



**KAUNAS UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING AND DESIGN**

Greta Pabrėžaitė

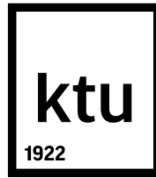
**ANALYSIS OF ENTERPRISE RESOURCES PLANNING
COMPUTERIZATION IN LITHUANIAN MANUFACTURING
ENTERPRISES**

Final project for Master's degree

Supervisor

Assoc. prof. dr. Rasa Mankutė

KAUNAS, 2016



**KAUNAS UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING AND DESIGN
DEPARTMENT OF PRODUCTION ENGINEERING**

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Industrial engineering and management (code 621H77003)

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Reviewer

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KAUNAS, 2016



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"Analysis of enterprise resources planning computerization in Lithuanian manufacturing enterprises"

DECLARATION OF ACADEMIC INTEGRITY

20

Kaunas

I confirm that the final project of mine, **Greta Pabrėžaitė**, on the subject "Analysis of enterprise resources planning computerization in Lithuanian manufacturing enterprises" is written completely by myself; all the provided data and research results are correct and have been obtained honestly. None of the parts of this thesis have been plagiarized from any printed, Internet-based or otherwise recorded sources; all direct and indirect quotations from external resources are indicated in the list of references. No monetary funds (unless required by law) have been paid to anyone for any contribution to this thesis.

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**MASTER STUDIES FINAL PROJECT TASK ASSIGNMENT
Study programme INDUSTRIAL ENGINEERING AND MANAGEMENT**

The final project of Master studies to gain the master qualification degree, is research or applied type project, for completion and defence of which 30 credits are assigned. The final project of the student must demonstrate the deepened and enlarged knowledge acquired in the main studies, also gained skills to formulate and solve an actual problem having limited and (or) contradictory information, independently conduct scientific or applied analysis and properly interpret data. By completing and defending the final project Master studies student must demonstrate the creativity, ability to apply fundamental knowledge, understanding of social and commercial environment, Legal Acts and financial possibilities, show the information search skills, ability to carry out the qualified analysis, use numerical methods, applied software, common information technologies and correct language, ability to formulate proper conclusions.

1. Title of the Project

Analysis of enterprise resources planning computerization in Lithuanian manufacturing enterprises

Approved by the Dean Order No.V25-11-7, 3 May 2016

2. Aim of the project

To analyse the ERP system implementation process in Lithuanian manufacturing companies and to find possible solutions for process improvement.

3. Structure of the project

Introduction, 1. Overview of ERP system prospects in Lithuanian industry, 2. Survey of ERP system usage and implementation in manufacturing enterprises in Lithuania, 3. Analysis of ERP system implementation process from ERP system supplier's perspective, Conclusions, References Appendices

4. Requirements and conditions

The overview has to be made using theoretical sources. In order to practically find the solutions for the evolved tasks the analysis has to be performed using various techniques such as survey, interview and other process analysis methods. Results and suggestions has to be based with arguments. The final project has to be prepared according to KTU regulations and requirements.

5. This task assignment is an integral part of the final project

6. Project submission deadline: 20__ ____ st.

Given to the student

Task Assignment received

(Name, Surname of the Student)

(Signature, date)

Supervisor

(Position, Name, Surname)

(Signature, date)

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SANTRAUKA

Šiame tiriamajame darbe yra analizuojama, kaip efektyviai Lietuvos gamybinės įmonės integruoja įvairias išteklių planavimo (angl. ERP – Enterprise Resource Planning) sistemas. Šios sistemos yra pakankamai sudėtingos ir jų integracija į įmones užtrunka nemažai laiko, kadangi visus darbuotojus reikia apmokyti, paruošti įmonės inventorių ir pan. Norint išanalizuoti detaliau visą diegimo procesą, atskleisti kylančias problemas bei pasiūlyti idėjų, kaip pagerinti sistemos diegimo procesą, buvo atlikta apklausa. Apklausoje dalyvavo Lietuvos gamybinės įmonės. Išanalizuotas konkretus ERP sistemos diegimo atvejis įmonėje, dalyvavusioje apklausoje.

