such as Problem, Availability, Service Continuity and Financial Management. A complex collection of processes can be documented and implemented if the company employs more than twenty-five ICT employees.

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