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**CHALLENGES IN BUSINESS PROCESS AUTOMATION FOR
SMALL AND MEDIUM ENTERPRISES**

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ABSTRACT**Author:** Ivan Trapeznikov**Title:** Challenges of business process automation for small and medium enterprises.**Department:** Graduate School of Management (StP. State University) ; Business Administration (LUT)**Program:** Master of International Technology and Innovation Management (MITIM)**Year: 2011****Place:** Saint-Petersburg (Russia) / Lappeenranta (Finland)
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Examiners: Acs. Prof .Sofya V. Zhukov, PhD, Prof. Liisa-Maija Sainio, Dr. Sc.**Key words:** Business process, business process automation, small and medium enterprises, IT integrators.

The aim of the study was to examine problems that small and medium enterprises are facing during the implementation of business process automation projects.

Study reveals problems from the point of view of companies who are implementing automation projects and from the point of view of IT-integrators who are specifying in IT solutions for small and medium companies.

АННОТАЦИЯ

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Ключевые слова: Бизнес процесс, автоматизация бизнес
процессов, малые и средние предприятия, ИТ интеграторы.

Целью данной работы являлось исследование проблем с
которыми сталкиваются предприятия малого и среднего
бизнеса в ходе выполнения проектов по автоматизации
бизнес процессов.

Исследование выявляет эти проблемы с точки зрения
компаний, которые внедряют у себя проекты по
автоматизации, а так же с точки зрения ИТ интеграторов,
специализирующихся на ИТ решениях для малого и среднего
бизнеса.

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1. Introduction

1.1. Study background

Nowadays, because of dynamically changing environment and severe market pressure, companies have to be on the top of effectiveness and always move further at the direction of continuous improvement. Every single piece and every single action of an enterprise should be involved to this improvement process. And it is obvious that this improvement is impossible without implementation of new information technologies. Therefore business process automation sometimes becomes a root problem of an enterprise.

Business process automation allows achieving many benefits such as reduce impact of human error, transform data into information, improve collaboration and information sharing, reduce information latency and others. After successful implementation of business process automation business processes in a company go faster, cheaper and with lower number of mistakes.

Share of small and medium enterprises in Russia is much less than in Europe or in USA, therefore Russian IT-companies put much less attention on small and medium enterprises requirements when they develop IT-products for automation. (Business and Financial Markets, 2008). Therefore Russian small companies face additional difficulties comparing to EU small companies. Western BPA solutions also not always fit requirements of Russian small companies because law peculiarities, lack of localizations and price.

My thesis describes challenges of business process automation

which small and medium enterprises are facing. Source of peculiarities of SMEs in BPA is that SMEs have less experience in automation, their business processes are less carefully described and they for sure can spend less money on automation. Due to specifics of SMEs and their IT capabilities, they often decide to cooperate with IT-integrators during the BPA. Experience and capabilities of IT-integrators can give large contribution to the process automation. Peculiarities of BPA in SMEs and also peculiarities of collaboration between SMEs and IT-integrators in BPA are under research focus.

1.2. Research goal and research questions

The study has two major research questions:

1. What challenges small and medium enterprises are facing during business process automation?
2. What is the difference of vision on business process automation between IT-integrators and small and medium enterprises?

The goal of the study is to identify challenges SMEs are facing during implementation of business process automation project. Those projects are expensive, time-costly and risky. Failure of the project can lead to serious losses for companies and even put company survival under threat. Therefore identification of potential problems before the project will start can reduce useless work, decrease project costs (both financial and timely) and finally increase probability of project success.

2. Business Process Automation

Implementing Business Process Automation company can upgrade and optimize current business processes by automating process components. By improving the performance, accuracy, and efficiency of key business processes, company is becoming more efficient and responsive to customer and employee needs. Good BPA software can build systems that pro-actively respond to changes in the data they are responsible for, thus reducing IT workloads and improving overall efficiencies (Chernicoff & Perschke).

Business process automation is a main element of an overall automation and management plan for both business and IT workflow: it would be huge mistake to consider that the word "business" limits the scope of BPA tools. Even vice versa: IT processes in a company are excellent candidates for the automation of repetitive tasks.

2.1. General definitions

Businesses Process - series of logically related activities or tasks performed together to produce a defined set of results. (Business dictionary). Davenport and Short (1990, 4) defined business process as "a set of logically related tasks performed to achieve a defined business outcome." A plenty of things can be covered by this definition: production, logistics, sales etc. Every business process has specific set of actions which lead to useful output (NetMBA).

Business Process Management (BPM) is the concept of controlling work items through a multi-step process. The items are identified and tracked as they move through each step, with either specified people or applications processing the information

(acf.hhs.gov). It is a systematic approach to making an organization's workflow more effective, more efficient and more capable of adapting to an ever-changing environment (searchCIO).

Business process automation (BPA) - removing the human element from existing business processes by automating the repetitive or standardized process components (Chernicoff & Perschke). It is just a simple definition which will be disclosed later in the research. One more definition of BPA: computer aided coordination of resources, facilities and people to achieve the desired outcomes in such a way that the process is optimized. (Alagse)

Key user - person that a software program or hardware device is designed for. (The Tech Terms Computer Dictionary, 2011). This definition is good but only IT-related. Another definition which is more business like: key user is an employee who is most competent in details of business process specific. (HR Planet, 2011). I think that synthesis of these two definitions defines key users of business processes which are going to be automated.

2.2. Stages of BPA

BPA project consists of the following stages: analysis of existing processes, modeling of new processes, pilot testing, implementation and customization. Detailed description of these stages is given at this paragraph.

2.2.1. Analysis of existing processes

Analysis of business processes is an initial stage of business process automation. Analysis can help to illustrate the basic concepts and relationships, and therefore explain the process (Harmon, 2007). The aim of this analysis is to identify bottlenecks in processes which can be reduced by automation.

Automation may help to keep personnel away from routine repetitive tasks and focus on higher-value activities. (Chernicoff & Perschke). However, before automation will take place, analysis of current processes is required.

Analysis of business processes is a formalization of enterprise activities or even a exposure of these activities because sometimes processes are not defined separately. Final result of business process analysis is a chain of activities interconnected to each other or the model of enterprise activities (Paul and Yeates, 2006). And it is important to mention that it is desirable to create as deep process model as it is possible, ideally to the level of a single employee. After analysis of business processes the clear picture of company working activities should be created in order to further automation of processes, procedures, structure etc.

All the stakeholders should be involved to business process analysis. (Harrington, Eric and Harm, 1997). Key users should be involved to analysis because they are ones who will mostly affected by future changes. Also participation of key users in analysis is highly important because of obvious fact that key users are the most acknowledged to processes they do in a company by every day basic. When analysts collect information about business processes, especially in initial stage, they have to contact and interview key users of business processes. Here it is useful to mention that problems related to contact with key users can stay first source of automation project problems.

Problems related to contacts with key users are not rare, especially is they are just regular workers. It happens because of lack of willingness to take part in automation, which is happened by management initiative. Other reason of problems is that key users consider analysts to be outsiders and therefore, key users do not want to explain all the peculiarities of their activities,

especially when it is financial activities. Those problems can increase project risks, enlarge project time and even lead to analytical errors and therefore, to wrong identification of automation goals.

2.2.2. Business process modeling

Modeling is a core of process automation and Information Technology (IT) development. Models enable decision-makers to filter out the irrelevant complexities of the real world, so that efforts can be directed towards the most important parts of the system under study. (Giaglis, 2001) However, both business analysts and IT professionals may find it difficult to navigate through a maze of theoretical paradigms, methodological approaches, and representational formalisms that have been proposed for Business Process Modeling (BPM). Here I will describe several BPM techniques which are most interesting and widely-used.

Flowcharting

Flowcharting is amongst the first graphical modeling techniques, dating back to the 1960s (Schriber 1969). It is a good tool for defining and analyzing current business processes, building a step-by-step picture of the process and defining, standardizing or finding areas for improvement in a process. Also using flowcharts can be used in different level of details which gives an opportunity to see the whole process or concentrate on some current steps of the process.

Most flow charts consist of three main types of symbol: ovals which reflect start and end of the process; rectangles, which reflect some instructions or actions and diamonds, which show decisions that must be made. Explanation of every symbol

should be written nearby one. Symbols are connected one to the other by arrows, showing the flow of the process.

Flowcharts should be created answering questions like “what really happens in a process?” or “what is going after this or that step?”. Working on the flowchart person should always challenge it in order to get the most clear vision of the process. An example of the flowchart is listed below.

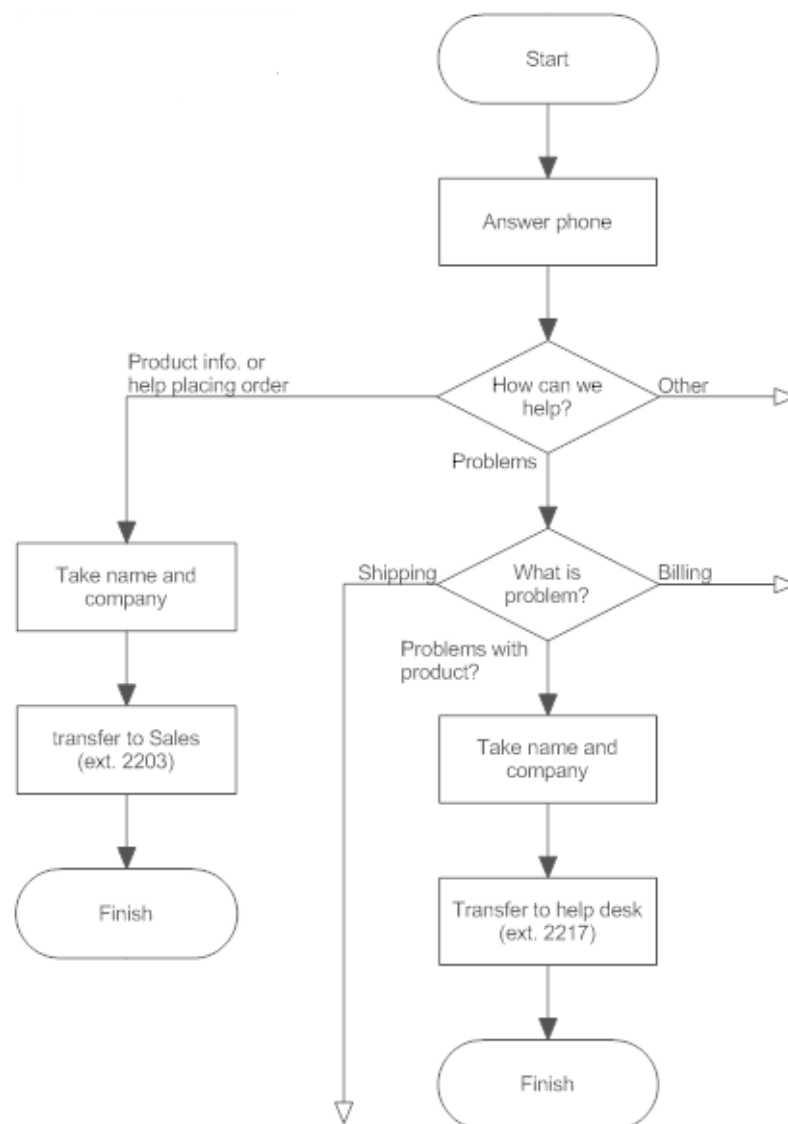


Figure 1. Flowchart (Source: Giaglis, 2001)

In spite of the fact that flowcharting has several advantages (e.g. it is familiar to majority, it is usable and there are a lot of program applications provides flowcharts as a descriptive instrument), flowcharting is no longer a dominant modeling technique because it can provide only basic facilities in representing processes. (Giaglis, 2001) Therefore, flowcharts are nowadays typically used as a graphical addition of the process description and just support narrative part when it becomes complicated and difficult to follow.

IDEF Techniques (IDEF0, IDEF3)

The IDEF (Integration Definition for Function Modeling) family of modeling techniques was developed as a set of notational formalisms for representing and modeling process and data structures in an integrated fashion. (Giaglis, 2001). It consist of several techniques such as the IDEF0 (Function Modeling), IDEF1x (Data Modeling), and IDEF3 (Process Description Capture). Here I will describe IDEF0 and IDEF3 because they are mostly related to business process modeling.

The IDEF0 method is available not only for modeling business processes, but for modeling of any action. According to information from official web page of standard, every process consists of:

- Inputs: raw materials, information.
- Controls: standards, procedures, techniques.
- Mechanisms: equipment and personnel
- Output: products, new information.

All these things presented like arrows which go to (or in case of output go from) the box called manufacturing function. This scheme is presented on a picture below.

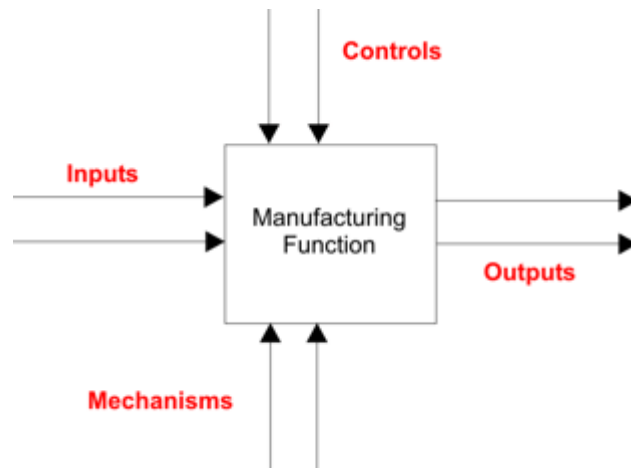


Figure 2. IDEF-0. (Source: *Integrated definition methods, 2010*)

In order to make more the model in greater details, we can split an operation to sequence of operations, which go one by one and an output of first operation is an input of second one etc. IDEF0 is not the only way to make a model of business process, however, other ways are similar and therefore there is no reason to stop on.

Despite its advantages, IDEF0 presents some crucial limitations which can make the technique unsuitable for process analysis. More specifically, IDEF0 models are static diagrams with no representation of time. Also IDEF0 models are unable to represent the behavioral or informational modeling perspectives.

To overcome limitations of IDEF0 the IDEF3 has been developed. IDEF3 describes processes as ordered sequences of events or activities. As such, IDEF3 is a scenario-driven process flow modeling technique, based on the direct capture of precedence and causality relations between situations and events (Mayer et al 1995). Saying "Scenario" we will mention a description of a

consequently changes of object properties in limits of a current process.

There are two types of diagrams used in IDEF3: Process-Flow diagrams describe flow of activities within a process and Object State Transition Diagrams show condition of the object in every stage of process and its transformation during the process flow. Examples of these diagrams for one process are situated below.

