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ENTERPRISE RESOURCE PLANNING IMPLEMENTATION AND ITS IMPACT ON PEOPLE AND PROCESSES IN BUSINESS ENVIRONMENT

IMPLEMENTACE ENTERPRISE RESOURCE PLANNING A JEJÍ VLIV NA LIDI A PROCESY V PODNIKOVÉM PROSTŘEDÍ

DIPLOMOVÁ PRÁCE
MASTER'S THESIS

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Introduction
Aim of the Thesis
Theoretical Background
Problem Analysis and Current Situation
Proposals and Contribution of Suggested Solutions
Conclusions
References

Literature / Sources:

BASL, J. and R. BLAŽÍČEK. Podnikové informační systémy. Podnik v informační společnosti. 2nd ed. Prague: Grada, 2008. ISBN 978-80-247-2279-5.
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Abstract

The master's thesis deals with an impact of implementation of Enterprise Resource Planning application on company's processes and people. Main focus is on changes in the processes caused by the implementation, evaluation of the effectiveness of these processes by appropriate methods sourced from the literature review. The focus is also concentrated on a form of impact on company's employees, and their perception of the change. The impact and its perception are analysed on the basis of a research using a form of questionnaire. With the regard to research results the company is recommended how to implement the application more efficiently into the firm's structure, in order to be perceived as valuable tool which enables the correct operations of the company.

Abstrakt

Diplomová práce se zabývá vlivem, který má implementace aplikace Enterprise Resource Planning na procesy a lidi v dané společnosti. Soustřeďuje se hlavně na změny v procesech, které tato implementace vyvolává a hodnotí jejich efektivnost pomocí příslušných metod, které jsou čerpány z literárních zdrojů. Dále je také zaměřena na to, jaký vliv měla implementace na zaměstnance společnosti a jak je jimi vnímána. Tento vliv a jeho vnímání jsou vyhodnoceny na základě výsledků výzkumu formou dotazníkového šetření. Návrhová část poté zahrnuje doporučení, jak zavádět do firemního prostředí danou aplikace efektivněji a také jakým způsobem lze tuto aplikace uvést do firmy tak, aby byla zaměstnanci vnímána jako cenný pracovní nástroj, který zajistí pro správný chod společnosti.

Key words

Enterprise Resource Planning, management, processes, improvement, implementation, real improvement potential, employees, questionnaire.

Klíčová slova

Plánování podnikových zdrojů, management, procesy, zdokonalení, implementace, reálný potenciál zlepšení, zaměstnanci, dotazník.

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Declaration

I declare that the submitted master's thesis is the original and has been written absolutely independently. I also declare that provided list of preferences is complete and copyrights are not violated (pursuant to Act.No. 121/2000 Coll., on Copyright Law and Rights Related to Copyright Act).

Brno, 30th August 2013

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Bc. Veronika Habánová

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CONTENTS

INTRODUCTION

The submitted master's thesis describes the theme *Enterprise Resource Planning Implementation and its Impact on People and Processes in Business Environment.*

The implementation of specific enterprise resource planning system is an important condition for effective work performance at specific departments with fully implemented system and even more important condition for effective co-operation of the employees and process interconnection within the whole company. The precise set up of specific processes for concrete departments and subsections is crucial in order to achieve desired quality of products and services provided by a specific company. The high involvement of employees in the current processes, providing them sufficient technology support as well as trainings on the new systems and processes can assure higher work performance resulting in high-quality products and services offered to customers.

The importance of a successful enterprise resource planning system implementation is a support by management team as well as by individual employees, who must be willing to accept changes, which the implementation carries, and help to the implementation team to understand the specific requirements of the company's environment, which must be presented in order to create customized, transparent and well fitted enterprise resource planning system providing a real and desired support to the whole company.

The impact on processes and people of the implementation of the enterprise resource implementation can be observed at standards establishment for processes, databases, information flow, work and employees. These impacts can be measured and can lead to reaching the company's targets and provide massive support to an individual employee, management team as well as to company's owners in a target achievement.

The author has chosen this theme due to his experience gained in the previous job in the position of Process Specialist.

AIM OF THE THESIS

The aim of this master's thesis is to analyse the enterprise resource planning implementation and its impacts on people and processes in business environment, as well as to provide further recommendations to the company management and to the implementation team based on the results from analysis of the current situation within the company.

In order to achieve the main purpose of this thesis the partial objectives have to be accomplished. The objectives of the thesis are to analyse the current situation in the company based on a research carried out among employees, and on processes of the company. The research purpose is to map the enterprise resource planning implementation and the impacts on people and processes, especially at departments or their subsections, where the implementation is considered by the implementation team as being successful.

The two methods for analysis will be used. The first method of real improvement potential will be applied on work performance and efficiency of processes at the department of Logistics, subsections Packing and Shipping, in order to compare the impacts of the implementation on the quality of processes, which are currently followed as well as the past ones. The second method used for an evaluation of the impact of the enterprise resource planning implementation on employees will be the research in a form of a questionnaire. The primary data obtained from the research will be analysed in order to describe the impacts and propose further improvements to the management and the implementation team on a better perception of process change for employees of the company a further progress in processes.

The structure of master's thesis is following:

The first part situated just after the introduction comprises a theoretical basis of the work with the aim to describe and explain the definitions and terms, which are used further in the thesis. The literature review presents also a basis for two methods used for the research. The second part is dedicated to the company's

introduction, to the analysis of the impact of enterprise resource planning system implementation on processes of Packing and Shipping, and the analysis of the impact on people, as well as to the interpretation of the research results. The last part of the thesis includes recommendations and proposals for the future progress of the implementation and decisions of the company's management, based on the evaluation of the current situation.

1 THEORETICAL BACKGROUND

In order to understand the content of this paper the theoretical part focuses on clarification of areas touched in the following part. Above all, the areas like operations management, change management, information technologies and systems, the enterprise resource planning, processes and other topics like performance and how to measure it in business environment.

The chapter dedicated to management of operations and change clarifies the role of management in business and its impact on employees. The motivation shows examples, how to get the best from employees. The chapters concerning information technologies and information systems, as well as the enterprise resource planning elucidate and present the terms concerning the technologies and the systems, the enterprise resource planning, as well as describing advantages and disadvantages of its business usage and how to implement these systems successfully in a firm. Following chapter focuses on measuring performance of a company and the impact of implementation of information system. Other chapter closely describes process and their importance in a company, and lastly the questionnaire theory is covered as well.

1.1 Operations Management

The terms like operations management, manufacturing management and production management are almost synonymous describing the area of operations and production management, involving not only management of production and operations, but also organizations and people (Donnelly, 2000, p. 478). Operations as a term was defined as “all activities directly related to the production of goods and services”, therefore management of operations is a function, which must be included in order to deliver a value to the customer. The operations management is a core business of any organization, often divided into functional lines of management: planning, organizing, staffing, directing, motivating, leading and controlling. The other functional areas of companies like

marketing, finance, accounting and purchasing are not considered in the operations management although they are part of an organization (Shtub, 1999, p.1).

Operations managers see the term product as some output of a productive system, which can be a good, economically seen as movable personal property, or a service, activity provided to a customer. The transformation of inputs into goods and services is the function of production, the most important in operations management.

Donnelly (2000) explains that company's operation management should be seen as a system, an accumulation of objects connected by the common purpose to accept and transform inputs into outputs provided to customers, while regularly interacting and being in interdependence.

It is the view of Koontz and Weihrich (1990) that the system of operations management is very complex as shows Appendix 7, where the operations management system is displayed on a model as a subsystem of total management system.

The inputs displayed in the operations management system model include: needs of customers and information, which are starting points for an idea of any production, also technology, labour and management necessary for the realization, as well as the fixed and variable assets pertinent to the transformation process. Transformation can be accomplished only when including managers and workers who use previously mentioned inputs to produce the demanded outputs in an effective and efficient manner. During the transformation process, some inputs are consumed, such as materials and other supplies, others like machines, warehouses, plant sites and buildings are considered to be relatively permanent. Many tools and techniques can be used to assure the suitable flow of the transformation system, as well as a constant focus on the system improvements.

Another important aspect of the system is Planning Operations, focused mostly on two duties: product/service decision and product and production design. At the beginning an enterprise takes a decision about the type of product or service to be

provided to customers, as well as the markets where it might bring success, also based on objectives, premises, and strategies of a company. At this point many variables must be considered, such as production at reasonable cost of production, engineering, transportation, warehousing cost etc. Then follows the design of the product or service and their production including: creation and selection of the product or service; completing of design process; development, testing and simulation of processes necessary for production; facility testing, and planning and scheduling of complete production system (Koontz and Weihrich, 1990, p. 440-443).

When the production system is successfully created or implemented, the management must be able to operate the system. The organization structure must be created, staff must be selected and trained according to their positions, including managers, who ensure the supervision and leadership in their working teams. The purchasing and inventory maintenance must be essential parts of the operating system, aiming at best rate of productivity in time and keeping the expected quality requirements.

All previous steps taken lead to the Controlling operations, specialized on set up of standards, comparing the real performance against the standards, and correction of their deviations. For this purpose the information systems were developed, allowing collecting, monitoring and operations with data created at planning, purchasing, quality assurance department, order and project management areas, warehouses, manufacturing, packing, shipping and other areas occurring in an enterprise. This topic is discussed later in the chapter 1.6.

Lastly the model points out the influence of external environment, like country regulations and laws, sociocultural environment, technological development and others, which can affect a company's business too.

All areas described above must be covered and seen as an interconnected system, when contemplating the production of any kind of output. All forms of products or services, their production and sale bring information, which should be

considered as an important source of data for future development of the business. (Koontz and Weihrich, 1990, p. 443-446).

1.2 Change management

The opinion of Koontz and Weihrich (1990, p. 282) is that "...the forces for a change may come from the external environment to the firm, from within the organization, or from the individuals themselves". According to Carnall (1999, p. 3-5) the industries are revolutionized by companies entering markets. The boundaries of all industries are shifting constantly. The computer companies initiate a revolutionary change by bringing new products and programs forcing the increase in computer usage. The internalization and globalization have been forcing changes for several years. The countries face the greater cooperation and interdependence between the private and the public sectors, the lifelong learning has become crucial, as well as growing demand for educated and skilled workers, etc.

All of these factors force firms to react in order to keep the business prospering. Companies can be found in a state of equilibrium, facing the forces pushing them into a change and other forces counteracting the change by maintaining the current status (Koontz and Weihrich, 1990, p. 283). Kurt Lewin (see Koontz and Weihrich, 1990, p. 283-284) defined this fact as equilibrium, which is preserved by two forces (visible in Appendix 6):

1) *Driving force* – new directive, policy or training;
2) *Resisting force* – unknown effects, fear of change, unknown or incomprehensible reasons for change, loss of benefits or power;

When the change is started, driving forces usually increase, which can create some valuable activities and movement, but also increase the restraining forces, mostly coming from the employees.

A firm's reactions to the forces can vary, one option is to resist the forces to change and react only when some crisis appears, which is not effectual in most situations, particularly in long term perspective. The other option is to plan the change thoroughly, which might comprehend a set up of new objective, strategies,

policies, organizational arrangement, or other changes in style of management and leadership, or even in the culture of a company.

The process of change includes three main steps to be taken:

- *Unfreezing step* – the need for a change; the motivation point to move on, feeling of a necessity to change due to the current or repeating problem or a situation;
- *Changing or Moving step* – the point, where the change actually happens, through the acceptance and embrace of new information, the concepts, or other development;
- *Refreezing step* – the stage of change stabilization; the reinforcement of newly implemented is crucial, the change must be congruent to employees' values (Koontz and Weihrich, 1990, p. 283);

Donnelly (2000) states that it has been proved by many organizations, that tarrying in the moment can cause an irrefutable damage to a company, therefore constant changes are necessary to be accepted and integrated as soon as possible, for which the reduction of resistance to change is crucial. It can be achieved by various ways. Organizational members' involvement in a change planning can decrease uncertainty of unknown future; considerable communication about a change may clear reasons and effects up of a change; the training and learning plan can help to see to an employee's new options; The most important is to create an effective plan of actions, that gives to a firm the necessary room for a change. The longer it takes to complete a plan, while carrying out an objective, more essential becomes an inclusion of contingency plans into the plan. It gives to management a chance to take potential effect of the change into account, and be better prepared to handle it well.

As Carnall (1999, p. 154) points out the change management is essential multi-functional problem. The development of professional and highly competent team and functions is not sufficient, because things change, improve and mature, so it asks for closer focus on the mutual collaboration across functional boundaries. Important is not only attitude and understanding of management and employees,

but also effective information flow and its control. In other words, to deal well with constant pressure for change, there is a need for appropriate accountabilities, systems for reporting, information and authority system. Essential is also a system how to allocate firms resources, connected with the need for revised systems usable for employees, the performance appraisal and promotion as a motivation, and other factors influencing performance improvements in order to fulfil the organization's objectives.

1.3 Motivation

According to Cejthamr and Dědina (2010) every company must react to changes happening on markets on daily bases. These changes have an impact on the whole company, its management, business and all employees. Some changes may have higher impact, than others, but all have some. Impact on an individual employee is also variable, but still all employees of most companies are forced on daily bases to learn something new, change their attitude or behaviour and pushed to reach peak performance. In order to keep employees providing to organizations, what is required, there is a need to motivate people.

Motivation is an individual issue of every each personality, it is mostly intentional, and under a control of each employee and his/her behaviour influenced by his/hers motivation.

The motivation's two most important factors are:

- Things, that encourages and cheers people;
- The strength of each person to become involved in a certain action.

Certain behaviour of people cannot be considered as motivation itself. The way that people behave depends on what is their motivation. Their performance is then the result of combination of their abilities and motivation.

If a manager wants to improve the work in an organization, then he/she must concentrate on the level of employee's motivation and must support them, in

order to control, that their power is directed towards successful fulfilment of firm's set up targets and tasks.

1.3.1 Types of motivation

There are many ways how to motivate people. Standard classification is a division of motivation on:

1. External – connected with a tangible reward as a salary or employee benefits, a contract of employment, work environment and work conditions; these rewards sometimes cannot be influenced by managers.
2. Internal – motivation that is related to "psychological" rewards, like an opportunity to use personal abilities, a sense of finding tasks and its accomplishment, due acknowledgement and appreciation, as well as a good care about employees; such rewards can be controlled by a manager.

When classifying motivation to work the division is following:

- Economic rewards – a salary, the social benefits, an entitlement to pension, material benefits and means;
- Inward satisfaction – it arises from a nature of a job performed by each employee, also from an interest in the job and from personal development;
- Social relations – the friendship, a teamwork, a hunger for success, a self-realization, a self-actualization (Cejthamr and Dědina, 2010, p. 142-144);

Research by Llopis (2012) suggests that apart from the classic ways how to motivate employees, there are certain forms, which can have a great impact on people employed within a firm.

One of the listed, are leaders, who can be trusted. Having a team of people, who can trust their leader or manager means that they believe he does his best to act in the interests of his employees and in return for his care they will try harder not to disappoint him by luck of their interest and effort in the work they do in a company.

Second important thing, which leaders should focus on, is making their people feel, that they are relevant to a team or a firm. Each person desires to be noticed and recognized for what he/she does. The best way, how to do it, is to find way how to increase the employee's potential. This will help to create higher performance and increase the team's loyalty.

Other step, which can be considered, when motivating your team, is a creation of space for opportunities of career advancement. As well as helping them to understand, that although the way to be more successful in their career may seem difficult at times, there are certain ways, how to make it happen. Leaders, who share their experiences of their successes and failures, make others feel, that they can improve as well.

Last but not least highly motivating factors are happiness and stable future. People are a lot more motivated to do the hard work and extra work, or just their work precisely, when feeling the safety, happiness and security in their working environment.

1.4 Information technology and information system

Before the terms like information technology and information system are defined, it is essential to specify the important terms and their interconnection, as well as their differences, which are commonly used in the definitions. Highly important in this field is to understand following terms:

- Data – a collection of unprocessed, untreated, unworked pieces of readouts, data or facts, used for future usage, calculations and reflections. This data can be collected, stored, processed. When interpreted and transformed into context it changes into a piece of information.
- Information – the evident result of processed data, which were organized, interconnected and sorted into appropriate order. Information is the data providing to business a certain substance, if put into context by trained employees or others having understanding of business context.

- Knowledge – the ability to know, understand and recognize the difference of meanings, models and patterns of information (Seige, 2007, p. 13)

1.4.1 Information technology

The information technology (IT) is perceived as a set of means and methods used for working with data and information. In general, the terms like information and communication technologies (ICT) might be met. These terms concerns technologies and technical tools used for collection, process, transformation, transmission and storage of data. After that the data can be pictured, used and evaluated for concrete purpose (Vymětal, 2009, p. 15).

1.4.2 System and information system

The system is generally seen as the purposely defined nonempty set of elements and set of bonds between these elements, where its features and connections determine features of the whole (Gála, 2009, p. 23). The elements may be considered to be indivisible to some level of differentiation and groups of elements may create subsystems within one system. The bonds among elements represent their connections either in one-way or two-directional movements. The systems are also connected to the surroundings due to inputs and outputs, which allow gaining and passing information to their surroundings. The systems are examined by their behaviour in the information system and also by the interaction and communication towards their surroundings (Vymětal, 2009, p. 13).

Taking the definition of a system into consideration, then the information system (IS) can be described as a system created by ordered set of relations between people, data and information sources. The purpose of information system is to provide suitable way how to express data and information. It is created by human sources, expedient tools and methods in order to reach set up targets. The creation of this system is based on three main components of an information system:

1) Input – the elements allowing to catch and collect data and information inputs, which become a subject for future transformation, or to connect the inputs;

2) Processing – includes elements, which provide transformation of entered data and information into desired outputs;
3) Output - presents elements able to carry information and other outputs to the receiver – user;

This kind of system is mostly extended by components ensuring the control of an information system and also feedback. The control component set up standards for processing, measures deviations and focuses on their minimization. The component providing feedback is able to evaluate the output and based on the result of the evaluation adapt the future input. It also has a power to influence processing and control components.

The information systems is the consistent and ordered set of components cooperating in order to create, collect, process, transfer and extend information. The main elements of IS are people – users of information and information sources, as well as communication technologies and other sources like the financial or technical. The information system can be run on one or more computer devices and other programs providing data processing (Gála, 2009, p. 23-25; Vymětal, 2009, p. 14).

1.5 Economic systems

Vymětal (2010) notes that the economic systems are sometimes called the economic software, but in general are systems designed for small or middle businesses, which has no sources for wide-ranging information system. These businesses are forced nowadays to use the application software enabling them to manage business data and support fundamental processes. These systems give assistance for finance agenda, procurement, storage, invoicing, taxes and wages. The extent of an internal integration and support of business functions is mostly lower, then if a company can use more complex Enterprise resource planning systems.

1.6 Enterprise Resource Planning systems

The Enterprise Resource Planning systems, generally seen as abbreviation ERP systems, are systems based on applications and application software. ERP system (ERP) is reckoned as the information system providing powerful tools which can cover business functions like planning and control of major company's processes, gaining resources and transforming them into outputs, while sharing common base for data and information. The word "Enterprise" reflects the ability of a system to support all partial functions within the company at all of their levels. The ERP can cover processes across levels of management, from operative to strategic. The system uses a standardized approach for these processes and offers a possibility to automate them, which helps to keep data consistent at one place. The complete ERP system presents the application core with common data base integrating all partial functions within the business and covering information needs of all system users (Gála, 2009, p. 159; Tvrdíková, 2008, p. 87; Vymětal, 2010, p. 19).

According to Basl (2008), the Enterprise Resource Planning has many available definitions, many of them interprets the system as not only application paradigm, but as a *"...method of an effective planning and managing of all kinds of business sources in manufacturing or distribution firm focused on services; these sources are necessary for acceptance and realization of customer order including following production, delivery and invoicing of good or service..."* (p. 65).

The ERP also symbolize a tool for well arranged record keeping of business data integrated with company´s functions offering the easy display possibility, as well as its adjustment, because it provides to user the options to:

- Create and keep updated extensive bases of firm´s data, including data about products, possessions, accounts, customers, suppliers, employees, etc.;
- Assure by its functionality and user interface the support for realization of processes of operating character, such as the processing of customer order starting at material purchase, over the organization of the order production, towards final packing and shipping. During the whole process it facilitates

the administration of related documents like orders, contracts, invoices, and others;

- Produce and present required outline, statistics and basic analysis (Gála, 2006, p. 64).

It is the view of Tvrdíková (2008) that one of the most important attributes of this system is a fact, that data must be entered only once. The entered data are then available to all users given the rights by system administrator to use, work or delete this data. This option avoids multiple data entry and allows diverse users to make use of it without causing duplicity or inconsistency of information. Due to this feature, the system does not allow errors caused by differences in data, entered by similar entities saved at several places. Every user has his/hers own entry code and is allowed to see, adjust or delete only concrete data, which are crucial for his work or which must be created, processed or deleted by his position.

Other important features of ERP systems are:

- Automation and integration of business processes;
- Sharing data, procedures and methods standardized within entire company;
- Creation and accessibility of data within the entire firm;
- Recording of a history of all data transactions.

Basl (2008) notes that these systems can be provided as an application, considered to be software solution for various areas of business, or complete software solution created to a specific business environment.

1.6.1 Functional modules of ERP systems

The structure of ERP systems can be described as modular, securing a balance between the integration and independence of individual modules. Companies generally purchase mainly the modules used for a support of their processes and functional areas. It is clear, that for business like a shopping mall, the manufacturing module would be of no use. Contemporary architectures of ERP

systems can offer application modules and also other modules focused on operations and support of business. The ERP architecture is often created by these types of modules:

- Application – providing functionality for major areas of business management such as procurement, sales, production, finance, human resource management, etc.;
- Administration – securing system settings, user rights settings towards data and functions access, keeping evidence and analysis of operations run by applications' functions;
- Documentation – containing user documentation for individual application modules and features for user interface of system, often indicated as "*Help*";
- Implementation – used for implementation of system into the business, allowing some adjustments – *customization* - of its functionality for specific company's processes and their optimization;
- Development environment – area used for development or adjustment of current program media used in the system;
- Communication – modules allowing communication of databases, or with the external systems, other applications used within the company or other technologies (Gála, 2006, p. 63-64).

Division and representation of ERP modules vary depending on an individual provider. The variation is also visible in their focus on a specific business areas, applications and processes. But basic modules are mostly very similar. The ERP systems cover mainly these business areas:

- Finance – management of accounting books, receivables and payables, focus on bank accounts, long-term assets, costs and controlling department;
- Sales and Marketing – integrated support for administration of customers, sales and management of marketing activities;

- Logistics – put into context of the ERP systems, modules offer administration and management of Logistics including warehouses, which can be divided to receiving, storage and kitting, then packing and shipping modules all using stock modules, but these two can plan shipping and packing as well as keep contacts of suppliers;
- Procurement – control of purchasing department, interconnected with logistics stock module, especially the receiving section for control of delivered purchased parts, management of purchase orders and suppliers cooperation;
- Human resource management – administration of employee evidence and their personal data, qualifications, functions in the company, their absence from work, their accomplishments connected to their employment, achievements, etc.;
- Production – the main focus of this part is planning of production, more precisely production of orders, tracking the status of orders with relation to the terms, tracking and analysis of stock, production management at two stages: operations and workshop jobs (Gála, 2009, p. 167-173; Basl, 2008, p.67).

1.6.2 Technological principles of ERP

Enterprise resource planning systems are oriented primarily on transactions. ERP systems use mostly transactional types of functions of IS. The modules share data due to common databases or by transferring data inputs and outputs. This means that by using one function of the whole system, all transactional operations are done within this function. The transaction performed in one module can automatically create a desired action in a different module. Suitable example can be a sale of goods based on a contract, which will appear as information, not only in sales module, but also in finance and accounting modules. Transactions are mutually consistent, can be traced back, as well as the causes and effects of particular transaction and its consequences.

Major part of ERP systems are based on relational database systems. The database systems are chosen into each individual company on the basis of a size of firm, this criteria is influenced also by the quantity of data that must be considered to flow through the system.

The role of ERP system is to present a centre of information system of a company. This position requires providing an ability to realize connections or interface for communication with other applications and programs. Many companies use applications like Computer Aided Manufacturing (CAM), or Computer Aided Design (CAD) or geographic information systems.

These systems can also offer a technology for management and automation of processes and workflow while optimizing expenses, helping to increase a productivity of a firm and decrease the risks of errors (Gála, 2006, p.65-67).

1.6.3 Advantages and disadvantages the ERP

Although ERP systems provide a wide range of solutions for a firm's management, replacing different departmental information systems and databases, it may not be a convenient solution for every company. Very complex portfolio of these systems and relatively high costs might not be suitable for small businesses, which can benefit from some smaller sized economic systems that are affordable and functionally sufficient. Large-sized businesses considering an implementation of ERP and other IS must compare pros and cons of the concrete systems and choose the most suitable one for their concrete business.

Advantages and benefits of ERP system

The reasons and benefits why to give preference to ERP system are many. The opinion of Vymětal (2010, p.38) is that, "...the main reason for ERP implementation is the fact, that it gives an opportunity to company's management to control better company's processes and resources...". Vymětal (2010) states another usually secondary fact, why firms tend to implement ERP into their business, which are savings of cost or workers. Other reason is support the future

users of the system, who do not focus on possible savings and better control as much as the top management. The crucial step to take, when deciding if and what kind of ERP system to choose and implement, is an identification of prospective benefits for two working groups, management and employees – the end-users.

Main benefits, which ERP systems provide to firms, are:

- The speed up of processes caused by data, procedures and programs integration;
- The effective access to data used for decision making, which are based on a single input of data from integrated databases;
- The overtness for communication and data exchange with other systems;
- A possibility to use international accounting standards;
- Relative decrease in number of specialized IT workers;
- Uniform user interface in all modules facilitates system usage training for employees;
- Higher market flexibility because of openness of system towards modules' functional extensions (Hoeven, 2009, p.25-27; Vymětal, 2010, p. 38);

The fully functional ERP system itself cannot assure, that the targets for which it was implemented, will be achieved. Although the main requirement of ERP is to meet the set up targets, for successful usage and in order to fulfil its potential, it is essential to meet the other conditions:

- The system provides a reliable and quick support;
- It supports meeting strategic, tactical and operative targets;
- ERP system features the functions which meet the requirements and specifics of the concrete business of a firm, which must be taken into consideration during the implementation and appear in a set up of functions;
- It must be run on the high-quality and reliable infrastructure;
- ERP is trusted and has a support from the company's management;
- System trainings for all employees – the end-users;

Other advantages of the ERP systems are integrated relational databases providing benefits when working with data, like:

- The same data, once entered, are used for multiple modules, which decrease the costs of data creation and maintenance;
- Higher data and information security;
- Higher reliability and lower duplicity of entered data;
- Support and simplification of archiving of the information;
- ERP provides an option to use the data for on-line analysis (Vymětal, 2010).

Disadvantages and drawbacks of ERP system

The complete implementation of ERP system brings the negative effects, problems and issues as well as the positive ones. Some of them can lead to the decision of the company not to implement this kind of system at all, or to post pone the implementation, or to stop it in its progress. The main disadvantages and drawbacks are:

- Long deployment period – the full deployment of ERP can take between 1 to 3 years, sometimes longer, depending on the extent of the system. If this system must be implemented into a business core as a reaction to the specific situation at the market, then it must be implemented in the shortest time scale possible, in order to achieve firm's targets for the implementation. Various suppliers of the ERP systems have the packages ready to be implemented, but there is very little space for customization of the package towards company's specifics of a business. Therefore, when the extent portfolio of the system is planned to be implemented, it is a long process of customization of the system towards the specifics of each business.
- Costs – suppliers offering the ERP system are focusing either on small and medium business, where they offer smaller packages of systems, which can be implemented quicker and easier, with none or very little customization, than larger customized systems used in large corporations.

Small and medium business mostly set up contracts with the ERP suppliers on the base of regular system maintenance, or help provided, when asked for, based on the fee, as well as paying for the ERP licence or a program. In comparison to large ERP systems, customized especially for the concrete business of each company, where the costs are much higher due to extent of the system, as well as the duration of its implementation, fees for customization and licence, online support, etc.;

- Complexity and complicatedness of functions and its integration – due to the fact that these systems are best for integration of full scale of firms' functions, the complexity of the system is understandable. The problems can arise from a different understanding and view on the company processes and their complexity, and type of communication between firms' employees and the ERP implementation team;
- Payback – the costs that these systems save to companies are not measurable straight after the implementation, even in longer period it is difficult to measure the costs savings (Dasgupta, 2001; Vymětal, 2010; ExcITingIP.com, 2011).

1.6.4 Implementation methodology

According to Edwards (2005) every methodology used for an implementation of the ERP system has very similar steps and rules, which should be followed and fully respected, if a customer desires to have functional ERP system set up according to his expectations and requirements. An implementation methodology represent mighty and organized complex of procedures, documents and activities, which are necessary for organizational support of steps, crucial for successful realization of a project and for minimization of possible risks, which may occur during the realization of an implementation. A firm is pushed to take each step carefully and with caution, while generating projects out of these steps. This allows a firm to estimate the financial and time demands of the project, as well as human resource and costs requirements. An essential prerequisite for successful usage of a methodology is consistent observing the rules and steps by whole realization team, in detail it means by all members of an implementation team

from a system supplier, as well as by every each employee, who will be using a system of a client. When a client desires to implement more sophisticated ERP system, where the project gets more difficult to be implemented, it is important to fully involve key users/customer's employees in an implementation, who form in integral part of an implementation team, and cooperate closely to their own solution. Then the complete process of an implementation becomes fully controlled and transparent process to all participants.

Research by Carr (2009) suggests that in general there are two types of methodologies used for ERP implementation, the **Traditional** and **Turnkey**. Both of them, as any ERP system have its pros and cons. First to be recognized is called the **Traditional methodology**, the first methodology introduced with the beginnings of ERP. Traditional methodology has six phases:

- Planning – moment, when the implementation team is created from customer's employees as well as from the suppliers' ones. Plan and resources are set with the focus on the company's objectives for project;
- Education – step for consultants of a vendor to educate the implementation team, which is a core for customer's self sufficiency and to make the project successful;
- Design/Configuration – vendor consultants are at the place to support the implementation team with designing, configuring and setting up the new system and processes crucial for business;
- Conference Room Pilot – the team dedicated for implementation test the system in several places and modules. The final test is called "*go live*" and it simulates the situation, when a firm will rely on the system, only. When the testing is successful, a customer team has reached a point of complete understanding of their newly implemented system;
- Cutover Activities – phase, when the implementation team desires to cutover process, trains the other firm's end users on the new system, trying to help them to like the new features of the new system, while the consultants support the team;

- Go Live Support – step, when positive attitude is the most important, as the system must be used by all end users, in order to create correct data flow through a company; the implementation team helps to everybody, who needs it, at real time; The consultants of a vendor stay at the start, when new system is used in the company, in order to help with solving new issues arising while the system is used.

Second methodology, which was introduced later, is the **Turnkey methodology**, which is a vendor lead method for ERP implementation. This one has similar six phases to the firstly mentioned one, but there are some changes to them, like:

- Planning – typical phase for both types of methodologies, the same targets to reach in this phase, but team from vendor plays stronger role in creation of a plan, where consultants from vendor are fully involved;
- Discovery/Setup/Configuration – step, where is reflected main difference from these two types due to a fact that consultants review the current processes, create, configure and create processes completely new. These are tested with minimal involvement of customer's team. Although the implementation team is created it only provides input on current processes. Therefore, it is called a "turnkey", because the system is designed and set up and then provided to a customer without the high involvement of people from customer's side;
- Prototype Review/ Education – moment, when consultants provide the new system to the implementation team and educate end users using prototype workshops, which are demonstrated to them. While the education is in a process, customer's employees provide a feedback to consultants on some issues, which may arise; these are solved by consultants on time. At the end of this phase, end users should accept the new system;
- Conference Room Pilot – similar phase to the first methodology, the system is tested, end user are led by consultants through several

conference room pilots. Lastly simulated CRP becomes a simulation of a system to go live. If all simulations are successful and team accepts the system, it is approved to go live.

- Cutover Activities – the same step, when the implementation team arrange to cutover process, trains the other firm's end users on the new system, while the consultants support the team;
- Go Live Support - no changes in this step as well as, if compared to the other method. The implementation team supports the end users to use the system, solving new issues, while being help for first moth by consultants provided by supplier of the system (Carr, 2009).

The main difference between these two methodologies is the customer involvement in the whole implementation process of the system. The Traditional methodology requires the implementation team created by customer's dedicated employees and vendor's consultants to figure out the way, how to implement with a success and get the rest of the customer's employees, who are the end user involved in the new system usage. To the contrary, the Turnkey methodology offers "ready to be used" system/software, which is presented to employees of customer by vendor's consultants, who implement the new system into the core of a firm and help end users to learn how to use it.

Pros and cons of methodologies

Both methodologies are used for implementations, and what Carr (2009) reports is that both of them has some advantages and disadvantages, which must be taken into consideration, when deciding, which kind of ERP system a company will choose as a core system to its business.

Advantages of the Traditional methodology:

1) The responsibility for the implementation project is up to a customer, he leads the process flow;
2) Lower level of support from supplier's consultants;
3) The business team is responsible to understand the new system, which causes the proactive attitude to support the project;

4) Self sufficiency of a customer in knowledge and use of ERP system is crucial.

Advantages of the Turnkey methodology:

1) Presumably short period for implementation (16 weeks instead of 26-40 weeks);
2) A customer is allowed to adopt the best practice processes, that supplier can provide.

Disadvantages of the Traditional methodology:

1) High level of ERP capability is crucial to be provided by the customer team;
2) Greater commitment of time and effort from the customer's employees dedicated into the implementation team.

Disadvantages of the Turnkey methodology:

1) The ownership costs will get much higher over the time of system usage;
2) The costs for ERP consultants can be very high as well;
3) The consultants provided by customer must learn the business of each customer;
4) Higher reliance is put on vendor for successful implementation of the system into customer's business.