Taip pat buvo surinkta informacija iš trijų ERP kompanijų tiekiančių ERP sistemas Lietuvos bei pasaulio įmonėms. Buvo išanalizuotas ERP sistemų poreikis, atskleistos kylančios didžiausios problemos tiek iš įmonių, tiek ir tiekėjų pusės. Taip pat remiantis apklausų rezultatais bei procesu planavimo metodais buvo sudarytas detalus ERP sistemos integravimo planas, kuriame matyti tiek įmonių, tiek tiekėjų atsakymybės bei įsipareigojimai.

Ši detali analizė apjungia įmonių ir tiekėjų ERP integravimo problemas bei abiejų pusių požiūri į tai. Remiantis rezultatais buvo pasiūlyti ERP integracijos proceso gerinimo metodai.

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SUMMARY

The project focuses on the analysis how efficiently Enterprise Resources Planning systems are being implemented in Lithuanian manufacturing enterprises. Implementation process is quite complicated and usually consumes a lot of time, because employees need to get trained how to use ERP system, companies need to prepare inventory for ERP system, etc.

In order to investigate in more details this implementation process, to reveal the biggest problems as well as suggest process improvement plans, the survey was conducted in various manufacturing companies in Lithuania. Also the case study was introduced, taking one company from survey list, analysing the development and implementation process of ERP system in this particular company.

ERP supplier's point of view was analysed as well by conducting the detailed information from three ERP suppliers in Lithuania. These suppliers provide their systems to Lithuania and worldwide. Using modern process planning techniques ERP system implementation steps were introduced.

This analysis shows the broader image of ERP implementation process looking from both: ERP user and ERP supplier points of view and depicting responsibilities from both sides. Based on that process improvement steps were introduced.

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INTRODUCTION

Enterprise Resource Planning (ERP) is the system that provides an integrated view of core business processes. It is required to use common databases maintained by a database management system. ERP systems track business resources - cash, raw materials, production capacity - and the status of business commitments: orders, purchase orders, and payroll. The applications that make up the system share data across the various departments (manufacturing, purchasing, sales, accounting, etc.) that provide the data. Nowadays ERP systems are very important in manufacturing enterprises [1]. ERP systems are being developed by various IT solution companies according the enterprise requirements. It is quite challenging task to provide the final ERP system packet to manufacturing enterprise and implement it accordingly. So there are many strategies and ways how the ERP system can be implemented. There are many success and failure scenarios of ERP system implementation captured in history as well.

The main aim of this work is to analyse the ERP system implementation process in Lithuanian manufacturing companies and to find possible solutions for process improvement.

In order to achieve successful analysis for the research main tasks are introduced:

1. To overview the Lithuanian manufacturing industry and the ERP usage.
2. To analyse ERP implementation process, success and failure factors theoretically.
3. To investigate the ERP system implementation process in manufacturing enterprises in Lithuania from ERP users as well as ERP suppliers point of view.
4. To evaluate analysis and suggest process improvement steps for future.

Lithuania is a developing country so it is important to investigate the pattern of the enterprises that is being followed. For this goal manufacturing industry is selected because Lithuania is having quite big chain of different manufacturing industries and enterprises. Also ERP functionality can be revealed the most in manufacturing enterprise.

For deeper analysis, there is a survey provided to Lithuanian manufacturing enterprises regarding their usage of ERP system. This survey will partially help to investigate the biggest issues that ERP users are facing. This should reveal how the companies are implementing the ERP systems. But this kind of analysis is from one, ERP users, perspective. There is another perspective – ERP suppliers. The IT companies that are supplying ERP systems to their customers (various companies) should be ready to present their ERP system package effectively and efficiently. They should analyse the company's needs and requirements very carefully. So in order to reveal and analyse both perspectives the qualitative survey is going to be made with Lithuanian IT companies providing ERP

systems. Conducted information will help to reveal the biggest issues and challenges that developing companies are facing in order to implement, install and maintain ERP system. In addition to this, ERP integration process is evaluated using Flow chart and Gantt chart based on the discovered steps of ERP implementation process.

In general, all these tasks should reveal how ERP systems are being implemented to the enterprises and causes of the ERP implementation problems will be detected. In addition to this evaluation the future recommendations for improvements will be suggested and evaluated.