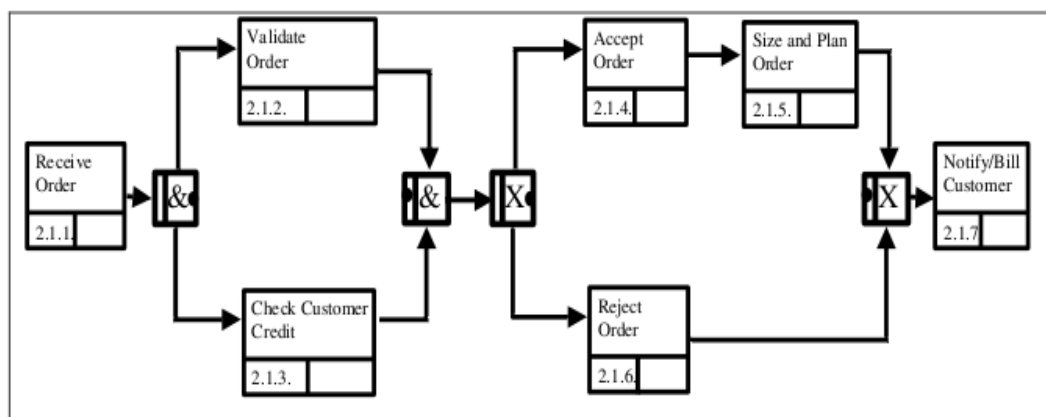


Figure 3. IDEF-3 Transition diagram. (Source: Giaglis, 2001)

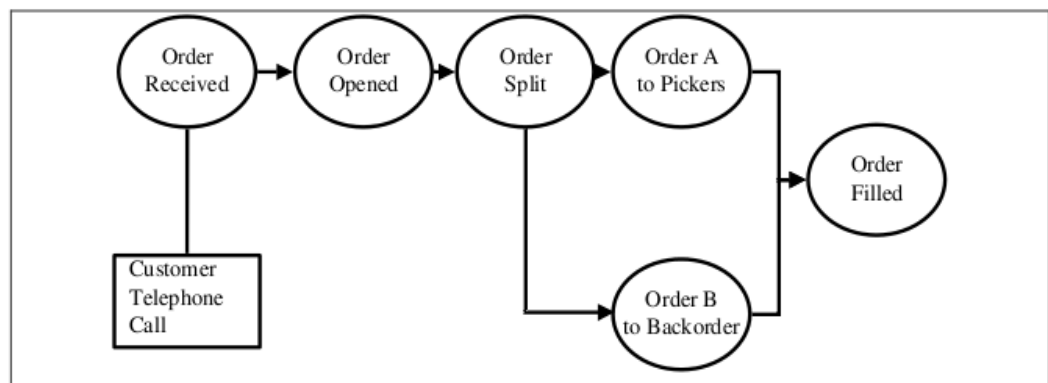


Figure 4. IDEF-3 Process diagram (Source: Giaglis, 2001)

Simulation

Typically simulation is used in business process modeling when the system is not easy to study directly. (Giaglis, 2001). Sometimes the best option for studying current business process

in an indirect studying by creating the simulation model, which is sufficiently similar to the real-world system. Information which can be learned from the model, if it has been made properly can also be applicable for the real system. Simulation can have many forms (e.g. continuous simulation, discrete-event simulation, system dynamics, Monte-Carlo simulation, qualitative simulation, etc.). In relation business process modeling discrete-event simulation and system dynamics seem to be appropriate, and therefore will be reviewed here.

Term Discrete-event Simulation is defined as “the process of designing a model of a real system and conducting experiments with this model for the purpose, either of understanding the behavior of the system or of evaluating various strategies (within the limits imposed by a criterion or set of criteria) for the operation of the system”. (Shannon, 1975). The term was historically fixed to modeling of systems of service of streams of objects of some nature: clients of bank, cars at gas station, telephone calls, patients in polyclinics, etc. such systems are called as systems of mass service. Using the discrete-event simulation person may split the process on stages and make a model which can help to understand bottlenecks of the system. Discrete-event Simulation is realized in system GPSS (General Purpose Simulation System) and a number of other programs e.g. GPSS/PC, GPSS/H, GPSS World, Object GPSS, Arena, SimProcess, Enterprise Dynamics, Auto-Mod, etc.

System dynamics is an approach of imitating modeling, which allows us to understand structure and dynamics of difficult systems. Also system dynamics is the method of the modeling used for creation of exact computer models of difficult systems for further use for the purpose of designing more effective organization and policy of interrelations within given system. Diagrammatic representations of systems dynamics models are based on cause and effect diagrams and pipe diagrams. The

purpose of these diagrams is to allow mental models about system structure and strategies to be made explicit. This approach is widely used nowadays. An example of diagram is illustrated below.

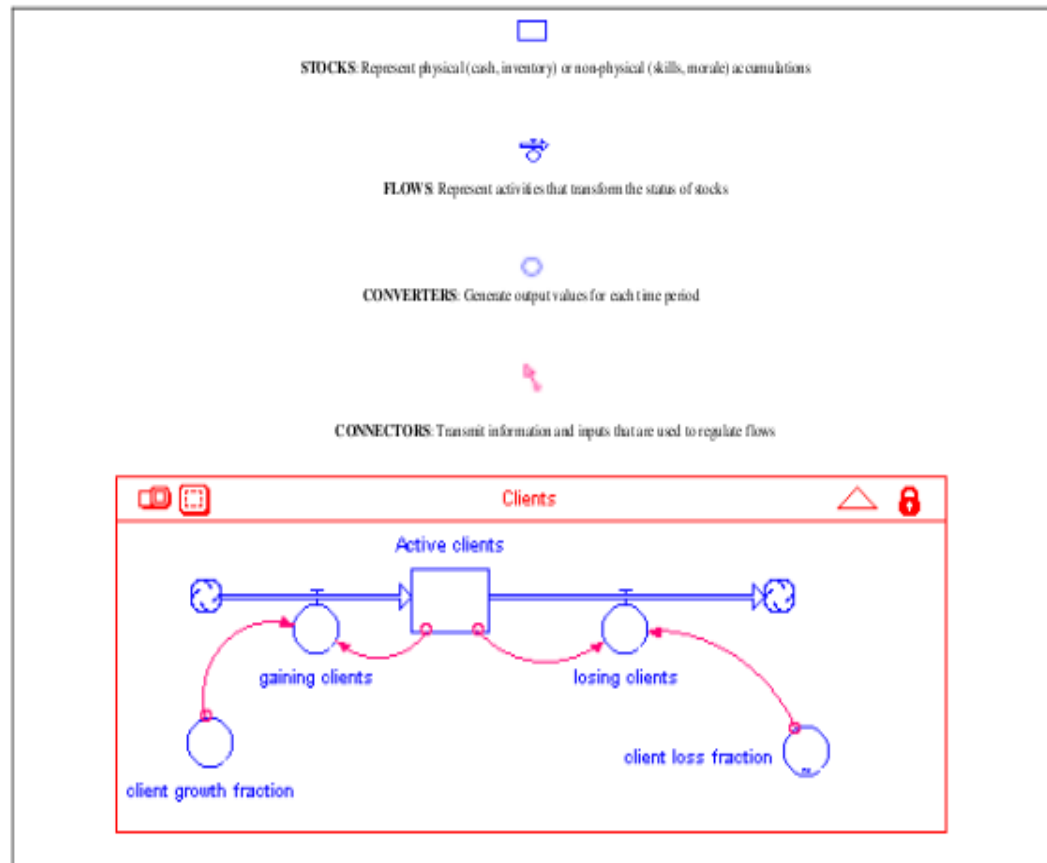


Figure 5. Simulation (Source: Giaglis, 2001)

Despite its advantages, system dynamics as a BPM technique has a number of limitations. Firstly, it places a great degree of expressiveness on feedback and control processes, which may be of limited importance in many practical situations of business modeling. Secondly, modeling is essentially deterministic and hence unable to cope with the stochastic elements that are so frequent in real-world business processes. Finally, “the technique’s limited range of primitive analytical constructs compels the analyst to adopt a specific approach which can sometimes limit the scope of analysis achievable” (Wolstenholme et al, 1993).

2.2.3. Pilot Testing

After project of business-process automation went through previous two stages and came to the testing stage, some gaps between the implemented solution and what the business wanted still can be discovered (Grandhi , 2009). Testing is a crucial step in the Develop phase. (Fried et al, 2005) It is such a stage of project when created solution is compared with business requirements. The International Standards Organization (ISO) describes testing as “Technical operation that consists of the determination of one or more characteristics of a given product, process or services according to a specified procedure” (ISO).

According to (Ford et al, 2008), the main advantages of using tests or partly implementation of process-automation while still using the existing system are following:

- Test helps in determination of bottlenecks in the automated process. Reducing these bottlenecks can give a serious contribution in the achievement of better results and can also decrease costs.
- Test helps in reducing potential errors (Jeston and Johan, 2008). Practicies of business-process automation shows that it relatively easy to detect typical errors which can occur most often even during the short period of a test stage.
- Test helps to identify potential risks of automation project. (Jeston and Johan, 2008) Clearly communicate potential risks with all parties of a process help to prepare them to possible negative outcomes.
- Test can help IT-department in step-by-step integration of a new solution to existing IT-infrastructure. Test launch can help to estimate potential load of hardware after full implementation of new system and form hardware requirements (e.g. need of new servers) (Jeston and Johan, 2008). Also step-by-step step

integration with legacy software help avoid potential system collapse.

- Project team can compare different solutions and decide which one is the most effective in this process.
- Executives can preliminary estimate results of an automating solution and this estimation can help to make final decision of implementation.
- Test can reduce implementation costs, time and prevent possible difficulties of the implementation process.

All the things mentioned above lead us to a thought that test stage is a significant component of business-process automation project which helps to improve project for a lower cost and decreases potential chance of project failure (Pol *et al.*, 2002).

2.2.4. Implementation And Customization

When the test phase is over, there is a time to start system implementation. Implementation is a main, and, often, the most time-taken stage. During the implementation stage project team customizes the system and adapts it directly to the business-process environment.

First of all, the clear implementation plan should be developed. It should contain necessary parts such as such as detailed hardware, software, and configuration requirements, preliminary deployment (test launch) description, and post-roll-out feedback and follow up. (Chernikoff & Perschke) All the hardware environment such as network servers, storage, utilities etc should be carefully inspected and prepared to launch. Develop and follow preliminary deployment checklists and procedures. In order to create good relationship with end users and other non-IT personnel related to the project, project team has to work with business executives in order to make clear scheduling for implementation of each step of business-process automation solution.

Creating job descriptions - written explanation of a job and the types of duties the job involves (Spitzer, 2007) - is a stage which often can be ignored by business executives, who require to go immediately to personnel training. However, clear job descriptions will simplify training and implementation process - it will be easier for everyone: business executives, end users and project team. Creating job descriptions and customization can be paralleled though.

One more thing project team should focus on is a training: "without proper training, users who do not understand the new process can quickly derail its success" (Chernikoff & Perschke).

During the implementation of BPA re-engineering and restructuring always takes place. It means that personnel will have to work in a new way. And the problem here is not only need to notify them and teach them to work in new environment. Main and, perhaps, essential covers in overcoming psychological rejection of changes and building a positive attitude towards changes. In other words, the human factor should be taken under consideration. In order to simplify training, the pilot group of lead-users which was involved to the testing process, should act as intermediaries between project team and end users assisting them in a training.

At the final stage in order to be sure that BPA project was successful, it is highly recommended to start measuring new processes and compare results with processes as they were before automation.

Carefully designed and tested solutions can start KPIs such as process time, number of errors and costs almost immediately after implementation. (Chernikoff & Perschke). And the sure that BPA project was successfully finished and result were achieved can motivate company to further automation based on previous experience.

Typical BPA life-cycle is presented on a picture below.

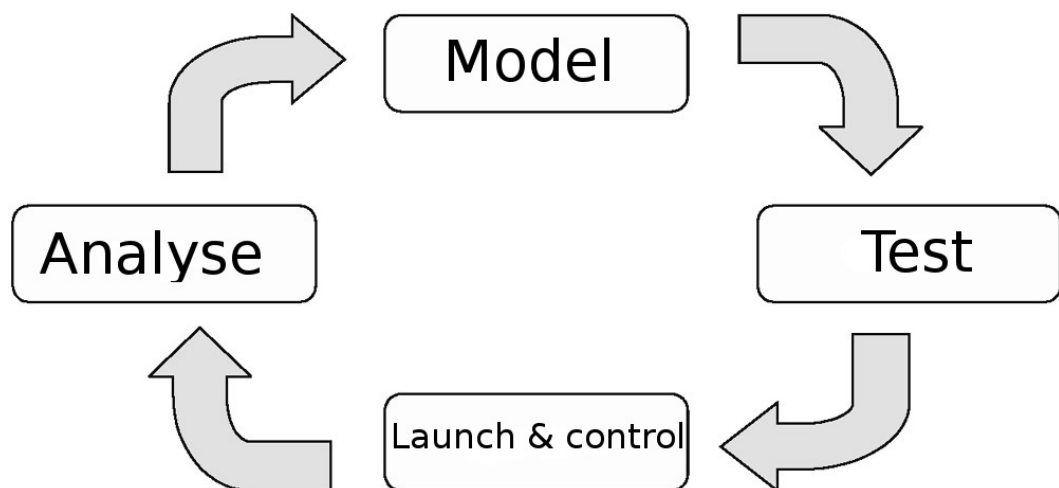


Figure 6. BPA life-cycle. (Source: Hillson, 2009)

2.3. Implication of BPA

All the processes which are needed to be automated can be split in two classes: The first class contains processes which common to all companies: standard business processes like help desk support, customer service, human resources hiring and termination, filing expense reports, or making sales calls. (Interactive Intelligence). The second class of activities is industry specific: Insurance companies process requirements, hospitals database of health-care records, banks process of credit applications and so on. Later on I will describe benefits which process automation gives to a company.

Reducing the impact of human error

There are some operations in office routines, where BPA offers a great opportunity to improving these processes. Especially BPA needed in repetitive processes where human input is critical. Identifying and automating repetitive and error-prone manual tasks with BPA has multiple benefits. (Chernicoff & Perschke) First and outstanding, BPA decreases human participation in those processes, and therefore reduces many errors. Automated processes won't skip steps, get upset, bored, or tired. They also frees up personnel whose time was previously reserved by repetitive tasks and allows them to put their efforts on higher-value activities where there is no what to handle without human input. In some cases BPA frees-up a resource entirely, which saves the cost of an FTE.

Transforming data into information

Most organizations have huge volumes of data and unfortunately all these data can be turned to diminutive volume of useful information, so they are data rich and information poor (Technology Executives Club). With BPA, IT can create automated

workflow processes that go beyond collecting and storing data (Chernicoff & Perschke); a well-understanding BPA solution is also able to analyze data and turn it in such forms which can be useful for decision-making. Good BPA tools have user-friendly graphical interface which allows to view on-line all the process related to data.

Improving collaboration and information sharing

It often seems as though IT and business are separate islands in a vast sea, interconnected only at the fringes, with much effort expended to perform identical or similar tasks (Chernicoff & Perschke). BPA is able to improve cooperation and information sharing within the company in order to help in achievement of business goals. Automated processes in any business unit are by definition more opened and favorable to knowledge-sharing. BPA is mutually beneficial deal for both IT and business sides of a company. This is especially true when business managers taking part in BPA process and when all the BPA tools have common interface. This common interface is best implemented with a user-friendly graphical interface (GUI), which represents streamline of all the operations and doesn't required IT skills in order to work with it. With an interface mentioned above, well-made BPA tool make it ease to automate business processes and interconnect business and IT logic of the company. And the output of this collaboration is an automated process which satisfies business and IT managers.

Optimizing workflow processes

No single application can support all processes (Chernicoff & Perschke), therefore many IT-departments managing plenty of applications in order to satisfy business needs. However, IT-departments are often facing a problem of interconnection of those applications or application servers. This situation becomes

a big challenge for IT-staff. BPA solutions provides for optimizing workflow processes by automation and connection different applications, services, and tasks. Complexity of these solutions vary from which are delivering reports to end-user to ones which performs an order of interconnection of data from different applications to a big whole without human input. Also difficulty of BPA solution depends on a point of application - it can optimize low-level processes as data backups or any high-level business processes.

Information latency an improvement IT-response time

There is a negative effect of information latency on business performance. Besides data quality, the effectiveness of decisions companies are dependent upon another variable: time. (Bonham, 2008). After a business event happened, the added value of a reaction on this event is decreasing over time. Consequently, it would be in very beneficial for business to reduce the time between business events and decisions made about them, even if the decision results in not leading to any action (Hackathorn, 2004). According to the author, there are three kinds of latency occurred: data latency, analysis latency, and decision latency.