It is strictly the responsibility of a customer to judge wisely which ERP system incorporate into his business. The customer must also consider, how much resources he can provide and how extent system will be needed, as well as which methodology choose. The ERP competency or previous experiences with these kinds of systems of his team must be considered as well as a need for the new system and changes it will bring. The ERP implementation can be successful only, if the team has a success.

1.6.5 Impact of ERP on employee performance

Research by Kanwal and Manarvi (2010) shows that, the deployment of ERP into a business core does not assure that a firm's performance will improve. Due to a fact, that Enterprise resource planning is a complete business management system, it affects every person in the company. The implementation itself as well as potential of this system will only prove its values and reach set up targets, when correctly used by end users in their job. Sun, Bhattacherjee and Ma (see Kanwal and Manarvi, 2010, p.34) conclude that the most usual reason, why ERP implementations can be a failure for a firm, is unwillingness and aversion to accept and use the ERP system. Gymph (see Kanwal and Manarvi, 2010, p.34) has drawn attention to the fact that user satisfaction with information system is one of the most important factor, that managers must focus on, when implementing any kind of IT system.

The work of Kanwal and Manarvi (2010) indicates that several factors influences potential success of ERP. A firm must always focus on IT planning and skills, ability of management for business process drawing, having committed executives and the whole management team into ERP implementation, even if it means intensive training and learning of the new system. As ERP affects the whole company, there is always something, what needs to be improved. In the case of these complex systems, the most important is the influence on all employees, when considering a likely possibility, that not every one of them is skilled and experienced in using such a complex IT system. Therefore, the most essential for a success of this expensive system's implementation mostly becomes a realization of a gap, which is between end user and ERP implementation team in their skills and understanding of such system. The most certain way, how to solve this issue, is very successful training for employees, which is easy to understand and in the case of need separated in to partial training, which can prevent potential fear of usage of something unknown, highly motivating factors for their desire to learn and use something new and frequent re-trainings, as well as constant support. Other important factors are in time communication about ERP implementation plans, high support for usage of ERP coming from senior management and guidelines about help, which is included in the system, as well as a help team within the company.

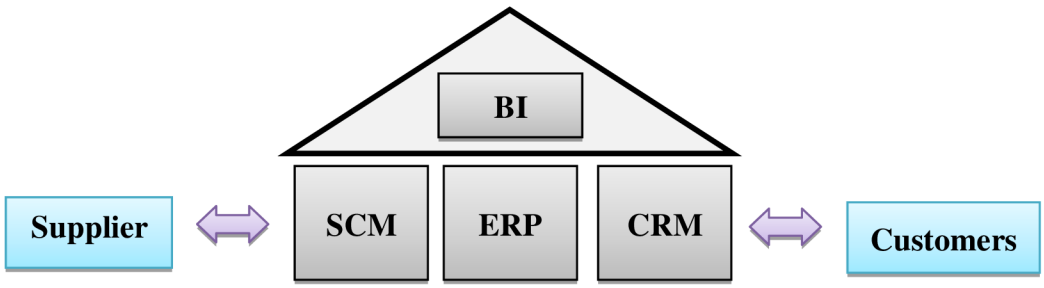
1.7 Second generation of ERP systems

The Enterprise Planning Resources systems II are also considered to be the second generation of ERP systems. These systems are able to integrate other supporting, managing and externally oriented business processes. Improved interconnection of internal and external processes is guaranteed by modules supporting management of customer relationship and management of a supply chain. Other added tools are some functions, which support decision making, transformation, analysis and clearing of data (Hoeven, 2009; Tvrdíková, 2008). Second generation of ERP is a complex system, providing software solution, which includes functionally and technological characteristics of various types of business applications. End users have an integration of many applications at their disposal under a single user interface. Therefore, there is no need to integrate partial heterogeneous applications, which come from different suppliers. The core of ERP II is ERP system itself connected with other systems (Gála, 2006).

Types of applications, frequently extending the ERP systems:

1. Supply Chain Management (SCM);
2. Customer Relationship Management (CRM);
3. Business Intelligence (BI) (Basl, 2008);

Figure 1: Extended ERP system diagram



Source: adapted from Basl (2008, p.89)

Many other extending modules and applications can be found at market provided by various ERP suppliers. Most common are:

1. Product Data Management (PDM);
2. Product Lifecycle Management (PLM);
3. Supplier Relationship Management (SRM);
4. Employee Relationship Management (ERM) (Basl, 2008);

1.8 Business Intelligence

Business Intelligence presents a complex of processes, applications and technologies of IS used for a transformation of data into information, the information to knowledge and knowledge to plans, which allows to fulfil set up targets of a firm. BI is considered to be an analytical and planning tool used for vast majority of managed areas in business. Applications of Business Intelligence use data, which are sourced using ERP or other types of transactional systems. BI systems allow changing criteria used for business data analysis quickly and flexibly, which allows end users to react with a speed essential in constantly changing world (Seige, 2007; Gála, 2006).

1.9 Evaluation of business performance and efficiency

According to Wagner (2009) the term "performance" is universally accepted as a characteristic describing a course, how a subject performs a specific activity. This characteristic describes also the activity based on a similarity with a reference manner of the activity execution. It is assumed, that the interpretation of the characteristic can be compared based on examined and referential effect from the point of view of a determined evaluating scale.

If a business performance is considered, it presents a characteristic denoting a course, how an organisation carries out its activities, compared to the referential ways of these activities. A choice of activities and criteria for performance evaluation is determined by individual groups of stakeholders and their interests,

which usually differ strongly. Determination of a principal criterion for evaluation and subsequent interpretation of results for a business performance can extend into uneconomical realm. The conflict of interests and preferences of particular groups of stakeholders should turn into a formulation of business strategies for a firm. The measuring and evaluating of business performance should be extrapolated from a degree of fulfilment of strategic targets of a company.

It is the view of Thomsett (2010, p. 184-187) that every manager of a company must understand, that he is not there alone. His performance surely influences his team, position of his department perceived by a company, other managers and their departments, as well as owners by the results of work done by his own team. A manager will report the result of his department at daily meetings to other managers, when cooperating on target fulfilment, as well as to executives. Therefore, a performance of the company must be measure not only in complete point of view, but also partially, in order to have a successful team, which helps to fulfil company's targets.

Performance measurement

A measurement is an activity, when some values are ascertained and set up for a specific characteristic of the investigated object. The result of a measurement is then a value, which has some sort of relation to the individual characteristic. The value is used for description of characteristics, which the examined object has. In order to interpret the value, a key for its interpretation should be used.

A measurement of performance is done for many reasons in business. The frequency and extent depend on examined area of business. In general, as the most significant functions of measurement are considered a memory backup, where the measured values are used a store of data about characteristics of the object for a specific moment, or for a certain time scale of development. Other significant function is a comparison backup, which serves for a comparison of measured characteristics or values in different time intervals. Next function is mediation, objectification and intensification of cognition. This specific function enables observers to get the data about examined object's characteristics. Last but

not least function is providing proofs in the case of a dispute about characteristics of an object (Wagner, 2009, p.35-36).

Valuation of business performance

It is the view of Vochozka (2011, p.9) that an importance of a value of business is more important nowadays, than ever before, due to constant changes at markets. A process of valuation of business, its result and a relevance of results are determined by the purpose for which the valuation is done, by stakeholders involved and projects involved in the valuation.

The point of business performance valuation is to render data, which describes the business. It should become a tool for monitoring the current state or near past and as a feedback. It becomes a main criterion for management team, when assessing a success of management of a firm. The owners rely on information from valuation heavily, as it tell them, if their injected capital is managed as they expect.

1.9.1 Financial analysis

The financial analysis is formalized method allows showing a financial health of a company. It enables the analytical and systematic approach to company's particular activities. Due to the families of ratios, which are calculated in financial analysis, it measures a degree of liquidity, activity or profitability of business.

The major source of data for analysis is an accounting statement. It is very important to interpret the results from accounting statement correctly, which requires experienced evaluator, it must be also compared to other than financial data and information about economic results from examined periods. The financial analysis examines mainly past results and informs about potential future for a concrete firm and potential risk, which should not be underestimated. Major benefit of this analysis is a comparison of financial data and its derived ratios in time examined (Vochozka, 2011, p. 12-13).

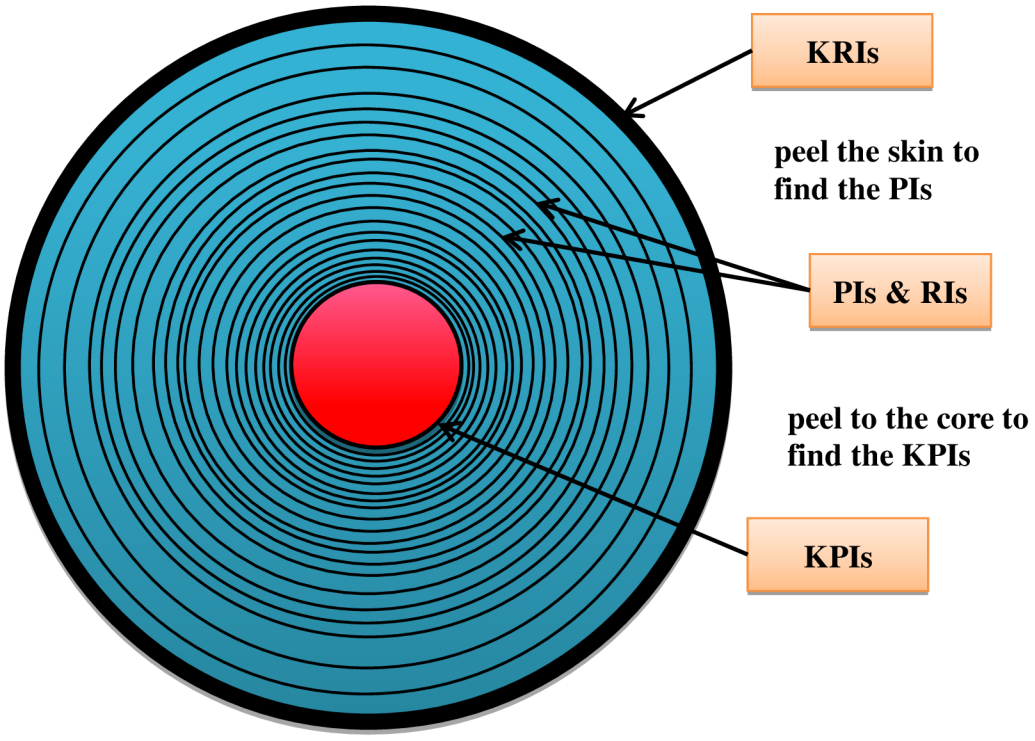
1.9.2 Key Result and Performance Indicators

The opinion of Parmenter (2010, p.1) is that very few companies actually work with correct measures, especially when using key performance indicators (KPIs). Even less companies actually monitor the real KPIs. The main reason is that KPIs are very often misunderstood and miscalculated. There four types of measures for a performance in business:

1. Key result indicator (KRI) – an indicator providing information, how the business has done in a perspective or critical success factor;
2. Result indicator (RI) – indicating what has been done in the business;
3. Performance indicator (PI) – a result of a measure, which tells to interested stakeholder, what to do;
4. Key performance indicator (KPI) - an indicator, which points out, what must be done in order to increase performance in a dramatic way.

It is quite usual practice in companies to mix inappropriately these four indicators. Therefore, an onion analogy displayed in the Figure 2 below, shows the relationship between four measures/indicators named above.

Figure 2: Four Types of Performance Measures



Source: adapted from Parmenter (2010, p.2)

The onion analogy describes what relationship is carried between the indicators. The outside skin of an onion is the result of the overall condition, in which the onion is. It proves how much nutrition facts it has obtained and what standard of care it has received from harvest to the store display. Key result indicator is measured as the outside skin. Although the outside skin provides important information, the lower based layers can give even more information. These layers show varied performance and result indicators, as a quality, aroma or taste of the onion. The core of the onion renders to stakeholders the key performance indicators (KPIs). The analogy explains that KRI covers a condition of state value and KPI shows, which of measured activities should be improved in order to increase performance and results.

Key Result Indicator

KRI is usually mistaken for KPI. Key result indicators show the results of a certain activity. It gives information to management team about the direction in which the company is moving. Though this indicator tells the direction, it does not state, if it is a correct one, or if there is a need to make some changes in order to improve company's results. They typically include the satisfaction of customers, then pre-tax profit, what profit can customers make, how satisfied are employees of a firm and return on capital employed. KRIs are mostly measurements of periods like single months, quarters, sometimes years. KRIs give information, which are presented especially to the board, because they are not involved in daily operations (Parmenter, 2010, p.2-3).

Key Performance Indicator

Key performance indicators (KPIs) are sets of measures, which are concentrated on aspects essential for performance of a company and for its current and future success. They are defined by seven main characteristics:

1. Non financial measures – not measured in finance;
2. Measurement is done repeatedly, some of them in real-time;

3. Interesting for CEO and top management;
4. All relevant employees must be aware of measurement and correct the action, if needed;
5. Every individual or a team is responsible for performance results;
6. High impact – influence major critical factors of success and more than one standpoint of balance scorecard;
7. Positive impact – influence positively other measures of performance.

If there is an illustration of KPIs in financial terms, it shows the measurement of result. The good example would be daily takings, which are the result of the activity executed in order to create takings. But KPI has a deeper meaning, for instance the amount of customer meetings on daily bases with key customers, who create the vast majority of profit to a company.

Therefore, KPIs should be measured on daily basis, weekly, monthly, or some of them at real-time. The orientation of KPIs is focused on the present day as well as on future. They should support the activities in business the way that imperfections and defects should be detected quickly. All KPIs lead towards changes and support innovations, especially in processes (Parmenter, 2010, p. 4-6).

Performance indicator and Result indicator

Parmenter (2010, p.3-4) also found that there are indicators, which are situated just between Key result indicator and Key performance indicator, these are not so crucial/key indicators, therefore these are determined as result indicators (RIs) and performance indicators (PIs). PI still has its importance, although not so fundamental and critical for company's performance. PIs are considered to be the non financial measures and are complements to KPIs. As an example can be demonstrated a percentage increase of sales out of 10% of the crucial customers, or the amount of implemented improvements suggested by employees within last 30 days, or a number of claims from key customers, as well as a number of delayed deliveries of goods to key customers.

Similarly the result indicators include all result measures, which e.g. for its time dimension, cannot reach the importance of Key result indicators. It can be for instance the net profit made at key production lines, or total of sales from previous day.

1.10 Balanced Scorecard

It is the view of Balanced Scorecard Institute (2013) that the Balanced Scorecard (BSC) was originally a performance measurement framework, created by Robert Kaplan and David Norton. This framework worked very well as an addition of a strategic non-financial performance measures to usually used financial metrics, providing to management team and firm's executives a view on performance, which was a lot more balanced. Therefore, in 1990s the term "balanced scorecard" was coined.

As Balanced Scorecard Institute (2013) states "the balance scorecard is a strategic planning and management system", the usage of its system can be found in business and industries, as well as in worldwide organizations either generating profit, or in non-profit ones and governments, in order "to align business activities to the vision and strategy of the organization, improve internal and external communications, and monitor organization performance against strategic goals". The evidence seems to indicate that there was a huge change from some framework to a complex system of managing a performance within the whole company.

Kaplan and Norton (2005, p.19-20) notes that BSC preserves traditional financial measurements, which shows past financial transactions, but are not focused on future and set up or update of firm's strategies. It adds some new measurements of future driving forces focused on investments in customers, suppliers, employees, processes, technologies and innovations for the purpose of creating a value. The goals and measures come from strategies and visions of a company and follow organizational performance seen from **four perspectives**: *financial, customer, internal business process, and learning and growth* (for further details see Appendix 16).

The BSC introduces managerial system, how to change vision and strategy into a balanced complete set of financial and non financial measures. Due to BSC can company's executives measure a value for present and future customers, which is generated by their business units, as well as focus on improvement of internal capabilities and investment, made in people, procedures and systems, which are

essential for future performance enhancement. But the BSC measures should part of the IS for all employees in a company, as it allows them to understand the results of their actions and decisions. The Balance Scorecard presents a balance between measures of various perspectives and views of various stakeholders. The measuring abilities of BSC are used for realization of managerial processes like:

- Clarification and transformation of visions and strategies into real targets;
- Communication and connection of strategic plans and their measures;
- Planning and set up of targets, and harmonization of strategic initiatives;
- Enhancement of strategic feedback and learning process (Kaplan and Norton, 1996, p.8; Kaplan and Norton, 2005, p.21; Balanced Scorecard Institute, 2013).

1.11 Evaluation of IS projects

When information system project is implemented or innovated, its evaluation becomes an integral part of company's general evaluation. There would be no reason for an organization to spend its sources on changing an IS, if a target fulfillment, an accomplishment of expected contribution or an elimination of undesirable effect could not be reached and proved by measurements. Top management and shareholders are mostly interested in the economic evaluation of IS project and its impact of financial indicators. Management at middle and low level, as well as the rest of employees, the end users, evaluate the IS project from user point of view. In order to evaluate the both points of view, various methods have been introduced worldwide, but choosing the right one for business is a difficult task to do, because any of them is not completely covering every part, which is necessary to be evaluated, when there is a need to see the business in full light (Vymětal, 2009, p. 99).

Therefore, there is a necessity to cover some of the most important and complex ones, in order to see, how a business can be evaluated, bringing a full picture on its progress.

1.11.1 Payback period and return on investment

Two methods, the payback period and the return on investment, work with financially expressed costs of a project compared to revenues generated from the project.

As Baker and Powell (2005, p.248) observes, "the payback period is an indicator of liquidity and risk for a project". On this basis it may be inferred that the payback period shows, what time is needed in order to raise net funds, which would cover the project costs. Therefore, the rules are as follows. The shorter payback period means that the liquidity is greater, which means that the project creates income quicker in order to cover the primary costs of project and vice versa.

The return on investment (ROI), or profitability, is a generally used method, how to evaluate investments, including IS/IT investments. It is a ratio of net profit to total assets, expressed in percentage. If the there is an investment in current assets, then management team increases the liquidity of the firm, but it lowers profitability, which might be gained otherwise. If the value of ratio in percentage is lower than a medium-term interest from the investment, the company should step in and make some change.

These measures are quite easy to be counted and then results interpreted, because they work straight forward with project values. The disadvantage of these measures can revenues expressed in numbers, because when expressing it, only partial effects caused by IS/IT project implementation, should be considered. Spotted the problem, these partial effects are difficult to identify and diversify from other effects caused by different investments (Vymětal, 2009, p.100; Baker and Powell, 2005, p.159).

1.11.2 Total Cost of Ownership

The analysis of Total Cost of Ownership (TCO) is a method, which evaluates costs alternatives used for a calculation of direct and indirect costs connected with IS. TCO allows clear matching of costs of IT infrastructure to run and own such

infrastructure. The method covers: 1) acquisition costs; 2) maintenance costs for HW and SW; 3) cots for potential expected development; 4) general maintenance cost.

All of above named costs have their lifetime period. The TCO method measures costs of each variant of projects with the others, but it does not tell, if the costs are correct or if the cost structure is as it should be. The TCO can only provide a help when choosing the option with best expense-to-revenue ratio (Vymětal, 2009, p.100-101; Voříšek, 2008, p. 356-357).

1.11.3 User and system project evaluation

When the IS/IT projects are implemented, and after it is decided to be running on daily basis, there comes a moment, when the project should be evaluated complexly. The evaluation from end user point of view is very important, as it provides a feedback to the implementation team and management team. The user and system method of evaluation covers many viewpoints, which are closely listed in the Appendix 8.

The main target of this type of evaluation is a comparison of process model at the start of implementation and the process model supported with the new IS system (Vymětal, 2009, p.109).

1.11.4 Benefits of IS/ERP

It is a common practice, that after IS is implemented the real benefits of implementation are not compared to expected ones. Main reason for this can be caused by following facts:

- The real benefits are difficult to be quantified in comparison with costs, because most of the benefits are of qualitative nature.
- Some of IS investments are made as in urgency.
- Benefits often have a delay, and manifest themselves few months after the implementation.

- In the case of ERP system, for their complexity touching every business area and processes within, it is a difficult task to screen out other impacts in a firm.

The real benefits of ERP implementation can be divided into groups based on the following criteria:

1. Division of benefits to calculable - **quantitative** and incalculable – **qualitative**; The best option is to balance both, e.g. stock reduction in value and speed up of receipt of order visualised in the system;
2. Benefits **direct** – targets reachable by ERP implementation, and **indirect** – support for direct targets;
3. Benefit **point of view** on the ERP core, e.g. ERP allows end user employed at controlling department to see through all Procurement, does not have to check each system for Planning, Purchasing, etc.
4. Benefit of **time** – a lifecycle of ERP gives enough time to adapt and change, when necessary (Svatá, 2007, p.116-118);

1.12 Improvement Potential

The improvement potential is a dynamic method used in practice for solving key managerial tasks like a creation and update of a firm's strategies, for the increase of productivity of firm's processes or realization of innovation project, like ERP implementation. This method can be used also for a formulation of targets, evaluation of project effects, and for set up of terms into a contract with an external supplier. Another usage is for measurement and evaluation of employee performance, a correct set up of supporting processes with relation towards main processes.etc. (Učeň, 2008, p.15).

1.12.1 Absolute improvement potential

The term Absolute improvement potential (AIP) is used for strategy creation. It presents a structured description of the best possible way, how a specific process in a concrete company should be realized, particularly the processes of key activities (KA) in a firm.

Key Activity

The key activities in a firm are those, which are run within the business, and their role is to:

- Determine productivity of a process;
- Include added value of a process;
- Support a synergy;
- Be a tool for a competitiveness;
- Be a determinative for a cost perspective of a process;
- Be a determinative for an effect perspective of a process;

As a term, the key activity is an activity consisting of one or more activities logically connected into subprocess, run in one organizational unit in a short period of time.

It is crucial, that as the key activities are chosen these, which truly determine the productivity of a process as a complex. The whole process contains a small percentage of key activities from all activities, generally about 3 to 10 KA. Every complex process contains some of them.

The AIP of key activities is set based on:

- Best practices – the practices considered as the best, which can put KA into practice in present time or near future.
- Benchmarking – a comparison with the top companies in a branch or generally accepted standards in a branch.

When setting up the AIP, the size of a company, regional conditions and other factors must be considered in a branch, it cannot be done in a generalized way (Učeň, 2008, p.15).

The limits of AIP

The opinion of Učeň (2008, p.17-18) is that a limit of absolute improvement potential can be every reason, which causes that the company does not reach a productivity of key activities at the point of AIP. Every company has its limits,

but the most important factor is the approach towards limits reduction on the productivity. Limits are internal and external, tangible and intangible.

Table 1: Examples of limits for AIP

Examples of limits for AIP	External	Internal
Unsubstantial	**market position legislative demand standards in sectors**	**selling method price policy company know-how IS/IT support**
Substantial	**logistics connected with existing production shortage material**	**supply structure product quality used techniques production capacity**

Source: adapted from Učeň (2008, p.17-18)

Internal limits can be influenced within the company by new projects, realization of strategic initiatives or by innovations in different areas. External limits can solved only by pushing back, where it is possible, like with suppliers, or they can be excluded by changing the business or respected and adapted towards them.

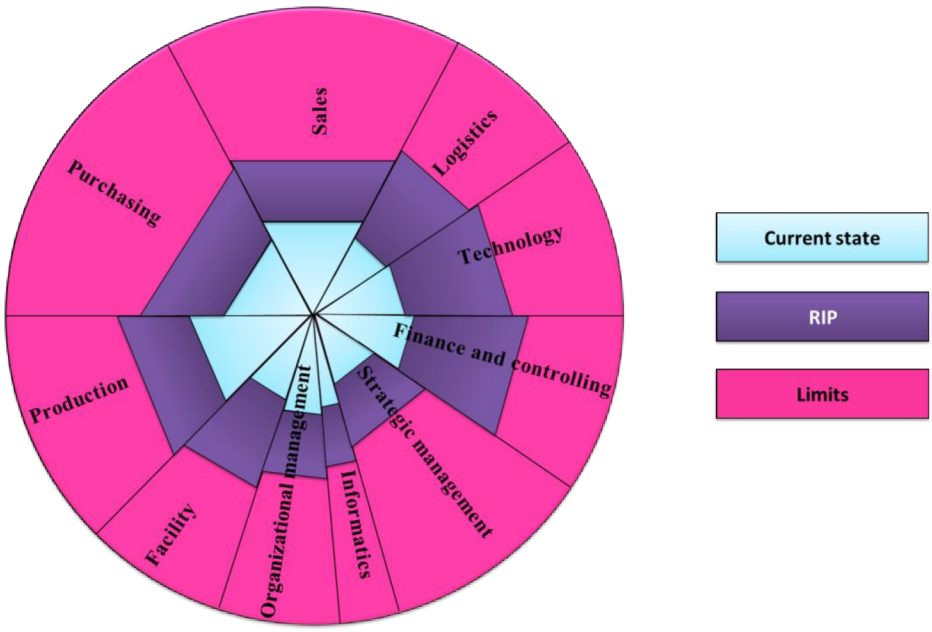
1.12.2 Real improvement potential

The real improvement potential (RIP) can be introduced as desired state of productivity of company's processes reachable in short or middle time period. The relation between RIP and AIP is that, AIP represents a distant, never reachable objective, which should determine the long-term strategic focus of a firm. Then, Real improvement potential represents practically reachable and desired state of company's processes set up and updated for short-term to middle-term periods, e.g. RIP1 can be 12 months, RIP2 can be 24 months, etc.)

The RIP is specified by a specification of KA of particular processes. The concept of RIP gives a space to establish a suitable frame for specification of requirements, evaluation and improvement of processes based on the best practices using the opportunities of IS. The RIP can be reached by IS and other

sources like marketing, technologies, education of employees, know-how, etc. But regarding the ROI, the information systems seem to be the best option (Učeň, 2008, p.18-20).

Figure 3: Relation between absolute improvement potential, limits and real improvement potential.



Source: adapted from Učeň (2008, p.3)

Limits of RIP

When trying to reach a real improvement potential the limits will be discovered. The limits must be classified by time periods, when setting up targets for a firm, and by the time scale the limits can be eliminated.

The limits, which seem to be reachable in long-term are mostly AIP and external limits. This should be covered by long-term strategy of a company.

RIP can be limited by internal short to middle term factors. These limits stop a company from reaching a target, if they are not eliminated at the start or in

process of realization. Structure and amount of these limits can change in time. Some of them eliminate themselves, are eliminated and new appear (Učeň, 2008, p.18-20).

The effects of reached RIP

The effort made on reaching RIP should always be paid back by benefits, which should appear as effects. These effects are **hard** or **soft**.

Hard effects can be visualised by numerical data, which can be transformed into financial effect for a specific period, like a year, a month, etc.

Soft effect represents an improvement, which numerical or financial expression is difficult or impossible. Soft effects will appear with time delay into hard effects (Učeň, 2008, p.20).

1.13 Metrics

The term metric is used with relation to measuring a performance in a company. It can be measured partially at each department, in a complete as a business point of view, or in the area of IS management. The definition says it is concretely defined method of measurement with defined extent which will be measured. It is an indicator used for quality, quantity and financial category determination. It is an indicator of performance and productivity compared to set up targets.

The metrics measure targets, critical factors of success, processed, activities, resources productivity and productivity of employees (Učeň, 2008, p. 21).

When measuring one specific area within the business, or a process or a project, the group of metrics used for performance and productivity measurement is considered, called *portfolio of metrics* (Učeň, 2008, str.32).

Attributes of metrics

The attributes defining metrics are generally:

- Title and identification;

- Algorithm, mathematical formula for hard metrics;
- Definition for soft metrics;
- Dimension (unit of measure, time period, organizational unit, etc);
- Initial and target value;
- Source of data for measurement;
- Procedure, method, periodicity, measurement timetable, results showing;
- Results verification (procedure, method, periodicity and responsibility) (Učeň, 2008, p.21);

The complex view at a metric is displayed in Appendix 9, where different types of metrics and their areas of usage are shown.

1.13.1 Metrics classification

1. Object measured – according to object, which is measured, the metrics are divided as **hard** and **soft** metrics. The main difference is in their measurability and ability to be expressed by mathematical, financial or other indicators.

Hard metrics can be measured objectively, tracking company's targets development. Their main focus is on a performance of processes and activities of an organization, or on customers. These metrics are easy to measure, are available to a company and can be transformed into financial expression for a certain period. Hard metric can be considered also an **indicator.** The indicator is a sign with determined acceptable boundaries, the upper and lower boundaries. If the real value is beyond the limits, it means that measured area, on which the metric was used, is in undesirable condition. The hard metric, which are not defined by indicator and do not have defined limits, must have defined a desirable condition, which is measured (Učeň, 2008, p.34).

Soft metrics are used for measuring and evaluating the level of performance and productivity of company's processes. The evaluation of some soft metrics is done by professionally run audits, because it is a difficult task to precisely express or quantify a value of their current condition. Some of these metrics are evaluated

using a **scale** and the best expected condition is the maximum on a scale. The current condition is then evaluated based on the distance towards desired condition. Soft metric are used for evaluation of: fulfilment of internal targets in a specific area; achievement of RIP of processes, alternatively effects from innovation of IS; and performance of sources and people in a company (Učeň, 2008, p.23).

2. Repeatability

These metrics can be divided into group of **continua**l and **discrete**. The continual metrics are used for measurement, which repeats in defined period. The discrete metrics are applied repetitively in the time limited scale for evaluation of innovative actions, like IS innovation, but the amount of measurement is low (Učeň, 2008, p.35).

3. Level of management

Strategic level – measuring uses hard metrics of targets, if it is possible then indicators, although discrete metrics are used occasionally as well.

Tactical level – when using hard metrics, the results are displayed by indicators, like comparison of values planned with a reality, but nowadays usage of soft metrics grows.

Operations level – hard metrics are used for results recognition focused on continual and discrete metrics. At this level hard and soft metrics are balanced (Učeň, 2001, p.35).

1.13.2 Metrics classification – effects of IS innovation

Internal metrics are defined by firms for their needs to measure benefits of IS innovations. Via internal metrics: the real effect of IS innovation and its impact on the company's performance can be measured; as well as the evaluation of efficiency of total resources invested; the support for motivation system for management and employees can be created, based on results of metrics evaluating

the success of realization of innovation; can be evaluated internal level of services provided.

External metrics are set by the user-company and supplier of IS. Mostly metrics with scorings. The purpose of these metrics is firstly to involve supplier to reach benefits from innovation of IS, and secondly to create useful and effectual for unification of targets set by team created from supplier and customer members (Učeň, 2001, p.35).

Measuring benefits coming from innovation of IS is problematic, which managers and consultants must focus on. The key is to identify the effect coming from IS innovation, like ERP implementation, which must not be confused with other effects coming from different projects like reengineering, process optimization, investment into tangible asset, human capital, etc. There are two views on this problematic.

The first point of view is the case, when the project focused on innovation of IS does not coincide with other projects, which could cause similar effects.

The second view comes into place, when the innovation of IS is a part of project of complete innovation of how the business is run, or when it is a part of very complex project. The effects are mixed up by the whole project and it is difficult to separate which effect is caused by innovation of IS only. Then the effects must be measured as a complete (Učeň, 2001, p.48).

The practice, which would be used to measure the effects, depends on management. Passive management accept the innovation as a necessary step, that a company must take without deeper understanding the problematic and benefits it brings to the operations and employees. This attitude often causes mistakes in innovations projects. But if the management is willing to see that change is not only essential, but very healthy and helpful, then they focus on return of investment and mostly use methods similar to financial methods, like:

- Cost criteria – cost saving is evaluated;
- Profit criteria – evaluation of profit earned;

- Cash flow criteria from investment (Učeň, 2001, p.48-56).

When measuring the effects of innovation of IS, it is essential to choose the areas, which have principal impact no company's operations, and which are directly affected by innovation. The portfolio of metrics should be consistent with individual perspectives of methods of Balanced Scorecard, and closely connected with main processes. Metrics should influenced by internal factors and eliminate the external ones. The metrics should be divided into hard and soft ones. Both groups support and complement each other.

Hard metrics are undemanding time and budget wise, as these metrics and numerical indicators, which are commonly available in variable applications used within IS of a company, like ERP. The problem can only occur, if a system is not using some data, as they are archived in paper version, etc. When setting up the hard metrics, the order of steps taken should be following:

1. Establishment of a team responsible for selection, definition and measurement of hard metrics. The members should top level employees, who understand complexly to a company, therefore are able to define criteria of performance, which should reflect the activities of a firm. The team should include consultants from supplier of IS.
2. Definition of hard metrics, their implication and connections to company's activities with a relation to its strategies. This will determine the balance of groups of metrics. The weight on the scale means the importance of metrics determined by expert opinion.
3. Set up of starting point and target values. Target values are connected with company's strategy, or project targets, but it should be reachable by IS innovation.
4. Verification of metrics by customer and supplier.
5. Monitoring of current values for a specific period and their comparison towards starting point and target values.
6. Analysis of final results. For its interpretation can be used soft metrics.

Soft metrics are used for a measuring and evaluating of a level of individual process, functional areas of a firm, and its level of informatics support in audit manner. When creating soft metrics, it is essential to create a frame, which covers main areas connected with an innovation of IS. Soft metrics are measured at key activities of these main areas and their processes. These metrics are also a tool for assessment of an increase of their efficiency, with assumption of optimal informatics support.

The manner of audit used for evaluation of some of soft metrics is realized in the way that an evaluator assign to KA a value evaluation from a scale of 0 to 100 points, which express the increase of efficiency based on the increase of informatics support of processes and KA. The evaluators should know the methodology in order to accomplish unified way of evaluation, which follows by steps described below:

1. Identification main functional areas and processes of a firm, where it is presumed that an innovation of IS will lead to an increase of efficiency.
2. Nomination of process or functional areas owners, the employees with major impact on these areas or processes. These people should create with supplier or external consultants a team for metrics employment. The team can correct requirements for IS innovation, based on real possibilities of supplier.
3. Definition of soft metrics, at every process must be chosen 3 to 10 KA, which will be measured and evaluated.
4. Set up of starting point and target values of soft metrics. Starting and final points should be described verbally. Briefly, but aptly, with the focus on the fact, that metrics should describe a performance of KA reached by IS innovation.
5. Determination of weight of each KA within the processes. Based on this information the particular valuations of metrics will be adjusted.
6. Definition of limit values considering that supplier is interested in a successful implementation.