1. OVERVIEW OF ERP SYSTEM PROSPECTS IN LITHUANIAN INDUSTRY

Manufacturing companies worldwide have long used ERP systems to streamline operations, address customization requirements and manage complicated supply chains in order to build profitable, sustainable businesses. ERP system provides integration of every aspect of procurement, production and delivery for manufacturers regardless of whether they are a make-to-stock, make-to-order or engineer-to-order manufacturer. In general ERP system covers five main modules [2]:

- 1) *Finance resource management (FRM)*: financial data management, accounting, financial data analysis;
- 2) *Sales (or CRM – customer relationship management)*: information about production, clients, interests, orders, bills, etc;
- 3) *Supply chain management (SCM)*: material requirement calculation, purchasing requests, warehousing;
- 4) *Manufacturing planning (or MRP – manufacturing requirement planning)*: framing orders, planning process in the workshop, information about required operations, documentation about the manufacturing operations, manufacturing cost evaluation;
- 5) *Personnel management (or HRM – human resource management)*: information for employees, start and end work registration, salary calculation, registration of courses for employees, etc.



Fig. 1.1. Enterprise Resource Planning system modules

Evaluating the functions and abilities of ERP system it is clear that ERP system is connecting different fields and departments of the company which is very important role in development of the

company. Companies must be particularly careful about choosing an ERP system flexible enough to meet their specific operational processes and functional requirements [3].

In general ERP production planning systems can be one of the most expensive investments for the company. Dependently from the needs of the company the installation price can differ from few thousand euros till thousands of billions of euros. One of the first major factors affecting the decision which program will be implemented in the company is the scale of the company. Proportionally to the scale of the company the complexity of technological processes and functions are involved in all the processes. According to that, ERP programs are divided into three main levels:

- 1) International Universal ERP systems used by big and medium scale companies in Lithuania such as: “SAP”, “Oracle E-Business Suite“ and “Microsoft Dynamics“.
- 2) Average complexity specialized ERP systems such as “Epicor“, “Sage“, “QAD” and others.
- 3) Small and noncomplex ERP systems for small scale micro companies.

Dependent on the types mentioned above, the price differs. First type is the most expensive because the systems are very big wide-spread in the world and commonly used for large scale companies. According the research made by the “Panorama Consulting Group” in 2010 investments for the ERP systems consist of 4.1% of total annual income. Overall the cost of ERP investment consists of:

- ERP system package (~30% of investment costs);
- Additional expenses required equipment installations (15% of investment costs);
- License (~25% of investment costs);
- Consulting (~30% of investment costs).

In order to successfully install ERP system often it is required to purchase some new technical equipment such as: servers, data base and network infrastructure. For all these features it is required to dedicate approximately 5-10% of total investment. These expenses depend on the requirements of the ERP system. Licence of the ERP system consist from 15 to 30% of the investment. Cost of license of complex systems usually is smaller because the cost of additional installation, testing, loading work is higher. International universal ERP system license price is [3,4]:

- “SAP” approximately 4000 EUR;
- “Oracle E-Business Suite” from 1500 EUR for small and medium companies (annual income is not more than 75 Billion EUR) till 4000 EUR for big scale companies.
- “Microsoft Dynamics” around 1500EUR

For micro companies ERP license price is smaller and can vary from few hundreds till few thousand euros.

Consulting expense usually is 30-50% of investment. The cost of consulting about ERP systems in Lithuania vary from: 150EUR till 500EUR. And consulting with “SAP” or “Oracle” usually costs around 1000-1200EUR.

According the data collected by Lithuanian statistics department in 2014 there were 29,8% of companies that are using ERP systems [5].