Data latency: nowadays all the process connected with data like extracting, cleansing, consolidating, or analyzing data from different independent databases can take hours. Because the process of uploading data into data warehouses takes a long time and therefore can slow down operational systems, this process is usually take place during off hours (e.g., at nighttime and on weekends). It means that if a business event occurred at the morning, systems-provided data wouldn't be available to managers who makes decision until the next morning (i.e., it is a 24 hours hold-up).

Analysis latency: In the early days of analytical systems, data analysis was "hard coded" to the needs of the executives.

Latency came there when those needs shifted frequently and executives had to wait for manually-made analytical reports to be in a table. To allow more flexible and scrupulous data analysis, some BPA tools like standard middle-ware languages and complex analytic packages were developed in order to improve data-analysis options. These new technologies allows for plenty of operational data that is stored in data warehouses to be quickly transformed to information.

Decision latency: As soon as analytical reports is presented to a manager, decisions should be made. In this stage the contribution of automation is much lower than in previous two. However, there are some BPA tools like business activity monitoring (BAM) software which specializes at reducing decision latency.

Many factors play role in determining IT response times. Any process is only as strong as its weakest link (Chernicoff & Perschke). Ready-to-use complex applications and latest-fashion hardware—or even billions of IT-staff can be helpless in a weaknesses that may be lurking in the process cycle. These weaknesses could be boiled down to a single point of failure like a task which does not complete before the next one starts. Failure of a single task could potentially create a domino effect that ends up causing a failure of the overall process cycle and therefore results increase in response times. The challenge then is to create a solution which will exterminate potential bottleneck.

The nature of information latency is presented in a picture below.

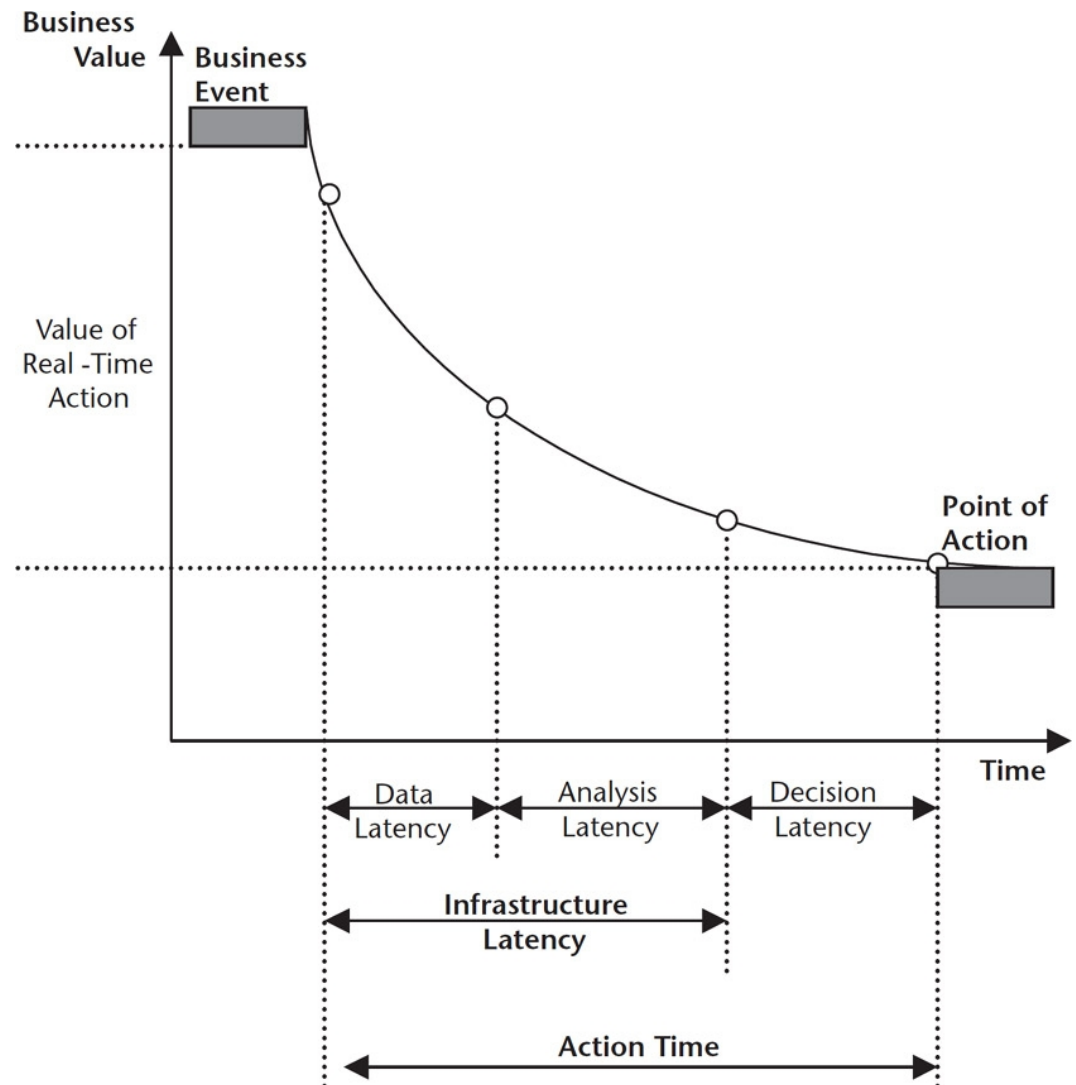


Figure 7. Information latency. (Source: Hackathorn, 2004)

2.4. BPA as a project

In spite of the fact that the automation is a continuous process, it can be successful only if this process is separated by concrete pieces – automation projects. In order to better handle the every piece, the project management approach should be applied for it. In this paragraph I will provide a brief description of a project management theory.

Everyday activities and projects differ primarily in that operations are ongoing and repetitive while projects are temporary and unique. Examples of projects can be: development of a new

product, constructing a building or implementation of a promo action. Let us describe some general features of a project.

Timing: Every project should have a clear defined dates of it's beginning and end. The end reached when goals of a project can be considered as achieved or when there is a clear recognition that there is no beneficial way to get project goals to be achieved and therefore the project is terminated. The duration of a project can vary from several days to several years, however in any case it is finite. The finite nature of a project is also defined by environment of a project:

- The window of a market opportunity is limited, and therefore project is created in order to utilize this opportunity like developing new product or service which is needed to satisfy the market.
- The project team is created to a single project and, when the project is done, teams often get disbanded.

Uniqueness: Project is created for a purpose to do something that has not been done yet and, therefore we may tell that project is unique. Here I am not telling about total uniqueness because some projects may be very similar. For example, a lot of similar business processes has been automated, however every automation project has unique features because of company specifications: number and quality of personnel, type of core operations, scope of operations, end users, key customers etc.

Progressive elaboration: That means that project development goes step-by-step as a consequence of iterations. For example the overall project has just general features at early stages and becomes more and more detailed during the progressive elaboration.

2.4.1. Project management

PMI (2008) gives the following definition of project management: “the application of knowledge, skills, tools, and techniques to project activities to meet project requirements.” project consists of 5 stages: initiating, planning, executing, monitoring and controlling, and closing.

Managerial function in a project typically consists of: Identifying requirements, delegation of tasks, and keeping under control main project parameters such as scope, quality, time-line, finances and other resources and risks. In every single project weight of managerial attention to each parameter can vary. It is necessary to mention that those parameters should be considered as parts of a whole because of their interdependence: for example any increase of times most probably will give effect on budgeting.

According to Richardson (2010), “the project manager is a person assigned by the performing organization to achieve the project objectives. Project manager can use variety of managerial tools in his routines. However, tools never can be enough. In order to achieve best handling of a project, manager should have specific skills related to the field of a project (e.g. he or she should be good at sports if the project is related to building a playing field) In addition to that, manager should have competencies related to following characteristics:

- **Knowledge** - here we summarize everything manager knows about project management.
- **Performance** - how manager can apply his knowledge in order to achieve results.
- **Personality** - here we refer to manager’s quality as a team leader. Personal effectiveness of manager can be very good motivation for improvement personal effectiveness of every single member of a project team.

2.4.2. Project life-cycle

According to Richardson (2010), “project life cycle is a collection of generally sequential and sometimes overlapping project stages”. Every single project definitely has a beginning and end, however all the activities situated between them will vary widely with the project. The life-cycle is a kind of framework which leads managers and project team throughout a project.

No matter on scope and area of the project, there is a typical structure of a project life-cycle: project start, organization and preparation, carrying out the project and closing. This general structure often used during the negotiations with executives (or clients) that are less competent in project features. This level of detailed elaboration can be useful in presentation of every project.

In spite of the fact that every project is specific and unique, there are some general features which can be related to all projects:

Cost and staffing levels which are not that high in the initial phase, getting higher during the project until the peak, and then they drop rapidly in a finish stage of a project.

Stakeholder influences, risk, and uncertainty, achieve its' maximums at the beginning and then goes lower and lower during the flow of the project. In other words project becomes less dependent on factors mentioned above and gets more and more power which helps it to be less attentive on external factors.

Stakeholder's ability to influence on final features of the project's output spending low quantity or resources is highest at the begging of the project and then decreasing during the project flow. In other words cost the closer the project stays from the final, the harder and more expensive to influence on its output.

Characteristics mentioned above are presented in figures below.

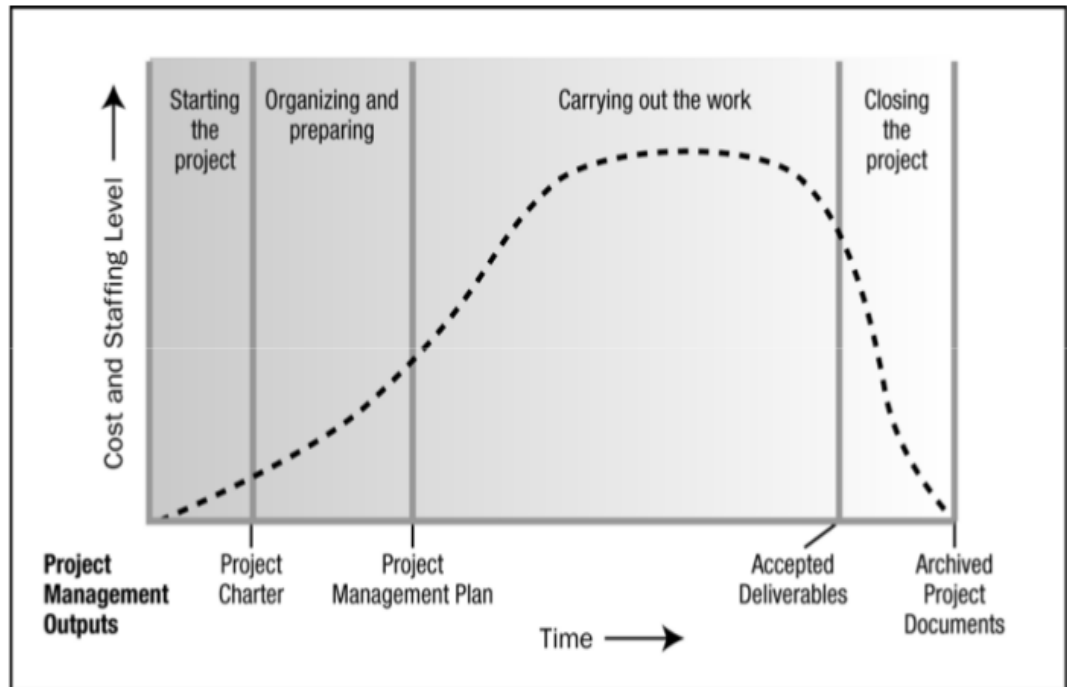


Figure 8. Project flow and efforts. (Source: PMI, 2008)

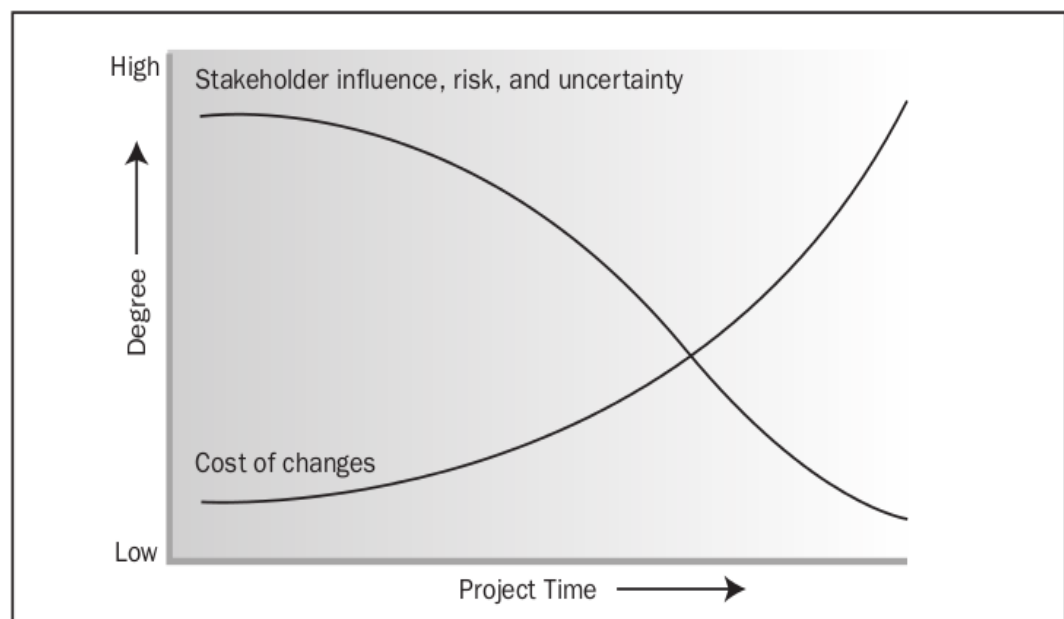


Figure 9. Project flow and risks and cost of changes

(Source: PMI, 2008)

2.4.3. Project management in BPA

There are two basic approaches on doing things in organization: regular-basic approach and project management approach.

According to Elliot and Mitchel (2009), “executing an automation project or the automation component of a large project without an automation project management as reckless as executing an engineering or construction project without a project manager.”

On a typical project, the overall project manager has to keep under control many different disciplines and functional areas that ultimately have to work together for the delivering of project outcome. Automation project activities begin at analysis and continue through implementation. However, the role of manager of automation project typically starts at business case development or project justification and those functions are outside the scope of the automation. Looking at the list of activities that fall under automation, it is easy to see that the scope of automation spreads across many fields of IT and business architecture.

In order to automation success it should be considered as a project and only as a project. And therefore project management techniques should be applied during the automation. Main project management techniques are presented below.

Project scope management

According to PMI (2008), “project scope management contains the processes required to be sure that the project includes all the needed work and only, to complete the project successfully”. It consists of the following:

- Collecting project requirements — here project manager should define and carefully document needs of all stakeholder of a project.
- Defining project scope — here project manager should carefully describe the detailed scope and output of a project.
- Creating work breakdown structure —here project manager should create a hierarchical structure of a project in order to split

it into smaller and therefore more manageable pieces.

- Controlling scope — here project manager should monitor and control the execution of things mentioned above and manage possible (or inevitable) changes of a project scope.

Project time management

According to PMI (2008), “project time management contains the processes required to manage timely completion of a whole project as well as timely completion of each stage of a project”. It consists of the following:

- Defining activities— here project manager should identify all the specific actions should be done in order to complete the project outputs.
- Sequencing activities — here project manager should identify and carefully describe interrelations between all the actions.
- Evaluating activity resources — here project manager should evaluate the sort and number of different resources which are required to fulfill every single activity.
- Evaluating activity duration — here project manager should evaluate (as sharp as possible) time needed to fulfill every single activity with existing resources.
- Developing schedule — here project manager should analyze order of activities and confront it with time and resources needed to fulfill each one and then create a schedule of the whole project. Here it is necessary to understand which activity can be started only after another one is already done (i.e. when output of first activity is an input of second) and which ones can be paralleled.
- Controlling schedule — here project manager should

monitor and control the execution of things mentioned above and manage possible (or inevitable) changes of a project schedule.