7. Monitoring of current state is done as a valuation in scale of 0 to 100 points. Evaluation in points expresses the rate of informatics support of each KA with relation to a target value.
8. Monitoring and analysis of screenings of soft metrics (Učeň, 2001, p.56-63).

1.14 Method of process performance recording

According to Učeň (2008, p.59-80) the determination of real improvement potential and comparison of current and desired performance and productivity of processes is very useful tool of a firm's management, when evaluating the performance of a firm as whole, or when updating its strategies, or even measuring IS innovations effects. This subchapter contains method of process performance recording using Real Improvement Potential theory at KA of key processes as a sequence of steps necessary to take in order to get results. For a need of this work is this method simplified and shortened. Some steps are missed out or touched on tangentially.

1. Determination of firm's processes

   It is essential to identify individual processes in a specific order: managing, main and supporting;

2. Determination of KAs of process

   Within the defined processes is necessary to define key activities, which have the major impact on productivity of process, costs and effects of process, as well as added value. Generally it is about 3 to 10 for each process.

3. Priorities of KA determination

   The key activities have a different impact on a performance and productivity of process. Therefore, it is a practical to provide for priorities of each KA within the process, e.g. by coefficients.

4. Set up of process targets and metrics

The targets of process must agree with real improvement potential of firm's strategy. The targets and metrics of process should include targets and metrics of financial and customer perspective of BSC. Considering the viewpoint of evaluating, how the targets for processes are using IS innovation, including ERP, then internal business process, and learning and growth should be included.

5. Creation of recording tables

Every KA of process will have a specific recording table, in which evaluation of KA will be record in audit manner.

Table 2: Recording table for real improvement potential

Process: Key activity: Priority KA:					
	RIP – target state of KA key attribute	Current state of KA attribute	Weight of attribute	Points for recording	Result for attribute
1					
2					
3					
4					
5					
		Total:			
				Result of record of KA performance in %:	
				The increase of KA performance from RIP achievement in %:	

Source: adapted from Učeň (2008, p.65)

In the paragraph below a method, how to fill in the Table 2 is described:

Step 1: In the column "RIP – target state of KA key attribute" are indicated specifications (the key attributes), formulated as a verbal specification of desired state of KA, its target performance. Parameters are designed to support the above defined targets. The attributes of target state of KA is the parameter, which is reachable by elimination of identified limits. It must be formulated precisely, based on business point of view and not to be strained by a current reality of a firm.

Step 2: Particular key attributes of KA are compared to other attributes, then weighted, while each weight express the role for performance of KA as whole, and the weight is recorded in the column "Weight of attribute".

Step 3: In the column "Current state of KA attribute" is by analogous structure and measure described current state of an attribute of KA.

Step 4: The comparison of current and target state is made. The method of zone evaluation is used, based on expert evaluation, which outcome is a quantitative statement, which evaluates the actual reached level of attribute towards the viewpoint of definition of target state in following zones:

a) 0-20 points – Target state is in a far distance from the real target, the requirements of target state are not currently reached at all, or fulfilled only partially.
b) 21-40 points – The reality fulfils the target state in maximum of one third of requirements, others are reached either partially, or not fulfilled.¨
c) 41-60 points – The reality is partially reaches the target state, in about a half of substantial requirements. Some of them can completely reach the target state; other may not reach it by no means.
d) 61-80 points – The reality fulfils the target state by two thirds of substantial requirements, the remaining requirements are accomplished partially or small part of them is not accomplished.
e) 81-100 points – The reality reaches all substantial requirements of target state. Some of less important requirements may be reached partially.
f) 101-130 points – The reached target completely fulfils all parameters of target state of KA attributes and in addition the solution contains desired parameter beyond defined target state.

The evaluators at first set up appropriate zone for comparison of current and target state, and then within the zone set up the value. The value makes the evaluation more accurate, but it also introduces a subjective view of the evaluator. This numerical value shows the percentage of which the target value of a specific KA

attributes is accomplished, and this number is recorded in the column "Points for recording".

Step 5: By multiplying points for recording with the weight of attribute within KA, the result is given and recorded in a column specified as "Result for attribute". The values in this column are counted up and result is normalized into percentage and recorded in a column "Result of record of KA performance in %". This value shows, in what percentage the current state of KA performance reaches the target state. If this value is deducted of 100, it will give us a percentage of a performance increase, which would be reached if RIP is reached. This will be recorded in a column "The increase of KA performance from RIP achievement in %".

Step 6: Recording table – benefits, costs and limits

This step identifies the effects, which will be reached, if the desired level of KA performance is reached, alternatively the performance will get closer to desired level. The result is recorded in a column "Benefits of achievement RIP at KA" visible in Table 3. The effects are either hard, numerical of financial for a concrete period, or soft, hard to be quantified. Rating of hard effects is difficult or impossible, especially for principal processes. Main and supporting processes can be determined by hard and soft effect much easier, as it is evident and more intuitive.

In some cases the effect is not a consequence of a single KA ad more KAs participate on formation of the effect. Such effect can be proportionally divided and recorded at all affiliated KA or assigned to a single KA, if the division is impossible.

Table 3: Recording table – benefits, costs and limits

Benefits of achievement RIP at KA	
Hard effects	CZK/year
Total per year	
Soft effects	
Costs of achievement RIP at KA	
Total	
External limits of RIP at KA:	
Internal limits of RIP at KA:	

Source: adapted from Učeň (2008, p.70)

Reaching real improvement potential of a concrete KA is in the most cases connected with certain costs. The costs for solution are always planned after formulation of a project. In the case of IT solution, the typical costs are a purchase of a licence, an HW infrastructure innovation, jobs done on development and implementation, or costs connected with a service and maintenance after implementation. These costs are generally connected with many processes and their KA, therefore it is impossible to divide them between each KA.

In the Table 3, the listing of external and internal limits is recorded, mainly those, which inflict that desired performance of KA is not currently reached, or was not in the past.

Step 7: Data processing, effects consolidation and interpretation

Accepting the fact, that appearing effects overlap and occur with more than one KA, it is suitable to create tables of all effects for whole analysis, especially for hard and soft effects, to make it more transparent. The effects appearing at particular activities with different intensities are consolidated.

In order to calculate the performance improvement of a whole process, the percentage increase of KA performance is multiplied with the KA priority within

the process. These products of all KA are summarized normalized into percentage.

The result of performance improvement from RIP achievement expressed in percentage is not usually manifested in the change of values of hard effects by the same percentage, and this result cannot be individually interpreted in this manner, although it is a very important base for a KA comparison. It helps to find and update managerial priorities, it shows KA which should be focused on primarily, and these should be improved and moved closer towards real improvement potential. These activities drive the performance of a firm great deal, and a firm should try to get know-how for KA improvement or use IT tools, like ERP, to make these KA more efficient (Učeň, 2008, p.59-81).

1.15 Business processes

The opinion of Basl, Tůma and Glasl (2002, p.25) is that, "Processes accompany a person literally at every step taken. Some of the vitally important we meet several times a day." It must therefore be recognized that processes are not typical just for corporations, although the most interest is paid to these, as Basl, Tůma and Glasl (2002, p.26) argues, because "...processes create a foundation of every functional corporation, a base for management of every corporation...". In connection with the technological changes and product and service innovations, the processes change as well, and any corporation must be able to react on these changes. According to Veber, et al. (2006, p.229), "improvement is natural reaction on changes", together with "...a pure necessity for keeping a corporation on the market..." as Řepa (2007, p.15) points out.

1.15.1 Description of business processes

The definitions mentioned in the literature sources are very similar. The example given by Šmída (2007, p.31) states, that "...a corporate process is an organized group of interrelated activities, which all together create values that customer appreciates...". Another definition by Řepa (2007, p.15) states, "Corporate process

is a summary of activities transforming a summary of inputs into a summary of outputs (products or services) for other people or processes, using people and tools. Given this evidence, it can be seen that input is equally important as output, because without people, tools and process, nothing would be created.

In order to manage processes, process management must be applied. This type of management monitors connections among individual activities in a logical sequence. Therefore better work organization can be achieved and it is easier to manage process improvement (Basl, Majer, and Šmíra, 2003, p.18-20).

1.15.2 Business processes modelling

The processes can be managed and improved, but it is essential to understand each process in details and understand the import of it. This knowledge helps to increase a flexibility, performance, competitiveness and productivity of a process. Identification of main processes in a business it a task of management, after that the other processes are identified and divided on partial processes. Basically, as a first step is considered the identification of fundamental processes, based on the analysis of actions and reactions in business, then a structure and mutual connections are recognized. Second step is to specify key processes, using the object analysis of products, and then their structure, mutual connections and main attributes are noticed. The last but not the least important step is to specify supporting processes by using the object analysis of an organization (Basl, Tůma, and Glasl, 2002; Řepa, 2007).

Modelling, in other words a graphic illustration, of processes is used for an unequivocal and understandable notation of processes, and at the same time it facilitates the orientation in an individual process and allows catching overlooked important details. The model of process is mostly understood as an abstract representation of a process in business, which usually allows that it can be transformed in an automotive work process. The created model should fulfil some basic characteristics:

- Understandable – for people who participate on its creation as well as for people, who are the users coming across to it at any user level;

- Reality – is captured in the process; its description must be exact, not to simplified and not substantially difficult either;
- Activities – main activities must be captured by a model (Vondrák, 2004, p. 9).

Modelling of processes is covered by many software applications based on a united base, which are supported by various types of standards and approaches, using a diverse signing depending on a type of modelled process. For this purpose, the usage of flow diagrams is considered in this work.

Flow diagram

The opinion of Kučerová (2007) is that the flow diagram is an oriented net graph, which allows to graphically capture definitions, analysis and methods, how to solve an issue. It uses symbols representing operations, data and flow.

Koch (2004) rightly points out that a flow diagram primarily specializes in a capture of activities and decision making and not so much in data flow and data changes.

The symbols used for the purpose of analytical part of this work, for description of processes and data flows etc., are visualized in Appendix 1.

When creating the flow diagram some basic rules must be followed. In the case, that the flow diagram should capture more complex process, it is appropriate to create several less complex diagrams of different levels of details, starting from most general scheme moving towards the most complex. Detailed extent scheme must be arranged clearly, if necessary into more subsections. Every diagram must have one starting point and one end, as well as one input and one or more outputs. If there is no connection towards the process, it must be finished. In general, the diagram should be arranged in such manner, that it is understandable and transparent. The data flow should be pictured from the top to the bottom and from left to right. The line showing the data flow should not cross each other and two lines should not connect in one point into one line. The confirmation of a correct

description of flow in the flow diagram and its all lines, which every each of them takes it from the start to end, must be done after the flow diagram is finished.

1.15.3 Business processes and ERP system

Basl and Blažíček (2008, p. 58) observes that corporate processes, which are used very often, like entering one information into several databases, can be more efficient and much quicker, because ERP system can make multiple record instead of user, who can record the information only once and other records are done automatically by the system. The ERP system can also in some cases under the certain circumstances predict future steps of the end user, and offer him a tool, therefore it saves time to user at several steps, which must be taken on daily basis. It can be considered that the ERP system saves time to a firm, especially to administrative employees in multiplied number, which increases the efficiency.

1.15.4 Business process improvement

Veber et al. (2006) observe that the improvement of business processes is the every moment, when economical or factual development is measured in comparison of current state to the past state. It is very miscellaneous and mainly perpetual process, which can be characterized in two levels:

- Incremental improvement – includes activities, which decrease the defectiveness and waste, and increase productivity and optimization of values. This improvement can be notice in long-term perspective.
- Transitional jump improvement – brings an immediate and substantial result. In this case current state is ignored and new state is looked for to replace the current one.

When improving the business processes, the continuity of processes is very important and must not be forgotten. Every process is a *link in the chain*. If one process, the link, is dysfunctional, the whole chain cannot work properly. In order to optimize the chain, we can see it as a **weight**, where the target vale is the whole chain weight, which should be minimized as much as possible, or **strength** of the chain (Basl, Majer, and Šmíra, 200, p. 23).

If the weight model is used, than the optimization is local and target is to decrease the weight of the whole chain, which can be done only by decreasing weight of each link in the chain. The connection with weight model and costs is close, as when the weight of the chain is decreased the costs are decreased too. It is a **cost point of view**. If the strength model is applied, then the strength of the weakest link dictates the strength of the whole chain, therefore the weakest link should be improved as soon as possible. With the increase of the strength of the chain is connected **flow rate point of view**, which emphasizes the need to increase the flow rate (closer details are provided in chapter 1.15.7). It is essential to realize, that the local optimization is not always the right solution, as the complex view of a firm and application of global optimization, connected with a search for the weakest link, which makes the improvement impossible, can be recommended as a following part of so necessary paradigm of business decision making (Basl, Majer, and Šmíra, 2003, p.23-34).

The improvement can be forced also by external factors, like customer's dissatisfaction, bad situation in politics or economics, or by internal factors like new ideas and visions of employees. The improvement activities can be of a spontaneous nature, coming from a current situation, or having a set up program, lead by management of a firm.

According to Basl (2002, p. 83) to make firm's management more efficient and improve its functionality, the methods like JIT and TOC, which are part of IS, as well as TQM, can provide a great help. The JIT method focuses on elimination of a random character within the system by making the best predictions of future state. By doing so it decreases the investments in to the stock and makes the current stock shorter. The method TOC tries to maximize workload at the place of constraint of the system. And the TQM method works on the increase of quality of all system elements. Close description of methods JIT and TQM is enclosed in Appendix 10.

1.15.5 Theory of Constrains

The Theory of Constrains (TOC) is a compact managerial theory providing a new approach how to manage and continually improve the business of a firm. The theory was developed by Eliyahu M.Goldratt, covers basic functional areas of a firm. It works on a system approach seeing a firm (an organization) as a chain of

interdependent processes. The key thought of TOC is an assertion that every system has at least one constraint. If there is not any constraint, then a company can achieve its targets with unlimited capacity.

The **constraints** can be:

1) Internal – a machine in production, a certain department in a firm, money, etc.
   External – a supplier's reliability, late payment from a customer, etc.
2) Tangible (physical) – machinery with insufficient production capacity, etc.
   Intangible - poorly defined processes, etc.;

The TOC provides a method, how to identify a constraint and effectively use it by paying most focus to the weakest link, which bring quick and real benefits (Goldratt and Cox, 2001).

If the constraint of the system is used, the whole system can be managed. The **method** of solution how to change and improve, realized in business by TOC comprise of several basic approaches, principles and techniques:

- Method of Socrates questioning;
- Five focusing steps of TOC:
  - Identification of system constraint;
  - Maximal usage of the constraint;
  - Subordination of a system to the constraint;
  - If the constraint is removed, the cycle stars again at new identification of a constraint.
- Effect/Cause/Effect technique, also known as Thinking Process:
  - Diagrams(Trees) are here to identify what, why and how should be changed, using a logical trees:
    - Current Reality Tree (CRT) – description of a current state and finding a core of the problem causing undesired effects;
    - Future Reality Tree (FRT) – description of a state, which should appear after the change;

- Prerequisite Tree (PRT) – this tree focuses on a determination of conditions, which must be fulfilled in order to reach desired results;
- Transition Tree (TT) – specifies possible obstacles and their solutions;
- Thinking Tree (Evaporating cloud technique): or Conflict diagram, which reflects the roots of the problem and making clear that change must be accepted (Basl, Majer, and Šmíra, 2003, p. 39-42).

The logical trees is useful visualization tool when characterizing an issue and in orientation in the complex situation. The process of creation of these diagrams is very useful for effective progress of change project (Basl, Majer, and Šmíra, 2003, p. 42). The graphical symbols used for tree creation are visualised in Appendix 2.

- TOC defined financial metrics:
  - Throughput – money generating rate; or it is money coming from sales less variable costs;
  - Inventory - money used for a purchase of inventory stock, but also the investments made, which helps to make throughput;
  - Operating expense – money invested to create a throughput, the transformation of stock to products;

The target for a company should be a profit, which can be achieved according to TOC, that throughput must be primarily maximized and at the same time the inventory and operating expenses must be minimized (Basl, Majer, and Šmíra, 2003, p. 33; Basl, 2002, p.83).

TOC application

The application of TOC method into practice is very wise, but in general can be seen in three basic fields:

- Important corporate functions: Operations, Procurement, Logistics, Order management, Marketing, Production;
- Throughput analysis: It contributes to decision-making process, based on consideration of costs of continual improvement process, where the key elements are introduced as a throughput, system limitations, statistically proved capacity protection and critical links;
- Logical process – TOC presents generally used tools for identification and solution of variable problems for organizations, which appear when reaching the set up targets. It helps to suggest solutions for issues found and get employees involved (Basl, Majer, and Šmíra, 2003, p. 33; Basl, 2002, p.49).

1.15.6 TOC compared to JIT and TQM

The TOC method compared to other methods is primarily focused on maximization of throughput, especially at a constraint. The TOC does not push for chance elimination as JIT, which is timing everything on order to keep the constant flow, which should reduce inventory. The TOC is always focused on the weakest link in the chain, trying to achieve the quality increase in all elements of the system, not like the TQM method, which primarily focuses on getting the right quality and analysing financial losses of goods produced, not having the right quality (Basl, Majer, and Šmíra, 2003, p. 33; Basl, 2002, p.43-45).

Therefore after consideration, the TOC method seems to be most suitable, when analysing the impacts of a complex system, the ERP system on the processes or even people based in a company.

1.16 Questionnaire Theory

A questionnaire is a common tool used for data collection in quantitative research, as it provides a possibility to a researcher to collect data from a large number of respondents, even in a short time. The questionnaire is composed from structured questions, which provide an idea, what respondents think about the topic

described by the questions. The structure of questions is composed in such order that researcher can discover an objective opinion of respondents, which is supported by the fact, that most questionnaires are completed anonymously, therefore people asked to provide their point of view at researched topics get space for honesty and openness. That is very important for the feedback. The absence of an interviewer causes higher pressure on the researcher, as it means that questions must be formulated clearly (Pavlica et al., 2000).

It is the view of Portál (2012) that when composing a questionnaire, it is essential to specify the exact targets of the research by the questions and the list of variables, and based on that create specific questions, while paying attention to make them comprehensible, and not making them suggestive. Therefore a good construction of questionnaire and clearly formulated question are the most essential for any research.

Pavlica, et al. (2000) has expressed a similar view. In addition, a questionnaire should start with an introduction, which explains to a respondent the purpose of the questionnaire. The introduction should also provide instruction, how to fill in the questionnaire correctly, and information, that a respondent's personal data will not be used for any other purpose, or abused in any way possible. The second part, main one, provides questions of two natures, mostly the questions covering the researched topic, secondly questions, which helps to identify a person responding, for instance sex, age, education, household income. In order to assure, that a respondent stays focused, the questionnaire should not take more than 45 minutes to complete. The formulation of questions should be corresponding with the age and education of respondents, therefore the difficult terms of academic, slang or technical nature should be excluded. The conclusion of questionnaire should include acknowledgement to a respondent.

According to Collis and Hussey (2003, p.179) and Pavlica et al.(2000, p. 119) the questionnaire is commonly composed of bellow described types of questions:

- Close ended questions – questions, which offer to a respondent predetermined options, from which a respondent must choose the option

closest to his of hers opinion. This type of questions is easier to be analysed, as the answer options are limited. The usual alternatives of answers:

  - *Yes* or *N*o (or *I agree* or *I disagree*) – two options provided to choose from, sometimes the option *I don't know* can be provided too;
  - *Rating scale* – the scale of preferences is offered to a respondent for expression of his or hers feeling, giving more precise expression to researcher; (for instance a respondent is asked to arrange in order five factors, that influences his or hers job the most by using a scale of 1 to 5, telling him or her, that number 1 is the most influential and number 5 is the least influ0ential thing);
  - *Multiple choices* – more options to choose from are provided to a respondent;
- Partially closed questions – providing alternative answers and a space, where a respondent can answer by writing in his own words;
- Open ended questions - there is no answer provided, so a respondent can express his or hers point of view; This type of responses can be uneasy for following analysis; Usually the respondents are asked for clarification of the opinion and its reasoning should be written down following the answer.

Most of the questionnaires are created in written form, although nowadays can be accessed using Internet. At the time, when questionnaires are dispensed to respondents, the researcher should provide them enough space and quiet uninterrupted place, where they can fill in the form anonymously. The collection of questionnaires must be sensitive too, not to disturb the anonymity by collecting the questionnaires personally by researcher from each individual respondent.

1.17 Summary of Theoretical Part

The aim of the theoretical part was to render a literature review, which is related to the issues of the operations management, change management, motivation, information technologies and systems, the enterprise resource planning, the processes and metrics how to measure, if an organization achieved determined targets.

The first three chapters were focused on management of operations and changes, and motivation of employees, clarifying basic terms concerning management and motivation.

In the following two chapters different systems and technology were described. The system in its general meaning, the information system and technology, with the connection and interconnection these systems and technology have on each other, as well as their role and importance in business.

Chapter six, seven and eight are dedicated to the complex information systems, the enterprise resource planning system of the first and the second generation and the business intelligence, which are the systems providing complex help to business. These chapters describe the specific terms used, the pros and cons of the complex systems, methodologies, how to successfully implement them into the corporate structure and changes it might bring to the companies.

Following five chapters are describing the options, how to evaluate business performance by various methods and metrics, using different perspectives on business value and offering different methods or metrics of the valuation, with a regard to the stakeholders, whose concern is the specific value of a specific firm.

The main focus of chapters number fourteen and fifteen is on processes in business and how to improve them by methods like the process performance recording, the research method, and others like TOC, TQM and JIT, in order to make processes more efficient and flawless.

The last chapter of the theoretical part comprises the theory of questionnaire, as this tool was used for the research made in a specific company to analyse, how employees feel about the new information system that the company uses, as well as the impact that they think it has had on them so far.

2 PROBLEM ANALYSIS AND CURRENT SITUATION

The second part of the master's thesis concerns itself with analysing the impact of the enterprise resource planning implementation on people and processes in selected company, which is CCI – Control Components Inc. At first the company itself and the company's business activities will be presented with the main focus on the operating activities and the functionality of a subsidiary placed in the Czech Republic, the CCI Czech Republic s.r.o., which is placed near Brno, in which the research was conducted[1].

Secondly, the findings and methodology used for a research will be discussed with the intent to evaluate the current situation detected by the research finding.

2.1 Control Components Inc – Company Profile

The Control Components Inc. (CCI) is part of IMI Severe Service, which is a part of IMI plc., multinational group, which has been listed on the London Stock exchange since 1966. The owners of the CCI are IMI Overseas Investment Limited and IMI Kynoch Limited, both situated in the UK, in Birmingham. The factory, later renamed to the current IMI, which means Imperial Metal Industries (IMI), was started up by George Kynoch in Birmingham in 1862. Nowadays, the whole IMI group covers market demand by providing the severe service, fluid power, indoor climate, beverage dispense and merchandising, with companies like CCI, BTG, STI, Truflo Rona, IMI Nuclear, Norgren, Kloehn, Herion, Maxseal, Pneumatex, Cornelius, 3Wire, etc. Nowadays the group employs in their manufacturing facilities more than 15000 employees in more than 20 countries and provides a worldwide service network (IMI, 2013; IMI, 2012).

[1] The information and facts used for company's introduction in this master's thesis are based on the official company materials, like company's website, annual financial reports, annual reports for shareholders, and author's own experience as the former employee of the company. All facts and information regarding the company provided in this particular master's thesis, as well as the research were consulted with a deputy designated by the company,, who was very helpful to the author of this thesis.

The company CCI was created in 1961 by Richard Self, who started the company as a reaction to the shortage of valves supplied on the market, which could handle very high-pressure liquid hydrogen and oxygen. The CCI develops, manufactures and produces wide scale of valves for power engineering, oil and gas industry, and for paper and cellulose production all over the world. Since 1967 the company has produced patented technology valve, the DRAG.

During more than fifty years, the company has acquired good reputation by solving issues and problems connected with the production and assembly of high-pressure valves operating in the very intensive and demanding conditions. Within this time the company has obtained a lot of valuable experiences, which are further developed and provided to customers as a final product.

The increases of sales in Sulzer valves and new managing systems, introduced in 1997, have moved the CCI to a leading position on the market, in 2001. The growth that the company faces allows it to meet company's obligations and promises, as well as customer's requirements at global level, while saving costs and shortening delivery times.

The employees of CCI are coming from various areas with wise experiences. More than 35% are with a university degree. The CCI uses its employees not only for design, engineering and technical support, but also for sales, project and order management, quality assurance, planning, purchasing, production, welding, logistics, and many other areas. The company has many modernized subsidiaries situated in Switzerland, Sweden, Austria, the Czech Republic, Italy, India, Singapore, Russia, Japan and South Korea, having the main headquarters, the CCI RSM, in California. These subsidiaries provide either production, or after market (after-sales) services, and sometimes both, for the global customers (CCI, 2013a; CCI, 2013b).

2.2 CCI Czech Republic s.r.o.

The subsidiary situated in the Czech Republic, has been placed in Brno since 2004. Due to the increase of production and development of a subsidiary, the CCI

Czech Republic s.r.o. (hereinafter referred to as CCI) is moved to the new building with bigger shop floor and office floor in the CTP areas placed in Šlapanice, city connected with Brno. CCI is currently employing about 340 employees.

The production in CCI covers high-pressure valves for different areas of industries, mostly power plants using fossil, liquid, solid and gaseous fuels. The production of after-sales parts is also placed in Brno, as a major part of production.

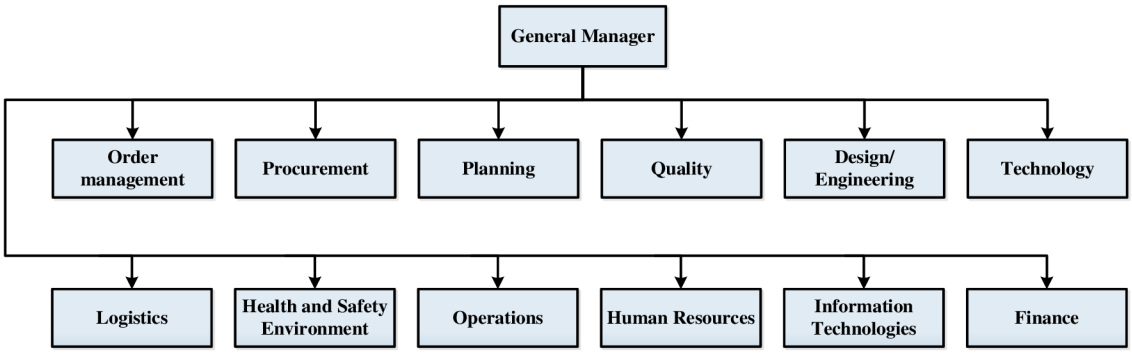
The subsidiary in Brno does not have a sales department and cooperates with other CCI subsidiaries situated in Europe, the USA and Asia (CCI, 2013c).

Due to the fact, that CCI in Brno must supply markets worldwide it faces different quality standards, as the USA, Europe and Asia have different quality standards, which must be met. Therefore, the production of valves and components in CCI Czech Republic s.r.o. is very demanding work, which requires experienced and educated team work.

2.2.1 Organizational structure

The mission of CCI is to offer products and services of very high quality by using modern IT and high-tech technologies, as well as with essential professional attitude of all employees. The CCI in Brno has a flat organizational structure, which in practice means, that the General Manager manages the area managers. The area managers of individual departments manage their employees, including Supervisor of each section, who lead other employees, mostly based at shop floor. The departments and areas can be divided into two main groups of non-manufacturing and manufacturing.

Figure 4: Organizational structure of CCI Czech Republic s.r.o.



Source: adapted from CCI (2013c)

Non-manufacturing departments are such departments, which provide all activities except the activities executed at shop floor connected with the production of output, like:

- Order management (OM) – the main responsibility of this department is a care of constant and smooth flow of an assigned order though the production; these employees communicate with Project managers from other subsidiaries and with a customer, solving potential incongruities, e.g. among production documentation and customer requirements;
- Procurement – the employees from procurement order planned material from suppliers of required quality, deal with the suppliers of material and services, control delivered supplies, etc.;
- Planning – based on orders, planning plans what and when must be done or what material purchased, plans machine jobs, making sure, that all machines are running and keeping the flow of production;
- Quality – the department of Quality is based in the office area, as well as in the shop floor; The employees from Quality department have a major responsibility to check and assure that the customer requirements attached in the documentation of every single order are followed due to the close inspection of material certificates, which come with all materials used for the production; The assurance is proved to customer by Quality

Certificates created by the Quality department, which are attached to every product before it is shipped to customers;

- Design/Engineering – the main concentration is placed at valve and its components's construction. They provide the technical documentation for the valves.
- Technology – the main focus of technology is on methods of machining, welding, assembly and CAD/CAM programming (programs, which provide the setups for machines);
- Logistics – this department cares about the inventory flow, including the steps like receiving, storing and issuing the inventory; the second subdivision focuses on packing final products for customer delivery, and creating shipping and customs documents for products and parts, as well as the shipping of products itself;
- Health and Safety Environment (HSE) – a department, which looks after the whole building and assures that working environment is run under the health and safety standards of the Czech Republic;
- Operations – a department of main responsibility to ensure and manage the production flow, as well as to organize and oversee the jobs done at machining, welding and assembly;
- Human Resources (HR) – the main role is to recruit new employees, taking care of the current employees by providing them trainings, improving their motivation and development, and solving any personal issues;
- Information Technologies (IT) – takes care of hardware and software solution for system support of the company;
- Finance – the finance department is divided into subsection of Accounting, which keeps a record of all financial transactions, and assures the financial flow, providing the final financial results for external and internal audits, as well as creating an annual financial reports for shareholders, and another subsection of Controlling, which creates invoices for produced products, analysis costs flow, and controls the stock flow from financial perspective;

Manufacturing departments are those, which create the physical product, or have a "manual" influence on the final appearance, before it is sent to a customer. Most of them are managed by the department of Operations with its subsections of machining, welding, assembly and stamping, situated at the shop floor. The Packing subsection is managed by Logistic department and Quality control is a subsection of Quality department.

- Machining – is the biggest working area within the CCI, where the most of parts are machined on modern CNC machines, as well as on NC machines and other machines; The operators working on machines can program some easier machining operations on their own, based on their knowledge and skills, more sophisticated programs are created by the employees from Technology department in programs CAD/CAM;
- Welding – at this department the individual parts are welded together; some of the jobs are done manually, some on machines, depending on predetermined design of a product, material used, etc.;
- Assembly – the workplace, where the valves and their components are completed by the fixed methods, assembling the individual products to the final form of the valve or other product; After the product is assembled, the pressure testing follows based on predetermined valve requirements from customer order;
- Stamping – the semi-finished and finished products are marked at predetermined place by the required identification data, like type of material, the number of issue slip (document providing information about parts and methods used to create a final product), order number, i.e.;
- Packing - a subsection of Logistics department, which is responsible for the secure packing and conservation of final products or parts, which are placed to either cardboard boxes or wooden boxes with inside fixations; Packing also takes parts on products' photo documentation and prepares Packing lists for internal order purpose;
- Quality control – assures the quality of material received from suppliers, controls semi-finished products supplied or if produced, then after every

important step in production, checks final products before approving these for customer delivery;

As the quality of products and components is the most important aspect, when producing such stressed products for very hard conditions, all of the above mentioned departments must pay close attention to every step taken within the complex production process to avoid any mistakes, which could cause major issue to a power plant, in which the valve would be installed and to people and environment connected to these areas.

The current arrangement of management team has been created at the option of the General Manager, appointed to his position in April 2012 (CCI, 2013c; EJustice, 2012).

2.2.2 Financial Results

When characterising a company, the accounting and financial indicators play the important role. The most important are those from previous periods, which reflect business success of a firm and its economic situation. The indicators help to predict the future situation of a firm and some preview on the management of its future development.

Table 4: Chosen financial results

Chosen Indicators (in thousands of CZK for a period)	2011	2010	2009
Balanced sum	2 076 001	964 725	167 212
Long-term assets	282 145	262 467	105 019
Economic result	107 158	-36 667	-2 002

Source: EJustice.cz (2012)

The data shows, that during years 2009 and 2010 long-term assets were doubled, which can be connected with the relocation of CCI into new place with much bigger shop floor due to the decision of IMI to increase the production. This corresponds to the balanced sum of assets, which had grown to the value of nearly six times higher, and therefore the economic result was very negative for these

two years. By 2011 although the Balanced sum had increased rapidly again, the long-term assets grew very little compared to 2010, which shows that a great amount of material was purchased and with the high economic result it indicates, that the production was much higher compared to previous years, which were affected by the relocation of the company. Unlike in 2009 and 2010, the economic result for 2011 was 107 158 000 CZK, which surely pleased all shareholders. This change can be connected with a newly appointed finance director, and with final settlement at the new locations, as well as new important targets set up, like inventory counts, which were focused on a reduction of stock stored at warehouse and increased production and sales of products.

Unfortunately, the financial results for 2012 have not been published yet, therefore the performance of CCI cannot be presented using financial analysis for future prediction of company's performance.

2.2.3 Strategies and targets of CCI Czech Republic

The official strategies of CCI for 2013 are:

- Satisfied customer;
- On time delivery;
- Flawless products and components;
- Cost saving;

The General Manager appointed in April 2012 to the CCI Czech Republic s.r.o. (hereinafter referred to as CCI Brno) informed the employees, that the main strategy for 2012 would be to use thoroughly the potential of machines and skills, as well as the education and experience of company's team. He has pushed the company to much higher production efficiency and started asking managers for improvement and adjustment of company's processes. The main reasons for these steps were customer claims on late deliveries and unsatisfactory products and components. By the end of 2012, the change could be noticed visually as well as valuated by growing numbers of products produced and delivered on time. The target of 2013 is to continue in successful change, which has started in 2012 and

improves even further, in order to create a space for extended production of other types of valves, increase the number of products and satisfy the growing number of customers.