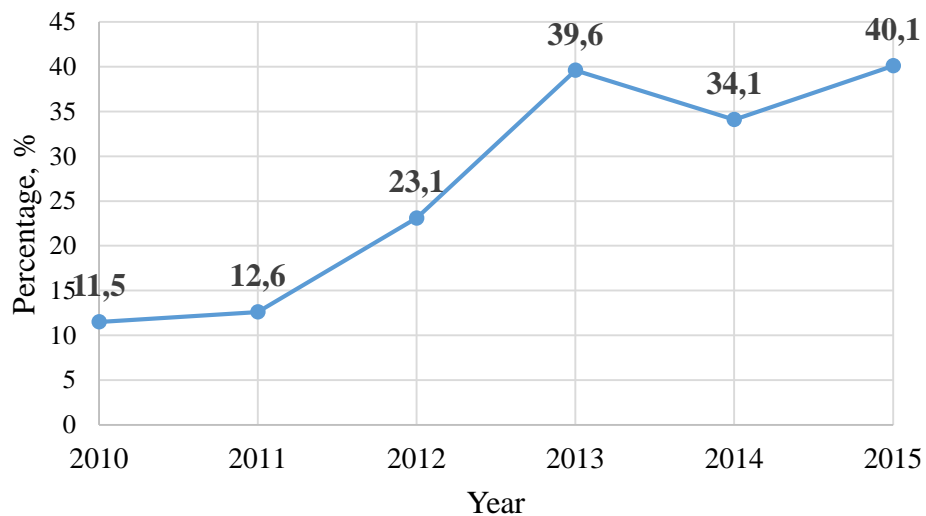


Fig. 1.2. ERP system usage in Lithuanian enterprises during 2010-2015 [5]

As it is seen in the diagram Fig. 1.2 the tendency within the years was increasing till 2013. So it is noticed that the need of ERP system in the companies was required and it can be stated that such process automation technology helps to improve overall efficiency of the work. In 2014 it is seen slight decrease of ERP use in Lithuanian companies. The reasons why it may decrease might be different. But forecast for the following years is even higher increase of the use of ERP systems in Lithuanian companies.

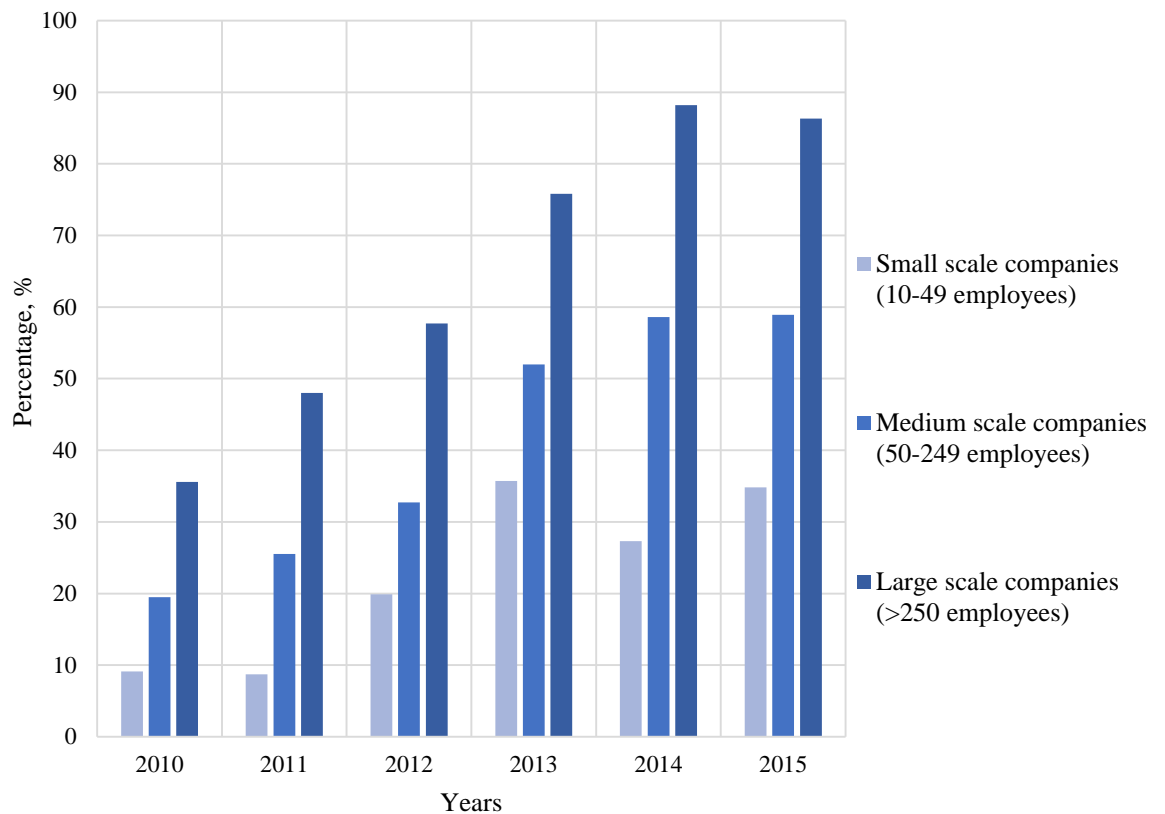


Fig. 1.3. ERP usage in Lithuanian Enterprises according the size of the company [5]