Project cost management

According to PMI (2008), “project cost management contains such a processes like estimating, budgeting, and controlling costs that way that the project can be completed within boundaries of the approved budget”. It consists of the following:

- Estimating costs — here project manager should estimate all the monetary resources needed to fulfill the project.
- Determining budget — Here project manager should split and prove estimated costs for every single activities and thereby spread costs through the project time line.
- Controlling costs — here project manager should monitor and control the execution of things mentioned above and manage possible (or inevitable) changes of a project budget.

Project quality management

According to PMI (2008), “project quality management includes processes and activities related to quality policies, targets and responsibilities in order to satisfy project needs as full as possible. It consists of the following:

- Planning quality — here project manager should define all the project and output issues related to quality and carefully note it in project documentation.
- Performing quality assurance and controlling the quality — here project manager should monitor and control outputs of each activity of a project related to quality issues mentioned above and manage possible (or inevitable) changes of a quality

requirements of a project.

Speaking about issues related to quality management manager should focus on following principles defining quality measures: first of all quality of an output should satisfy customer requirements, secondly quality measures should be proactive in order to reduce extra activities related to corrections and mess, thirdly quality issues should motivate project team to continuous improvement and finally it should be defined beforehand who is responsible on every quality issue.

Project human resources management

According to PMI (2008), “project human resources management contains all the issues related to the project team”. It consists of the following:

- Developing human resource plan - here project manager should define what human resources needed to a project and correlate these needs with number of people, their skills needed to work out every project stage, mentions connections between parties and carefully describe it in a project documentation.
- Attracting project team - here project manager should attract needed human resources and make it sure that all of them will be available to be involved in a project in necessary degree.
- Developing project team - here project manager should turn a group of people to a team in order to obtain synergy effect and develop competencies of every member of a team through organizational learning.
- Managing project team - here project manager should keep track on a team performance and provide necessary feedback during the work on a project. In case of possible (or inevitable) needs manager should make changes in a team structure.

Project risk management

According to PMI (2008), “project risk management contains all the issues related to increasing the probability and contribution of possible positive events and decreasing the probability and contribution of possible negative events related to a project.” It consists of the following:

- Planning risk management issues and identifying possible risks – here project manager should determine possible risky events, create an instruction related to these events and carefully describe it in project documentation.
- Performing qualitative and quantitative analysis of risks – here project manager should analyze impacts of possible risks and present results in numerical and non-numerical characteristics.
- Planning risk responses – here project manager should clearly define scenarios and action plans which helps to increase probabilities to decrease negative impacts of risky issues. For example in case of shortening project he should define some project actions which are optional to skip without considerable negative effects to a project outcome.
- Controlling risks – here project manager should keep track on a risk plan, control implementation of a risk scenarios in case of occurrence of risk potions, identify new risks and evaluate effectiveness team work with risk scenarios.

It is necessary to understand that all the processes mentioned above are interrelated to each other and also to processes from other fields of project management. In spite of the fact that every process has clear frames, processes can be overlapped as well as they can be separated.

Concluding the paragraph I want to add that project-oriented approach is not a general solution for BPA success. However if

project-oriented approach will not be implemented, it will most likely lead to project failure.

2.5. BPA software

Business process automation is usually connected with some software solutions. First of all, there is a question, what to prefer – find software which reflect all company needs if it exists or to make software from scratch? Is there anything in the middle of those two approaches?

A piece of software can be unmodified, so-called plug-and-play solution, solution which is needed to be customized from system requirements or a solution totally created for a single problem (Webster, 2008). Those options vary from the following perspectives.

- **Cost** - acquisition and installation of box-solution software is most likely cheaper than development and installation of equivalent custom software. Company can even install free trial version of some software products or even use it for free if the number of users is small enough. However in case of self-development nobody will provide free trial. One more issue here is that if company decides to develop own software, it has also to invest resources to maintain and update this software while in case of purchased solution it's provider will care about this. (though after some time company will have to pay for updates)
- **Sustainability** - purchased software, even customized, will probable less satisfy firm' specific requirements than developed specially for this purpose software. One more assumption here is that this software is exist. Therefore company may spend time to find some software solution, customize it and even then it will not work as it needed. Developing software gives assurance that this software will

clearly reflect company's needs.

- **Time** - a purchased software can be installed and launched almost immediately. If it is customized software, it will take some time and finally specially developed software is the most time-consuming option.

Criteria mentioned above are illustrated in a diagram below.

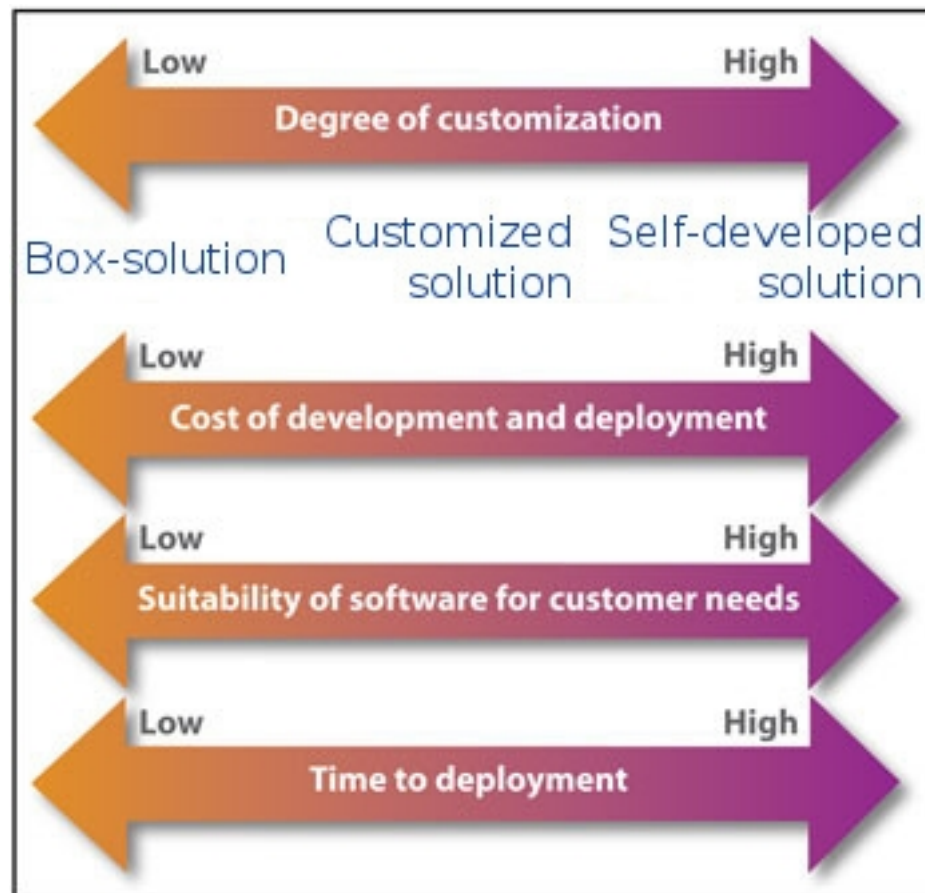


Figure 10. Software in BPA. (Source: Webster, 2008)

There is no single answer what type of solution is best. However except of criteria mentioned above, also firm IT-capabilities should be mentioned. Creating own software factory is a very complex process especially for non-IT company. One more factor against self-development is that there are many solutions for typical business processes like accounting, customer relationship etc. However, in some cases exclusive software can stay a firm's competitive advantage.

2.6. BPA and outsourcing

2.6.1. Outsourcing

Outsourcing - “the contracting or subcontracting of non-core activities to free up cash, personnel, time, and facilities for activities in which a company holds competitive advantage” (BusinessDictionary). Non core activities at definition above are equal to support activities in Michael Porter’s theory discovered in earlier paragraphs of the paper. As we may see from the definition, companies starts outsource their activities because they find it beneficial. Bragg (2006) described following advantages of outsourcing:

- **Attracting new skills** - because companies are physically unable to specialize in everything, there is no option to be perfect in all the activities related to its’ business. Therefore skills of some employees may be not sufficient to handle some activities in best way. Therefore company can attract skills and experience of employees of companies which specialize on activities they have been attracted for.
- **Attracting better managers** - sometimes skills of in-house staff are sufficient, however it can be the problem which is much harder to decide - poor quality of management. In this case outsource a function can be an option. One more option here is to outsource managers.
- **Focusing on strategy** - if company decided not to outsource any activity, its managers should handle a plenty of functional, or so-called tactical issues all the time. In this case outsourcing some functions will help to unload managers and give them time and effort to focus on s strategic issues related to business which are much more important for competitive advantage.

- **Avoiding volumes of investments** – some functions can be inefficient in company because a nature of these functions is such that it requires huge volumes of investments. For example IT function is required to update software and hardware. Outsourcing such functions will help company temporarily avoid these investments, however keep function in a level required to survive in a market.
- **Handling rapid growth** – if a company staying in a situation of a rapid increase of market share, it can be challenging for the organizational structure to react on a rapid growth. Outsourcing can help to handle activities which have such a nature that they are changing qualitatively because of changing of scale.
- **Handling seasonal peaks** – some businesses has such a nature that demand is highly influenced by seasons (e.g. flowers retail). In this case company infrastructure may stay unable in seasonal peaks, or, vice versa, may stay useful in slow seasons. In this case short-time outsourcing of some support (or even core) activities may optimize infrastructural costs.
- **Reducing costs** – all the companies try to reduce their cost because it is a way to increase overall profit. Reducing costs by outsourcing is possible when outsources can offer cheaper price because of usage of scale effect. Also last decade outsourcing to Asian countries became popular because Asian companies can attract qualitative personnel for much lower costs than in developed counties. Also better performance control which can be achieved only when the activity is a core for a company can reduce service price for customers.

There are much more advantages of outsourcing then I described here and every outsourcing company can provide plenty of them in their advertisements. However there is a reasonable question – what is the other side of the coin? Cobbert (2004) and Bragg

(2006) have found risks companies may face when they decide to outsource some of their functions. These risks will be presented below.

- **Future changes in supplier circumstances** – supplier of outsourced function not depends on a company as much it may want and therefore it is unable to impact on it's strategy. And here is a risk that outsourcing company may face financial difficulties, or it can change it strategy in unbeneficial way or even will not be able to provide required service in a future. This risk may be lowered in case of continuous monitoring situation of the outsourcing company.
- **Loss of control** – when some processes of a company are outside-the-house, there is much harder to control them. So company may see only output of a process but do not see how it really works. Furthermore in this case it will be much more challenging to fix the situation if something will go wrong.
- **Loss of flexibility** – when company decides to outsource some function, it becoming dependent for an outsourcing company, its procedures and rules. Also the longer is outsourcing relationship, the higher is the cost of shift outsourcing partner of coming back to self-service. In last case complexity of issue might be increased due to reasons of possible reduction of specialists or their occupancy in other activities.
- **Negative costumer reaction** – some costumers may have negative attitude towards outsourcing because of the high appreciation of a brand before – they may argue that outsourcing may decrease quality of the end product or service which company delivers to a market. Also in case of outsourcing abroad social responsibility issues may take place because some of customers may be patriotic (e.g. lowers of U.S.-made cars). In case of great reductions of workforce in some locations company may even have negative attitude from all the local community.

- **Employee resistance** - outsourcing may affect on job status not only for employees, but even on job status of middle and upper managers who was responsible for that function before outsourcing. In this case outsourcing process may face barriers created from company personnel.

In spite of all the risks mentioned above, outsourcing market nowadays is valuable. And any company successfully implemented outsourcing will continue outsource other functions. Typical outsourcing path is presented at a graph below.

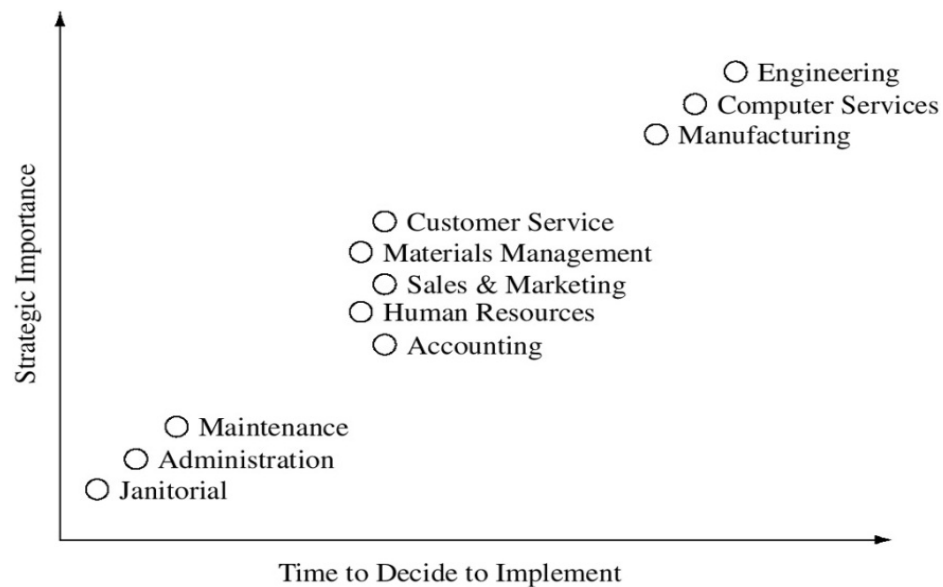


Figure 11. Outsourcing path. (Source: Bragg, 2006)

2.6.2. IT outsourcing

Kendrick (2009) gives the following definition of IT outsourcing: “IT outsourcing involves an organization contracting out services to a supplier to be performed to agreed levels over a set period of time.” Another, but very simple definition of IT outsourcing refers to “the outsourcing of IT processes to produce IT-related products and services” (Elschinger, 2007). The market value of IT outsourcing is more than the market value of outsourcing of any other functional area (Bragg, 2006).

There are number of functional areas within a scope of IT

outsourcing: data-center management, application services, network services, system maintenance, technical support, application development etc. (Corbett, 2004). Let us briefly go through benefits and risks which are common mostly for IT outsourcing.

Benefits

No matter what the company is, when it prefers to outsource some of its IT function, some benefits are expected to achieve. Those benefits may be one of following:

- **Competition** - in this case experience and knowledge of IT-service provider can offer competitive advantage to the firm.
- **IT changes** - outsourcing strategy may lead firm to significant change of its business. Other situation that the market where company operates requires innovative IT solutions in order to satisfy customer needs. In case of outsourcing strategy company becomes more agile in this way.
- **Responsibilities** - in spite of the fact that firm may feed it's own IT department, sometimes it is hard to achieve good-quality result from it. In case of outsourcing strategy parties sign so-called service level agreement (SLA) - which reflects needed level of quality and financial commitments of vendor in case of SLA failure.
- **Cost of changes** - in spite of all the difficulties related to IT, company may somehow manage the maintenance of IT infrastructure. However, IT has a very dynamic nature, therefore IT facilities sometimes (and not as rare as companies would like it to happen), IT systems needed to be updated. In this case companies may attract outsource specialists to transit a company to new IT system.

Risks

- **Data security** - the most important risk in IT-outsourcing.

The key word of IT is information. No matter what function from IT will be outsourced, it means that outside people will have an access to some company data. This risk is strictly related to intellectual property, confidentiality and commercial classified information. This is the most important issue against IT outsourcing.

- **Existence of business** - because business functions getting more and more dependable from IT, the power of can be so high that breakage of collaboration between vendor and company may be a serious threat to very opportunity of keeping the business alive. Also such a high power of vendor may create a situation that vendor will increase prices and company will have no other option except of being robbed.