2.3 IFS

It is the view of IFS (2013a) that the IFS is global enterprise resource planning software vendor for industries, which has the core of their discipline based on the asset management, field service management, supply chain management, project management and manufacturing. The IFS applications are used in more than 2100 companies in over 60 countries. The IFS can provide "...a component-based suit for product and asset lifecycle management", which can be adjusted and configured for ERP, EAM, ERP based on project, as well as for field service management, or can be a combination of all four types. The history of IFS can be traced back to 1983, when the first IFS Application has been created to meet the customer needs, which were changing, and since then the main motto for IFS has become "to be agile, usable and keep low costs of ownership".

The enterprise resource planning application from the IFS (hereinafter referred to as IFS) is a one global product, which means, that if a company wants to expand, it still keeps its IT system functional, as the IFS supports global implementations by using one single database for the small to large divisions. The IFS also supports various types of manufacturing models, depending on the industry a firm comes from. The industries covered by IFS are Aerospace and defence, Asset Intensive, Automotive, Construction and Contracting, Energy and Utilities, High Tech, Industrial Manufacturing, Oil & Gas, Process Manufacturing, Retail and Service Providers. The Applications can cover several areas of management and various departments, which can be found in many firms worldwide, as visible in Appendix 11, like Finance, Human resource management, Project Management, Manufacturing/Production, Procurement, Planning, Warehouse management, Quality management, Risk management, Engineering change management,

Supply Chain management, Logistics management, Order management, Sales and Service management, e.g. by various application and components. The IFS Applications are comprised of more than 100 business components, which are created of more than 6000 software components. Every components has a defined purpose and designed interface, which determines what the components does. Therefore, when it comes to changing some components, it can be done without affecting components, which should not be changed (IFS, 2013b).

If a company wants to implement the IFS, there is a need to contact the company, and together the solution suitable for a particular company can be found. The IFS Applications provide enough components and with the approach to allow changes on every individual component, a firm can choose exactly, what is needed for their business.

Each company is an individual customer with individual needs which must be satisfied. The IFS Applications is a single, integrated product, which supports the management of processes within an organization. It provides to end user easy way how to fulfil the job requirements, saving his/hers time when managing software and business. The architecture of IFS Applications is component service-oriented, therefore each firm can choose only exact components, which might help to its business. The most important feature of IFS is that it provides to organizations a change, when it is needed. The IFS Applications are able to change and evolve without disrupting the implemented solution, which were already implemented at the start of implementation. The other important feature is that each solution can be adjusted to some extend to customer needs, therefore it is not essential to change all processes built up before implementation, although some of them might need some adjustments (IFS, 2013c).

The IFS is able to be integrated with any other user interface, like Internet, Microsoft Office set, Java, etc. The applications have been developed to become user-friendly, because even the high functionality of solution without an ability of end user to make full use of it is valueless. After redesign the IFS has features like IFS Enterprise Navigation Search, which helps to search demanded data in system, crystal-clear navigation, menus, which are icon-driven, etc. The IFS

applies the approach of close cooperation with customer, as they respect the rule that customer knows his business the best. Therefore, before anything is set up, the IFS team listens, run business advisory seminars and policy-making groups and for a very close collaboration with the customer. After that the suitable IFS solution is chosen and the process of implementation is planned (IFS, 2013a).

The implementation of any enterprise resource planning software or system is a process, which involves a customer as well as supplier of software. The methodologies of implementation differ in customer involvement. In general, there are two approaches, closer described in chapter 1.6.4, either the employees of customer become members of implementation team together with vendor's consultants, or the customer employees are just taught by consultants, how to use newly implemented software. The similarity in both approaches is that without any level of customer's participation in ERP and full engagement in system/software usage, once it is implemented, the software cannot be successful and fulfil predetermined targets.

The implementation of project demands high quality achieved in two main areas: the quality of delivered solution for each organization and the quality of implementation project. The *implementation methodology* that IFS uses is known as **IFS AIM**, which is focused on delivering the both quality requirements, the software solution and project of implementation too. The IFS AIM is the set of descriptions of roles and processes, guidelines, procedures for quality control, and manuals for users. It also provides tools for modelling of processes, the issue handling, version management, document management and project planning. All tools ensure the quality of project and traceability of data and operations. The extent of a customer involvement depends on a particular implementation project (IFS, 2013a; IFS, 2013d).

2.4 IFS implementation project for CCI

The Control Components Inc. together with IMI made the decision of global level to implement ERP system as a core system for CCI subsidiaries, with the main focus on 4 subsidiaries situated in the Czech Republic, Switzerland, Austria, Sweden and its headquarters – California, in 2009.

Following year the preparations of IFS implementation project were done, which included the team composition, decisions about the key processes and functions to be implemented, what data migration it might require, the order in which the implementation should be proceeded, the roles of people in the implementation team, where the implementation would start, the resources necessary, etc.

In 2011, the implementation team composed of people with extensive experiences and knowledge of IFS Applications, like the manager of implementation team, highly experienced with the IFS, working for IFS at managerial level for more than ten years, the business system analyst and a consultant with a broad IFS experience and more business system analysts with broad ERP experience. The second part of the implementation team was created from people with extensive experience and deep knowledge about products, components, technology, engineering, systems, data and processes connected with CCI, like the business system analyst from CCI Austria, Project managers from CCI RSM, in California, and system administrators and developers from the Czech Republic. The core of the implementation team was created for the purpose of IFS implementation to the software/system core of selected subsidiaries. Every subsidiary should also have the IFS support team, after the implementation is completed, tested and alive, which would remain at each subsidiary to provide employee training, and help with the system on daily basis. For this purpose 4 employees have been hired, whose responsibility has been to understand the system and be able to help the end users with any issues connected to IFS daily usage. The main reason for such substantial implementation team was first of all the long-term plan to implement IFS into cores of several subsidiaries, and secondly the crucial step for every successful implementation, which is the complete adjustment of a company

systems, processes, data, flow, etc. and the education of entire management team and end users on the new system, which requires support and commitment of top management to achieve successfully this significant change of the current system.

The decision was made also about the key processes – functions, which would be covered by IFS system:

- Project Management;
- Customer Order and Invoicing;
- Document Management;
- Manufacturing Standards – Quality requirements, etc.;
- Supply Chain Planning;
- Procurement;
- Manufacturing;
- Inventory;
- Logistics – Shipping and Packing;
- Accounting Rules;
- Financials;
- Report and Queries for other Locations.

When decided which processes might be essential to cover by IFS, then migration of data was necessary too. The data, which considered to be migrated included:

- Financial data;
- Invoicing - customer and supplier;
- Inventory on hand;
- Orders done by Procurement department;
- Manufactured orders – finished and in process;
- Structures of products;
- The complete inventory data;
- Routings.

The goals of IFS project were:

1) Single, standard and effective system, which would support decision making;
2) Improved efficiency of business by real time and accurate flow of information;
3) Complex business processes with joint effective communication between customers, employees, suppliers, etc.;
4) Integrated business system;
5) Support global reach by providing multi lingual, multi currency and multi legal entity;

The objectives set for IFS implementation project were:

1) Decision making, which is quick, informed and based on data provided in system;
2) Quick respond to market opportunities, changes and challenges;
3) Continuous communication across the value chain focused mainly on customer;
4) Standard, efficient, simple and user friendly business information system;
5) Robust business information system, which can adapt to new business acquisitions.

As with any other ERP implementation, even the IFS implementation project required

On the basis of the decision of CCI and IMI, the implementation started in the Czech subsidiary, in CCI Brno, in 2011. The team was placed in the office area, and started to focus on processes, data, flow of both and other details connected with production and its management in details. The implementation team was held in Brno for nearly year and half, and then the decision was made to suspend the activities connected with implementation of IFS for the time being. Within the time of implementation, the team has managed to implement IFS into several departments and provided application and system, where it has never been before, in detail the IFS covers:

- Document management;
- Order management;
- Finance;
- Human Resources;
- Planning;
- Logistics – Shipping and Packing.

The implementation of the IFS has shown many issues, which could not be seen before. It pointed out several mistakes, week points of process, systems, data discrepancies, and other issues, which has to be faced in order to improve the control over every step it takes for production of individual valves and components of high-level technology.

2.5 Research

The analytical part of the master's thesis is based on the two types of the research, which were carried out by the author in the CCI Czech Republic, s.r.o. The research main focus is to analyse, what impact has had the IFS implementation on people and processes, in concrete at the Logistics department, specifically at Shipping and Packing subsection, as the cooperation between the CCI department and the IFS implementation team was from the module implementation point of view complete, successful and independent on the old previous systems. Therefore, the research is divided into two sections, the first focuses on the IFS implementation impact on processes. The second part of the research is concentrated on the impact, which the IFS system implementation has had on employees working at Shipping and Packing.

2.5.1 Research Methods

The author of the master's thesis used two methods, how to measure the impacts, which the IFS implementation has had on people working in CCI Brno and on processes at Shipping and Packing, in CCI Brno.

As the research method used for measuring the impact on processes that the author has used, is the *method of process performance recording* using real improvement potential (by Učeň, see chapter 1.14). This method can be considered as a soft metrics, which is used for the process performance measurement, as well as for the level of support provided to the process by ERP software. The method is based on comparison of two states – the target state and current state. Due to a fact, that there is a need to use this method for comparison of state of processes before the IFS implementation and optimized processes after the IFS implementation, as the *current state* will be considered the state before the implementation, although the Logistics uses the IFS for more than 18 months, and as the *target state* will be considered the state after the IFS complete implementation at Logistics run on daily bases.

Within the process of Packing and Shipping, the key activities had to be determined. The determined KA are used and analysed by individual recording tables. Every key activity has verbally specified attributes of the current state (before the IFS implementation) and the target state (after the IFS implementation). The criteria, which in theory (see Učeň, 2008, chapter 1.14) is called "Current state of KA attribute", the author of thesis renamed to the "Original state of KA attribute", as the criteria evaluates the state prior to the implementation, which is not current now, therefore the term of "Current state of KA attribute" would be misleading. It is assumed that the method and its results would not be affected by this minor change. Therefore the real improvement potential – target state of KA key attribute and Original state of KA attribute will be compared. The weight of attributes and points for recording are evaluated from the point of view of the increased process performance influenced by using modules and functionalities of the IFS. The points for recording was set by the author of the master's thesis, discussed and audited by the Logistics Manager and the Supervisor of Shipping and Packing. The value "Result of record of KA performance in %" shows, in what percentage the current state of KA reaches the target state. The value "The increase of KA performance from RIP achievement in %" presents a percentage of the increase of process performance, which would be reached, if the real improvement potential is reached.

Due to the formulation of individual attributes in such manner that it provides the comparison of process with and without the usage of ERP, the tables of recordings show some positive effects and benefits, which are expected from the ERP system implementation.

The second method used for the analysis of the IFS implementation impact on people, who work in the company CCI Czech Republic s.r.o., is the *method of questionnaire*. The questionnaire consisted of 15 questions and all types of questions were used for the construction of the questionnaire. The employees chosen to become respondents had to answer the questions of multiple choices, rating scale, closed ended and Yes/No questions. The open ended questions were used to give a respondent a possibility to express his own opinion, suggestion or reason.

Selection and formulation of the questions was based on the target of the research, which is to understand, if they employees from Logistics subsections Packing and Shipping feel, that the IFS implementation has had the impact on them and their work, as well as how they feel about the new system and what would be their choices of the system, or if there is anything, what they would like to be changed.

The division of questions was organized into five thematic groups, which cover the topic of their focus:

- Questions no. 1 – 3: questions used for the identification of the respondent in general by gender, age, department, where he/she works and the length of employment within CCI Brno;
- Questions no. 4 – 6: the main focus of these three questions is to understand, why a respondent decided to join the company and how he/she perceives the culture and climate of the organization;
- Questions no. 7-9: are focused on employee's feeling about his/hers work done within CCI Brno, if he/she thinks that Supervisor of the subsection understands and evaluates enough his/hers work, and if he/she likes his team or prefers working individually;

- Questions no. 10-12: questions cover the opinion of a respondent on the current process at his/hers subsection;
- Questions no. 13-15: focus on the opinion of a respondent on the previous or other process which was or could be run in his/hers subsection;
- Question no.16: is determined to understand how well was the change of past and current process progressed from employee point of view by providing rating scale of marks 1 to 5;
- Question no.17: is used for expression of employee's opinion on changes, which could have been done to influence the progress of the process change.

The questions have been composed by the author of this master's thesis based on deep knowledge of situation, which had to be faced by employees during the IFS implementation and based on literature described in Chapter 1.16.

The questionnaire is available in Czech and English language version in Appendix 3 and Appendix 4 of this master's thesis.

The questionnaires were distributed in the meeting room for one day and employees could freely fill them out during that day, signing out the list of respondents, in order to control at the end of the day that everyone filled out the form. The completed questionnaires were thrown into the sealed box, which the author picked up in the evening that day in the intact condition. The Logistics department has 4 employees, Logistics Manager, Process Supervisor, Logistics Specialist and Logistics Supervisor of Shipping and Packing. The Logistics subsection Shipping has 8 employees. The Logistics Packing has 9 employees. All together 21 employees filled out the questionnaires, which represents 100% of respondents planned to enquire.

The results from questionnaires will be interpreted in Chapter 2.8. The presentation of answers will be displayed using graphs and tables for more transparent and clearly arranged result presentation, in detail see Appendix 5.

2.6 Impact on processes

It is necessary to describe closely the Logistics department, in order to clarify the impact on it. The CCI Brno has the Logistics department, run by Logistics and Process Manager, who has been with the company for nearly two years, which is separated into four subsections run by three Supervisors. The four subsections are:

- Shipping and Packing – both run by Supervisor, who has been with the company for more than 3 years;
- Kitting - a department responsible for issuing of material from the storage space, which is supervised by an employee, who has been put into the position a year ago;
- Incoming – a department responsible for receiving supplies of material supervised by an employee, who has been with the company for several years;

Due to the fact, that Logistics Manager is responsible not only for a quality job done by Logistics department, but also for a good quality and efficiency of processes in the whole company, the cooperation between him and the implementation team has been substantial. The main target they all agreed on, have been process improvements, especially at Logistics subsections of Shipping and Packing, due to the customer claims issued on the work done by these two Subsections. Another reason for close cooperation was ability of the implementation team to implement IFS Shipping module and Packing sub – module of Shipping, which would have high impact on these departments.

2.6.1 Impact on processes - Packing

When the implementation team started to focus on the Packing process, they brought out to the attention of Supervisor and Manager that some steps (activities) of high importance in the Packing process are missing, which could be reason for problems that Packing is facing. The Supervisor of Packing started to analyse the situation and agreed to work on process improvements and IFS module

implementation in cooperation with the IFS implementation team and the supervision of the Logistics Manager.

The Planning process - past

The process is modelled using Microsoft Visio and BPM (by Kučerová, see 1.15.2). Every step in process of Packing is expressed every activity, which should be done, in order to continue to the following activity. The exceptions like an omission of any activity in the process by an employee, is not considered for the evaluation. The complete packing process flow of the past is displayed in the Appendix 12.

The past process of Packing was not standardized, giving a space to creativity of individual employee, was not recorded (the products and components), and with missing several check points and controls. The performance of the past process was highly affected by human errors made by employees, who physically took over and packed products and components, and employees, who created paperwork connected with packed products and components. As the major demerits of past process could be considered:

1) Missing accessible record keeping of Inter-Company Purchase Order (ICPO – customer order provided to CCI Brno by other subsidiary with Sales department) and Issues Slips (IS – document providing information about all materials and products necessary for the individual order to be completed) and IS versioning;
2) Photodocumentation record keeping absence;
3) Missing Packing list - internal and package structure;
4) Detailed box marking;
5) Concrete storage space for boxes and record keeping of stored boxes;

The Packing process – the present day

The new process of packing, influenced by far-reaching IFS implementation includes more steps, which must be done in order to keep the flow in the right and correct direction, as well as preparing every package according to standards,

which CCI Brno requires. The employees working at Packing sub-section have not been changed in major manner, although there have been some changes, but none of them was not due to the implementation of new system. The comparison of the past process and present process shows that many activities have been added, including high control of material packed, as well as the package material control and documentation control and recording of important steps during the packing process. The structure of the process has changed by adding activities with standardized order and methods. The IFS provides to Packing record keeping, information and data, as well as necessary support for previously missing essential controls. For details of present process see Appendix 13.

Changes to the past demerits:

1) In the past, the ICPOs were not available in any system. The ICPO could be received only from Order managers, who had received them from other subsidiaries and their Project managers, which executed the actual customer order at their Sales department. Therefore, the Logistics in CCI Brno could hardly ever check data in ICPO, the specific packing requirements and instructions, the valves and their parts to be packed, etc.. The IFS implementation has brought a solution by providing Document Management module, which provides all ICPOs, with the scope of supply – the list of all goods (valves and components, or just parts for aftermarket sales), which all belong to each customer order, even with dates of their changes in the system, to see the actual and last valid ICPO. The end user with rights to look up this module can see the information, which is necessary for his informed work to be done.

2) Another problem was, that the Issue Slip, document providing information about parts and products, which should create one complete customer order, was only provided to Packing subsection as a piece of paper placed on the pallet full of goods, which were handed over to Packing either from Kitting, Assembly, or Quality. This piece of paper should be always checked and ticked if the goods on the Issue Slip are consistent with the

actual ones placed on the pallet. The problem of this paperwork control emerged from the fact that if Planning department, responsible for creation of Issue Slips, changed the Issue Slip, which is a common practice emerging from changes in ICPO, e.g. some material/products should be postponed and sent to customer later, some materials/products should not be used or prepared for customer at all, etc., then they saved the last version of Issue Slip in the system by overwriting previous version. This change could not be seen in the system. Therefore, if an employee from Kitting printed out the Issue Slip on Monday, prepared it during Monday, and handed it to Packing on Tuesday, but on Tuesday early morning someone from Planning was forced to change the Issue Slip, automatically the Packing packed the content of the pallet, which agreed with data in the enclosed Issue Slip and sent to customer the content, which was not approved. The IFS implementation team created for Planning department such module, which records versions of each IS, in the case that the IS is changed. Therefore, the employee, who is accepting the pallet with goods firstly checks, if the IS provided on the pallet is the last version – the valid version and if the goods are at the same amount and not damaged, then this pallet can be accepted to be packed. If not, it is returned to the previous department. Then when the Shipment document is created with all individual lines of products from ICPO, each line has its own Issue Slip, and these Issue Slips are checked again, if all goods on these are in agreement with material packed on the basis of these ISs.

3) Another issue, which had to be faced was missing Photodocumentation of packed goods, as well as loaded boxes. During last three years several claims have had occurred, coming from customers, claiming that some parts were missing in the boxes, which had been paid, but not sent. Claims were also covering damaged parts, which have been sent to customers, or sometimes orders have been interchanged and sent to the wrong customers. The IFS and Logistics agreed to creation of documentation based on photos, taking pictures of all parts, before packing, when

wrapped in protective covers and placed in layers of goods, their fastenings, and the complete boxes with its markings, as well as the boxes loaded to the truck of forwarder. It provides visual proof, in the case claims appear and has to be answered.

4) Part of the problem with the past process was the basic system called "Packing info" used for complete documentation of every package created to be loaded on a forwarder's truck and then shipped to a customer or other subsidiary with sales department. The Packing info has been just the Excel sheet, in which data about the shipment and packing was recorded. Due to a fact, that the IFS implementation has not been completed yet, the Packing Info is still used, but it has been improved by the IFS team and connected with the IFS Packing sub-module, providing all kinds of data, allowing creating internal Package list, which is the list of all materials packed in agreement with each line of IFS Shipment (the scope of all goods, which must be packed and prepared for loading; the IFS Shipment is the same as ICPO, except occasional separation of valves from one order, which are sometimes required to be shipped in two or more batches at different time, day, month or year). The IFS implementation has not covered properly Planning department and the Inventory, because of that, the Packing Info (run in Excel) is still kept, as Issue Slips use it too. Therefore the IFS team has created a method of keeping track of data by combining of Packing Info and Package and Shipping structure by creating Internal Packing list, which provides data about all parts packed. Parts are matched to the unique box number, in which are stored. The package structure is a summary of all parts packed, every part has its own line in Shipment run in IFS too, and therefore it is all interconnected.

5) Due to the claims, which has been faced and warnings from the IFS implementation team, another step to improve the performance has been made, the detailed marking of the boxes. It has always been a standard and indispensability to mark the boxes with CCI logo, a centre of gravity,

warning symbols, Project number (Customer order number), dimensions and weight of the box. But since the IFS has been implemented new improvements were introduced. Every box has its own unique number, which is generated by IFS and recorded in Packing Info too. Every box has its own folder in IFS, where the pictures are stored, as well as Internal Packing list, shipping documents. The brand new label "packed" with the personal number of employee, who packed the box and date of packing, as well as address label of CCI Brno. Due to these changes, every employee of Packing feel higher responsibility for the job he/she executes, which initiates better performance and increases interest to do it "right". Due to this change, every month the quality of the job executed by individual employee is reflected in the salary paid.

6) The CCI Brno has main warehouse and external warehouse for storage of boxes with finished goods and components, and for the inventory storage. Nowadays, the Packing department prepares for customers on daily bases about 30 boxes, which has to be stored somewhere. Some of the boxes must go through certification, some must be shipped later, some of them are waiting for other goods to be prepared and packed, therefore with missing system and allocation at concrete storage space, the track of boxes can be easily lost. In the past, it often happened, that forwarder had arrived waiting for loading, and particular boxes could not be found, so the extra costs were paid for no service provided, and the delivery was delayed to the customer in complete, which again increased the costs of the order. The IFS system provides the application which gives to end user possibility to choose the storage from internal or external, and specific location in the warehouse.

2.6.2 Real improvement potential determination – Packing

The method for RIP determination has been described in details in Chapter 2.5.1, the *method of process performance recording*, which has been modified to

compare the current state of process with the past state of process in order to measure the impact of the IFS implementation run on daily basis.

Determination of Key Activities within the Packing process

Within the process of packing of goods, the key activities have been determined, as listed below:

- Record keeping of ICPO and ISs – 1st Check at Packing;
- Photodocumentation record – proofs of parts protection, layering, fixation; box marking and loading;
- Internal Packing list and Package structure – 2nd Check at Packing;
- Box marking – detailed;
- Record of box storage.

2.6.3 Process targets

The targets of most processes within the CCI Brno are very similar to the targets of the company. As targets are to satisfy its customers, on time delivery of perfect condition of valves and components, which are not very specific targets, it is very difficult to be more precise in targets for process of packing. After consulting these targets with Supervisor of Packing, the following targets are listed:

- Full, valid and real time records in agreement with ICPO and IS – no valid claims of missing parts or non-fulfilment of package instructions;
- Spotless and consummate Photodocumentation – Claims to be cancelled based on Photodocumentation providing sufficient proof;
- Full scope Internal packing documentation with all details of every part packed; Package structure with parts allocated to boxes – no claims of swapped components;
- Box marking with unique box number – no additional unnecessary costs of careless approach;
- On time delivery, - no valid claims for late delay.

2.6.4 Recording tables

The individual recording tables are provided to measure the impact of the IFS implementation on process, using method described in Chapter 2.5.1.

Table 5: Recording table – KA of Record keeping of ICPO and ISs – 1st Check at Packing;

Process: Packing Key activity: Record keeping of ICPO and ISs – 1st Check at Packing Priority KA: 25					
	RIP – target state of KA key attribute	Original state of KA attribute	Weight of attribute	Points for recording	Result for attribute
1	ICPO available and updated in real time with package requirements and list of goods to be sent to customer	No record keeping of ICPO. Occasionally provided by Order manager. No record of goods or package requirements available.	30	101	3030
2	Issue Slips are provided im versions, the highest version is the latest, most valid version. Issue Slips in the IFS.	Issue Slips are rewritten provided on pallet as enclosed paper. No control of validity. The IS provided in Excel.	35	45	1575
3	Up-to-date ICPO is in agreement with latest version of Issue Slip. Visible in the IFS.	ICPO not reachable, if updated Order manager must inform the rest of the CCI Brno. Issue Slips updated with delay and rewritten. No consistent system of ICPO and IS cooperation.	20	75	1500
4	End user from Packing with assigned rights can look up the ICPO and actual Issue slip using in the one united system any time.	End user from Packing must contact Order management and Planning department to provide him/her the ICPO and IS, hoping that it is the last version.	15	70	1050
		Total:	100	300	7155
				Result of record of KA performance in %:	71,55%
				The increase of KA performance from RIP achievement in %:	28,45%

Source: the author of master's thesis (2013)

The fact that in the past the company had not software, which could provide record keeping operation, was causing severe issues. At beginning, the Packing subsection did not even know in most cases, what the packing requirements are for each customer order. Therefore, the package was done by intuition of an employee, which at some cases led to damage of products during transportation or

at the time of storage in warehouses. Due to the old system of rewriting the Issue Slips, while providing the Issue Slip in paper form by other department lead in many cases to customer claims, as parts packed did not respond to latest customer requirements. For these above mentioned reasons the weight of first two attributes is higher, scoring at 30 and 35, following two attributes are also important, but the time delay in matching latest version of ICPO with IS and ability of end user to enter the system is less important than providing in complete wrong information. As visible in the column Points of recording, the accomplishment of RIP is successful only in first attribute, as the ICPOs are run in transparent IFS system, which is the reason for 101 point. The ISs are run in Excel, interconnected with ICPO, which is better, both are accessible by end user with dedicated rights, but unfortunately the end user must different system to see one interconnected information; therefore the RIP is achieved only by two-thirds.

Table 6: Recording table – KA of Photodocumentation record – proofs of parts protection, layering, fixation; box marking and loading;

Process: Packing Key activity: Photodocumentation record – proofs of parts, its protection, layering, fixation; box marking and loading; Priority KA: 20					
	RIP – target state of KA key attribute	Original state of KA attribute	Weight of attribute	Points for recording	Result for attribute
1	Photodocumentation taken and stored in IFS, interconnected with corresponding order (box);	Photodocumentation is not taken;	30	88	2640
2	Photodocumentation of parts before packing; Each part is interconnected with each line in the IFS and its picture;	No photos of parts on pallet prepared to be packed	20	25	500
3	Photodocumentation of parts wrapped in protective materials;	Parts wrapped but no proof of photodocumentation;	20	70	1400
4	Photodocumentation of layering of protected parts ;	Photos of layers of protected material were not taken.	10	70	700
5	Photodocumentation of protected parts fixed to stop them from moving in the box;	Photos of fixation were not taken.	10	70	700
6	Photodocumentation of box marking and loading; Connected to Package structure in IFS;	Photos taken of box marking and its position in loaded truck of forwarder;	10	45	450
		Total:	100	368	6390
				Result of record of KA performance in %:	63,90%
				The increase of KA performance from RIP achievement in %:	36,10%

Source: the author of master's thesis (2013)

Photodocumentation has shown to be important, in the case that customer claims appear, or when some misinformation of wrong parts packed is spread, or when the control arrives and wants to check the content of boxes. In the past, the Packing did not take any pictures. The claim that appeared have been claiming missing parts, or extra parts in boxes, damaged parts by moving in the box, are parts layered in top layer being heavier than bottom layered pats, parts with rust, etc. Other claims were for wrong box sent to wrong customer, and damaged boxes. The Photodocumentation record of parts on pallet, parts being wrapped in protective materials, then layered and fixed, as well as photos of boxes and their markings, with the process of loading and position of boxes in the truck of a forwarder provide irrefutable proofs, when claims arrive. Due to the implementation of IFS, these issues were solved and since then many claims have been successfully refused. The IFS also provides the Document Management, which allows photos attachment to particular order and box number. According to frequency of claims and their costs to cover issues in valid claims, the highest weight - 30 has been given to the complete system of Photodocumentation in the IFS, where in no time can be found pictures connected with order. But points are not so high, as pictures are only connected to order but have to be searched though, when looking for a specific part - 88, as the IFS allows so exact interconnection that it is more, that Packing could dream off (the opinion of Packing Supervisor). Another high weight is given to photos of parts before packed, as it shows quality and exact parts with their markings, and parts wrapped in protective materials, the weight 20. But other points for attributes 2 and 6 are lower at 25 and 45, as there is no connection to a specific part in IFS. Unlike with attributes 3, 4 and 5, where Photodocumentation just shows the protection, fixation and layering, where points are reached at levels of 70. Because the IFS system might actually provide some interconnection of each part in every state of packing, wrapping, positioning and fixing to each dedicated line in the Packing structure, the total score could be higher. But in general, the system provides all picture dedicated to the particular order.

Table 7: Recording table – KA of Internal packing list and package structure – 2nd Check at Packing;

Process: Packing Key activity: Internal packing list and package structure – 2nd Check at Packing Priority KA: 20					
	RIP – target state of KA key attribute	Original state of KA attribute	Weight of attribute	Points for recording	Result for attribute
1	Structured Packing list - internal, run in IFS, interconnected with Package structure.	Packing List run in excel, providing insufficient data.	40	45	1800
2	Package Structure run and created using the IFS, showing exact goods in exact boxes, inter connected with Internal packing list within one system;	Non existing official Package structure.	50	62	3100
3	Exact data in Internal Packing list and Package structure are in agreement. Visible in one united system.	Data provided only about Internal Packing List.	10	45	450
		Total:	100	195	5350
				Result of record of KA performance in %:	53,50%
				The increase of KA performance from RIP achievement in %:	46,50%

Source: the author of master's thesis (2013)

The key activity, which is the creation of the internal packing list and package structure, serves as the second check point, where dedicated packing employees create documents, which are used as internal and customer documentation of parts, which are included in the boxes dedicated to specific project. Due to fact that in the past, only Internal Packing list was created on the base of insufficient data, many mistakes leading to claim had been done, which is shown by the weight of first attribute 40, as the implementation team improved the quality of data provided, but has kept it in Excel program, therefore point reach the value of 45 only. The highest weight has got second attribute, as the implementation team introduced the Package structure, interconnected with ICPO, ISs and Shipping document. The structure shows in detail, where and what is packed, and other important data, which are exact and correspond with the reality. Due to these facts, the weight reaches value of 50, but the points only 62, as it is not interconnected with Internal Packing List within one system. Last attribute covers

accuracy of data, which has been improved by IFS, but as it has not been interconnected, the weight is 10 and points 45.

Table 8: Recording table – Box marking – detailed;

Process: Packing Key activity: Box marking – detailed; Priority KA: 10					
	RIP – target state of KA key attribute	Original state of KA attribute	Weight of attribute	Points for recording	Result for attribute
1	CCI logo, a centre of gravity, warning symbols, Project number (Customer order number), dimensions and weight of the box; Printed as a sticker by a system.	CCI logo, a centre of gravity, warning symbols, Project number (Customer order number), dimensions and weight of the box;	60	81	4860
2	Unique box number, which is generated by IFS and recorded in Packing Info and Package structure; Generated by IFS.	Non existing unique box number.	20	45	900
3	Markings: packed, personal stamp and address of CCI Brno. Recorded in IFS and printed out.	Non existing data about employee, who packed it; the date, when is was packed and address, where to return in the case of issue.	20	45	900
		Total:	100	171	6660
				Result of record of KA performance in %:	66,60%
				The increase of KA performance from RIP achievement in %:	33,40%

Source: the author of master's thesis (2013)

The first attribute is considered as the most important due to necessary markings, weighted at 60, pointed 81 by disability of system to create printed stickers for markings. The attribute 2 and 3 are weighted the same 20, as their importance is minor especially for transportation needs. But both are pointed only over 45, as the IFS system is not set up and does not support any form of generation and itself data recording of unique box number, generated in Packing Info excel system, and other markings related more to the employee responsibility and performance.

Table 9: Recording table – Record of box storage;

Process: Packing Key activity: Record of box storage; Priority KA: 10					
	RIP – target state of KA key attribute	Original state of KA attribute	Weight of attribute	Points for recording	Result for attribute
1	CCI Brno storage space run by IFS.	CCI Brno storage space run by CCI Brno stock and Packing Info Excel sheet;	20	5	100
2	Unique box number has its own specific and exact allocation in warehouse; run by IFS;	No allocation of stored box;	50	65	3250
3	The allocation of box with unique box number is displayed in Package structure run in IFS.	No allocation of stored box; Boxes displayed in Packing Info (excel sheet);	30	20	600
		Total:	100	90	3950
				Result of record of KA performance in %:	39,50%
				The increase of KA performance from RIP achievement in %:	60,50%

Source: the author of master's thesis (2013)

Record of box storage is very important because it is common practice that the order is not packed and shipped in one day, but it takes longer to complete the packing of order, or sometimes the delivery condition is to keep boxes at our warehouse, and customer will organize the pickup of his order by himself. Therefore, if the boxes are stored at two warehouses, the internal and external, the orientation and allocation of boxes is crucial, which is shown by highest weigh of second attribute - 50, which provides data about every individual box stored, but points received are only at level 65, as this is not run by IFS, the record is done in the Packing Info excel sheet. The other two attributes have lower weight of 30 and 20, as for it is not so important for Packing, if storage space is covered by the IFS nowadays, and if the allocation is visible in the Package structure, which is not any of these attributes, therefore it achieves low points of only 5 and 20. The IFS implementation could not reach that far within the time frame, but it would be easier for employee orientation to use just one system, and probably quicker, as shows other KAs.

2.6.5 Consolidation of results from recording tables - Packing

The consolidation is accomplished as the summation of results from recording tables of all Key activities within the process of packing,

Table 10: Result from recording tables - Packing;

Process: Packing			
Key activity:	**Priority KA:**	**Points KA**	**Results of KA**
Record keeping of ICPO and Iss – 1st Check at Packing	25	71,55	1788,75
Photodocumentation record – proofs of parts, its protection, layering, fixation; box marking and loading	25	63,90	1597,5
Internal Packing list and package structure – 2nd Check at Packing	20	53,50	1070
Box marking – detailed	20	66,60	1332
Record of box storage	10	39,50	395
Total:	100	295,05	6183,25
Result of process performance record in %:			61,833%
The increase of process performance from RIP achievement in %:			38,167%

Source: the author of master's thesis (2013)

Due to the results visible in Table 11, it can be noted that from the information system support point of view, the original state of process was able to achieve its performance level by 61,83% from its real potential, before the IFS was partially implemented.