Another data (in Fig. 1.3) taken from Lithuanian Statistics department reveals the dependency of ERP system usage in the company according to the size of the company itself. There are three main sizes how enterprises are defined by the scale of the company [6]:

- 1) Small scale Enterprise consists of 10 - 49 employees
- 2) Medium scale Enterprise consist of 50 – 249 employees
- 3) Large scale Enterprise consists of more than 249 employees

Looking to the Fig. 1.3. for small scale enterprises from 2010 to 2015 the usage has increased from approximately 9% to nearly 35%, in medium scale companies – from approx. 20% to nearly 59%. And if the enterprise is large scale it is nearly impossible to not have an ERP system implemented in the company. Analysis revealed that more than 86% of large enterprises in 2015 were using ERP system [5]. It is seen that the ERP usage increased 2.4 times comparing with the result in 2010 when the ERP usage was around 36%.

Evaluating the tendencies it can be stated that the bigger the company the higher the need and the requirement of having and implementing ERP system in an enterprise.

1.1. Overview of manufacturing fields in Lithuania

Lithuania has been developing country up till 2015 till it has implemented new currency – Euro. However, according to World Bank information for Lithuania in 2014 the GDP per capita is 14573 EUR. So looking to these numbers and comparing with other countries (for example GDP per capita in 2014 in Norway was 87000 EUR or United States was 58000 EUR) it can be seen that Lithuania is still developing country [6]. The factor of changing currency from Litas to Euro has definitely opened new opportunities for Lithuania, because having the same currency as most of the countries in European Union simplified the procedures involved currency exchange and various similar issues. Naturally, with the greater possibilities to establish international contracts and business plans, improve and simplify export the industry is developed as well.

Today are different kind of industrial fields developed in Lithuania [7]. Below it is provided the short overview of main manufacturing fields that are developed in Lithuania: chemicals and plastics, textile, furniture and wood, food, metal and plastic, electronics and Laser technology industries.

Chemicals and Plastics

Chemicals and plastics, the two closely related sectors, stand out as some of the best-established industrial activities in Lithuania. The production of main chemicals, fertilizers and primary forms of plastics accounts for over 80 percent of the country's chemical industry turnover.

Key manufacturers within the sector include Lithuanian companies “Achema” (a leading manufacturer of nitrogen fertilizers and chemical products in the Baltic States) and “Lifosa” (a producer of nitrogen-phosphorus fertilizer), and foreign-capital companies “Neo Group” and “Orion Global Pet” (makers of PET raisin, based in the seaport city Klaipėda). The chemical and plastics sector employs over 5400 people; It has received more than 89 EUR million of foreign direct investment – around 2.63 percent of the total FDI in manufacturing.

Textile

Another profitable industry in Lithuania is the textile industry Lithuania's textile and clothing industry, maintaining its centuries-old traditions, today is actively investing in creating unique brands and contemporary design, in effort to develop products with higher added value. About 1000 companies and 25000 employees in the sector. Lithuania's textile and clothing sectors are export-oriented, textile manufacturing and clothing production sectors especially. Generally, export share in the total sector's production volume was 78,2% in 2011. The goods are being exported to Russia,

UK, Denmark, Germany, etc. The leading companies in textile and clothing sector include “Neaustinių medžiagų fabrikas Group”, “Korelita”, “Audimas SC”, “Linus SC”, “Omniteksas JSC” and “Lelija JSC” etc.

Furniture and wood

The Lithuanian furniture, wood processing and paper industry has long-standing traditions in producing high quality products. The industry is well-developed - modern production facilities are utilized, the workforce is highly skilled and the operating costs are relatively low. Lithuania is the fifth biggest “IKEA” supplier in the world. At the beginning of 2012 there were 722 companies operating in the industry of furniture production employing 20300 workers which is 2.5% of the overall labor force. 97.5% of operating companies are SME`s, 2.5% large companies. Despite decrease in number of companies furniture production, 2011 compared with 2010, grew by 35.5%. Goods are being exported to Sweden, Russia, Germany, Denmark, etc.