2.6.3. IT-integrators

According to Prencipe, Davies and Hobday (2004) IT-integrator is “a company that builds computing systems for clients by combining hardware and software products from multiple vendors”. This definition reflects that IT-integrators combine and customize solutions for companies from all the available software in order to satisfy customer requirements (in our case - to achieve automation project goal).

In previous paragraphs stages of automation projects were disclosed. As it was written there, BPA projects start from analysis of current business processes and then go throughout all the stages to the project final. And there is a question - IF company decided to collaborate with IT-integrator, when this collaboration should start? According to I-teco (2010), collaboration should start from the very beginning o the project. IT can decrease the probability of wrong definition of project goals. IT-integrator should take part in requirement specification

development, and it is obvious that understanding of business processes is needed for that.

Consulting and Integration

According to Reinolds (2002), the first outside partner in BPA is a consultant. Consultant might help to improve the project outcome. However, some companies separates IT-consulting and IT-integration and others prefer when those actions are interrelated. Let us briefly describe what lies behind these two approaches.

In case when those two things are separated, consultant do not have a direct interest to recommend concrete solution for implementation or at least this interest is not uncovered - however it is not uncommon when consultant receives a commission from vendor. But here I have to mention that consultant is out of responsibility for recommendation he/she gives.

Advantage of second approach is that in this case there is no separation of responsibilities: if one company has developed and implemented an automation solution, there is no other intermediary who can be faulted for project failure. However, if IT-integrator will control the whole process, there is a risk of dependence of this IT-integrator. However the direct interest in recommendation the most expensive solution in this case is obvious.

Speaking about consulting, we have to understand that process automation consulting is rather business-consulting, than IT-consulting because business process automation is first of all about business.

2.6.4. IT-integrators and BPA project team.

Speaking about advantages and disadvantages of collaboration with IT-integrators, they are basically the same as for all other outsourcing and IT-outsourcing activities. Here we have to mention that if some processes can be outsourced completely, BPA is impossible without collaboration of all parties involved.

First of all, for project success it should be project leader – person from client company who is responsible for the project and who has enough authorities for making key decisions.

Secondly, almost every company has an IT-department – no matter what size is it and what functions it carries out. Automated solution will be somehow integrated to company IT-infrastructure and therefore collaboration between IT-integrators and internal IT-stuff is also needed. It can be mentioned many times that BPA is first of all about business, however pure technical problems can easily fail the project.

Thirdly, key users are also should be involved to the process. They are main benefit-takers from process automation and their underestimating of their role in a project can be costly for it.

Summarizing everything mentioned in paragraph, success in process automation will come with employing all the stakeholders the multi-dimensional and multi-departmental collaboration should be adopted. (Lientz, 2004). This collaboration is presented in figure below.

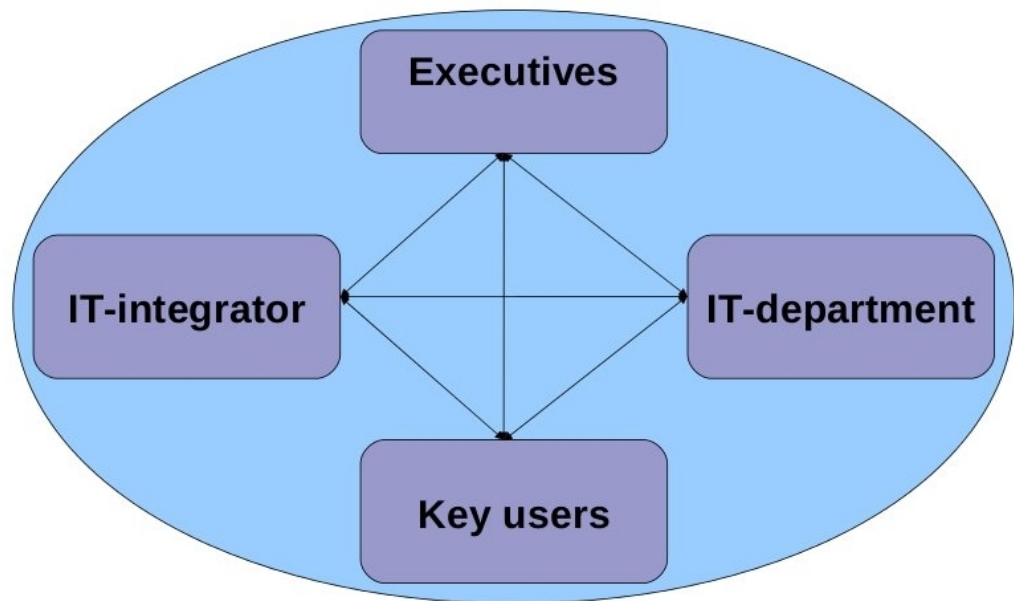


Figure 12. Collaboration in BPA. (Source: developed by author)

2.7. Chapter Summary

Business process automation was described in Chapter 2. All the important points about business process automation were presented in the paper: stages of BPA project, BPA implication, project management approach towards BPA and variety of software solutions which can be used. Also paper describes IT-integrators which are main stakeholders of BPA. Summing, this chapter fully describes business process automation.

3. BPA in small and medium enterprises

Business process automation can be very beneficial. It can be risky though. In this chapter I will discover what differ small and medium enterprises (SMEs) from big companies in context of business process automation.

3.1. SME peculiarities

Let us start from general definition of SME. According to European Commission (2011), enterprises can qualify as SME if they satisfy following criteria: total number of employees is less then 250, turnover is less then €50 million or total balance sheet is less then €43 million. Russian Federal Law number 209 (2007) defines small and medium enterprises as firms which average annual number of employees is less then 250.

Small and medium enterprises sufficiently contribute to economies of developed countries. According to European Commission (2010), “more than 99% of all European businesses are, in fact, SMEs”. They provide about 60% of job positions and more than 50% of total value-added created by business in the European Union.

In spite of the fact that value of SME is highly estimated by Russian government, it's contribution for Russian GDP is only about 13-17% (Alinga Consulting Group, 2008). It happening because the resource-based character of Russian economy and state monopolies (or so-called natural monopolies). Law, tax and other barriers lead to small development rate of Russian SMEs.

Let us describe what differs SMEs from Multinational Companies (MNCs).

First of all, in SME manager and owner is one person. This fact and generally more centralized management structure gives

following advantages:

- Decision-making procedures in SME are much simpler than in MNC. It gives additional flexibility towards MNC and therefore SME can faster respond to market changes. It allows SMEs faster enter perspective market areas and reduce unprofitable activities.
- Small business do not need complicated management, accounting and control system which gives sufficient economy on spent.
- Higher level of collaboration between workers and managers in SME helps to satisfy workers' needs and therefore flexibly react on those needs. It gives opportunity to save employee even for smaller salary. (Ong, Ismail and Goh, 2010)
- Back side of this coin is that centralized structure do not gives enough authorities to persons, who are not decision-makers. It means that in case if decision-maker is not available, some actions can be delayed for a long time.

Secondly, small and medium-sized firms definitely have less resources than large organizations. Resources in this case is much broader concept than monetary resources. It means following:

- SMEs prefer to employ generalists rather than specialist. It happens because SME may not have enough resources to attract capable specialists and also can not load them in full-time base (Thong, 1999).
- SMEs financial resources do not give them an opportunity for long-term goals and therefore they basically focus on short-term action which give profits faster. Therefore they mostly focus on tactics than on strategy.

3.2. IT-department maturity

In spite of the fact that nowadays everyone understand value of information technologies, research show that companies spend about 1% of turnover to IT. (Connect, 2004). And SMEs spent on their IT about the same percentage that MNCs. According to Nerenberg (2009), about 65% of IT-budgets go to necessary spent like updates, maintenance and others and only 35% goes to development. However, IT infrastructure should respond firm's requirements within any budget.

Companies and executives face with plenty of new requirements and some of them directly related to IT (Dittmar and Lee, 2006). It happens because structures and operations of companies are so complex that it is harder and harder to get necessary information on time. One more reason of new requirements is that IT infrastructure of the company should be up-to-date. (Dittmar and Lee, 2006) It happens because of dynamism of IT industry and because IT structure should be changed with changing of company's activities.

We can say that nowadays IT performance of company is important like never before. Several years ago managers didn't concentrate on IT that much because they didn't estimate contribution of technologies so high. However, because of mentioned reasons situation has directly changed and therefore business executives started to examine their business approaches concerning IT. (Dittmar and Lee, 2006).

In spite of the need of cooperation of IT and business, a lot of today's business leaders examine "black box," unsure of what happens within it and not particularly care to find out. (Battles et al, 1996). It happens because of some problems of successful IT implementation which I will describe later on. However, IT department should not exist in the company just by itself, but it

should be connected with other departments. Modern Information technologies and information systems created based on technologies became irreplaceable tool in achievement of strategically goals and sustainable development of the company (Zorya, 2010). But IT makes competitive advantages only if they implement appropriately. (Oborudovanie, 2008). And in order to provide such an implementation, cooperation between IT and business executives needed. Today's IT organizations have taken on new responsibilities that far transcend their traditional role of managing and storing data. (Chernicoff & Perschke) IT operations are now more created by, and being responsible to, higher-level business processes. IT manager which only cared about the status of network servers may now facing with customers or suppliers who can't access the company's Service Oriented Architecture (SOA). As the borders between business and IT processes continue to blur, they both need some tools which allow collaboration in creating effective workflows and re-engineering or abandoning ineffective ones. Business process automation (BPA) provides a key strategy for streamlining workflow processes and integrating business-side logic with IT tasks. (Chernicoff & Perschke). However, IT understanding of business needs depends on IT-department maturity.

3.2.1. IT-department maturity stages

According to Wiggers et al (2004) there are following stages of IT-department maturity.

IT as a facility

First stages called IT as a facility. As a rule, IT department born with an enterprise. This stage is a stage when there are just several computers in a company. The department consist of one

or two persons who handle everything, which is somehow connected with IT: computers, servers, telephony, cams etc. Other personnel calls them programmers and no matter what these persons really do. There is no spiting roles and every person do everything. There are no documents regulate activities of department, and responsibilities of workers also not defined. Statistical data about performance of the department in best case collected in heads of workers on intuition level. It leads to absence of risk management and therefore main task of department is liquidation of consequences of happened risks. By the way, nobody register these accidents and department doesn't see necessity of records: simple problems as usual solved immediately and complicated ones just postponed for best times. Informal help desk works on cafeteria and principle of personal connections plays one of the key roles. Quality of performance of the department fully depends on versatility of knowledge of staff and their willingness to do their best. Business executives estimate these quality by themselves (if my computer works well), mobility of staff (this person has been here ten times for today so it means that he works good). There is no budget of IT department, money invested when they needed. Business considered these spent are considered as a necessary evil.

IT as a service

Second stage of IT-department maturity called IT as a service. During enterprise development, IT system penetrates more deeply to business processes of enterprise and management start to understand that in case of failure in IT all the business of important part of it will be paralyzed. From this moment term "automation" stays the most important and IT department started to be controlled by executives or status of the head of the department growths to executive. From this moment IT

system enters to the next part of its development. Number of personnel grows, there is some separation by functional indication. Most frequently department splits in two groups: one group works with equipment and system software, and second one works directly with business applications. Documents which regulate activities of the department like official instructions, frameworks and so on stated to appear in this stage. This documents are rarely concrete and mostly contain general phrases about "support of network", "support of users" and so on. Referring to this documents, IT staff started to refuse to maintain coffee machines and other important elements of office wellbeing, proving that it is not about IT. Equipment and software started to be accounted within Excel or Access. At this stage mostly there is no concrete budget on automation, software procurement mostly is not planned, but depend on executives' mood and willingness. Absence of systematic approach leads to problems related to usage of new products because IT system is not ready to adoption. Company surrounded by big number of suppliers of IT services and IT products and there is a contract with every supplier, however, these contracts are read only in a stage of its' signing by head of IT department and then they are kept on a shelf. And work of suppliers is reminded only when some problems occur.

At this stage help-desks, which use simple automation tools appear. There is no quality estimation system because nobody know how to calculate it. As a rule, two simple methods are used: whether IT department estimates quality by itself, or some simple criteria like a number of applications to help-desk is used. The result is an absence of reliable information about performance of IT system as a whole.

IT as a partner

Third stage called IT as a partner. It started when business executives stop to count money spent on wires, servers, applications and start to ask totally different questions. How much it will be to reduce time of restoring of database to five minutes? How much will be 15 minutes of idle of sales manager? What revenue will we gain after implementation of distant client service? In other words, business requirements grow and IT department considered not as a service item but as a business unit and there is no development of business without development of IT. IT started to be considered not like the sum of single products and technologies, but like a system of informational services. The structure of the department started to change: instead of division by technologies there is a division by business technologies. There is a clear vision of IT department in an enterprise: firstly the document package defining list of services and level of support and quality of services created. Relationship with suppliers is also controlled in the ground of this package. The KPI-based system is implemented and this system defines quality of performance of the department and single persons in particular. IT investments started to be considered as general investments with all the consequences: decision of investments can be accepted in the ground of investment laws such as NPV. Risk management is also fully presented. IT department changes its focus from reactions to problems to predicting and pro-acting. Help-desk is functioning completely - the criteria of its performance is a response time and ability to predict system's behavior. There is a planing of IT development and furthermore, there are short and long-term plans.

IT as an enabler

Fourth stage called IT as an enabler. IT-department growths till this stage mostly in IT-related companies. At this stage IT becoming one of the core functions of the business. At this stage company's e-sales contains major part in total sales. Therefore IT-department works both with company managers and employees, and with customers. Therefore understanding and satisfying customer needs becoming a key responsibility of IT-department. (Wiggers et al, 2004)

IT-portfolio in this stages completely interwoven with the day-to-day activity of the business. Large percentage of the company portfolio consists of IT-based offerings.

At this level IT-department becomes full-grown profit center and it's operations related to discovering new markets which are unable to operate in without IT.

Evolution of IT-department maturity is presented on a figure below.

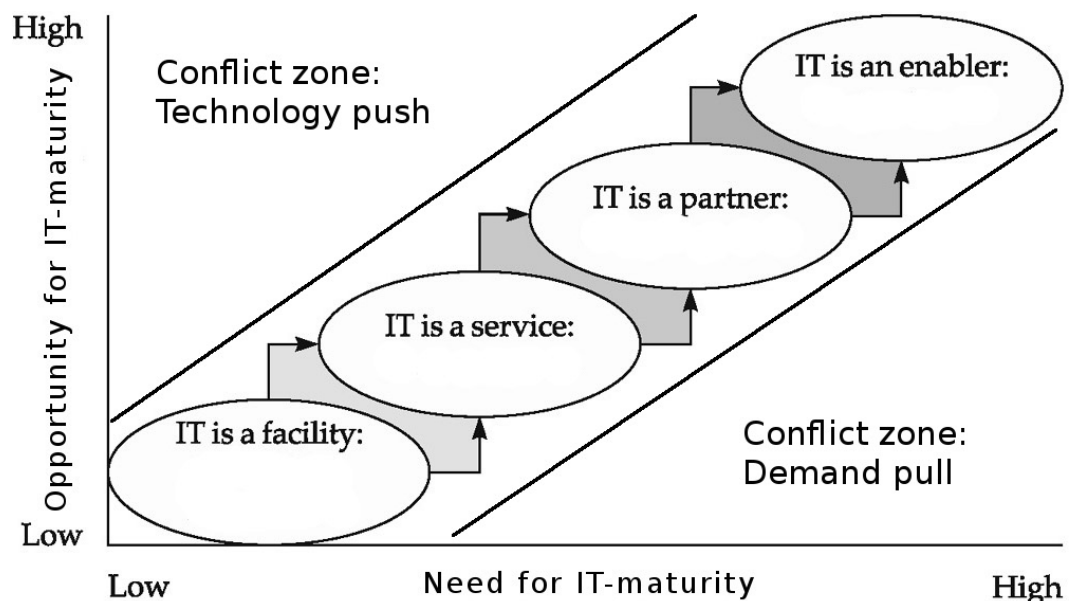


Figure 13. IT-department maturity evolution.