It is considered, that the state of packing process using partially implemented IFS software solution, presents real improvement potential. Then, after the implementation of the IFS, which has been so far only partial, the performance of Packing has increased by 38,17%.

As was described in the theoretical part of this master's thesis, these statements cannot be presented as the result of the ERP implementation only, which would have increased all other hard metrics by the same percentage. The result can be presented and understood in general features as a tool for managing a company, based on which can managers set up their expectations in sophisticated way of future trends in business performance development.

2.6.6 Impact on Packing – hard metrics and effects

The evaluations and results of measuring the performance using the soft metrics should be supported by the usage of some hard metrics, which are relevant to the examination of the researched process. The choice of used hard metrics should correspond with process targets, or more precisely with the company's targets and its strategies.

In the case of the CCI Brno, the main targets of the company are to produce as much as possible, as quick as possible, keep or improve the quality of products and components, satisfy all customers, the on time delivery, constantly improved processes and major costs savings, as well as no valid customer claims. The company has been increasing its production since 2009, when was relocated to the new bigger warehouse.

The author has measured using the hard metrics some factors of packing, which would support the hypothesis, that the IFS implementation has brought many benefits to the company.

Data used for hard metrics are sourced from CCI Brno databases, consulted with Logistics department, in order to be precise.

First hard metric will be applied on measurement of number of valid customer claims and related costs, which result from the valid claims settlements, as visible in the table 11. The number of valid claims had a growing tendency during years 2009 to 2011, and in the first year of using fully the IFS Applications, 2012, it has dropped down by 65% decreasing the costs of claims by 72%, which is the amount of 2,160,000 CZK. In the following half of the year 2013, the number of claims dropped down by 63%, decreasing the costs, which are totally unwanted by 76%, the amount of 640,000 CZK, although it measures only the half of the year, as the data for the full year are not available yet. It clearly shows, that the new process with addition of actions and steps, which have to be taken in order to create detailed Packing documentation with sufficient information has helped to avoid discrepancies in Packing, although the amount of orders, which employees of packing department packed constantly grows, although the number of people

employed at Packing, the subsection of Logistics department of CCI Brno remains the same.

Table 11: Hard metrics – cost of claims

Year	2009	growth in %	2010	growth in %	2011	growth in %	2012	growth in %	2013 (1st half)	growth in %
Number of valid claims per year	5	N/A	12	140	23	92	8	-65	3	-63
Costs spent on claims settlement (in thousands CZK)	500	N/A	1 450	190	3 000	107	840	-72	200	-76
The costs increase (in thousands CZK)	N/A	N/A	950	N/A	1 550	63	-2 160	-239	-640	-70

Source: the author of master's thesis with CCI Logistics cooperation (2013)

The second hard metric is used on data, which shows the average time spent on creation of Packing documents and amount of mistakes made in these documents for last four and half years, see Table 12.

Table 12: Hard metrics – time consumed for creation of Packing documents, mistakes made and orders packed;

Year	2009	growth in %	2010	growth in %	2011	growth in %	2012	growth in %	2013 (1st half)	growth in %
Average time for Packing documents creation for one order (minutes)	20	N/A	20	0	45	125	50	11	55	10
Amount of mistakes per Packing documents for one order	5	N/A	8	60	12	50	3	-75	1	-67
The amount of orders packed	200	N/A	500	150	1 000	100	1 400	40	1 200	-14

Source: the author of master's thesis with CCI Logistics cooperation (2013)

It is obvious that since the IFS Applications with major impact on process of packing has been implemented, the number of mistakes made in Packing documents dropped down by 75% by first full year of the IFS usage, year 2012, and another drop in the half of second year of IFS usage by 67%, the first half of 2013. The IFS Applications have been implemented in second half of the year 2011, obviously it took some time to all employees to learn new processes and start using the IFS properly, and therefore the impact of ERP implementation cannot be applied on year 2011. The impact also cannot be examined further as the result for the whole year 2013 is not known by now. Although the time necessary for creation of Packing documents has grown in the first year of full usage of the IFS applications by 11% compared to year 2011, due to increased amount of activities, which must be carried out, the growth of time necessary for creation of documents has already slowed down even though there is still another increase, in the first half of year 2013 it has been only by 5%.

Although, the reasoning for the increase of orders cannot be supported only by the implementation of the IFS Applications, the hard metrics displayed above clearly shows, that the implementation of the IFS has pushed to some level on the performance of Packing. Obviously, the quality of work, paper work and packages has been increased, proved by savings on claims settlements and mistakes made. The evaluation is not absolutely precise, due to a short time of measurement, as the implemented modules affected mainly year 2012 and 2013, but the results for 2013 cannot be provided yet. Still, there is a measurable positive effect, proved by Logistics department in CCI Brno.

2.6.7 Impact on processes – Shipping

When the implementation team started to focus on the Shipping process, they informed the Supervisor and Manager that some steps (activities) of high importance in the Shipping process are missing as well as in previous Packing process. The Supervisor of Shipping, knew the issues as well as and started to push the IFS module implementation in order to cover missing steps to the point when they finally have created the current Shipping module, which provides

sufficient data and modules for necessary actions, which need to be executed by other departments like Order management, Planning, Quality and Packing.

The Shipping process - past

The process is modelled using Microsoft Visio and BPM (by Kučerová, see 1.15.2). Every step in process of Packing is shows the activity, which should be done, in order to continue with the following activity. The exceptions like an omission of any activity in the process by an employee, is not considered for the evaluation. The complete Shipping process flow of the past is displayed in the Appendix 14.

The past process of shipping the order for customer to the customer's address or to other subsidiary was not standardized, giving a space for creativity of individual employee. It was recorded only as the attachments in the e-mail communication of an individual employee. The data and information about customer was insufficient, sometimes with the wrong delivery address, taking very long to get hold of these data, because all communication was based on phone calls with Project managers, verbal communication with Order managers and emails to individual employees. There was no plan of what and when would be shipped, so everything was done at the point, when any information reached the office of Shipping. The data about products, as valves and components, including individual parts of each component were poor. Therefore, the Customer packing list was consisted of few lines, which did not describe in details, what was packed within the boxes and shipped to the customer. There was no possibility to create Shipping Invoice with accurate data like the country of origin of products, or other documents for the customs purpose. If material was released for Packing and Shipping, the information sometimes got to the Shipping office earlier, before the material was moved to be pack to the Packing subsection, and Shipping documents were created too early, which caused the recreation of these documents in the following day and wise versa, meaning that sometimes the order was packed on time, but Shipping documents were created much later and forwarder was ordered late, which caused time delay on the whole order and the delivery of the order was delayed too. The delay caused high shipping costs too.

The Shipping process – the present day

The new process of Shipping influenced by the IFS implementation includes more steps, which must be done in order to keep the flow in the right and correct direction, and keep deliver on time. The employees working at Shipping sub-section have not been changed in major manner, although there have been some changes, but none of them was not due to the implementation of new system. The main change was hiring more employees, but it is a result of the increase of orders shipped every year. Nowadays, the employees from Shipping use the Shipping module from IFS, which takes the data from ICPO and involves other departments to input data about customer, product and components, as well as time plan of shipment.

The comparison of the past process and present process shows that not so many activities have been added, including but the extent of information and data provided, as well as time savings, when gathering the information is very different. For details of present process see Appendix 15.

The main and positive changes, observed at Shipping after the IFS implementation has been:

1) Data and information storage and quality – in the present system, data are provided by assigned departments like Order Management, Quality, Planning, etc. Data and information are very exact, sufficient, up-to-date and extended, when compared to past. Every employee from Shipping subsection can reach any data about the shipments, which gives them a chance to cooperate in high time pressure and successfully ship on time all orders, if on time delivery is not disturbed by other department, which is not considered for this evaluation. These data provides to Shipping a plan of orders to be shipped, so it gives them a chance to plan the time schedule for preparation of shipping documents and split particular orders to every employee, which gives them higher performance efficiency. New database provided by the IFS shows them closer information about the products and components, which are going to be shipped. This is important for

estimation of amount of goods and their packed weight for ordering the forwarder's pick up and type of truck. The customer prices are also mentioned within the system, although this information is confidential and visible only to determined employees from Shipping and Order Management, but necessary for customs purposes, like creation of Export declaration, etc.by Shipping.

2) New feature provided by the IFS is a structure of Shipping documents. The module in IFS predetermines which data about the shipping parts and customer, and customs controls, etc. should be entered, giving very little space for creativity to every end user of Shipping module. As standard information included on Shipping documents are considered preferential origin. These data is used for the creation of Declaration of country of origin used for customs purposes and as a quality viewpoint for some customers. Another standard is to include information like item description. The new document is new Customer Packing list with the description for every item. And as additional standard is considered the Letter of Credit, which is used for assurance of customer, that all goods ordered, together with appropriate documentation, will be delivered to him on requested date and place, by using the specific bank as an intermediator of sale, whose responsibility is to check, if all required things are prepared to be shipped, and if it is considered to be at the condition, which customer would like to receive, the bank approves the payment of customer to the account of supplier, the CCI Brno.

3) Shipping release - In the past it was quite common practice that Shipping, the subsection of Logistics department, was acknowledged to start working on preparation of Shipping documents by phone call from Project manager from other subsidiary than CCI Brno, or by phone call or email from Order managers from CCI Brno. This step took long time, and did not have any standards, regardless the fact, that depending on the employee from OM, or PM department, some employees from Shipping

were privileged to receive such phone calls more than others, which caused that work performance was not very effective. Due to the implementation of IFS Applications, the release of order to be shipped is done by Order managers within the system, after the order is released by Quality department and Project manager, and this release is visual in the system within the second from the approval step. This gives a chance to employees at Shipping to agree together on project assigned to every one of them and make the work of the department a lot more efficient. The other issue from past was, that some orders were released to be packed and shipped, but it took them some time to be moved to the Packing area, which caused the problem, that sometimes the Shipping documents were created for orders, which could not be packed the same day, and the Shipping documents had to be updated and changed following day again.

2.6.8 Real improvement potential determination – Shipping

The method for RIP determination has been described in details in Chapter 2.5.1, the *method of process performance recording*, which has been modified to compare the current state of process with the past state of process in order to measure the impact of the IFS implementation run on daily basis.

Determination of Key Activities within the Shipping process

Within the process of shipping, the key activities have been determined, as listed below:

- Shipping Plan;
- Shipping document's Standards;
- Shipping Release;

2.6.9 Process targets - Shipping

The targets of most processes within the CCI Brno are very similar to the targets of the company. The CCI Brno targets are to satisfy the customers, on time delivery of perfect condition of valves and components, savings costs and

increasing production and its efficiency. These targets are not very specific in the time perspective, which means that it is difficult to be more precise in targets for process of shipping. After consulting these targets with Supervisor of Shipping, the following targets are listed:

- Full, valid and real time records in agreement with ICPO and IS – no valid claims of missing parts or non-fulfilment of package instructions;
- Precise following of Shipping Plan;
- High standards of error-free documents;
- On time delivery, - no valid claims for late delay.

2.6.10 Recording tables

The individual recording tables are provided to measure the impact of the IFS implementation on process, using method described in Chapter 2.5.1.

Table 13: Recording table – KA of Shipping Plan;

Process: Shipping Key activity: Shipping Plan; Priority KA: 30					
	RIP – target state of KA key attribute	Original state of KA attribute	Weight of attribute	Points for recording	Result for attribute
1	IFS provides all data necessary for Shipping. Shipping plan provided too; Data up-to-date;	Communication based on phone calls, verbal communication and e-mails; No plan of shipments;	50	65	3250
2	IFS provides scope of supply - the amount to be shipped in real time and customer prices, which are up-to-date;	No data provided about prices and components loose parts.	30	42	1260
3	Detailed Customer Packing List is created ahead due to data in the IFS;	Basic packing list created with no details of goods.	20	85	1700
		Total:	100	192	6210
				Result of record of KA performance in %:	62,10%
				The increase of KA performance from RIP achievement in %:	37,90%

Source: the author of master's thesis (2013)

In order to follow the precise Shipping Plan, provided in the IFS and set by other departments, the precise and up-to-date data and information must be reachable at any time to any employee from Shipping. If any of documents is missing the particular data, the shipment cannot be loaded to the forwarder's truck and it can

cause major delay and destroy the Shipping plan by postponing other shipments. Therefore the attribute no.1 has the weight 50, as in the past there was no system, which provided plan and precise data to the Shipping subsection. The points reach the value of 65 because of the fact, that some data are not updated by particular end user as often as it should. The second attribute has higher weight than the third one, 30 to 20, but prices are also updated less often, which cause issues and time delay as the Shipping must ask for approval of up-to-date prices, before using the values in the system, points 42. The least important attribute, detailed Customer Packing list reaches the highest value of points, 85, as the IFS and the end users from other departments fill in the system mostly very precise and exact data of components scope of supply before there is a need to create documents for each shipment.

Table 14: Recording table – KA of Shipping document's Standards

Process: Shipping Key activity: Shipping document's Standards; Priority KA: 40					
	RIP – target state of KA key attribute	Original state of KA attribute	Weight of attribute	Points for recording	Result for attribute
1	Shipping Documents Standards based on fields to be filled in the IFS; Other departments fill in the fields in real time.	No standards for Shipping documents;	45	45	2025
2	Creation of Shipping Invoices based on data from IFS, like declaration of country of origin;	Shipping Invoices without declaration, based on insufficient information;	35	81	2835
3	Letter of credit provided; all data available in the IFS in real time by all subsidiaries;	Letter of Credit was not provided;	20	42	840
		Total:	100	192	5700
				Result of record of KA performance in %:	57,00%
				The increase of KA performance from RIP achievement in %:	43,00%

Source: the author of master's thesis (2013)

The standards predetermined for shipping documents are crucial, the weight 45, as it secures the possibility, that something might be forgotten by an employee. The IFS introduced Shipping Documents Standards to all departments responsible for input of information. Unfortunately, Order managers are not very keen to fill in the data at real time, when informed about the data, or when something changes

and data should be updated, therefore only 45 points. Second attribute, the creation of Shipping Invoices is weighted with value 35, but points 81, as most of the materials contain information in the IFS of the country of origin, which is a big step forward in the creation of Shipping Invoice and pleases the customer, who needs this information mostly for customs purposes. The last attribute is the least important in this specific KA, the creation of L/C document (the Letter of Credit), because it is quite new and the some subsidiaries still face the issue to provide data necessary for its creation in real time, so the weight is only 20, with 42 points.

Table 15: Recording table – KA of Shipping Release

Process: Shipping Key activity: Shipping Release; Priority KA: 30					
	RIP – target state of KA key attribute	Original state of KA attribute	Weight of attribute	Points for recording	Result for attribute
1	Shipping Release in real time using IFS Application.	Shipping release phoned, verbally provided, or emailed.	45	82	3690
2	Allocation and fair division of orders to be prepared by shipping employees, due to visualised IFS system;	Privileged employees had more orders to prepare, than others. No system showing orders to be prepared for shipping.	35	58	2030
3	Released order at the point, when it is accepted to be packed due to the IFS release;	Released but not known, if accepted to Packing;	20	85	1700
		Total:	100	225	7420
				Result of record of KA performance in %:	74,20%
				The increase of KA performance from RIP achievement in %:	25,80%

Source: the author of master's thesis (2013)

The release of an order to be packed and shipped must be wisely timed. The IFS has provided application, which shows, when the release has been approved, which means, that Quality approved packing of goods and Packing department accepted goods after their control. This signal is visualised in the IFS system visible for Shipping department, who can then start preparing Shipping documents. Therefore, the first attribute is the most important with weight of 45, and points 82 for clever solution provided by the IFS implementation team. The other attributes are less important with lower weight, 35 and 20, but different in

the fact, that expected fair division of orders, based on the visualised system is not working so well, due to special dedications of particular orders to individual employees by Project managers from other subsidiaries than CCI Brno, points 58. In contrast the third attribute receives 85 points due to a fact, that very little Shipping documents must be changed and updated because of misleading information, that some order would be released and accepted by Packing to be packed, although the Packing would return it back, as was common in the past.

2.6.10 Consolidation of results from recording tables - Shipping

The consolidation is accomplished as the summation of results from recording tables of all key activities within the process of Shipping,

Table 16: Result from recording tables - Shipping;

Process: Shipping			
Key activity:	**Priority KA:**	**Points KA**	**Results of KA**
Shipping Plan	30	62,10	1863
Shipping document's Standards	40	57,00	2280
Shipping Release	30	74,20	2226
Total:	100	193,30	6369
Result of process performance record in %:			63,69%
The increase of process performance from RIP achievement in %:			36,31%

Source: the author of master's thesis (2013)

Due to the results visible in Table 16, it can be noted that from the information system support point of view, the original state of shipping process was able to achieve its performance level by 63,69% from its real potential, before the IFS Applications software was partially implemented.

It is considered, that the state of shipping process using partially implemented IFS software solution, but fully implemented Shipping Modul, presents real improvement potential. Then, after the implementation of the IFS, which has been

so far only partial, the performance of Shipping, the subsection of CCI Brno Logistics has increased by 36,31%.

As was described in the theoretical part of this master's thesis, these statements cannot be presented as the result of the ERP implementation only, which would have increased all other hard metrics by the same percentage. The result can be presented and understood in general features as a tool for managing a company, based on which can managers set up their expectations in sophisticated way of future trends in business performance development.

2.6.11 Impact on Shipping – hard metrics and effects

The evaluations and results of measuring performance using soft metrics should be supported by the usage of some hard metrics, which are relevant to be examined at researched processes. The choice of used hard metrics should correspond with process targets, or more precisely with company's targets and its strategies, as was mentioned also within the process of packing.

In the case of the CCI Brno, the main targets are the same as mentioned in chapter 2.6.5, the main targets of the company are to produce as much as possible, as quick as possible, keep or improve the quality of products and components, satisfy all customers, on time delivery, constantly improved processes and major saving costs, as well as no valid customer claims. The company has been increasing its production since 2009, when was relocated to the new bigger warehouse.

The author has measured using hard metrics some factors of shipping, which would support the hypothesis, that the IFS implementation has brought many benefits to the company.

Data used for hard metrics are sourced from CCI Brno databases, consulted with Logistics department, in order to be precise.

As the first hard metric is used the comparison of values of the average time spent of creation of Shipping documents, the average time spent of finding relevant data used for creation of Shipping documents and the number of mistakes made in Shipping documents (as it is average it is calculated per one order in the concrete

time period) in the period of four and half years, from 2009 to the first half of 2013, see Table 17.

Table 17: Hard metrics – Time and mistakes of Shipping documents

Year	2009	growth in %	2010	growth in %	2011	growth in %	2012	growth in %	2013 (1st half)	growth in %
Average time for Shipping documents creation for one order (minutes)	15	N/A	20	33	35	75	60	71	65	8
Average time spent on finding relevant data for Shipping documents per order (minutes)	60	N/A	70	17	75	7	30	-60	15	-50
Amount of mistakes per Shipping documents for one order	6	N/A	9	50	12	33	2	-83	1	-50
The amount of orders shipped	200	N/A	500	150	1000	100	1400	40	1200	-14

Source: the author of master's thesis with CCI Logistics cooperation (2013)

The results from Table 18 show, that since the IFS has been implemented with the Standards for Shipping documents and additional documents, which can be created due to access to data, which could have not been accessed before the implementation, the time needed for creation of Shipping documents has increased rapidly in the first year of full usage of IFS for Shipping by 71%, but in the first half of second year of usage IFS has slowed down to the increase of 8%. The average time spent on finding relevant data for Shipping documents has had decreasing tendency since 2012 by 60% and in the first half of 2013 by 50%, it is clearly by IFS Shipping module, where Order managers and other departments must fill in the data. The number of mistakes made in the documents has been dropping down too, in the same period of 2012 and 2013, by 83% and 50%, although the amount of orders constantly decreases.

The second hard metric used for performance measurement of Shipping subsection are Transport cost spent on the shipment in 2009, 2010, 2011, 2012 and the first half of 2013.

Table 18: Hard metrics – Transport cost spent on the shipment

Year	2009	growth in %	2010	growth in %	2011	growth in %	2012	growth in %	2013 (1st half)	growth in %
The amount of orders shipped	200	N/A	500	150	1000	100	1400	40	1200	-14
Transport costs per year (in thousands CZK)	2000	N/A	6000	200	15000	150	14000	-7	9600	-31
Average transport costs per order per year (in thousands CZK)	10	N/A	12	20	15	25	10	-33	8	-20
Transport costs savings (in thousands CZK)	N/A	N/A	-1000	N/A	-3000	200	7000	-333	2400	-66

Source: the author of master's thesis with CCI Logistics cooperation (2013)

The IFS has put in place the function, which allows creating the Shipping Plan. If an employee, who arranges transports for shipments, is able to know what weight of shipment, the terminal address and when it is going to be shipped, then an employee can arrange some forwarder in advance, which causes lower prices for transportation, as show the results too. The number of shipments constantly grows, except for the last first half of 2013, which cannot be considered as a drop, because it is not a final result for the whole year. After implementation and full usage of IFS, 2012, the total costs for transportation per year has dropped by 7%, and in the first half of 2013 has dropped down again by another 31%. The average transport cost per order per each year has had the decreasing tendency too, in 2012 compared to 2011, by 33% and in the following half of 2013 by 20%. The most important are the savings of costs. The calculation of cost saving is applied in the formula, which shows, that if the transportation had not been delayed and could have been ordered in advance, and kept at the price from previous year, it

would save some money to the company, as it is the target of the whole company, the CCI Brno to save costs. The transportation costs after implementation of Shipping Plan, standards for Shipping documents, IFS Shipping module providing data and implementation real time Release, have started to decrease, which show the result, that in 2012 the company saved compared to 2011, the company has saved 7,000,000 CZK on transportation and in the first half 2013 the amount of 2,400,000 CZK, which has been proved by Logistics CCI Brno, due to the same price lists for years 2011,2012 and 2013 of all forwarders, who agreed to keep the prices, as the CCI Brno has increased the amount of shipments by every year.

2.7 Impact on processes – results

The company CCI Czech Republic s.r.o. has acquired a strong tool of support by implementing the IFS Applications, the software, which provides process management, data integration and support for informed decision making. Product of significant quality has been partially implemented by professional team, which provided conscious help for business improvement. The ERP team supporting end users remained in CCI Brno, although the project of implementation IFS Applications has been suspended.

The main benefits of partially implemented IFS system are mainly:

- Improved processes and standards of work done within Logistics – Packing and Shipping;
- Better and accessible data and information flow within the company;
- Sophisticated information system;
- Cost savings measured at Packing and Shipping subsections of Logistics for last year and half of full usage of IFS at amount of more than 12,000,000 CZK.
- Employees feeling more responsible for their job results.

These benefits and results are in agreement with CCI Brno Logistics Manager, who observes the equal benefits as the author of the master's thesis. The Manager added the information that ERP implementation should be started again and follows up already implemented modules with the same progress and success.

The usage of method called real improvement potential has showed the increase of processes performance of Packing by 38,16% and of Shipping by 38,71%. As was mentioned earlier, these results do not prove that it would have major impact on changes of hard or financial indicators, although some costs saving have been noticed. It only shows that at the time of comparison both states of processes using the RIP method some savings within the packing process and shipping process have been identified.

2.8 Impact on people

The research of this master's thesis is focused on analysing the impact of ERP implementation, specifically on the IFS Applications implementation run by the implementation team created by people of knowledge and experience with the IFS Application and people from CCI with deep knowledge and experience of goods, processes, etc. The implementation has not been successfully completed due to the Top management decision to suspend the implementation for some time. Therefore, some departments are fully implemented with their new system modules, processes and working procedures and standards, and some has not been changed at all, running in the previous IS systems.

The subsections Packing and Shipping of Logistics department have faced the successful implementation of the IFS Applications, modules Packing and Shipping, which changed their processes and work and documents standards. This has been described in the previous chapters. Therefore, it can be considered that the implementation of IFS might have some impact on the employees working at these subsections, as well as on the Logistics Manager, Process Supervisor, Logistics Specialist, and Logistics Shipping and Packing Supervisor. All together

it makes 21 employees which might have been influenced by ERP implementation.

The questionnaire was provided for one day in reserved meeting room, where it could be filled out freely and put in the sealed box. That way it was kept anonymous, although every employee had to sign the list of attendants for assurance that everyone took part in the research led by the author. All 21 employees took part of the research, which was based on the questionnaire of 17 questions focused on people, work performance, valuation of work, current process acceptation and tendency to look to the past process.

The results of the research, the answers to the group of questions will be presented in the separate manner with usage graphs and tables for more transparent and clearly arranged presentation of results from the research. Where the results did not reach some level of significance, the interpretation of answers is covered in lower level of depth, although the interpretation in graphs and tables is available in Appendix 5.

2.8.1 Results of Research – Questionnaire

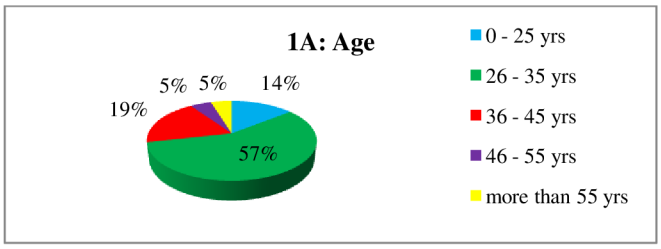
The research sample consisted of 21 respondents in total of below described characteristics (see Appendix5):

- *The structure of age:* has consisted of the biggest group 12 people (57%) in the age of 26 to 35 years, than 4 people (19%) in the group of age of 36-45 years and 3 people (14%) in age group younger than 26 years, only one person in the age group 46 to 55 years and lastly 1 person older than 55 years, which makes in both cases 5% from total. Therefore, the team at Logistics department can be considered as young aged, as 71% of employees are aged below 35 years.
- *The structure of gender:* 5 women (24%) and 16 men (76%), which is acceptable due to the fact that Packing subsection is placed at shop floor, where heavy goods must be handled.
- *The structure of the whole Logistics department:* is in agreement with the real proportion of workforce necessary for success of each subsection and

department maintenance as a complex. It is clear, that the Logistics department is run by Manager, Process Specialist, Logistics Specialist and Supervisor of Shipping and Packing, these 4 employees create 19% of employees covered in the research, as other Supervisors had very little knowledge about researched topic. Then 8 employees are responsible for success of Shipping, which creates 38% from total. The highest number of employees - 9 is in Packing subsection, which is 43% of total employees researched.

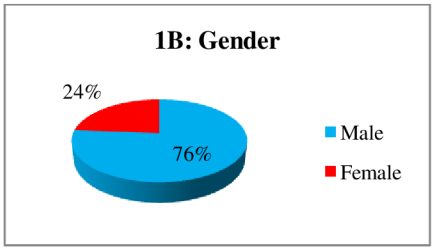
- *The length of employment:* almost half of employees has been in the company for the period of 1 to 2 years (43%); compared to that second highest number – 24% have just started in the company, 0 to 3 months of their employment; interesting is that almost the same number of employees 19% have been employed for more than 2 years, and 14% has spent over 3 years in this business; All together is presents that fluctuation of employees is not very common within Logistics, as most of the employees has been within the company for 1 to more than 3 years.

Figure 5: Age of respondents



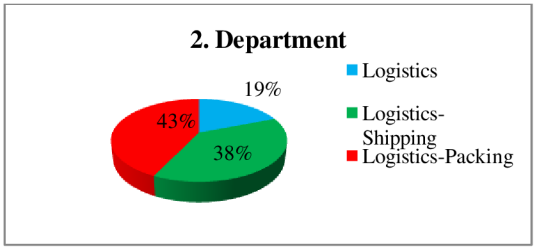
Source: Author's own study

Figure 6: Gender of respondents



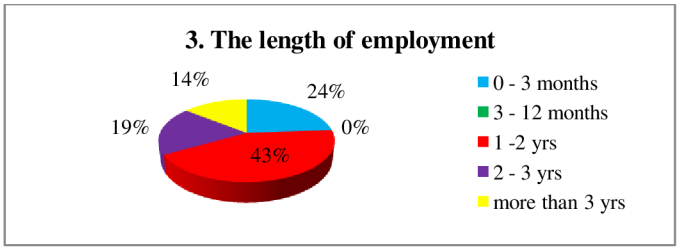
Source: Author's own study

Figure 7: Allocation of respondents



Source: Author's own study

Figure 8: The length of employment



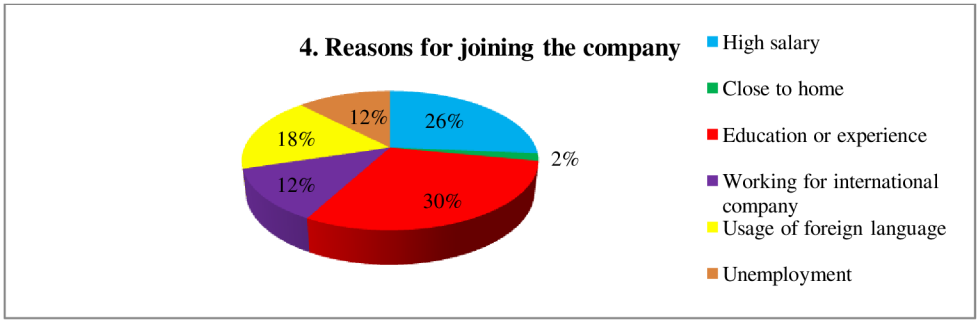
Source: Author's own study

- *The reasons for joining the company and organizational climate and culture perception: - question no.4, 5 and 6;*

The most frequent answers of employees, who joined the company was due to possibility to work in the field, where they already had the most experiences or was educated, which shows 30% all together, of which 25% is Logistics, 28% is Shipping and 35% is Packing. The least important reason was the distance from their home represented by 4% for one employee from Packing. Second most important factor of final choice has been high salary, as it is known within Brno, that CCI Czech Republic s.r.o. offers higher salaries than most of the companies within each position, proved by 26% of employees' answers. The third important factor is international culture with main English language used for office communication, which shows 18% in total, and 25% for Logistics office and 22% for Shipping only. The least important were considered working for international company and unemployment scoring at 12%, although the unemployment was

considered as the important factor by Packing, where it scored 17%, which is third highest reason for working in CCI Brno, just after education and salary.

Figure 9: Reasons for joining the company CCI Czech Republic s.r.o.

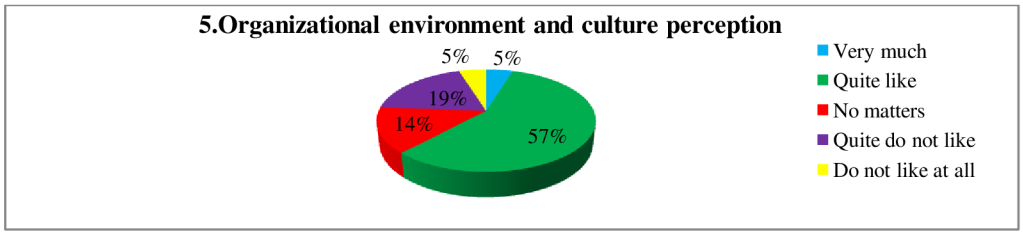


Source: Author's own study

The questions no.5 and 6 focused whether the employees like or dislike the culture and climate of the organization and main reasons supporting the feelings about the culture and climate of the company.

If we consider the Logistics as the whole, more than half of employees quite like the culture and clime of the company by 57%, the Logistics office team of supervision by 75%. The main reasons are technical support and equipment and management created by Czech people beside foreigners. On the other side nearly 20% ticked the option that they do not like so much the culture and climate of the company due to internal work rules and procedures and ordered overtimes and very restricted time breaks, presented by 22% from Packing. The only time break employees from Packing have is for the lunch, which seems to be very little, when they have to be very focused on hard work in demanding environment on shop floor.

Figure 10: Organizational environment and culture perception – question no. 5



Source: Author's own study

Table 19: Reasons for respondent's answer to question no. 5

Question no.6

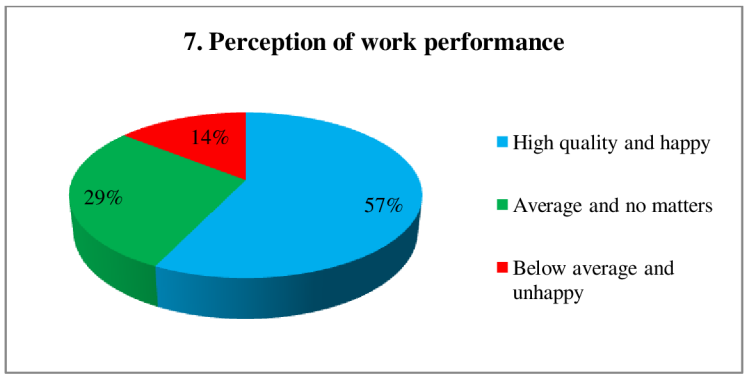
Reasons for respondent's answer	Logistics	Logistics-Shipping	Logistics-Packing
Technical facilities and equipment	4	7	8
Internal work rules and procedures	4	4	2
Daily meetings			3
Internal communication in English and on PC	3	4	2
Work of individuals	2	4	3
Czech management	1	7	9
Foreign management	3	1	
Ordered overtimes and restricted time breaks		1	9
Other		1	
Total	17	29	36

Source: Author's own study

- *Work performance perception: questions 7,8 and 9;*

The question no.7 was analysing how employees perceive the quality of their work and how they feel about doing this jobs within CCI Brno. Most employees feel that their performance produces high-quality work and are happy to work for CCI Brno by 57% of all, especially the Logistics by 75% as opposed to Packing, where only 45% of people like coming to their work every day. Nearly one third of employees do not matter whether they work for CCI Brno and think that their work performance is average of what they could achieve. Only 14% of all think, that they would be probably happier working for different company and it affects their work performance, which is considered to be below average with the highest scoring at Packing.

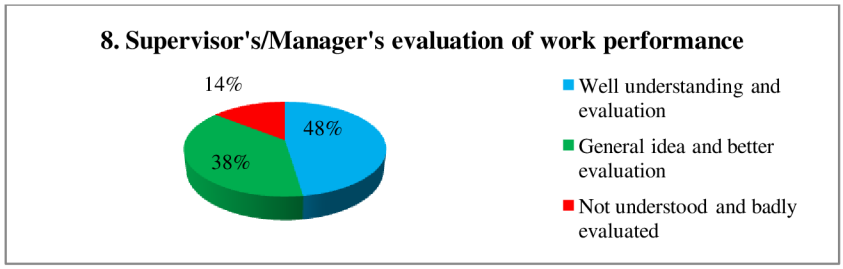
Figure 11: Perception of work performance



Source: Author's own study

The answers for question no.8 were very variable with the main difference in the groups of people and their perception. Generally, 48% of employees think, that their supervisor/ manager deeply understands what aspects their work performance depend on and due to this knowledge can evaluation fairly what financial or other evaluation of work should be like. The 4 employees maintaining the whole Logistics, like manager, two specialist and supervisor feel that the person higher in the hierarchy can understand their work precisely giving 100%, in comparison with Shipping, where half things that Supervisor understands very well and half thinks that he should know better. The Packing thinks by 45% that their Supervisor knows very well and his evaluation is fair, 33% in unhappy and are sure that he knows very little and 22% agrees that he could learn more, but still knows enough.

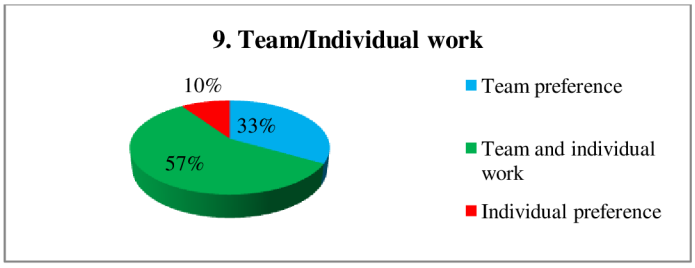
Figure 12: Supervisor's / Manager's evaluation of work performance



Source: Author's own study

As with question no.9, it is the fact that the new processes have introduced the work responsibility of individuals, which was not measure in the past, which is evaluated on month basis at Packing and quarterly at Shipping and Logistics. The answers have shown, that most of the employees enjoy working in the teams as well as being seen for their individual work performance, which show the figures 57% for general feeling, 100% at Logistics maintenance, 62% at Shipping and only 33% at Packing, which prefers to work in team in 56% in opposite to Shipping, who likes team work by 25%. Only 10% in general like individual work.

Figure 13: Team and individual work



Source: Author's own study

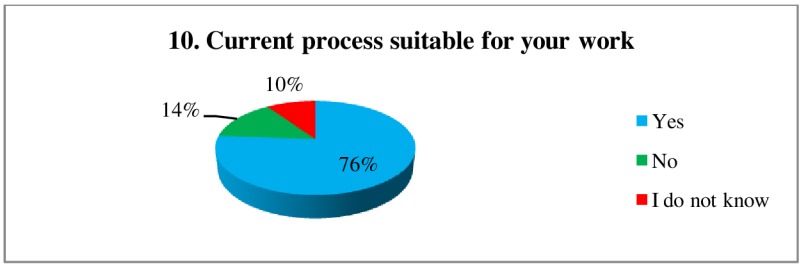
- *Current process suitable for your work: questions no. 10, 11 and 12.*

The analysis of employee perception of current process is very important. The question no. 10 asks the respondent, if he thinks that current process is suitable for his/her work. The current process is the process changed due to the IFS implementation. 76% of all employees share the opinion that the current process is the right processes for their work, which is supported by Logistics in 100%, Shipping by 75% and also Packing by 67%. About 10% in general is not sure, if the current process is suitable, and 14% think that it does not cover well their work. This is supported by detailed explanations in question no.11, when all employees agree that to follow the current process they all must pay high attention to more details of their work, but the process is clearly arranged and transparent, which was proved by 17 employees, and data are easier to be accessed. The employees, who are probably unhappy about the current process claim that more

complex process should be compensated by higher salary, 10 people, and 8 employees agreed that it is difficult and time demanding to follow.

The employees from Logistics were generous when providing possible changes and improvements to the current process. The most often have been additional time breaks, which is the case of Packing mostly, as they have only one time break for lunch, higher financial compensation and less time demanding process. The improvements for the process were suggested further interconnection with other departments in IFS and. improved real time data flow.

Figure 14: Current process suitable for your work



Source: Author's own study

Table 20: Reasons for respondent's answer to question no.10 – Current process

Question no.11

Reasons for respondent's answer	Logistics	Logistics-Shipping	Logistics-Packing
More difficult and time demanding		2	6
Higher attention to more details	4	8	9
Individuals responsibility evaluated monthly	4	6	4
Clearly arranged and standardized	4	7	6
Data accessibility	4	6	3
High-quality of work displayed	3	5	3
More complex process not financially compensated		3	7
Other			1
Total	19	37	39

Source: Author's own study

Table 21: Possible changes to current process

Question no.12

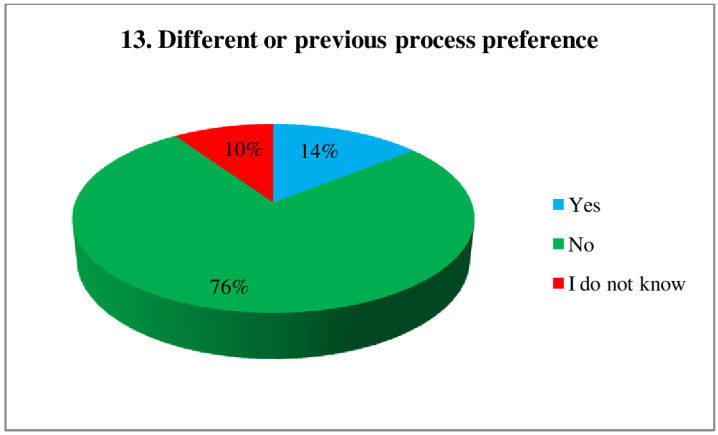
Reasons for respondent's answer	Logistics	Logistics-Shipping	Logistics-Packing
Further interconnection with other departments in IFS	4	5	2
Better financial compensation	0	3	5
Improved real-time data flow	4	3	2
Less time demanding process	1	3	5
Additional time breaks	0	2	6
Total	9	16	20

Source: Author's own study

- *Different of previous process preference: questions no. 13, 14 and 15.*

In accordance with the results for previous group of questions, the author asked employees if they wish to have different or previous process, due to the fact, that some employees have been in the company for short period of time and might not experienced the past processes at Shipping and Packing. The 76% of employees would not wish to substitute their current processes for the past process or for the different process. The minority of 14% in of all respondents, mostly at Packing by 22%, would like to change the current process to the past one or to completely different one. These results are quite opposite to the results from previous group of questions, which means that the same people, who are unhappy with their current process would like to return to past process or to different process. As the reasons stated in the answers in question 14, the majority composed by 7 people would like less time demanding and easier processes, which would require lower concentration and less aspects of work to be controlled, as well as higher financial evaluation, if processes remain this complex. Reasoning for return to past or different processes were first-hand communication and cooperation, as well as bringing back team responsibility and evaluation the work as the result of team work. On the other hand, the employees provided some changes, what they would do to the past or different processes as clearly defined scope of supply, shipping and packing plan as well as improvement to information system, which are the same steps taken and mirrored in the current process.

Figure 15: Different or previous process preference



Source: Author's own study

Table 22: Reasons for respondent's answer to question no.13 – Different/previous process

Question no.14

Reasons for respondent's answer	Logistics	Logistics-Shipping	Logistics-Packing
Easier and less time demanding		2	5
Less concentration and less aspects of work		2	5
Team responsibility and evaluation		2	3
More transparent and clearly arranged			1
First-hand cooperation and communication	1	3	2
Better visualized high quality of work			2
Complexity of work and financial evaluation balanced		2	5
Other			1
Total	1	11	24

Source: Author's own study

Table 23: Possible changes to different/previous process

Question no.15

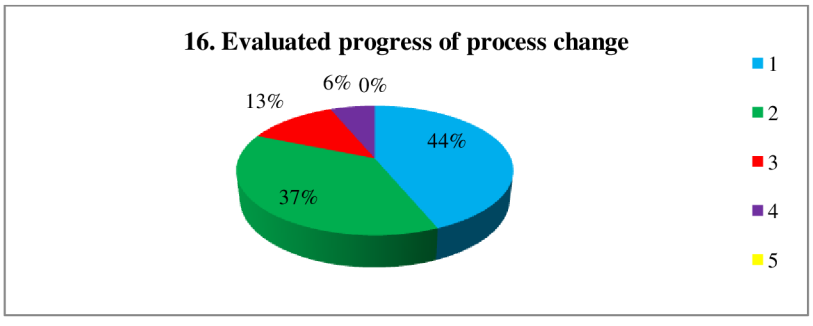
Reasons for respondent's answer	Logistics	Logistics-Shipping	Logistics-Packing
Clearly defined scope of supply	2	6	4
Exact packing and shipping plan	2	3	3
Improved IS	4	3	3
Total	8	12	10

Source: Author's own study

- *Evaluated progress of process change – question no.16:*

The question no.16 provided to respondents rating scale of values from 1 to 5, in which the value 1 means that the change of process was continuous and smooth without major issues, the mark 5, means that the change of process was sudden, not suitably planned and caused major issues to you or your team in work performance. The mark 3 expresses that the change of system was not continuous neither sudden, causing only minor issues, which were managed well. The values 1 and 2 was ticked in most cases by 44% and 37%, then 3 by 13% and value 4 by 6%, nobody gave to the progress of process change mark 5, although one third of Packing ticked the mark 3, as they probably though that it could have been more continuous and smooth.

Figure 16: Evaluated progress of process change



Source: Author's own study

- *Possible changes to progress of process change – question no.17:*

As the last question was considered to put the type of question with no predefined answers and allow respondents to express their own ideas and opinions on how the progress of process change could be improved. This question gave rise to several ideas, but most common was to implement the IFS Stock module. The second most frequently mentioned was to continue in the implementation of Planning and Quality module. Just after these two, some respondents felt, that additional training in the IFS would be beneficial as well as higher involvement of employee in the IFS implementation.

Table 24: Possible changes to progress of process change

Question no.17

Reasons for respondent's answer	Logistics	Logistics-Shipping	Logistics-Packing
Add implementation of IFS Stock module	4	3	3
Implementation of Planning and Quality module	4	3	2
Higher employee involvement	0	3	3
Additional IFS trainings	0	3	4
Total	8	12	12

Source: Author's own study

2.9 Impact on people –results

It is possible to observe that the Logistics and its subsections of Shipping and Planning are mostly created by men, as from the number of 21 employees, only 5 are women. The majority of employees are younger than 35 years and vast majority have been in the company for period of 1 to 3 years. The most of the employees are at Packing department, all men, due to the facts, that it is placed at shop floor and these people have to handle heavy goods and work in more demanding environment conditions. The second largest group of people is situated in the office of Logistics, the Shipping subsection, which is created by 8 people, sharing the office with two women, the Logistics Specialist and Process Specialist, as well as two men, the Logistics Manager and the Supervisor of Shipping and Packing, who are considered as the Logistics "maintenance" team.

The most of these employees work in the IFS, the Shipping, Packing and Document Management modules, except the majority of Packing, where most of the employees have not been trained or dedicated for the IFS training, because the Packing has only one computer at their disposal for the creation of the relevant documentation, what is the responsibility of the Packing Shift leader and his deputy.

Most of the people, who work in the office, have chosen this company because it provides them a job in the field, which is suitable to their work experiences or education at first, finding the most important factors, why to stay as the high salary and the possibility to communicate on daily basis in English, unlike for shop floor situated employees, who took the job in order to be employed rather than to use a foreign language on daily basis.

Once again the most of the people quite enjoy the culture and climate of the company, mainly employees from the office area for its high technical support, mixed nations in the management team and the internal communication in English. On the other side, the employees from Packing feel that they would deserve less strict internal rules and the work procedures, more time breaks and less ordered overtimes. In general, the Logistics team is quite happy by 57% of all.

The work performance is considered by employees to be of high quality and people feel happy to come to work every day by 57% from Logistics team, although 22% of employees from Packing think that they could perform a better quality of work and that some other company might be better for them. The work performance must be always evaluated, which can be done based on the knowledge of aspects and procedures of every work done. In general, people feel by 48% that their manager/supervisor knows their work thoroughly and their evaluation is in the agreement to the quality of work performance. The fact known is that the new processes at Shipping and Packing have introduced the work responsibility for individuals, which was not recognized as such before. The individual work performance is then evaluated on a monthly basis at Packing and quarterly at Shipping and Logistics. Due to the IFS implementation the work

performance of individuals can be measured, especially at the Shipping subsection, which is dedicated to work on the particular orders, in opposite to Packing, who must work mostly in teams, in order to pack the goods and perform as an individual, when making quality checks and taking Photodocumentation, which can result in customer claims, if these jobs are not done properly.

The current processes are the processes that have been changed and improved due to the IFS system implementation and the deep cooperation of Logistics team with the IFS implementation team. The employees perceive the current processes by 76% as the right processes to be followed, providing accessible data, individual work performance evaluation, being clearly arranged and transparent, but with higher demands on attention paid to details and on time. Nearly half of the respondents think that more complex processes as these on Packing and Shipping should be compensated financially at higher level. Employees were offered to suggest the additional changes to the Packing and Shipping processes and they asked to improve the real time data flow, which depends on other departments like Order Management, Planning and Quality, which unfortunately have not been fully covered by the IFS yet. Another improvement considered to the current state has been further interconnection of the IFS to other departments, which again cannot be done yet, due to the suspended implementation of the IFS Applications.

There are always some people, who do not like the changes, or it is hard for them to cope with it. Although the 76% of all respondents would not want to return to the past processes or different processes, some respondents provided few reasons for the return to the past or turn to the different processes. As the most important reasons were less complex, demanding and team responsible processes, which are the clear proof of inability to accept the change for some employees. On the other hand, other reasons like the low level of first-hand communication and cooperation, as well as bringing back the team responsibility and evaluation of work as the result of the team work might be considered to be increased, especially at Packing, where they have to listen to special requirements for packing explained by Order managers and they also have to work together at some points of the whole process in order to pack the large valves. In opposite,

the employees provided some ideas for changes, what they would do to the past or different processes to improve them, which are the exact changes, which the IFS implementation team has implemented. The most common have been the clearly defined scope of supply, the exact packing and shipping plan and the improved information systems. Therefore, it can be concluded that even employees, who are not willing to accept the change, would not like to return to the past or different processes, as they would change the exact features, which current processes carry after adjustments due to the IFS implementation. This is the obvious and clear impact, which the implementation has had on employees, as they already think, that some major changes helped to improve their work.

The progress on the process change was evaluated as smooth and continuous without causing major issues to Shipping and Packing, which Logistics manager, Specialist and Supervisor supported. Evidence, that although processes have been changed, and have had the impact on employees, they all considered the progress of change as the desired one. The employees suggested that the IFS implementation should continue and implement the IFS Stock module, as well as modules for Planning and Quality in depth. The only issue that was addressed to the implementation team was that the additional IFS training would be of benefit, and would probably higher the employee involvement in the change, which could have the higher impact on the better acceptance of the change of processes, which have had a major impact on employees at Logistics, especially on Packing and Shipping.

2.10 Analysis summary

The IFS modules and applications are described in details in Chapters 2.3 and 2.4, where the modules for Logistics are delineated, as well as the applications, tools and standards, which are applied on the processes and work done within Logistics subsections Shipping and Packing, and for maintenance of whole Logistics department. In the Chapter 2.7 the processes and impacts of the IFS have been

analysed. The results from analysis showed, that the concrete ERP solution provided by the customized IFS Applications is suitable for Packing and Shipping, and since it has been implemented and fully used by the end users from various departments, it has brought positive results and effects for the whole company, especially at analysed subsections of Logistics, the Packing and Shipping, where calculated cost savings has reached already at the amount of 12 million. These results were confirmed by Logistics Manager and Supervisor too, as well as by the former members of the IFS implementation team. Based on the results from analysis showing that due to the change of simple and non-standard processes into the clearly arranged, transparent and extended processes, the number of customer claims has been dropping, which is the second important target of the CCI Czech Republic s.r.o. It can be concluded from the presented evidence, confirmed by company's employees at the managerial positions that the hypothesis "The implementation of the IFS Applications suited specifically for CCI Czech Republic s.r.o. by the IFS implementation team can optimize and improve processes at Packing and Shipping subsections" is valid.

The results from the research focused on the impact of the IFS implementation on people in the CCI Czech Republic s.r.o. proved that the employees - respondetns perceived the impact of the implementation in general to be the positive one, described in details in Chapter 2.9. Although the change of routine procedures can be difficult to accept for some employees, who may not be happy that the new processes together with sophisticated systems providing real time data of extended scale, are more time demanding and requires higher level of concentration, when asked if they would like to return to the past processes, and what they would change on the past processes, if provided such option, all of them mentioned that required changes would be exactly those, which are the exact introduced by the IFS implementation team in the cooperation with Logistics management and the maintenance team. The majority of employees feel that impact of the IFS Application is high, helping them on daily basis. The employees expressed in the questionnaires the opinion that the IFS implementation should continue, introducing to the company Stock module, which would help with inventory records, as well as the extension of the IFS impact on Planning and Quality might

bring the similar results, as with Logistics, where 76% of employees are satisfied with current processes, data flow, access to information and working in the CCI Czech Republic s.r.o. on daily basis.

3 PROPOSALS AND CONTRIBUTION OF SUGGESTED SOLUTIONS

The aim of this particular part of the master's thesis is to offer proposals for further improvements in the ERP implementation and its impacts on processes and people in the company. The submitted suggestion for improvements proceeded from the analysis of the current situation, processes, and the employee's perception were discovered from the research results.

This chapter is divided into two parts; the first subchapter offers proposals for the additional improvements in processes at the Logistics department, as well as within the whole company due to the interconnections of departments in the CCI Czech Republic s.r.o., and the second subchapter, which provides further recommendations in the field of the positive impact on people.

3.1 Proposals for process improvements

The subchapter offers proposals for the changes and the improvements regarding processes of the company, based on the results from the research.

Although the company has put some level of emphasis on well-functioning ERP system, specifically customized the IFS Applications, and created very professional team, consisting of the professionals and experienced employees from CCI, as well as very experienced professionals from IFS, all responsible for creation of the specific ERP customized for Control Components Inc., the implementation team placed in the CCI Czech Republic s.r.o. was working at the subsidiary for less than two years. The decision to suspend the implementation stopped all actions regarding ERP system implementation. The period of two years was not long enough for the implementation team to implement all customized modules of the IFS Applications system in every department, where it was planned to be implemented. Due to this fact, some

departments are using the IFS, some are using the IFS partially and various departments are using the other incompatible information systems, or the excel sheets. This causes various issues for all departments, as the compatible system would assure the quality and compatibility of data so necessary for the production of high quality valves and components.

The research has proved that even the Logistics department is not run fully in the IFS. The subsections Packing and Shipping have their own the IFS modules, which provide them standardized processes, the real time data and information necessary for the work of employees placed in both departments. The company management should consider continuing the IFS implementation, as it has already improved processes and the quality of work performance, as well as reduced the number of customer claims and the costs connected with claims at the Logistics subsections of Packing and Shipping.

The implementation team could consider working on implementation of Quality and Planning department modules, as well as implementing the IFS modules for Procurement and introducing the Stock module for the other subsections of Logistics, like Incoming and Kitting, which struggle with their stock record run by the Excel Sheets.

The main proposal for the company management would be to adapt to the specific shape of Part numbers system all materials stored at warehouses and create a real-time database run in the IFS Stock module. This would provide essential information to all departments and could increase the cost savings, as well as the quality control of final products, the two main targets of Control Components Inc.

3.2 Proposals for system perception improvements

The subchapter offers proposals for changes and improvements regarding the processes perception of the company employees based on the results from the research.

The IFS implementation team started the implementation of the customized IFS Applications in 2011, when the main target of the team was to analyse in depth company's processes and data. Another step for the team was to involve employees from each department, in order to customize the IFS modules by the specific requirements of the CCI Czech Republic production. After these two steps were taken and introduced to the management team, the decision was to start implementing at departments. The first department to be implemented was considered to be the Logistics. The implementation team realized, that the Shipping and Packing are using very simple database with the lack of data and information provided. This lead to the creation of highly customizer Logistics Shipping and Packing modules, which source data straight from Intercompany Customer Orders and show them in real time. This change introduced the necessity to change the processes, which was possible due to intense cooperation of Logistics Manager, Logistics Supervisor for Shipping and Packing, Process Specialist and Logistics Specialist with the IFS implementation team based in the subsidiary. After the change of systems and processes has been processed, the rest of the employees at Logistics were trained to use the system and understand the every step in their new processes.

The proposal for the former IFS implementation team might include the higher involvement of more employees into these changes before, during and after the real changes of systems and processes, as some of them would appreciate it.

Another proposal for the ERP maintenance team in the CCI Czech Republic s.r.o. is to provide additional trainings on the system and the IFS modules usage, as some employees do not have the confidence in their usage yet.

The last and probably most important proposal directed to the new management team would be to consider reopening of further the IFS Applications implementation as the desire for fully functional real time database and system is highly supported by employees of CCI Czech Republic s.r.o.

CONCLUSIONS

The main objective of this master's thesis was to measure the impact of enterprise resource planning implementation on people and processes in business environment and to propose further recommendations to the company management on how to achieve set up targets for the implementation and for the whole company, with regard to the analysis of the current situation in the company.

To fulfil the main objective, it was essential to execute the literature review, describe the selected company, determine the key activities of analysed processes and carry out the research on the process of the company, as well as to conduct a questionnaire and carry out the research on the employees of the company. Another step was to interpret the research results and evaluate the current situation in the company with the main focus on the quality of processes and their perception by the relevant employees. As the result of research the proposals of suitable suggestions and recommendations, how to improve the current situation were presented.

The first part of the thesis is focused on the particular literature review, which provided the theoretical background to the issues of change management, enterprise resource implementation, its concrete methods and its impacts on employees, as well as with the focus on the processes and their improvements within the implementation of enterprise resource planning system in the manufacturing company.

The beginning of section two was dedicated to the company's introduction. The major part of the second section was focused on the evaluation of current situation in the specific company and the research results interpretation. The research methods and tools, in detail the method of real improvement potential and questionnaire, were included in this section as well.

The last part of the thesis was consisted of proposals and recommendations to the company management and to the implementation team that would improve the

current situation in the company. The proposals suggested were based on the research results and covered the recommendations that would improve processes and the perception of employees.

The main objective of this master's thesis was fulfilled by above described.

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LIST OF ABBREVIATIONS

AIP	Absolute Improvement Potential
BI	Business Intelligence
BSC	Balanced Scorecard
CAD	Computer Aided Design
CAM	Computer Aided Manufacturing
CCI	Control Components Inc
CEO	Chief Executive Officer
CNC	Computer Numerical Control (machines)
CRM	Customer Relationship Management
CRP	Conference Room Pilot
CRT	Current Reality Tree
EAM	Enterprise Asset Management
ERM	Employee Relationship Management
ERP	Enterprise resource planning
FRT	Future Reality Tree
HW	Hardware
ICPO	Inter-Company Purchase Order (Customer Order in CCI Brno)
IFS	Enterprise Resource Planning of IFS company

IMI	Imperial Metal Industries
IS	Information system
JIT	Just in Time method
KA	Key Activity
KPI	Key Performance Indicator
KRI	Key Result Indicator
N/A	Not Available
NC	Numerical Control (machines)
PDM	Product Data Management
PI	Performance Indicator
PLM	Product Lifecycle Management
PRT	Prerequisite Tree
RI	Result Indicator
RIP	Real Improvement Potential
ROI	Return on Investment
SCM	Supply Chain Management
SRM	Supplier Relationship Management
SW	Software
TCO	Total Cost of Ownership
TOC	Theory of Constrains method
TT	Transition Tree
UI	User Interface

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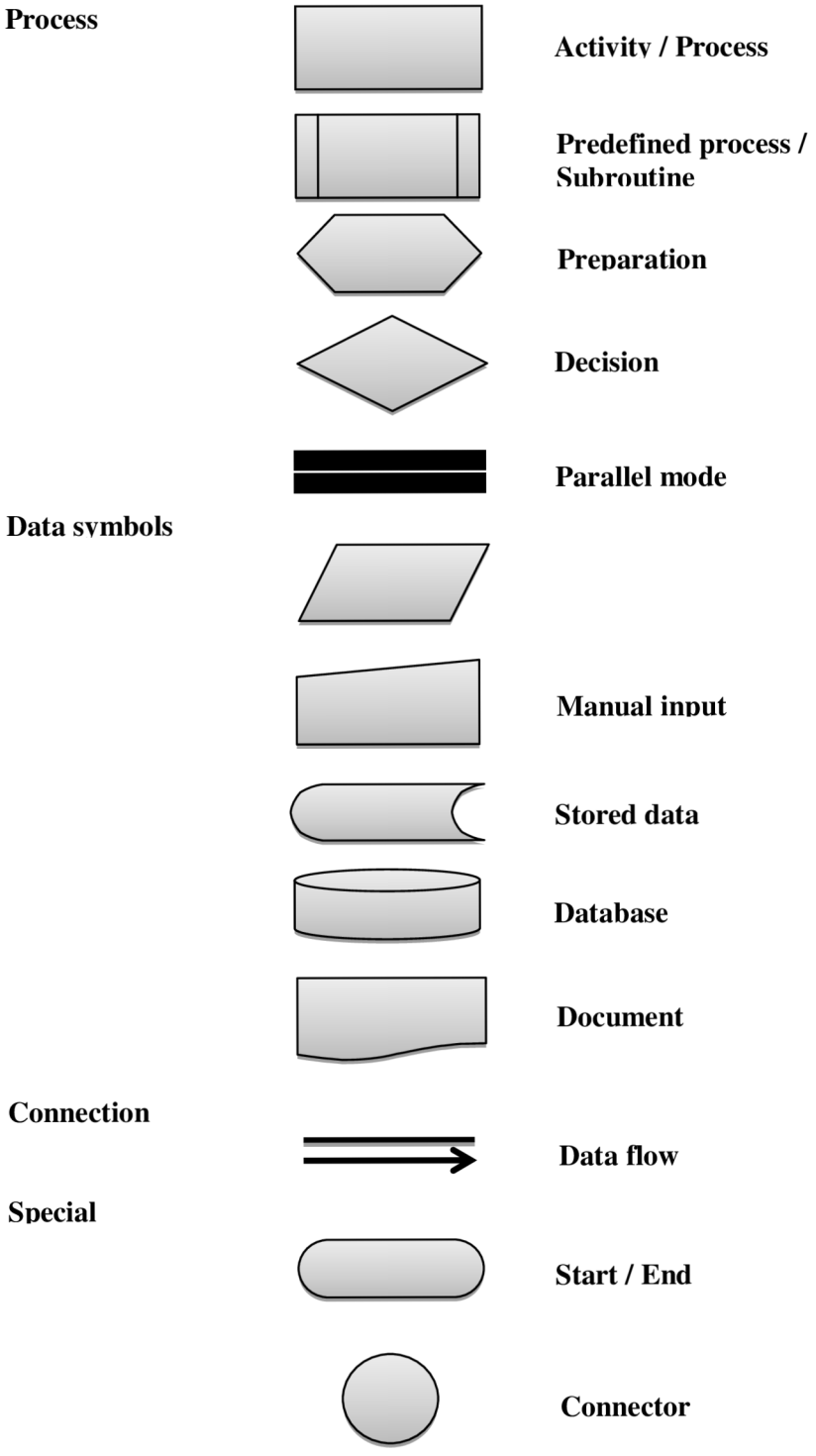
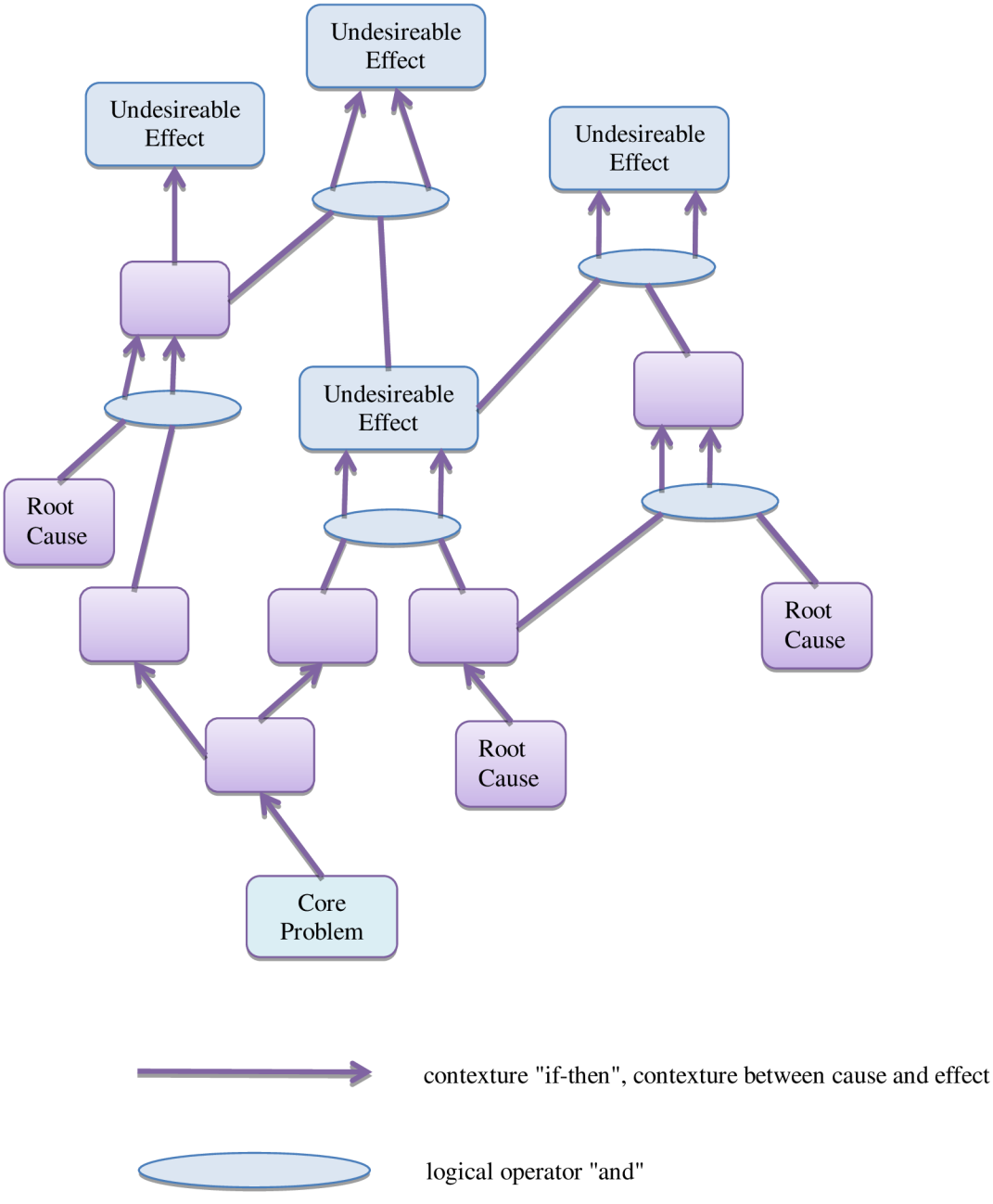
Appendix 1: Flow diagram symbols



Source: adapted from Kučerová (2007)

Appendix 2: Current Reality Tree scheme and used symbols



Source: adapted from Basl, Majer, and Šmíra (2003, p.39)

Appendix 3: Questionnaire for Employees in Czech

DOTAZNÍK PRO ÚČELY DIMPLOMOVÉ PRÁCE

Dobrý den,

obracím se na Vás s prosbou o pomoc vyplněním dotazníku, který je součástí výzkumu v rámci mé diplomové práce. Tato diplomová práce se zabývá vlivem implementace ERP na procesy a lidi v podnikové praxi v rámci společnosti CCI Czech Republic s.r.o./.

Při vyplňování dotazníku Vás prosím, aby byla vyplněna vždy pouze jediná možnost z nabízených možností, pokud text v otázce neuvádí jinak. U otevřených otázek, kde není nabídnuta možnost, prosím využijte daný prostor pro vyjádření vlastního názoru.

Každý dotazník je zcela anonymní a vyplněné otázky budou zpracovány pouze mnou bez jakékoliv účasti třetí osoby ze strany vedení společnosti. Pokud máte jakýkoliv dotaz ohledně dotazníku a výsledků dotazníkového šetření, je možné mě kontaktovat na emailové adrese: xphaban00@std.fbm.vutbr.cz .

Velice Vám děkuji za vaši ochotu a čas.

Veronika Habánová

studentka Fakulty Podnikatelské, VUT Brno

1) **Prosím udejte Váš věk a pohlaví.**

A) 18-25 let B) 26-35 let C) 36-45 let D) 46-55 let E) 55 a vice let

A) Muž B) Žena

2) **V jakém oddělení a dílčí části oddělení společnosti CCI Czech Republic s.r.o. pracujete?**

A) Logistika B) Logistika- Shipping C) Logistika – Packing

3) **Jak dlouho ve společnosti pracujete ke dnešnímu dni?**

A) 0-3 měsíce B) 3-12 měsíců C) 1-2 roky D) 2-3 roky E) déle než 3 roky

4) **Jaký byl hlavní důvod k tomu, abyste přijal místo ve společnosti CCI Czech Republic s.r.o.? Můžete uvést vice možností.**

A) Dobré platové ohodnocení.

B) Společnost se nachází poblíž místa mého bydliště.

C) Možnost práce v oboru, jež jsem vystudoval nebo mám již nějaké zkušenosti.

D) Možnost pracovat v mezinárodní společnosti

E) Možnost uplatnit cizí jazyk při každodenní pracovní činnosti.

F) Jiný důvod.....