(Source: Wiggers et al, 2004)

3.2.2. IT-department maturity and BPA software solution

As we see from the picture, over-matured IT-department should be only when it is reasonable because in opposite way SME will stay in a situation of technology push, and if SME is not ready for this push, it is just extra pressure and waste of money. So let us get back to Paragraph 2.5. and answer a question: what kind of solution SME will prefer – box solution, customized solution, or fully in-home developed solution.

Paragraph 2.5. says in-home development provides solution which is going to fit all the business requirements and specifics. However this paragraph also stated that in-home developed solution will definitely cost much more and will take much more time. Furthermore, it is obvious that level of it-department maturity should be high in order to develop software for enterprise – IT-department should be as a small software factory.

Let us go to the problem from different point of view – some business simply do not need specified solutions. In other words level of IT-demand some SME is low because their operations can easily be standardized. (Wiggers et al, 2004). When SME playing in some small market niche with innovative or just unique product, their operations can be pretty unique and therefore software market can just not contain box-solution which could fit all the requirements of this kind of SME. However, if SME is not unique but basing their activities on some location (for example restaurant or corner-shop), there are a lot of this kind of SMEs worldwide and therefore the probability that there is some software solution which will fit their requirements is much higher in this case. Therefore this kind of enterprises have no reason to feed their own software factory.

Summing up everything mentioned above we can tell that decision about what kind of software solution to prefer generally

based on two criteria: IT-department maturity and level of activities uniqueness. Variety of decisions is presented at the figure below.

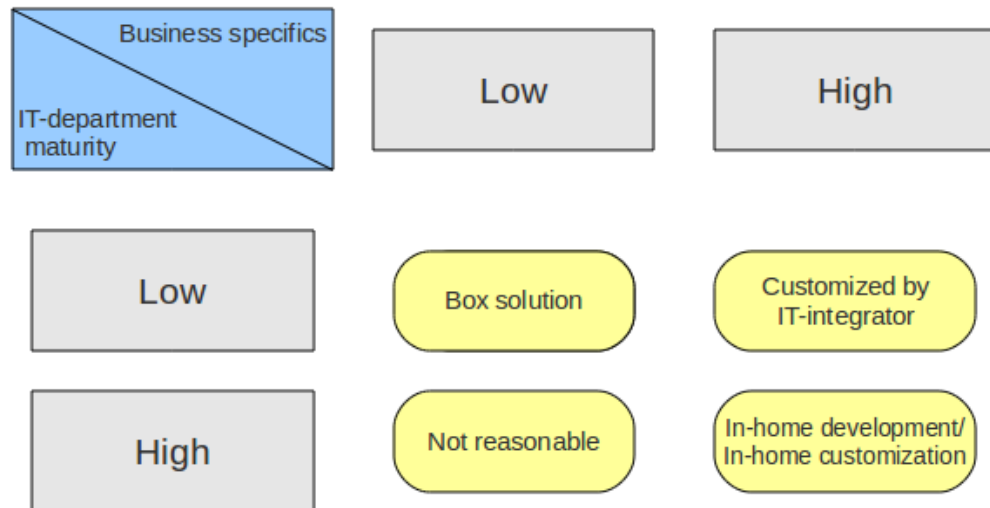


Figure 14. Variety of IT-decisions. (Source: developed by author)

3.2.3. IT performance measurement.

We may tell that measurement of IT-department performance is also related to stage of maturity of IT-department. Let us focus more on IT-department measurement.

It becomes challenging - to estimate efficiency of IT-department. (Khodyrev 2006). Actually everyone should understand that nobody can achieve on-line control of dynamically-developing IT structure (Battles et al, 1996). However, there are some general ways to evaluate how well company's IT department works.

In my research I will focus on non-IT companies - companies which are not focused their activities directly on sphere of information technologies, in their value chain IT department situated in supporting activities - activities which not gain profit. Therefore firm can build competitive advantage organizing IT-related spent more effectively. However, it does not mean that

company should focus only on cost reduction, but also on other performance indicators which will be presented below.

Being subjective, the business value of IT is subject to economic debate. The productivity paradox states that the enormous amount of money spent on IT has not been reflected in the productivity of labor. (Wiggers et al, 2004). Main problem here is that information technologies here are intermediaries and therefore they have indirect influence on business performance through business technologies.

First of all we have to recognize that there no unique recipe of chosen right metrics because every company has it's own tasks and expectations from IT-department. According to Aitken (2003), all the metrics can be separated in four spheres: cost efficiency, effectiveness, quality and value-added.

Cost efficiency: We can include here metrics about:

Supply economy: how economically the business can 'buy' IT products and services supplied by its IT function. An example of these metrics is a percentage of revenue spent on IT.

Buy economy: how economically the IT function can buy IT products and services from third party suppliers. An example is price of each server bought.

Asset utilization: how well company 'sweats' it's IT assets. An example is percentage of utilization of staff or computers.

Staff productivity – how much IT 'output' is produced per unit 'input'. For example, the number of project milestones achieved each month.

Effectiveness: We can include here metrics about:

Practice compliance: the level of compliance of IT working practices with best practice 'standards'.

Portfolio value: value of the total portfolio of projects to be undertaken. Here we measure how the agreed project portfolio *potentially* adds value to the business.

Value delivery – how well the value promised by the overall project portfolio is sustained throughout the development process.

Project delivery – how successfully projects have been managed.

Quality: We can include here metrics about:

System quality: here we gap between the delivered functionality and the commercial requirements. An example is system mean time between failure.

Customer satisfaction: costumers perception of the IT function and its services.

Service quality: it can include many factors, such as report turnaround times or the number of system failures.

Support quality: it describes quality of service in post-implementation stage. An example is average telephone response time.

Value-added: We can include here metrics about:

IT function alignment: how well IT function takes part to achieve business results, i.e. is it some contribution of IT-department to improve overall company performance.

Competitive advantage: how IT department helps to enlarge competitiveness of the business, for example it is used to create entry barriers or to increase costumers switching costs etc.

Aitken (2003) has presented all the types of criteria in scheme below.

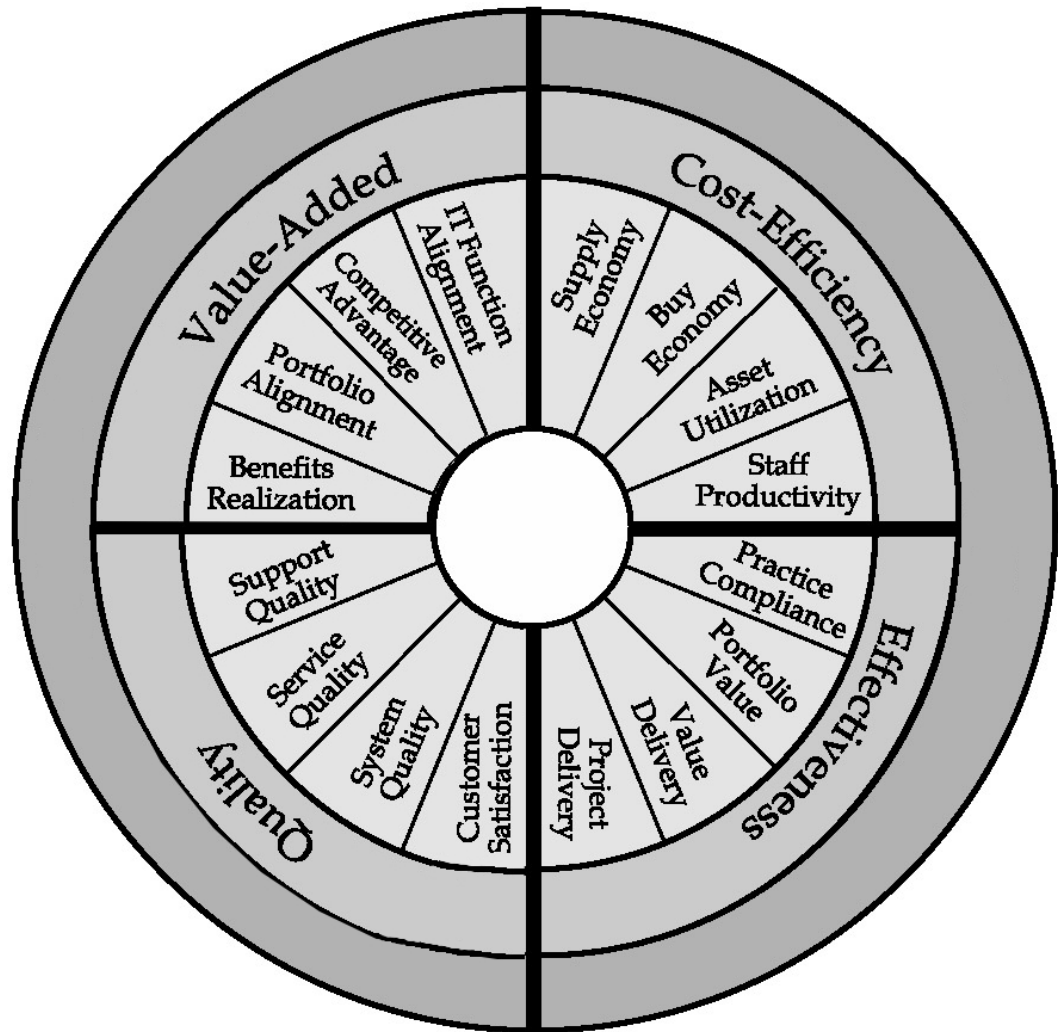


Figure 15. IT-performance measurement. (Source: Aitken, 2003)

In a process of choice metrics, manager should take under consideration following eight criteria.

1. Be accurate (± 5 per cent? e.g. a 5 per cent improvement in performance ± 5 per cent isn't going to impress anyone).
2. Be objective (i.e. it's not just a matter of opinion).
3. Be consistent (i.e. everyone reporting this measure does it exactly the same way).
4. Be 'unfudgeable' (i.e. not susceptible to cynical manipulation by vested interests).
5. Be unambiguous (i.e. there must not be multiple

interpretations - high/low numbers are always good/bad and changes in the value are almost certainly attributable to changes in the thing being measured rather than some other factor).

6. Be externally 'benchmarkable' (i.e. tell us how we compare with, say, our competitors or ESPs).

7. Be important (i.e. measure things that say something important about the value of IT to the business. Ultimately it should be related to the company's financial results. This is the 'so what' test).

8. Be readily understood by non-IT managers (in particular, the board).

Also it is important to mention that those metrics used for IT-department measurement are interconnected with level of IT-department maturity. Of course those interconnections are not straight, however, the higher level of maturity, the higher level of metrics are used to estimate performance.

3.3. BPA problems in SME

Business process automation can be applicable and useful for any size company. Automated processes even at micro enterprise go faster and cheaper. In order to summarize everything mentioned above, we will go through main problems SMEs facing during automation.

First of all, SMEs are less experienced in automation than MNEs. According to Thong (1999), the extent of automation adoption in SME is less than in MNEs. Other researches also tell that SMEs are trying to focus on some processes automation even when horizontal-integrated process automation is needed (Connect, 2004).

Secondly, automation budget in SMEs is much less than automation budget of MNEs. Staples automation report (2008) tells that Staples spent more than €2.5 million in 3 years with more than 1.5 million of initial investments. Unfortunately, automation that is often perceived as the sole preserve of the large multi-nationals, who can afford to invest a great deal of money up front, for very good reasons. In spite of the fact that there are a lot of different systems available in a market, most still reflect the MNCs philosophy, employing a high-end, language-based development environment, and requiring extensive programming and expensive consulting. Small companies can not apply similar solution because of much less budgets. (Strategic Direction, 2002)

Thirdly, structure of SME is more flexible than structure of MNE. It gives some advantage to SME because it gives additional flexibility, however, it also can be a root of automation problem. It becomes challenging to describe processes and therefore to create suitable automated solution for company with unclear

structure. Furthermore, unclear structure can be a barrier not only for processes descriptions, but for very creating of overall vision about automation.

3.4. Theoretical framework

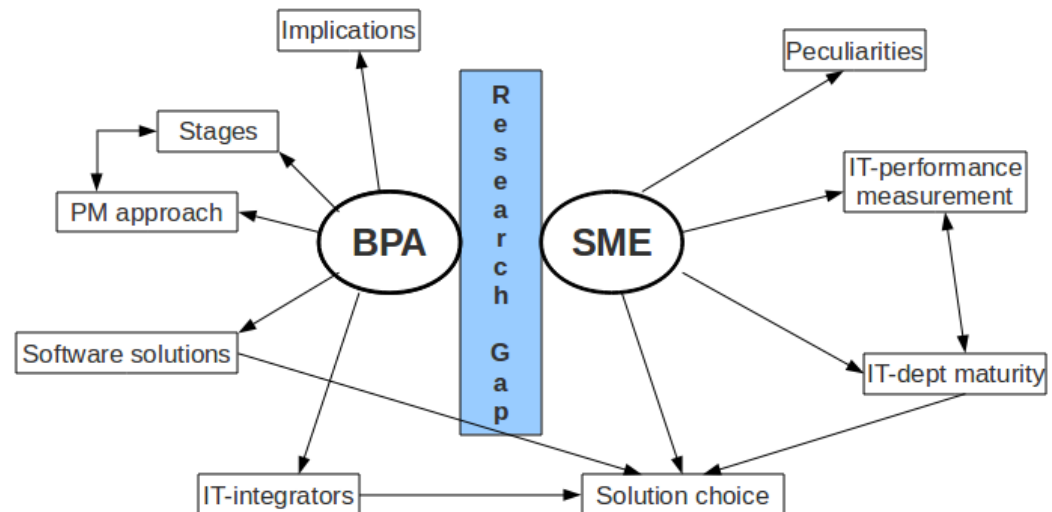


Figure 16. Theoretical framework. (Source: developed by author based on theory)

This theoretical framework reflects all the theory streams presented in the paper. Also connections between theory is reflected in the theoretical framework.

3.5. Chapter summary

Small and medium enterprises were described in chapter 3 in context of business process automation. This chapter describes general features of SMEs and their difference with MNEs. Also peculiarities of SME IT-department and their relationship with choice of BPA solution were described in the chapter. Finally some problems which SMEs can face during business process automation are presented in the chapter.

4. Research methodology

4.1. Research methods

I have chosen qualitative analysis method because I consider that this method will help me to discover a problem from different perspectives. According to Myers (2006), qualitative methods help researcher to understand the context where decisions and actions take place and because the aim of my research was to provide complex understating of challenges small and medium enterprises facing during automation projects, qualitative research is considered to be the right method.

I have chosen face to face interviews as a method for data collection. I consider that this method is the most useful to discover all necessary information because this method gives an opportunity of flexibility. The interviews was semi-structured which means that interviews was based on list of questions, however additional questions were used and questions was varied according to respondents answers. In other words stream of discussion was flexible and reactive on respondents answers. That gives an opportunity to get all the necessary details and clarify them. Opened questions and flexible structure of interview is useful to get a sufficient replies (Bryman and Bell, 2003).

The sample of research was divided in sub-samples. First sub-sample was presented by small and medium enterprises that recently faced business process automation project. Second sub-sample consisted of IT-integrators that implements business process automation solution mostly in small and medium enterprises. That gives me an opportunity to discover problems from different perspectives and find a gap between different

vision of a process.

Interviews was based on lists of questions I developed basing on theory discovered in theoretical part. Those lists of questions was aimed to discover the nature of automation processes, to discover main path of the process and difficulties companies facing during the process. Two lists of questions discovered research problems from different perspective and therefore questions from one list were connected to questions from another list.