5) **Jak vám vyhovuje prostředí a kulturní zvyklosti firmy?**

A) Vyhovují zcela B) Celkem vyhovují C) Ani nevyhovují ani vyhovují

D) Celkem nevyhovují E) Zcela nevyhovují

6) **Prosím, abyste uvedl/la důvody, které vás vedly ke zvolení předchozí odpovědi v předchozí otázce. Můžete uvést vice možností.**

A) Technické zázemí a přístroje.

B) Interní pravidla a předpisy zavedené pro řízení chování zaměstnance.

C) Způsob komunikace v rámci firmy na základě denní pravidelné schůze s vedoucím.

D) Užití anglického jazyka v rámci vnitropodnikové komunikace a užívání vnitropodnikového systém na PC.

E) Teamový způsob organizace práce je upřednostněn před individuálním.

F) Přítomnost managementu tvořeného Čechy.

G) Přítomnost management tvořeného jinými národnostmi.

H) Nařizování přesčasů a omezené přestávky.

I) Jiné důvody.....

7) Jaký máte pocit ze své každodenní pracovní činnosti ve společnosti CCI Czech Republic s.r.o.?

A) Odvádím dobrou práci a do práce chodím rád.

B) Práce, kterou odvádím odpovídá průměru, pracovat v této společnosti mi nevadí.

C) Myslím si, že bych dokázal odvádět svou práci lépe, nejspíš bych práci v jiné společnosti.

8) Myslíte si, že Vás nadřízený dokáže ocenit Vaši práci na stejné úrovni, jako je úroveň Vaší práce?

A) Ano, můj nadřízený mé práci detailně rozumí a cení si práce, kterou odvádím.

B) Myslím si, že můj nadřízený má obecnou představu, co obnáší má práce a cení si jí, ale mohl by se více zajímat a ocenit ji o něco lépe.

C) Můj nadřízený nerozumí práci, kterou dělám, a tudíž ji nedokáže dostatečně ocenit.

9) Jak na Vás působí práce ve Vašem teamu?

A) Svůj pracovní team mám rád/a a upřednostňuji práci v tomto teamu.

B) Neshledávám žádný výrazný problém v teamové práci a práce za svoji osobu mi také nevadí.

C) Raději bych v tomto teamu nepracoval a pracoval pouze sám za sebe.

10) **Jaký je Váš názor na současný proces? Zdá se Vám vhodný pro Vaši práci?**

A) Ano B) Ne C) Nevím

11) **Z jakého důvodu jste odpověděl v předchozí otázce daným způsobem? Můžete uvést více možností.**

A) Současný proces je složitý, náročný na čas.
B) Současný proces mě nutí, abych se soustředil na více aspektů mé práce.
C) Současný proces vyžaduje individuální zodpovědnost, za kterou jsem na konci měsíce hodnocen.
D) Současný proces je přehlednější a jasně stanoven.
E) Současný proces mi umožňuje přístup k datům, která dříve nebyla k dispozici, nebo se těžko sháněla.
F) Současný proces poukáže na kvalitní práci, kterou vykonávám denně.
G) Současný proces je složitější a moje práce by měla být lépe finančně hodnocena.
H) Jiný důvod.....

12) **Kdybyste mohl něco na současném procesu změnit, co by to bylo?** Prosím, popište Vás osobní názor. Pokud si myslíte, že změna není potřeba, můžete tuto otázku přeskočit.

……

……

13) **Upřednostnil/la byste raději jiný či původní proces?**

A) Ano B) Ne C) Nevím

14) **Z jakého důvodu jste odpověděl v předchozí otázce daným způsobem? Můžete uvést více možností.**

A) Jiný/původní proces by měl být/byl jednodušší a méně časově náročný.

B) Jiný/původní proces by mě nenutil/nenutil mě se soustředit na takové množství aspektů mé práce.

C) Jiný/původní proces by měl podléhat/podléhal kolektivní odpovědnosti a hodnocení.

D) Jiný/původní proces by měl být/byl přehlednější a jasně stanoven.

E) Jiný/původní proces by měl umožnit/ umožňoval přímou spolupráci a komunikaci s kolegy z jiných oddělení, což je v současném procesu nahrazeno daty v systému.

F) Jiný/původní proces by měl lépe poukázat/lépe poukazoval na kvalitní práci, kterou vykonávám denně.

G) Jiný/původní proces by lépe odpovídal/lépe odpovídal složitosti práce ve srovnání s jejím finančním hodnocením, než proces současný.

H) Jiný důvod.....

15) **Kdybyste mohl něco na původním procesu změnit, co by to bylo? Případně navrhněte jiný proces, který by lépe odpovídal výkonu práce na vašem oddělení.** Prosím, popište Vás osobní názor. Pokud si myslíte, že změna není potřeba, můžete tuto otázku přeskočit.

……

……

16) **Pokud jste zažil změnu, kdy původní proces byl změněn v současný proces, prosím Vás, abyste ohodnotil známkou od 1 do 5, průběh této změny. Pokud jste v této době nebyl v CCI Brno, vynechejte tuto otázku.** Hodnota 1 vyjadřuje, že změna byla průběžná a hladká bez závažnějších problémů a hodnota 5 vyjadřuje názor, že změna byla náhlá, nevhodně naplánovaná a způsobila závažné problémy Vám či vašemu v teamu v odvádění dobré práce. Hodnota 3 vyjadřuje, že změnu procesu nelze hodnotit ani jako průběžnou a bez výraznějších problémů, ani jako náhlou způsobující závažné ohrožení kvality práce Vaší nebo Vašeho teamu.

A) 1 B) 2 C) 3 D) 4 E) 5

17) **Kdybyste mohl ovlivnit průběh změny z původního procesu na současný, co byste změnil?** Prosím, popište Vás osobní názor, pokud jste tuto změnu zažil, pokud ne, můžete tuto otázku přeskočit. Pokud si myslíte, že změna není potřeba, můžete tuto otázku přeskočit.

……

……

Appendix 4: Questionnaire for Employees in English

MASTER'S THESIS RESEARCH

Dear Sir of Madam,

I would like to ask you to fill out the questionnaire presented to you, which is the important part of my research essential for my master's thesis. The master's thesis analyses the impact of ERP implementation on people and processes in CCI Czech Republic s.r.o. /.

During the process of filling out the questionnaire, please make sure that you mark only one of the offered answers in every presented question, which is closest to your opinion, unless the instruction allows more answers to be marked. If you decide to mark the answer "Other", please add write down your own answer. Also add your own answer as the replay to the open ended questions with no answer option.

Every filled out questionnaire is completely anonymous and the answered questions will be processed only by the author of the master's thesis with no assistance provided from the management of the company. If you have any queries regarding the questionnaire or the results from the research, please feel free to contact me using provided email address: xphaban00@std.fbm.vutbr.cz .

Thank you for your time and effort in advance.

Veronika Habánová

Student of Faculty of Business and Management, Brno University of Technology

1) **Please indicate you age and sex.**

   A) 18-25 yrs B) 26-35 yrs C) 36-45 yrs D) 46-55 yrs E) more than 55 yrs

   A) Male B) Female

2) **What department or subsection of department of CCI Czech Republic s.r.o. you work in?**

   A) Logistics B) Logistics- Shipping C) Logistics – Packing

3) **How long have you been working in the company up to this day?**

   A) 0-3 months B) 3-12 months C) 1-2 yrs D) 2-3 yrs E) More than 3 yrs

4) **What was the main reason for you to become an employee of CCI Czech Republic s.r.o.? More answers possible.**

   A) Interesting salary.

   B) The company is situated close to my home.

   C) The opportunity to work in a branch, which I studied or have the most experiences with.

   D) The opportunity to work in the international company.

   E) The opportunity to use foreign language on daily basis.

   F) Other.....

5) **How do you like the environment and cultural practices in the company?**

   A) Very much B) Quite like C) It does not matter to me

   D) Quite do not like E) Do not like at all

6) **What reasons motivated you to your answer in the previous question in certain way? More answers possible.**

   A) Technical facilities and equipment.

   B) The internal work rules and company procedures.

   C) Internal manner of communication based on daily meetings with the Supervisor of the subsection.

D) The usage of English language for communication within the company and for company's system used on PC.

E) Team manner of work is privileged to the work of individuals.

F) Czech managers within the Top management.

G) Foreign managers within the Top Management.

H) Ordered overtimes and restricted time breaks.

I) Other.....

7) What is your feeling of daily work in CCI Czech Republic s.r.o.?

A) I perform high-quality work and like going to work.

B) The performed work by me can be rated as an average. do not mind working for this company.

C) I think that my work performance could be better, I would probably like to change the company.

8) Do you think that your Supervisor/Manager can evaluate your work at the same level, as the level of your performed is in reality?

A) Yes, my Supervisor understands my work in details and evaluates my work well.

B) I think that my Supervisor has a general idea about what my work requires, so he could be more interested and then provide better evaluation.

C) My Supervisor does not understand my work, therefore cannot evaluate it properly.

9) How do you like working in your team?

A) I truly like my team and prefer working in the team, than on my own.

B) I do not see any problem working in my team but I also like working on my own.

C) I would prefer working on my own than in the team I am part of it.

10) What do you think about current working process? Do you think it is suitable for your work?

A) Yes B) No C) I do not know

11) What reasons motivated you to your answer in the previous question in certain way? More answers possible.

A) Current process is difficult and time demanding.

B) Current process forces me to pay attention to more details of my work.

C) Current process requires the individual responsibility, which is evaluated at the end of each month.

D) Current process is clearly arranged and standardized.

E) Current process allows me to access data, which could not be accessed easily in the past, or was hard to reach.

F) Current process points out the high quality of work, which are provide on daily basis.

G) Current process is a lot more complex and my work should be better financial compensated.

H) Other.....

12) If you could change anything on the current process, what would that be?

Please, describe your own opinion. If you think that any other change is not necessary, you skip this question.

……..

……

13) Would you prefer different or previous process?

A) Yes B) No C) I do not know

14) What reasons motivated you to your answer in the previous question in certain way? More answers possible.

A) Different/previous process should be/had been easier and less time demanding.

B) Different/previous process would not/did not force me to concentrate on so many aspects of my work.

C) Different/previous process would not/did not apply the individual responsibility and evaluation.

D) Different/previous process would be/was more transparent and clearly arranged.

E) Different/previous process would/did allow first-hand cooperation and communication with employees from other departments, which is substituted now by data in system.

F) Different/previous process would/did show the high-quality of my work better, performed on daily basis.

G) Different/previous process would be/was better balanced, the complexity of my work on one side and financial evaluation on the other one.

H) Other.....

15) **If you could change anything on the previous process, what would that be? Or you can suggest other process, which you think would be better for your department.** Please, describe your own opinion. If you think that any other change is not necessary, you skip this question.

……

……

16) **If you were present at the time, when the previous process was changed to the current process, please, evaluate by marks 1 to 5, the progress of this change. If you were not present at the time of process change in CCI Czech Republic s.r.o., please skip this question.** The mark 1, means that the change of process was continuous and smooth without major issues, the mark 5, means that the change of process was sudden, not suitably planned and caused major issues to you or your team in work performance. The mark 3 expresses that the change of system was not continuous neither sudden, causing only minor issues, which were managed well.

A) 1 B) 2 C) 3 D) 4 E) 5

17) **If you could influence the progress of change of previous process to the current process, what would you change?** Please describe your own opinion, if you have experienced the change, if not skip the question. If you think that any change would not be necessary, skip the question.

……

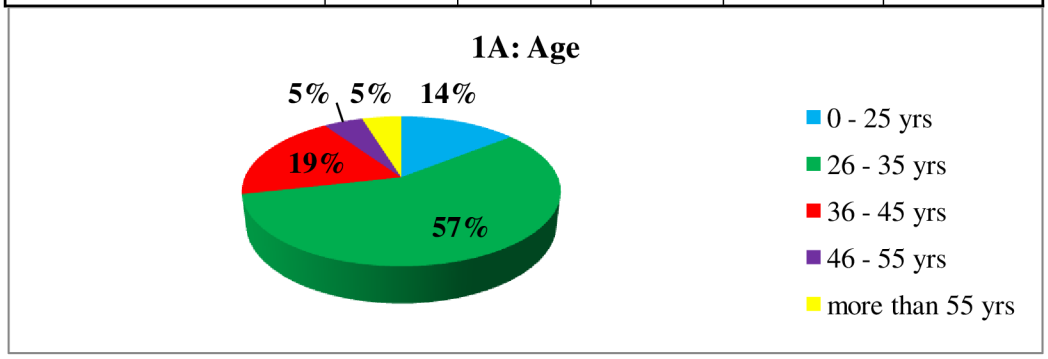
……

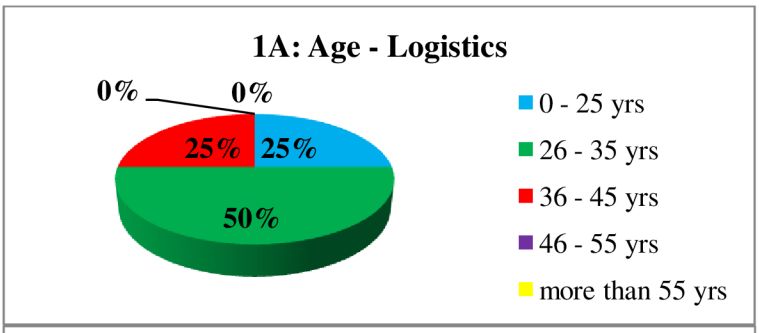
Appendix 5: Graphical Interpretation of questions

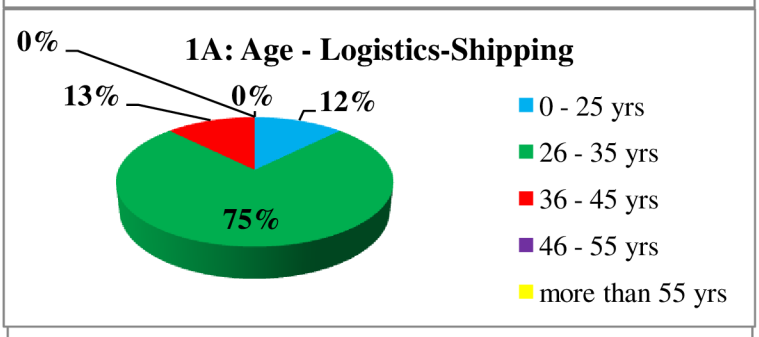
Questions no. 1 – 3: Research sample characteristics

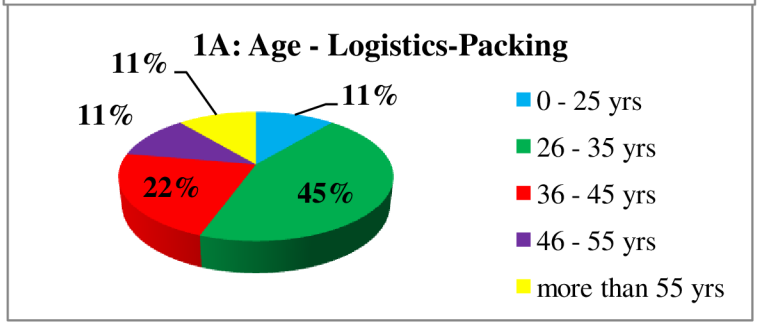
Question no. 1A: Indication of age of respondent

Department/Dept.-subsection	0 - 25 yrs	26 - 35 yrs	36 - 45 yrs	46 - 55 yrs	more than 55 yrs
Logistics	1	2	1		
Logistics-Shipping	1	6	1		
Logistics-Packing	1	4	2	1	1
Total	3	12	4	1	1



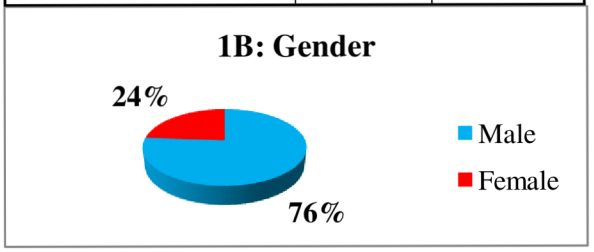






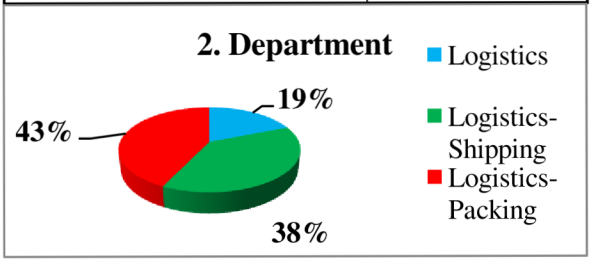
Question no. 1B: Indication of gender of respondent

Department/Dept.-subsection	Male	Female
Logistics	2	2
Logistics-Shipping	5	3
Logistics-Packing	9	0
Total	16	5



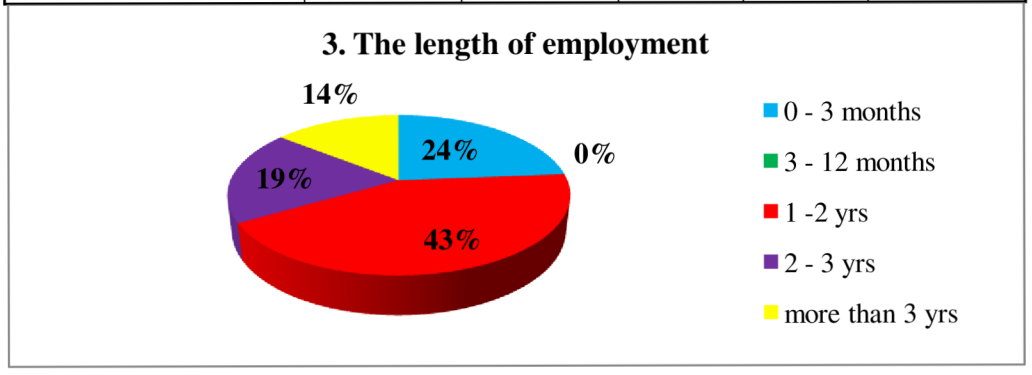
Question no. 2: Department allocation

Department/Dept.-subsection	Quantity of employees
Logistics	4
Logistics-Shipping	8
Logistics-Packing	9
Total	21



Question no. 3: Length of employment in CCI Czech Republic s.r.o.

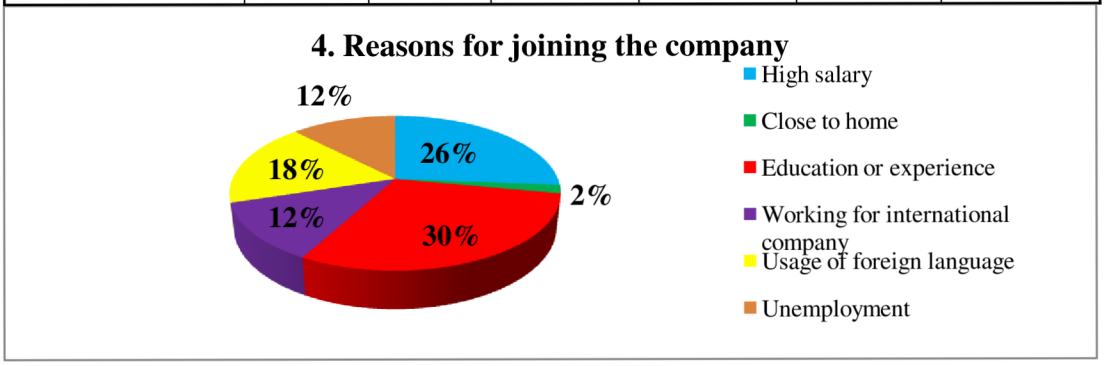
Department/Dept.-subsection	0 - 3 months	3 - 12 months	1 -2 yrs	2 - 3 yrs	more than 3 yrs
Logistics			2		2
Logistics-Shipping	2		4	2	
Logistics-Packing	3		3	2	1
Total	5	0	9	4	3

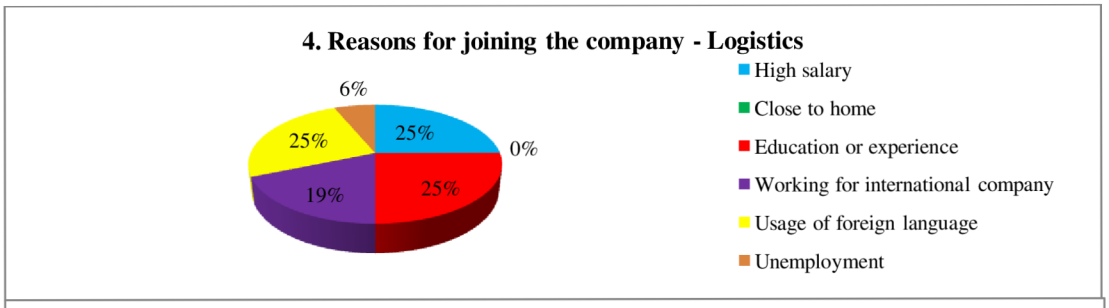


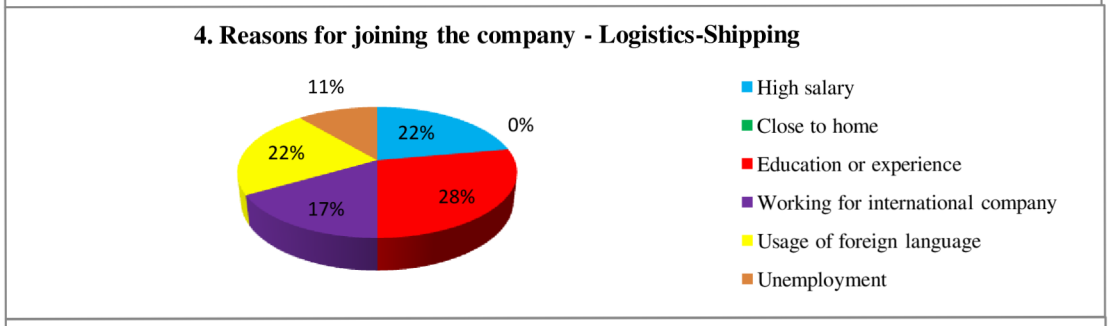
Questions no. 4 – 6: Research sample characteristics

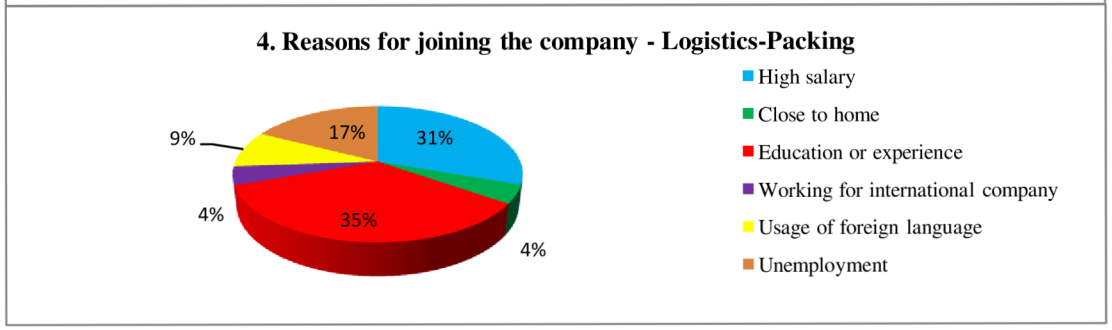
Question no. 4: The most frequent reasons for joining the company acc. to department

Department/Dept.-subsection	High salary	Close to home	Education or experience	Working for international company	Usage of foreign language	Unemployment
Logistics	4	0	4	3	4	1
Logistics-Shipping	4	0	5	3	4	2
Logistics-Packing	7	1	8	1	2	4
Total	15	1	17	7	10	7



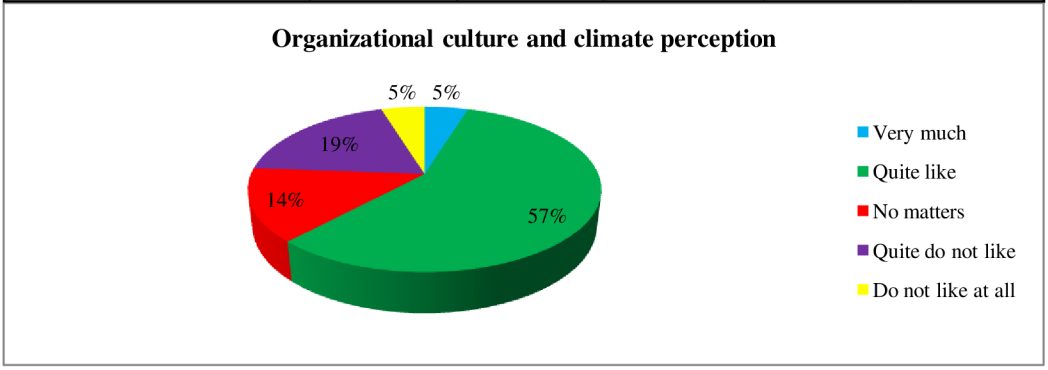






Question no. 5. Organizational culture and climate perception acc. to department

Department/Dept.-subsection	Very much	Quite like	No matters	Quite do not like	Do not like at all
Logistics		3		1	
Logistics-Shipping	1	4	1	1	1
Logistics-Packing		5	2	2	
Total	1	12	3	4	1



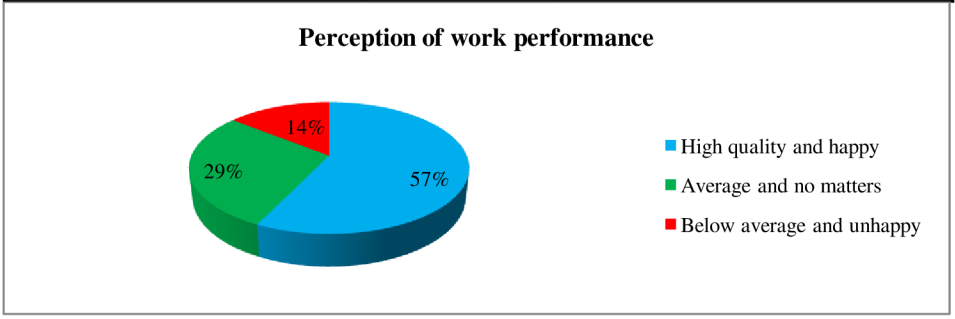
Question no. 6: Reasons for respondent's answer to question no. 5

Reasons for respondent's answer	Logistics	Logistics-Shipping	Logistics-Packing	Total
Technical facilities and equipment	4	7	8	19
Internal work rules and procedures	4	4	2	10
Daily meetings			3	3
Internal communication in English and on PC	3	4	2	9
Work of individuals	2	4	3	9
Czech management	1	7	9	17
Foreign management	3	1		4
Ordered overtimes and restricted time breaks		1	9	10
Other		1		1
Total	17	29	36	

Questions no. 7 – 9: Research sample characteristics

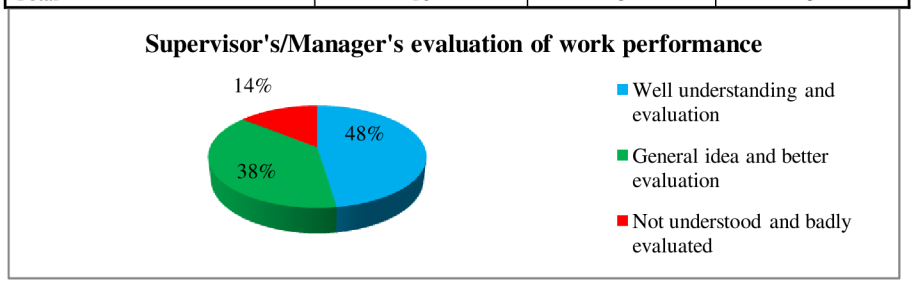
Question no. 7: Perception of work performance in CCI Czech Republic

Department/Dept.-subsection	High quality and happy	Average and no matters	Below average and unhappy
Logistics	3	1	0
Logistics-Shipping	5	2	1
Logistics-Packing	4	3	2
Total	12	6	3



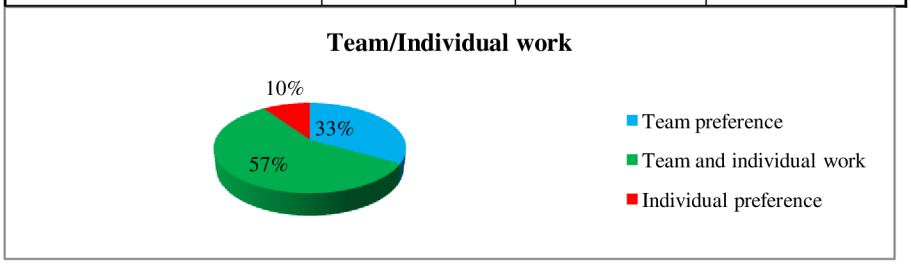
Question no. 8: Supervisor's/Manager's evaluation of work performance

Department/Dept.-subsection	Well understanding and evaluation	General idea and better evaluation	Not understood and badly evaluated
Logistics	4	0	0
Logistics-Shipping	4	4	0
Logistics-Packing	2	4	3
Total	10	8	3



Question no. 9: Team/Individual work

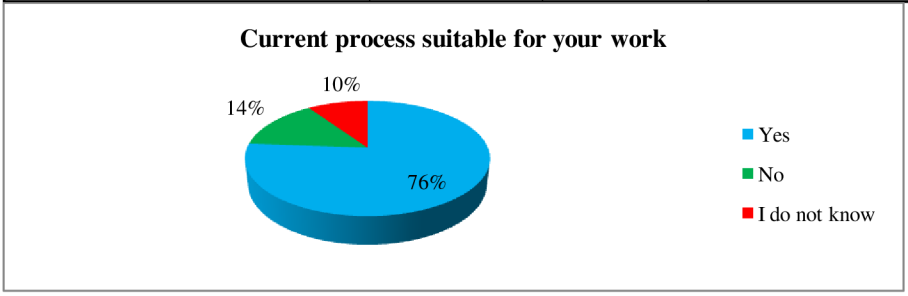
Department/Dept.-subsection	Team preference	Team and individual work	Individual preference
Logistics	0	4	0
Logistics-Shipping	2	5	1
Logistics-Packing	5	3	1
Total	7	12	2



Questions no. 10 – 12: Research sample characteristics

Question no. 10: Current process suitable for your work

Department/Dept.-subsection	Yes	No	I do not know
Logistics	4	0	0
Logistics-Shipping	6	1	1
Logistics-Packing	6	2	1
Total	16	3	2



Question no. 11: Reasons for respondent's answer to question no. 10 - Current process

Reasons for respondent's answer	Logistics	Logistics-Shipping	Logistics-Packing	Total
More difficult and time demanding		2	6	8
Higher attention to more details	4	8	9	21
Individuals responsibility evaluated monthly	4	6	4	14
Clearly arranged and standardized	4	7	6	17
Data accessibility	4	6	3	13
High-quality of work displayed	3	5	3	11
More complex process not financially compensated		3	7	10
Other			1	1
Total	19	37	39	

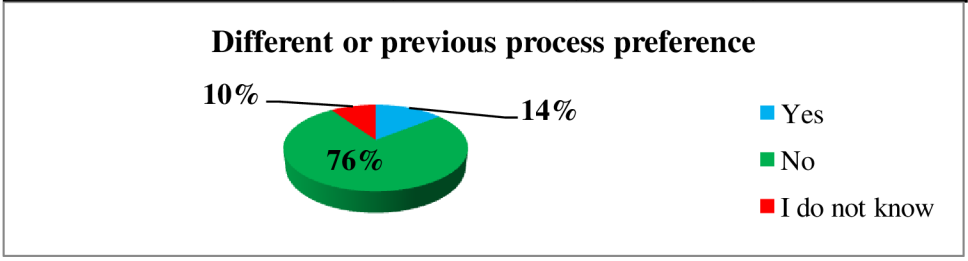
Question no. 12: Possible changes to current process

Reasons for respondent's answer	Logistics	Logistics-Shipping	Logistics-Packing
Further interconnection with other departments in IFS	4	5	2
Better financial compensation	0	3	5
Improved real-time data flow	4	3	2
Less time demanding process	1	3	5
Additional time breaks	0	2	6
Total	9	16	20

Questions no. 13 – 15: Research sample characteristics

Question no. 13: Different or previous process preference

Department/Dept.-subsection	Yes	No	I do not know
Logistics	0	4	0
Logistics-Shipping	1	6	1
Logistics-Packing	2	6	1
Total	3	16	2



Question no. 14: Reasons for respondent's answer to question no. 13 - Different/previous process

Reasons for respondent's answer	Logistics	Logistics-Shipping	Logistics-Packing	Total
Easier and less time demanding		2	5	7
Less concentration and less aspects of work		2	5	7
Team responsibility and evaluation		2	3	5
More transparent and clearly arranged			1	1
First-hand cooperation and communication	1	3	2	6
Better visualized high quality of work			2	2
Complexity of work and financial evaluation balanced		2	5	7
Other			1	1
Total	1	11	24	

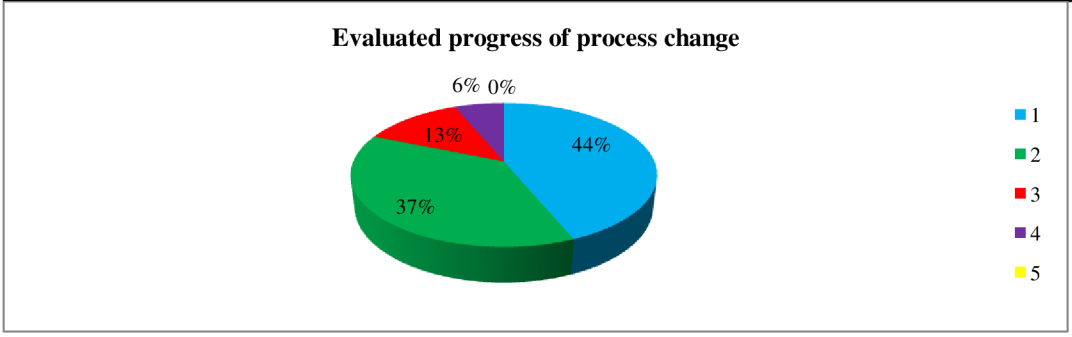
Question no. 15: Possible changes to different/previous process

Reasons for respondent's answer	Logistics	Logistics-Shipping	Logistics-Packing
Clearly defined scope of supply	2	6	4
Exact packing and shipping plan	2	3	3
Improved IS	4	3	3
Total	8	12	10

Questions no. 16 – 17: Research sample characteristics

Question no. 16: Evaluated progress of process change

Department/Dept.-subsection	1	2	3	4	5
Logistics	2	2	0	0	0
Logistics-Shipping	4	2	0	0	0
Logistics-Packing	1	2	2	1	0
Total	7	6	2	1	0

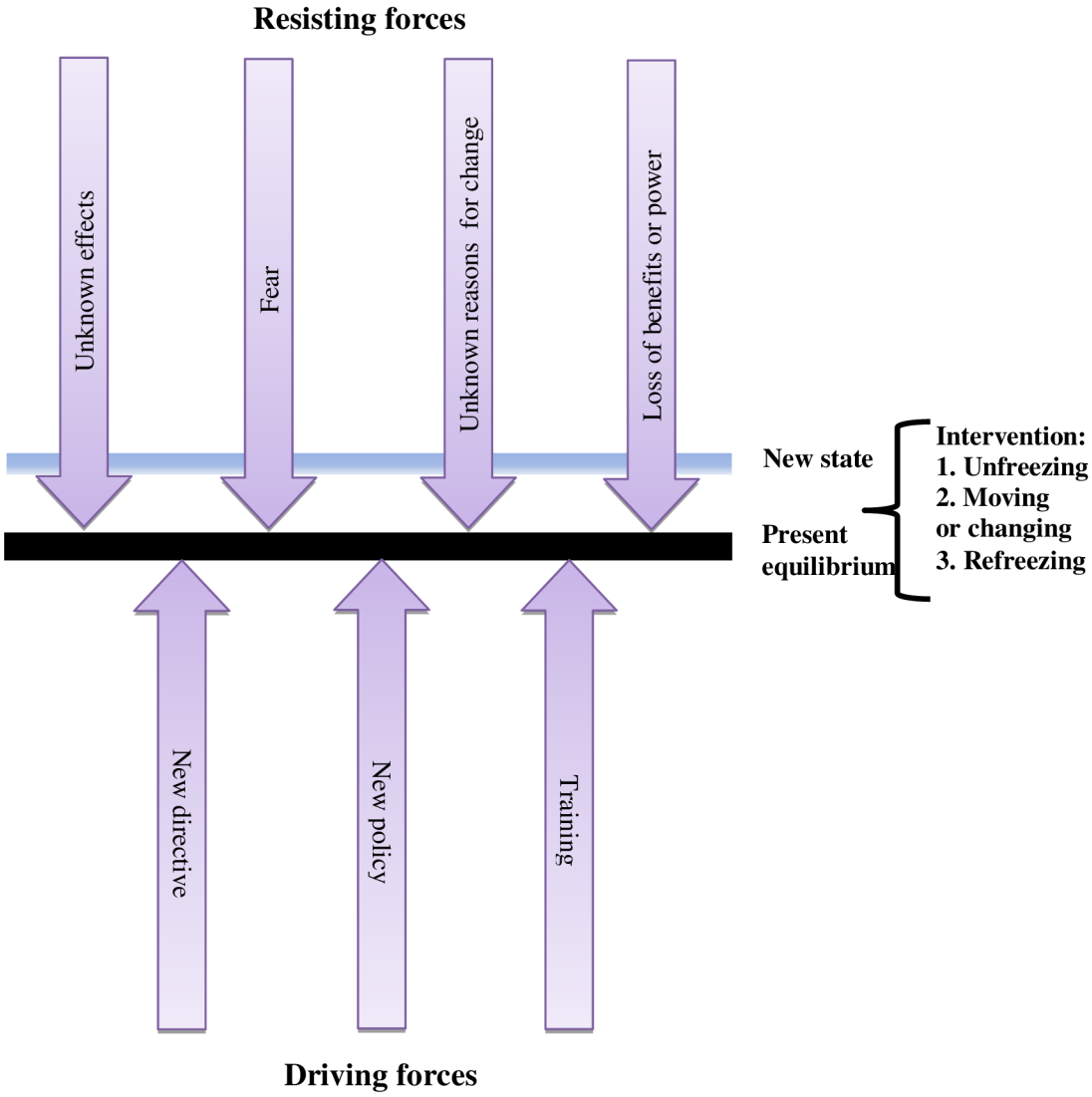


Question no. 17: Possible changes to progress of process change

Reasons for respondent's answer	Logistics	Logistics-Shipping	Logistics-Packing
Add implementation of IFS Stock module	4	3	3
Implementation of Planning and Quality module	4	3	2
Higher employee involvement	0	3	3
Additional IFS trainings	0	3	4
Total	8	12	12

Appendix 6: Moving an organizational equilibrium

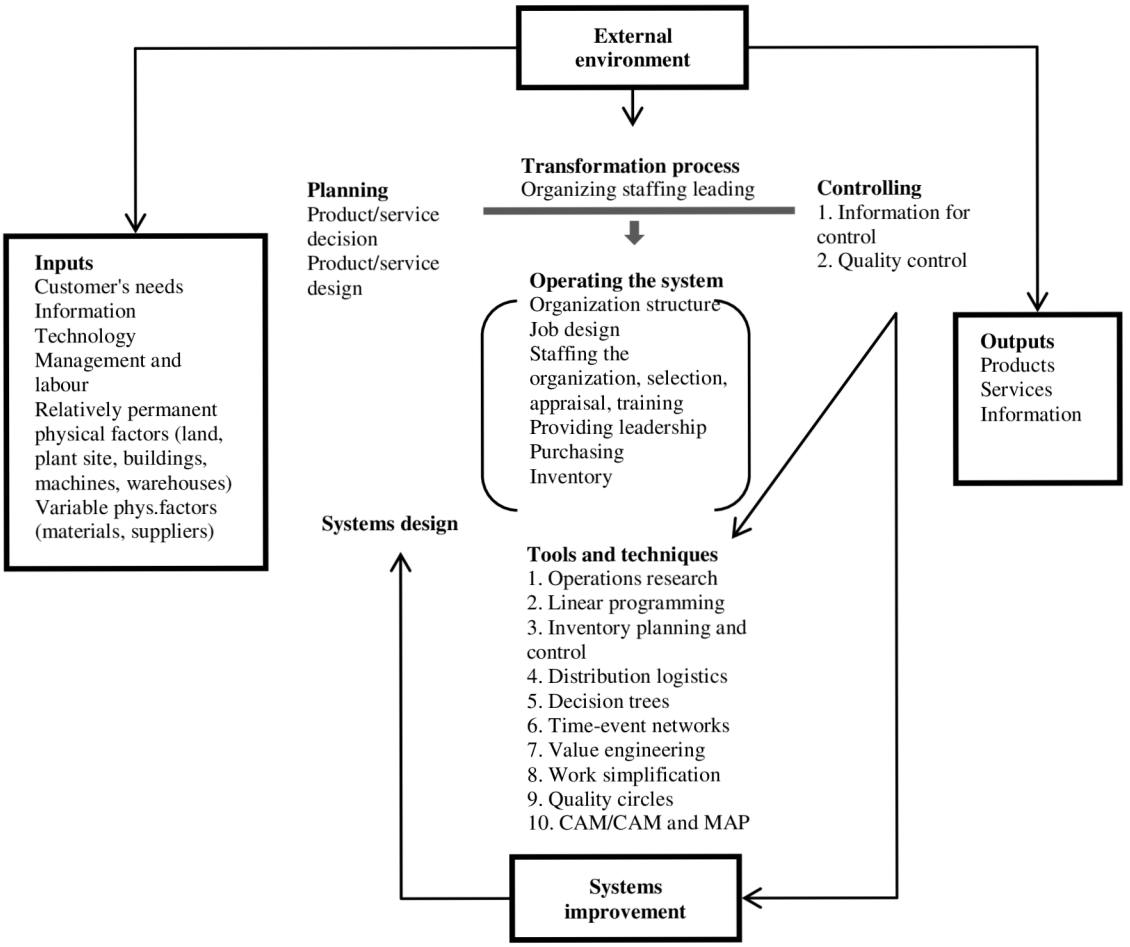
Moving an organizational equilibrium



Source: adapted from Koontz and Weihrich (1990, p. 284)

Appendix 7: Moving an organizational equilibrium

The Operations Management System



Source: adapted from Koontz and Weihrich (1990, p. 441)

Appendix 8: Information system evaluation

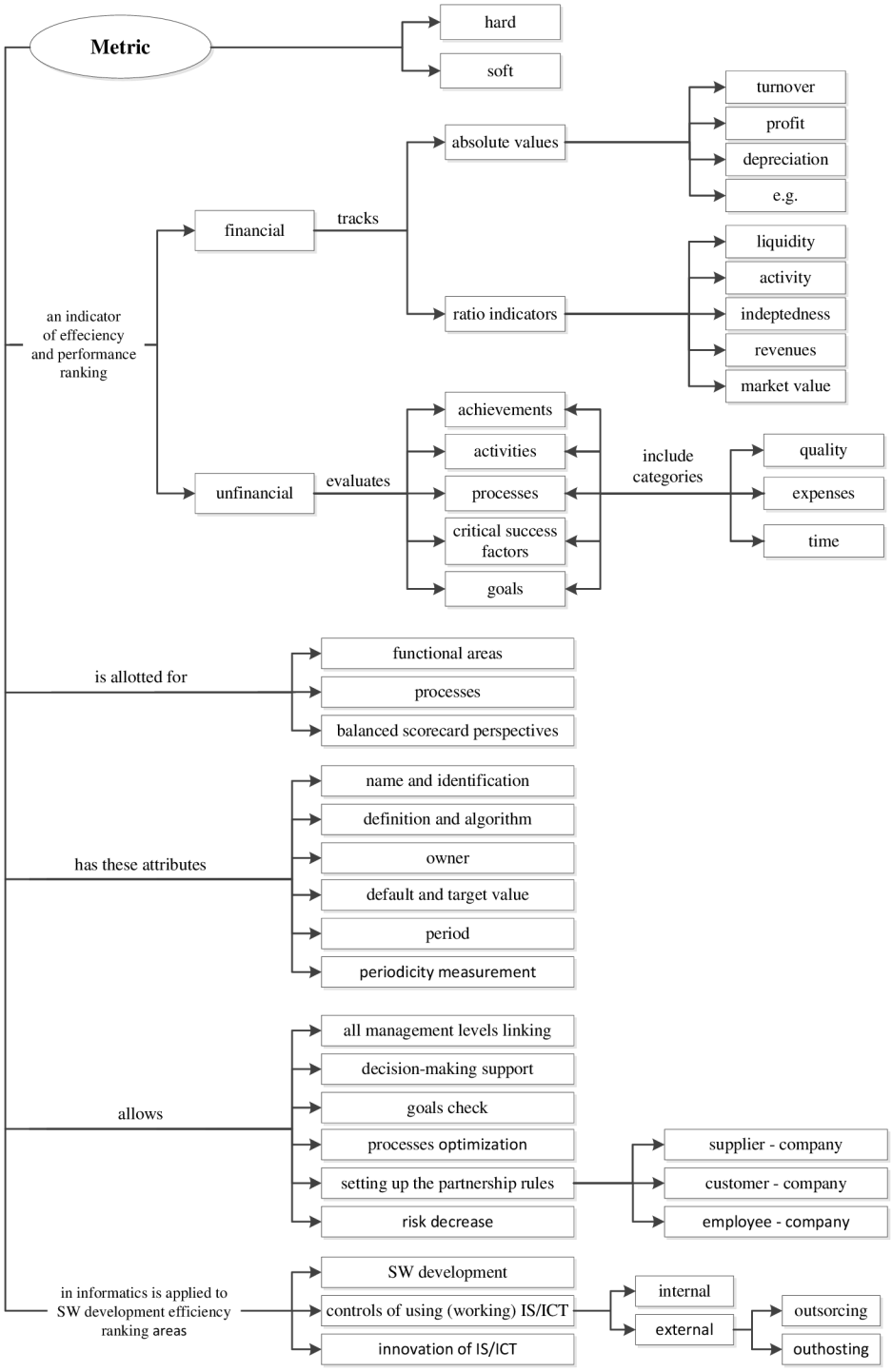
The user and system viewpoints IS project evaluation

Aspect	Indicator	Indicator meaning
Integrity	Environmental integrity	True view of the real world
	IT function integrity	Output data from the previous function can be used in following function
Redundancy	Finding of duplicate contexture	Information redundancy
Throughput	Measured values of quantity and time	Potential capacity limitation
Effectuality	Ratio of more complex functions to the total (functions)	Even fully implemented process may not be effective within IS
Readiness	Time consumption for the information delivery to access point	Analytical and comparative functionality indicator
Organization	Process support level	Conflict detection, necessity of system synchronization criteria
Efficiency	Economical efficiency indicators	Investment valuation
Safety	Protection from abuse	Protection of sensitive data and functions
	Protection from attack	Protection from hackers, viruses and other attacks, spam etc.
	Integrity of authority	Authority is valid for the system as the unit
	Integrity of modularity	Authority can be parameterized and adapted
	Accordance with company safety rules	Grows together with company size
	Network and application safety components accordance	Attainment of integrity in safety
Hardiness	Defined politics of restarts	Allows control starts after defects
	Backup level	Attainment of safety and reusability of the main data
	Readiness to start after fatal error	Possibility of substitute service and start after disasters
	Controlling algorithm against user mistakes	Prevention of worthless mistakes, background papers for training

Source: adapted from Vymětal (2009, p.7)

Appendix 9: Attributes of metrics

Attributes of metrics



Source: adapted from Učeň (2008, p.22)

Appendix 10: JIT and TQM methods

Just-in-Time method

The method Just-in-Time (JIT) is focused on making management in a company most effective. The target of this method is a complex time saving for a production of any product, which causes costs savings and increases labour productivity. The method uses very exact prediction of future state and tries to eliminate all random characters. It is characterized by seven zeroes: Zero rejects (spoilage), zero time for adjustments, zero stock, zero manipulation, zero interruption, Zero time for supply, Dosage of size one. The JIT uses KANBAN (system introduced by Toyota) production philosophy, which has a positive effect on the unfinished stock kept on warehouse, and is the same as JIT, the part of management of material and semi-finished product flow. It emphasizes the importance on employee participation in the process in order to increase the quality, and uses the TQM method as a total quality control. The results of JIT are higher flexibility of production processes, which causes higher profitability and quicker production, as well as decreased stock and space demand for warehouse (Basl, 2002, p.83; Tomek, and Vávrová, 2003, p.326).

Total Quality Management

The Total Quality Management (TQM) model was developed in the middle of 20th century mostly in Japan. The model is based on precisely defined requirements and proceeds from the principle that all employees are involved to the process of constant improvement of products and services using innovative scientific methods (Bartes, 2004, p.56).

Basic principles of TQM are:

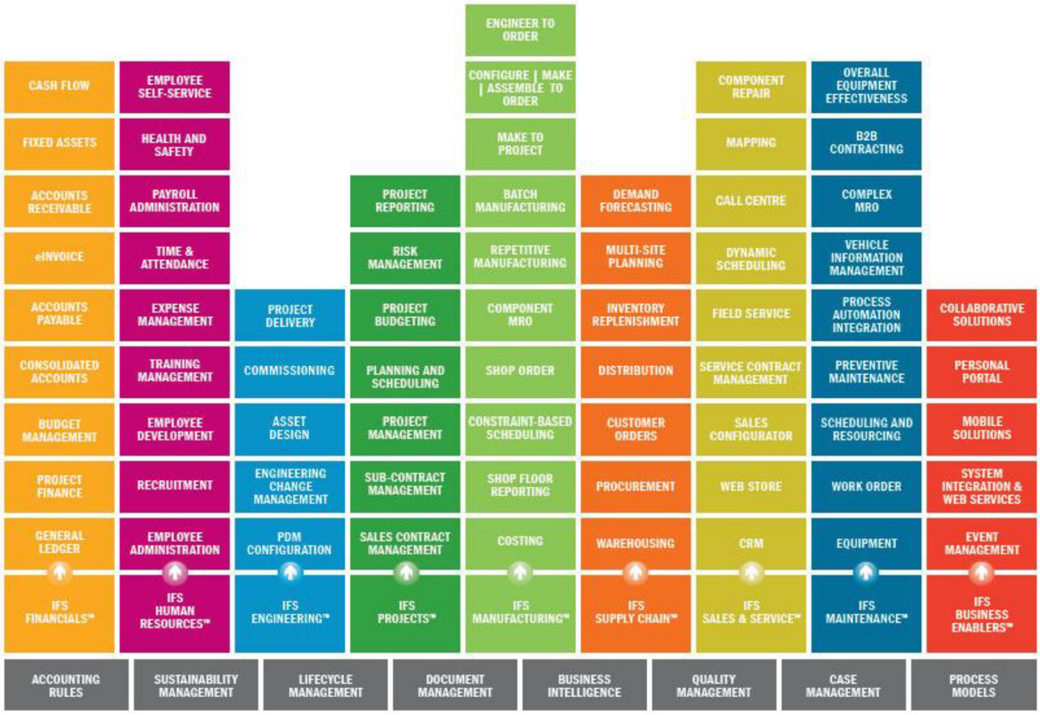
- Customer focus;
- Leadership;
- Employee involvement;
- Process approach;
- System approach;

- Decision making based on facts
- Enduring improvement.

The concept of TQM is an open system, which is not fettered by standards and regulations, but searches for everything positive, which could be used for company's improvement. TQM is mostly connected with innovations, implementation or maintenance of systems. TQM follows from strategic attitude with the target is to preserve existing quality standards and create partial improvements. It puts emphasis on the cooperation between individual functional areas within the organization, which helps to improve quality entirely (Nenadál, 1998, p.29). The similarity of TQM can be seen in Six Sigma and Lean tool set method, where the success of a company is measured by the quality of products and management acceptance of their roles within the business (John, et al., 2008, p.5).

Appendix 11: IFS Applications

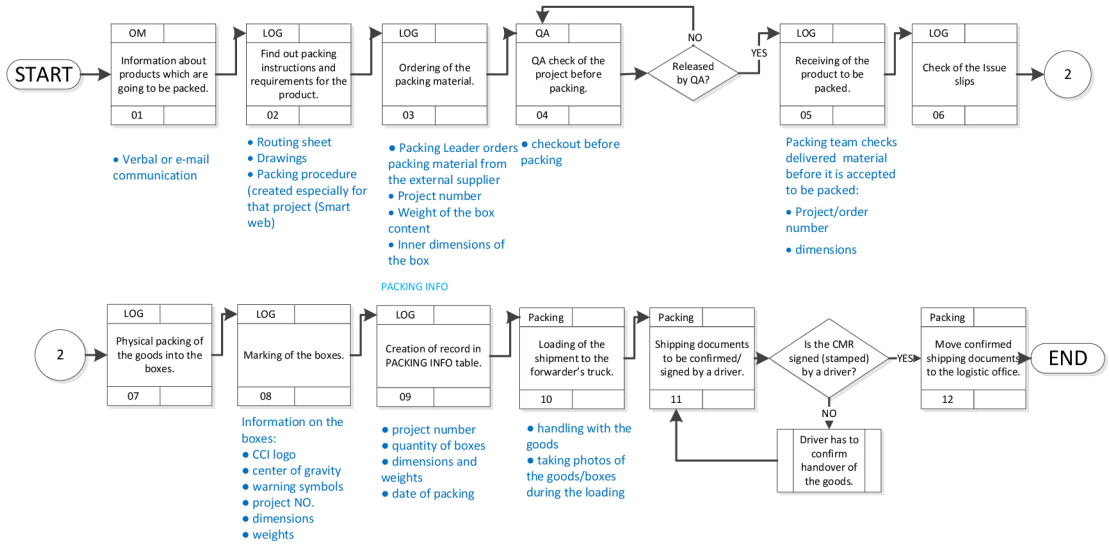
Applications of IFS



Source: E-PASAULE (2007)

Appendix 12: Packing flow - past

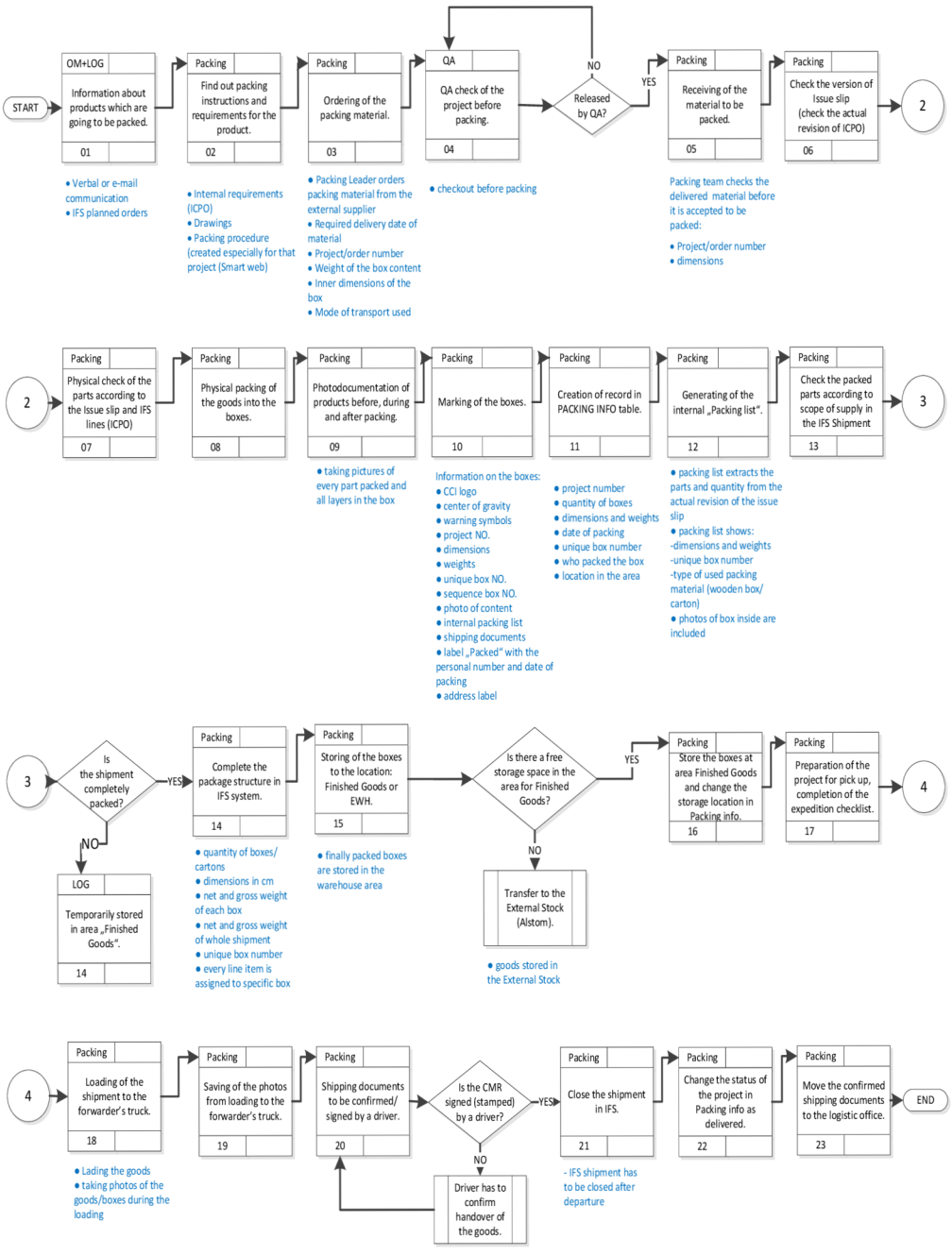
Packing process flow – past



Source: created by the author of master's thesis, verified by Logistics Supervisor for Shipping and Packing subsection (2013)

Appendix 13: Packing flow- present

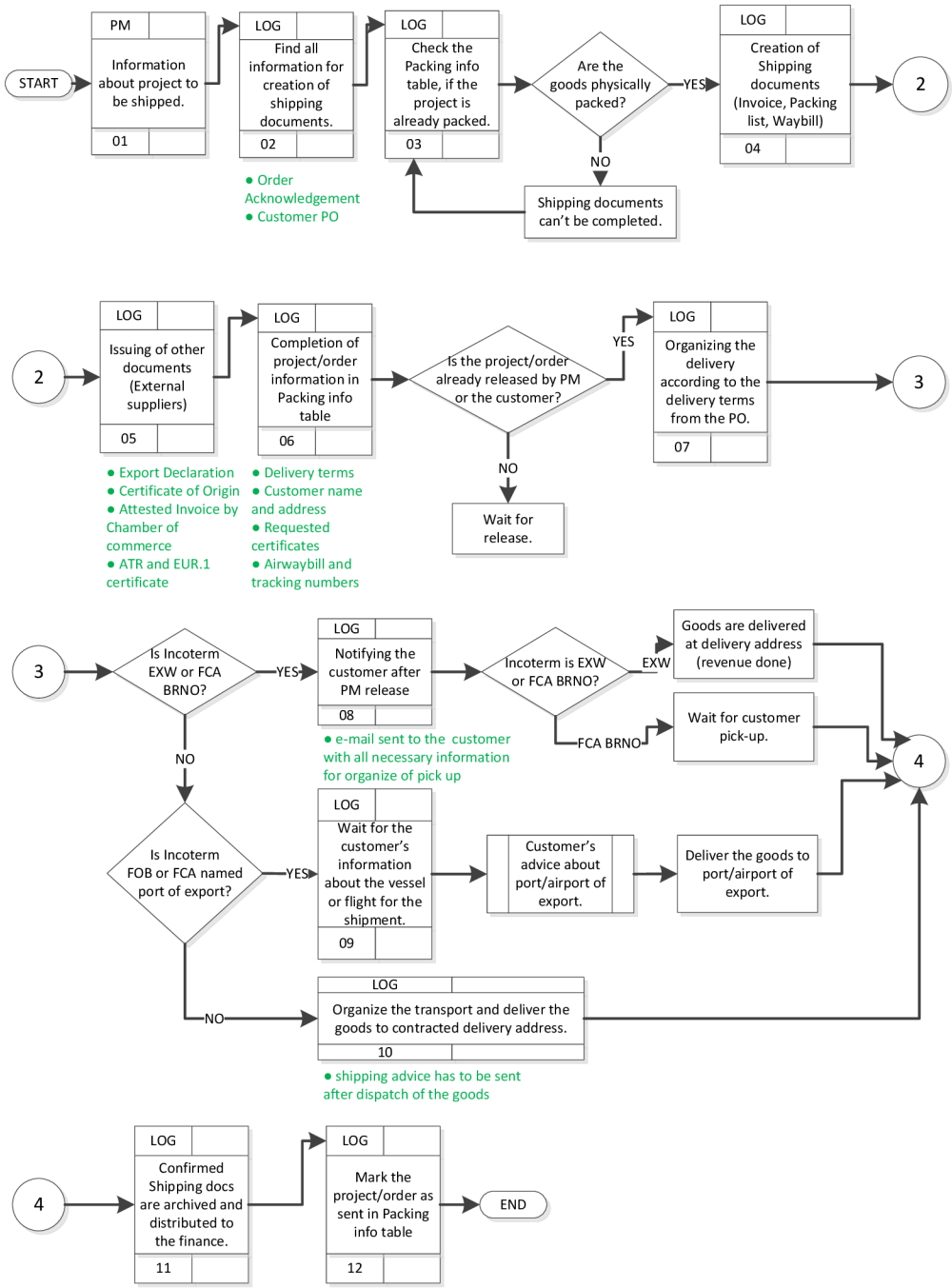
Packing process flow – present



Source: created by the author of master's thesis, verified by Logistics Supervisor for Shipping and Packing subsection (2013).

Appendix 14: Shipping flow - past

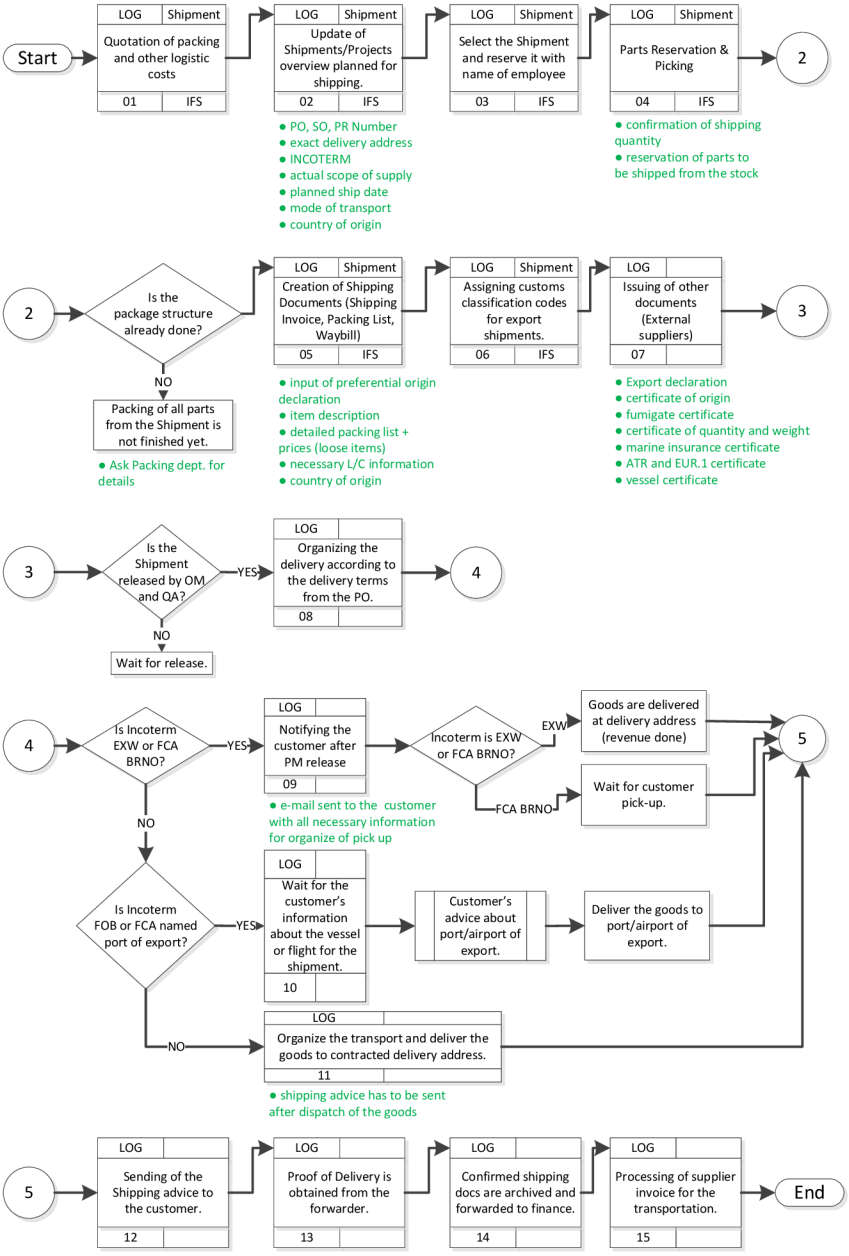
Shipping process flow – past



Source: created by the author of master's thesis, verified by Logistics Supervisor for Shipping and Packing subsection (2013)

Appendix 15: Shipping flow - present

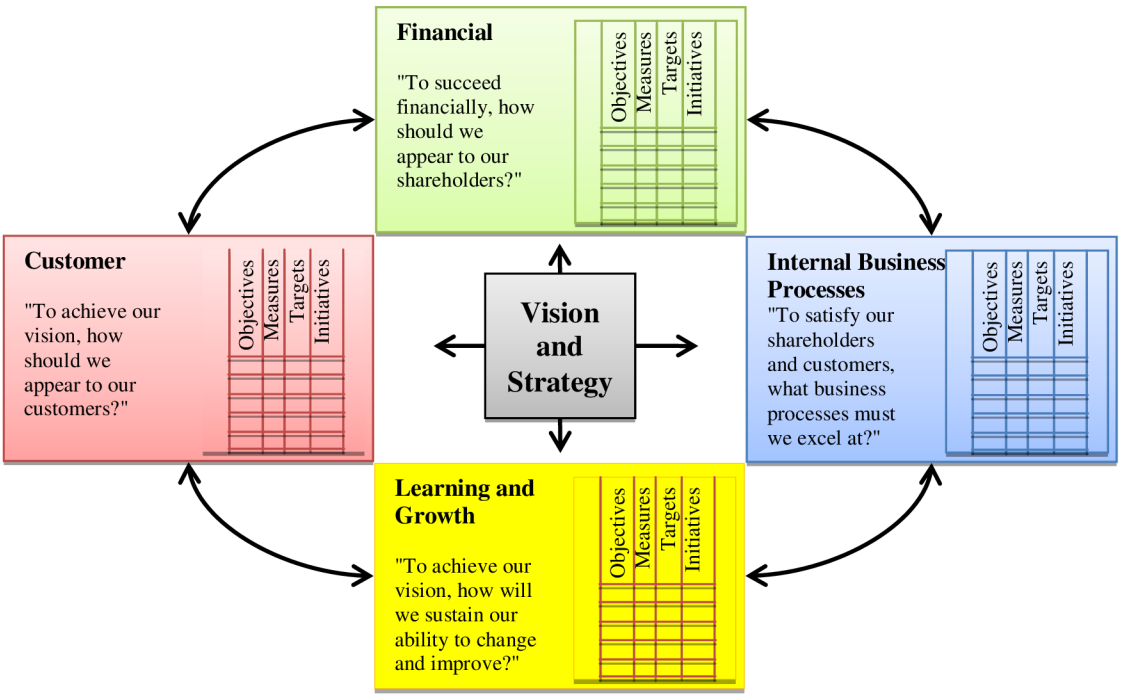
Shipping process flow – present



Source: created by the author of master's thesis, verified by Logistics Supervisor for Shipping and Packing subsection (2013)

Appendix 16: Balanced Scorecard framework

The Balanced Scorecard – A Framework to Translate a Strategy into Operational Terms



Source: adapted from Kaplan and Norton (1996, p.9)