4.2. Data collection

Primary data was collected through interviews during March and April 2011. There was six companies interviewed from SME side and four companies from IT-integrator side. Most of companies from SME side have successfully implemented business process automation and one company decided to interrupt the project. Also one interview was about internal business process automation of IT-integrators business processes. It discovered process from different perspectives. Respondents from IT-integrator side was companies who are specified in automation of business processes of SMEs. Peculiarities of that kind of project was disclosed during interviews.

The most challenging during data collection was to disclose all the aspects about business process automation in SMEs. I want to mention that experience obtained during first interviews gave positive impact to later interviews.

4.3. Data analysis

The qualitative data collected from interviews consisted from a large amount of material. In spite of the fact that this material

was structured according to lists of questions, the structure was much less clear than quantitative data. All the observed results was analyzed within following characteristics:

- **Recursive analysis:** that means data analyzed after first interviews was several times re-analyzed when the new data collected. It helped me to find connections between all the data collected from sample and take out logical regularities. According to Swanson and Elwood (2005), recursive order is essential one for data analysis: analyzing all the data separately will not discover just peculiarities but not regularities.
- **Clustering:** According to Swanson and Elwood (2005), clustering is the process “grouping things together based on their similarities and differences”. After collecting and carefully noting all the issued mentioned in interviews, I have started to group issues together based on their similarities. This method shows that mentioned issues can be uniting in groups and problems in those groups may have one factor underlies and therefore similar mechanisms of solution.
- **Relationship analysis:** collecting data I discovered that one problem may (and, for sure, will) be a reason of another problem will appear. I have discover those relations and built a logical chain of evidence. It helped to understand the root of risks of automation projects.

Here I want also mention that skills I developed during data collection and analysis helped me to understand complex nature of business process automation. Combination of theoretical foundation and empirical study helped me to discover research problem in a most effective way.

5. Analysis of empirical results

In this chapter the focus is on the results of the research. As mentioned earlier in the report, two different streams were chosen for this research: defining challenges which small and medium enterprises are facing during the automation process and defining main differences in vision of BPA project between SMEs and IT-integrators. Interviews results are presented in appendices. In this chapter I will describe main groups of problems and then summer them up in conclusion.

5.1. HR problems

So-called human factor is one of main challenges in business-process automation. I want to point out three main problems related to personnel: resistance to automation, poor qualification and training.

5.1.1. Resistance to automation

Key users of process, which is going to be automated can reject automation. It happens because automation always means changes related to everyday operations. Maxim Schepelin from One-To-One group doubt that "People in Company distrust changes." It means that personnel will have to study new processes, and those processes will be more connected with computers and software. It becomes challenging for people whose IT-skills are low, especially elderly employees. Therefore successfully designed project can face difficulties in implementation stage. (Implementation was discusses in Paragraph 2.2.4.) Three clients and two integrators mentioned during interview that this problem is one of key problems of

implementation of automated solution. This problem also can occur problems in earlier stage when personnel don't present description of current processes or even refuse negotiations with project team. (Paragraph 2.2.1) Here I want to note that Vasily Akulov from Tecwill has mentioned that even after one year after launch of automated solution some key users still operate in old way.

5.1.2. Poor level of professional skills

In this paragraph I want to mention problems related to lack of professional skills of employees. This problem for SME was discusses in Paragraph 3.1. Some people are making only limited number of operations in their professional field, they may not see what stays behind this operations. Impact of that fact on automation process is following: first of all it gives problems in a stage of analysis: project team facing difficulties in getting current process descriptions and connections between processes (Paragraph 2.2.1). That problem goes to stage of design because poor formulated processes lead to problems with software specifications (Paragraph 2.2.2). Aleksey Polyakov from 1C-BIT even mentioned that “the more level of professionalism of key users, the better formulated requirements we getting from them”. Then problems goes further to implementation stage (Paragraph 2.2.4) because poor qualification enlarges period of training. And also design of solution which were base on poor description of processes leads to longer after-launch customization of solution.

All the factors mentioned above leads to following conclusions: increase of project duration, increase of project budget and to non-fulfillment of costumers expectations towards automation. (event was discusses in paragraph 2.4) Everything mentioned

increase risk of project failure.

5.1.3. Personnel training

Personnel training is a very important part of automation project, which contribution on time, budget and output of project is often underestimated. This problem occur in late stages of automation - Testing and Implementation stages (they described in Paragraphs 2.3 and 2.4.) Problems with training was mentioned by four respondents from client side and from all the respondents respondents from IT-integrator side. Main problem here is that cost and time of training is underestimated by clients and therefore it leads to extra spent and time. According to Aleksey Korneyev (LLC-Promkonsalting): "Training expenses can almost double spent on IT-integrator specialists work". Length of training depends on quality of personnel, usability and complexity of software solution and organization of training process.

5.2. IT-infrastructure problems

As it was mentioned in previous chapters, business process automation always related to information technology. General cause of this problems is under-maturity of IT-infrastructure (IT-maturity was described in Paragraph 3.2). Respondents have defined two types of problems related to IT-infrastructure: hardware requirements and legacy applications.

5.2.1. Hardware requirements

BPA solutions sometimes are complicated systems which need specific hardware equipment like software servers, network

servers etc. Four respondents from client side mentioned that their hardware were needed to be upgraded because of automation project. All the IT-integrators mentioned that it often happens that their customers don't expect hardware upgrades to automation project and therefore they have increase automation budgets in order to successfully implement project. According to Vladimir Tugarinov from Soft-Sib “Hardware can cost up to 50% of total automation spent”. Underestimation of this spent increases risk of delays or even interruptions of projects.

5.2.2. Legacy applications

Integration of automated solutions and applications been used in a company's operations before also may lead to problems in automation. Five respondents mentioned it as a problem. Applications may work with different format of input files, and may have different format of output. Integration different software between each other leads to increase customization spent. However, in case if company decides not to use legacy software anymore, there is a need of data transfer between legacy software and automated solution. Maxim Shepelin (One-To-One group) mentioned that often it is easier to organize manual data transfer because customization developing software solution will cost much more. Here company takes risks of data losses. Also manual transfer may lead to incorrect transmission of data. All of that may occur serious problems for a company in future.

5.3. Organizational problems

In this paragraph I will discover barriers related to organizational structure. Here I want to mention problems connected with lack of responsibility delegation, need of process re-engineering and irreplaceable persons in automation projects.

5.3.1. Lack of responsibility

During automation project especially in stages of analysis and design (Paragraphs 2.2.1., 2.2.2.) there is a strong need of permanent contact between IT-integrators (or IT-staff in case that it is an at-home automation) and key users of process which is going to be automated. This need also was described in Paragraph 2.6.3. This contact needed in order to get the description of current processes, defining system requirements and because nature of automation project is such that some corrections and fixations can always happen. All this collaboration may require considerable amount of time and effort from key users. However, key user may have a big load of everyday work which he or she considers to be in first priority. Also key user may refuse contact because he or she thinks that it is not upon user's field of responsibility. Three respondents mentioned that this lack of responsibility may sufficiently increase project duration and even risk of failure. Vladislav Shabanov from LLC Iskra mentioned that "project without responsible persons is a dead project". This situation happens because executives may not understand that such a collaboration is needed and therefore this collaboration was not properly organized. Also in case that personnel rejects automation (as it was mentioned above) this absence of responsibility delegation gives an additional field to project failure.

5.3.2. Need of process re-engineering

Four respondents mentioned that sometimes processes in company can be organized in such a way that there is no reason for their automation. It means that there is a need of deeper process improvement or even total process re-engineering. Here it can be two options for companies: first option is to make process re-engineering and second one is still try to automate process with small changes in it.

Process re-engineering means increasing risks because personnel may not be ready to start work in totally new way. Also process re-engineering will lead to additional time and money consumption and companies may not be ready to such expenditures and changes. Everything mentioned above lead us to logical conclusion that risk of project interruption becomes rather high in case of need of processes re-engineering.

If company decides to automate current processes (it may also happen because executives just do not understand that processes are needed total re-engineering) it may follow the case that automation will not give expectable effect on that. This dissatisfaction may lead to dissatisfaction about business process automation as a whole. Alexey Polyakov mentioned that “client may stay disappointed after automation even though he was informed that there is no reason to automate these processes”.

5.3.3. Irreplaceable persons in automation process

Automation process can take a long time. It is a complex project with a lot of inputs, outputs, stages, procedures and peculiarities.

Three respondents mentioned that if automation project takes too long, some knowledge about the project may be situated only in a head of one person. Vlad Shabanov (LLC-Iskra) responded that “Once Implementation specialist has quited company and moved to other city and therefore we decided to stop some projects.” Therefore this person becomes totally irreplaceable for this project. This situation creates a lot of risks to project failure because in case those persons will quit the project, nobody will be able to sort out the entire question this person was responsible for.

5.3.4. Lack of process description

In order to automate processes, they needed to be carefully described first. Four client-side and two integrator respondents mentioned that absence of process description to be a problem in automation process. Lack of description happens in SMEs because executives do not recognize a need of description before business process automation (Lack of process understanding at SMEs described at paragraph 3.3.). However, lack of description leads not only to automation problems but also to repetition of the same tasks by different employees. Also there is a clear understanding that lack of process description lead to additional expenditures in all the stages of automation: in analysis stage there collecting job specifications takes time and effort of project team and key users. Alexey Korneyev from LLC-Promkonsalting mentioned that process description negotiations can take up to 5 stages. And here it is useful to remind that different problems of contacts between IT-integrators and key users can take place. Also it is obvious that poor process description leads to additional expenditures in customization stage.

5.3.5. Delays in decision making process

Automation project consist from several stages and start of some stages are needed to be approved by decision-makers especially when start of next stage require some payments of sufficient attraction of personnel. Delays in those approvals lead to undesirable consequences to an automation project. Vasily Akulov from Teckwill has mentioned that decision approval process took much time during automation and therefore sufficiently increased duration of all project. Two more respondents from client side also mentioned that those delays often make barriers to automation project. They also stated that it may happen because contact person does not have enough authorities to make decision by oneself and therefore decision needs to go upstairs to executives and then back to project team start next stage. Lack of authority in SMEs described in Paragraph 3.1. It also can be some delays because persons who have enough authorities can be busy or they just can stay away from the project and explanations of project features can also take time. All those sings lead to losses of motivation of project team and therefore decreases probability of successful finishing of the entire project.

5.4. Different vision of automation process

In this paragraph I will discover problems business process automation related to differences in vision on the process between clients and IT-integrators. Actually those differences occur mostly in early stages of projects and therefore, if not been overcome, they may lead to project failure in early stage. This situation not leads to serious financial losses to client, however, in this case processes still goes as they went.

5.4.1. Lack of understanding the automation process reasons

When executives decide that current processes are needed to be automated, there are different reasons of that. One of those reasons is that automation became a fashionable trend. Alexey Korneyev has mentioned that “In this case client does not really have any expected outcomes from automation and therefore it is hard to create solution which will satisfy this kind of customer”. However, when IT-integrator sees client’s willingness to collaboration, it starts to offer different solutions based on previous experience of automation. However, all the respondents from IT-integrators mentioned that collaboration with such a customer most probably won't lead to a contract. Furthermore, in case contract will be signed, further work on project will be complicated by absence or poor understanding of automation outcome.

5.4.2. Dynamical requirements

When reasons of automation are not stated clear and when business processes of the client are not clarified, it is hard to specify requirements of automated solution at early stages of project. Therefore plenty of additional tasks may appear during the late stages of project. Some of those tasks may be fixed by minor forces, however, Aleksey Polyakov (1C-bit) has mentined that some of them can multiply project costs and time. And customer, who does not understand complexity of changes and the very nature of changes in a project, may disappoint about that and even interrupt the project. (This nature is described at Paragraph 2.4) Three respondents mentioned that dynamical requirements of customer are a very risky factor for automation project.

5.4.3. Cost estimation

As usually automation has three following types of costs: software costs, hardware costs and cost of specialists work. All these costs may vary depending on many factors: hardware costs depend on what IT-infrastructure the company already has. Software infrastructure depends on what solution company will chose and how many work places needed to be equipped by this solution. The more agile solution is, the more it costs. All those spent can be defined in an early stage of negotiation, however even those ones can be higher than client expected.

As respondents mentioned, cost of specialist work depends on many factors. First of all, there is a number of specific requirements which are needed to be customized. The rule of thumb here is that the more specific box-solution customer will prefer and the less specific it's business is, the cheaper customization will be. (This logic described at Paragraph 2.5.) Also, as it was mentioned earlier, the clearer process description and system requirements are, the earlier customer will know final price of the deal. Also qualification of personnel may influence price of training which is also often ignored by clients. Also duration of training period may increase total time of automation.

Software cost also play it's role in cost estimation. Stanislav Beletskiy (Sashechkin & Rights) mentioned that their company considered two software alternatives. First one was not user-friendly and second one was too expensive. Therefore executives of Sashechkin & Rights decided to stop automation project.

All the factors which influence costs increase risks of the project. After some amount of money or some period of time customer may decide that there is too much spent on automation and interrupt the project.

5.5. Performance management problems

When automation project is starting, managers always expect some positive outcome as a result of a project. However, almost every respondent mentioned that outcomes have not been measured. For example, Elena Kirillova from LLC Vega-Trans stated that her company has general automation goals like “we want to save some money on this process” or “we want to make this process faster than before”. Measurement of result of five respondents was just an intuitive measurement like “process started to be faster”. A paradox here is that no one considered it to be a problem, and even more: managers stay more or less happy after automated solution has been launched. However, absence of measurement mechanism gives uncertainty about project benefits. One respondent mentioned that if measurement mechanisms would be implemented and expectations of automation project would be presented in financial units, it will probably give positive impact on velocity of decision makers.

5.6. Lack of project documentation

According to interviews, there is no uniqueness about project documentation which is used during automation projects. There are only two documents, which are widely used during automation: commercial offer and requirement specification. First document is mainly used in order to describe total price of automation to client, and second one mainly is used in order to avoid potential pretensions from clients in case that of dissatisfaction. According to Alexey Polyakov (1C-BIT) “in case of big projects we always try to note all the project details, however when project is small and not very complex, project details are in the head of IT-specialist”. He also mentioned that some companies want to see project plans and diagrams (methods of

modeling processes are presented in Paragraph 2.2.2), however major part of clients just don't need that kind of project documentation.

Alexey Korneev (LLC Promkonsalting) mentioned that they use process maps for automation projects, however, those process maps used mainly by IT-integrator and therefore client does not see their contribution. Even more, LLC Promkonsalting often face difficulties when they ask key-users to feel up process maps.

Vladislav Shabanov (LLC Iskra) that he uses flowcharting in order to describe processes, but also only for internal usage.

Only Vasily Akulov from Tecwill and Stanislav Beletskiy Sashechkin & Rights from client side have mentioned that some business process management tools hve been used during modeling stage. Other respondent mentioned that it was no clear documented process design, however, they have not mentioned it as a problem.

Aleksey Polyakov (1C-BIT) responded that “some clients didn't grow up for project documentation ”. Therefore usage clear business models with this kind of client will not give useful contribution, however, can take time and effort from both sides. He mentioned that when company applies project management approach (Project management approach features are presented in Paragraph 2.4.), it can see current progress of the project. Furthermore, he mentioned that project management documentation gives global vision on project, it is much easier to control it and generally increases probability of successful finish of the project.

5.6. Chapter summary

All the problems discovered in this chapter and their interrelations are presented in a table below.

Problem	What stages problem affect	Which problem related with	Problem cause	Problem outcome
Resistance towards automation	Analysis, launch	Lack of process description, long training	Initiative from top, fear towards changes	Lack of process description, barriers in negotiations, increased time,
Poor level of personnel skills	Analysis, test, launch	Training	SME peculiarities	Increased training, resistance
Personnel training	Test, implementation	Resistance, cost estimation	No experience in BPA.	Cost estimation
Hardware requirements	Modeling		Poor IT-infrastructure	Cost estimation
Legacy applications	Modeling, launch		Nature of new solution	Cost estimation data losses
Lack of responsibility	Analysis	Resistance	No project-team approach	Lack of process description, increased time
Need of re-engineering	Modeling	Understanding automation needs	Organizational structure	Project interruption, bad project outcome
Irreplaceable persons	Any stage		Organizational structure, project structure	Considerably increase risk of project failure
Lack of process description	Analysis	Lack of responsibilities	SME structure,	Repetitive tasks, additional spent
Delays in decision-making	All stages	Lack or responsibilities	No project-team approach, SME structure	Delays between stages
Lack of understanding reasons	Modeling	Dynamical requirements		Disappointments, cost estimation
Dynamical requirements	Modeling, Implementation	Lack of understanding reasons	Different vision	Cost estimation

Table 1. BPA problems and their interrelations.

Problem	What stages problem affect	Which problem related with	Problem cause	Problem outcome
Cost estimation	Modeling	Dynamical requirements	Training, hardware, lack of process description	Increasing project risks
Performance measurement	Modeling		SME structure	No justification of project
Lack of project documentation	Analysis, modeling	Lack of vision the whole automation process	Clients not mature enough, no clear standards	Absence of global vision and control

Table 2. BPA problems and their interrelations, continue.

5.7. Managerial recommendations

Concluding the whole research work, I came up with the list of recommendations on how to decrease risks of automation project failure and increase overall effectiveness of project outcomes. Here I want to mention that there is no universal recipe which gives a hundred per cent probability of project success. However, I believe that fulfillment of these recommendations will make path to project success shorter and cheaper.

Firstly I recommend to create a knowledge database which will contain following:

- Clear job descriptions to every position company has. This job description is a list of responsibilities and everyday actions of each employee in a company.
- Process descriptions. It should contain all the business processes company does. These description should reflect connection between departments and people inside every process, process incomes and outcomes.
- Details of automation projects. Here should be all the documents related to current automation projects and already implemented projects or their parts. Best way here

is to standardize all this information and note it in frames of a single form in order to better understanding it by future readers.

One more detail about database that it's actuality should be taken under consideration as often as possible and information about jobs and processes should be fresh and correspond to real situation is a company.

Second recommendation is that project team should be created for each automation project. This team should be cross-departmental and contain stakeholders from all groups: authoritative managers, key users and IT-specialists. It will help to avoid problems of lack of responsible persons from these groups.

Third recommendation is that automation projects should be split into iterations. Every iteration can actually be considered as small independent project. In case of automation project interruption for example due to financial reasons, this approach will give some beneficial results after any stage of big project. All this iterations should be recorded to knowledge database. This will help to go back to automation after some time even if persons from project team leave the company.

Next recommendation is that automated processes should be measured before and after BPA. Of course, there no sense in measures just for measures. Furthermore, sometimes it is really hard to give some concrete numbers about processes. However, if it is possible, measurement should take place.

Some automation projects bring positive effect which is observable without any measures. However, some do not. And speaking about this project, difference in process KPIs can justify automation and promote further automation if managers doubt it's reasonableness. In case when KPIs show opposite things, they can be a signal that there is wrong approach on automation has been chosen and it should be reconsidered.

In case when there is hard to get quantitative KPIs, some questionnaires or feedbacks from key users can serve as KPI.

The last, but not least recommendation is that managers should not underestimate key users and their willingness towards automation. Motivation of key users should be considered. In order to increase this motivation, I will suggest following:

- Key users should be involved to the project since the very beginning. Even more, they should be involved since the idea of making automation has been born. Every idea should be discusses with key users. It helped to gain their experience in a field of processes which are going to be automated. Also knowledge about what key users want to improve in a process can be very useful to project outcomes.
- In a testing stage some pilot group from key users should be organizes. This group may contain most experienced (including IT-experienced) users, or those who have more authority within key users. Test group will help to spread automation through all the key users.

5.8. Research limitations and future research directions

Every study, no matter how it was conducted, has some limitations. Limitations of this study are following:

- Every automation project which was discussed at interview was discussed with only one person. Therefore one possible stream of future research is to conduct analysis of differences of vision on a single BPA project between different stakeholders.
- Interviews as a method of research is also a limitation.

During interviews I can discover only personal opinion about the project and therefore collected data was based on these opinions. Also interviewee could forget some project details because project were realized some time ago. Therefore direct observations of BPA projects could be mu future research recommendation.

- Most of organizations I have interviewed has relatively low level of IT-department maturity. Therefore future research direction is to compare strategies and problems of BPA of SMEs with different levels of IT-department maturity.
- During empirical data analysis I found several main groups of problems related to BPA projects. Every group can be discovered deeper in future research.
- Most of interviews were based on successful experiences of business process automation. Some information about failed automation projects may be collected in future research and compared with successful stories.
- The last future research direction is to check whether recommendation given in this thesis are applicable and relevant. In other words research about usefulness of given recommendations is an essential continue of current research.

6. Conclusion

In order to conclude my work, I will sum up everything has been done. My master thesis discovers different features of business process automation in small and medium enterprises from different perspectives.

First of all, thesis discovers the nature of business process automation. In overview of a literature I has discovered the essence of the process, main stages of the process and specific features of these stages. Here I want to point out that literature more concentrated on a benefits and advantages of automation and techniques allied during the automation. It may lead reader to misunderstanding that automation is an easy and only beneficial project. In case difficulties were mentioned in a literature, it is mostly written that these difficulties are easy to overcome, without notification that it will cost additional time and money.

Secondly, because automation always related to information technologies, it was necessary to discover IT-business relationship. Here I found plenty of information about problems that may appear during this relationship. The most beneficial outcome from this for me was the notion that IT-department should have an understanding of firm's business processes and goals in order to contribute to these goals achievement most efficiently. Also the theory of IT-department lifecycle was essential here because as it seems from empirical results, the more developed IT-department is, the more effective business process automation goes.

In the empirical part of the work I applied qualitative analysis method to discover main challenges of business process automation for small and medium enterprises. Here I decided to discover a problem from two different perspectives: I discovered

the process from the point of view of companies who have recently passes automation projects and from the point of view of IT-integrators who specialize on implementation of that kind of projects in small and medium enterprises. During collection and analysis of data problems were detected and divided on several groups.

First group of problems is related to company personnel or so-called key users of processes which are going to be automated. In this group I put problems with qualification of staff and its motivation towards process automation. Also personnel training - necessary part of automation process is included to this group of problems.

Second group of problems is related to company's IT-infrastructure. Integration of the automated solution may create those problems as well because of specific requirements of automated solution. Here I mentioned problems with hardware requirements and problems related to connections and integration between new solution and applications already used in a company or so-called legacy applications.

Third group of problems is related to the organizational structure of the firm. Here I put problems related to delegation of responsibilities about an automation project, problems which occur when existing business process structure needs total re-engineering, problems with growing value of some employees or so-called person dependence of a project and finally I have described situations leading to delays of decision making during the project.

Fourth group of problems is related to the different look onto automation process between clients and IT-integrators. At first I mention problems happen when company managers do not have a clear answer of a question "Why do we need automation?". Also here I put a problems poor understanding of the project

difficulties. Those two problems lead to the situation when project requirements and scope can be changed in any moment and therefore, it becomes hard to define final budget and duration of a project.

Finally, during the data collection I have discovered that SMEs almost don't use any measures of automated processes. It leads to following: first of all, and I found it to be a paradox, managers stay happy after successful launch of automation in spite of the fact that automation outcomes have not been measured. However, I believe that in a long or even medium term carefully designed and implemented automation project will be beneficial for a company. Therefore I may suppose that this scenario - not measured but happy - is not a problematic one. However, absence of measurement leads also to other scenario - when companies interrupt automation projects because of their expensiveness. Clearly counted potential outcomes could affect on a launch solution when there is a clear description of benefits presented.

Summing up what was written before, I can say that research goal was achieved and research questions were answered.

Speaking about practical implication of the work, I would like to say that results of my study gives the description of potential challenges which managers and project teams may face in different stages of automation project. Knowing them managers could apply proactive models of behavior and therefore minimize risks of project failure.

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Appendix 1. List of questions #1 for Interviews with companies who has recent experience in business process automation.

During analysis of this questioner it is recommended to keep in mind that interviews were gained in a form of semi-structured discussion. This so-called list of questions was used only like a road map of interview. Discussion was held around these questions in a form suitable for each respondent.

1. What business processes in Company has been automated?
2. Who initiated BPA in Company?
3. What was a reason for the automation?
4. What was an aim of the automation?
5. Who conducted the automation?
6. How automation was planned?
7. What alternative solutions were taken under consideration and why current solution has been chosen?
8. What kind of software has been used for the automation?
9. What problems company faced with the automation?
10. Who and how has measured effects given from the automation?
11. Were denoted goals achieved?
12. If any problems occurred after automation process?
13. How much time the automation project has taken?
14. Which stage has taken more time?
15. Has any tests of automated process take place?
16. What is a role of IT-department in a company?
17. Size of company (in total number or employees).
18. Size of IT-department (in total number or employees).

Appendix 2. List of questions #2 for Interviews with IT-integrators.

During analysis of this questioner it is recommended to keep in mind that interviews were gained in a form of semi-structured discussion. This so-called list of questions was used only like a road map of interview. Discussion was held around these questions in a form suitable for each respondent.

1. What companies more often become clients – SMEs or large companies?
2. How much time the automation process usually takes?
3. What percentage of clients breaks the project down?
4. What are main reasons of break?
5. Who usually creates an automation project?
6. Who is a contact person from the client side?
7. What documents are used in a project:
8. If IT-integrator has a before-automation process description?
How it has been obtained?
9. What feedback mechanisms used?

Appendix 3. Results of interviews with companies who had recent experience in BPA

Company name	LLC Vega-Trans	LLC Ligr
Field of business	Sales	Sales
Automated process	Circulation of documents	Circulation of documents
Project initiator	Key users (accounting department)	Key users (Financial department)
Reasons for BPA	Overload of accounting dept	Lack of organization and control, repetitive tasks
Goal of BPA	Decrease time, improve control	Define standard, improve control, decrease costs
Project team	IT-integrator + IT-dept + key users	IT-dept + IT-integrator
Documentation	Requirement Specification (RS)	RS, questionares
Why chosen solution	Market leader, previous experience	Market leader, previuos experience
Software used	Specified by IT-integrator	Specified by IT-integr
Problems	training, IT-infrastructure (hardware)	Training + Infrastructure (legacy apps)
How effects has been measured	Intuitively	Intuitively
Level of satisfaction	Ovesatisfies	Satisfied
Additional problems after BPA	Not mentioned	Not mentioned
Total BPA-project time	7 month	1,5 month
Longest stage	Launch, training	Design
IT-department stage	Facility-service	Facility
Total employees	20, 6 key users	30
IT employees	2	1

Table 2. Results of interviews with companies

Company name	Tecwill	Tecwill
Field of business	B2B sales	B2B sales
Automated process	Accounting, circulation of documents	Internal communication
Project initiator	CFO	CFO
Reasons for BPA	Lack of control	Huge telephone bills
Goal of BPA	Reduce errors, improve control and transparency	Reduce costs, improve security
Project team	IT-integr + IT-dept	IT-department
Documentation	Flowcharts	No documentation
Why chosen solution	Previous experience	Best for current goals
Software used	Box solution	Box solution
Problems	Infrastructure (legacy app)	Resistance of key users, bad usability
How effects has been measured	Intuitively	Compared bills
Level of satisfaction	Satisfied	Satisfied
Additional problems after BPA	Not mentioned	Not mentioned
Total BPA-project time	1 month	2 weeks
Longest stage	Endorsement	Training
IT-department stage	Facility	Facility
Total employees	50	50
IT employees	2	2

Table 2. Results of interviews with companies, continue.

Company name	NasHOTEL	Sashenkin & Rights
Field of business	Hotel	Juridical consulting
Automated process	Check-in-out, bills, accounting	Circulation of documents
Project initiator	Executives	Key users
Reasons for BPA	Competitors	Repetitive tasks, errors
Goal of BPA	Develop standard, transparency	Develop standard, reduce errors
Project team	IT-integrator	Key users + IT-department
Documentation	RS, process descriptions	Mind-maps, process description
Why chosen solution	No analysis of alternatives	2 alternatives: 1-st not user-fr, 2-nd expensive
Software used	Box solution	Box solution, specified by IT-int
Problems	Training, legacy app	Price/user friendliness
How effects has been measured	Intuitively	Not measured because project didn't finished
Level of satisfaction	Partly satisfied	Not measured because project didn't finished
Additional problems after BPA	Some errors can take place	Not measured because project didn't finished
Total BPA-project time	1 year	6 month from idea to stop decision
Longest stage	Design, launch	Endorsement
IT-department stage	Facility	Facility
Total employees	40	15
IT employees	2	1

Table 2. Results of interviews with companies, continue

Company name	One-to-one group	LLC Promkonsalting
Field of business	Sales	BPA
Automated process	Circulation of documents	Circulation of documents
Project initiator	CEO	CIO
Reasons for BPA	Low speed, seasonal peaks	Lack of control
Goal of BPA	Reduce time, simplifying	Improve control, on-line access
Project team	IT-department	IT-department
Documentation	Process description, BPNM,	Process maps
Why chosen solution	Legacy app, previous exp	Best solution for this size, no need to customize
Software used	Specified by IT-dept	Box solution
Problems	Personnel resistance and training; lack of responsibility; developer is irreplaceable, lack of process description	IT-infrastructure – both hardware and legacy applications
How effects has been measured	Increased turnover	5-8 h/week economy
Level of satisfaction	Some additional on process	Oversatisfied - increased sales
Additional problems after BPA	Complicated price calculation	Not mentioned
Total BPA-project time	3 month	1 month
Longest stage	Launch	analysis
IT-department stage	Facility, service, partner	Creation of business processes
Total employees	70	8
IT employees	6	2

Table 2. Results of interviews with companies, continue

Appendix 4. Results of interviews IT-integrators

Name	1C-BIT	LLC Iskra
Time from contact to contract	From 3 days	2 weeks
Time from contract to finish	1-3 month	2-3 weeks
Reasons for interruption	Time, financial reasons, no clear understanding of automation needed complex reorganization of business processes	Lack of understanding of complexity, time, budget
Contact person from client side	Key user, IT-specialist	Executive, key users
Who creates project	IT-integrator	IT-integrator, client when has very concrete problem
Documents used	RS, proposals, mind maps, process maps	RS, mind-maps
How process description collected	Analysis, negotiation	Analysis, description from client
Main problems	Hard to get process description, hard to estimate costs and time, lack of understanding complexity, resistance of personnel, no responsible person from client side, process needed reconstruction, contact person don't have enough authorities	Dynamics of client requirements, no responsible person from client side, no clear vision of duration, lack of understanding reasons for automation.
Feedback mechanisms	QA department, marketing department, release feedback form	During support

Table 3. Results of interviews with IT-integrators

Name	LLS Promkonsalting	Soft-Sib
Time from contact to contract	From 3 days	From 1 week to 1 year
Time from contract to finish	From 2 weeks	From 3 weeks to 2 month
Reasons for interruption	Lack of understanding reasons, complexity, costs	Budgeting, specific business requirements
Contact person from client side	Middle-managers, IT-executive,	Executive, IT-executive rarely
Who creates project	IT-integrator	IT-integrator
Documents used	RS, process maps, proposals	RS, contract, proposals
How process description collected	Description from client, negotiation	Negotiation, observation
Main problems	Under-qualified and resisted key users, no responsible person from client side, lack of understanding of automation process reasons and benefits	No clear understanding of automation process and budget
Feedback mechanisms	During support	Special standard

Table 3. Results of interviews with IT-integrators, continue