Food

The food sector produces a major share of the total value created by Lithuanian producers. The most developed food processing subsectors are milk, meat and grain processing. Other well-established sectors are brewing, fish processing, canned vegetables, fruits and confectionery. Over 600 companies operate in the food processing industry in Lithuania. In 2011, 43.6% of total food production and 16% of total beverages production were exported. Main exports goes to Russia, Germany, Latvia, Poland, etc. The leading companies in the food sector include “Vičiūnai Group”, “Pieno Žvaigždės”, “Rokiškio Sūris”, “Kauno Grūdai”, “Švyturys-Utenos Alus”, “Norvelita” and “Biovela”.

Metal and Plastic Manufacturing

The Lithuanian engineering industry is the country’s largest processing production sector, generating 4% of Lithuania’s total value-added. The industry consists of over 1500 companies, employing 24000 specialists. Metal processing is a highly competitive and rapidly growing sector in Lithuania, a country with long-standing traditions in engineering. Many of the Lithuanian companies within the sector have successfully integrated into international markets over the past decade. Goods are being exported to Germany, Latvia, Sweden, Russia, Norway, etc. Lithuanian metal processing and transport equipment companies supply various transport components to major international companies, such as “Rolls-Royce”, “Siemens”, “Volkswagen”, “Volvo”, “SAAB” as well as to the NATO. The leading companies in engineering sector are: “Vakarų laivų gamykla”, “Schmitz

Cargobull Baltic”, “Litnaglis”, “Stansefabriken”, “Sappa profiliai”, “Danplastas”, “Stevila”, “Plamega”.

Electronics and Laser technology

Medical electronics and optical instruments are main focus areas for electronics manufacturers in Lithuania. Another key area is the manufacture of radio, television, and communications equipment components, which are exported to Scandinavia, Western Europe, and Eastern European countries like Poland and Russia. Laser technology is a key industry for Lithuania, allowing the country to make its mark internationally. Lithuania accounts for more than half of the global market of pico-second laser spectrometers. These are widely exported to European countries, USA, Australia as well as countries in Asia. At present in the country there are over 10 companies engaged in production of lasers and laser systems based on own research. The export production turnover is about 20 million EUR a year. 80% of laser production is exported to the international market. Some of the leading sector's companies that successfully operate in Lithuania are: “Ekspla”, “Light Conversion”, “Altechna”, “Eksma Optics”.

So in general, industry in Lithuania is developing and it is important to analyse how manufacturing companies are implementing ERP systems in their processes [8].

1.2. Overview ERP systems in Lithuanian manufacturing companies

ERP systems are being more and more popular in various enterprises in Lithuania. Investigation of ERP systems development and application in Lithuanian enterprises revealed that there are over 300 local Lithuanian IT companies that are developing, selling and installing over 900 local and foreign ERP systems, such as: UAB “Būtenta” provide their own ERP system called under the name Būtent; UAB “Contour Lab” offer Counter Enterprise system; UAB “Baltijos kompiuterių centras” offer ERP DAFO system, etc. International ERP systems are used in Lithuanian enterprises as well. For example UAB “Epicor Software Lietuva” offers Epicor Vantage software, UAB “Microsoft Lietuva” offers Microsoft Dynamics NAV and Microsoft Dynamics XA.

However the leading ERP systems within large scale companies are „SAP”, “Bann”, “TD Edwards“, “Oracle“ and “People soft“. These systems can process huge amount of data and it is best suiting solution for the big scale companies. Medium scale companies usually choose ERP systems such as: “Microsoft Dynamics“, “Scala”, “R&B FORB“, “Monitor” or “Hansa”. These systems provide flexibility, user friendly environment so it is best suiting for medium scale companies [2].

Cost of ERP system for Lithuanian enterprises

Cost of license of complex systems in Lithuania is usually smaller because the cost of additional installation, testing, loading work is higher. International universal ERP system license price vary: “SAP” approximately 4000 Euros, “Oracle E-Business Suite” – from 1500 Euros for small and medium companies till 4000 Euros for big scale companies, “Microsoft Dynamics” – around 1500 Euros [9]. For micro companies ERP license price is smaller and can vary from few hundreds till few thousand Euros. In that case Lithuanian companies have two options to choose:

- 1) to buy and implement international ERP system;
- 2) to choose local system developed by IT companies itself in Lithuania.

Distribution of ERP

ERP system distribution in Lithuanian manufacturing companies can be evaluated by the scale of the company – big, medium small or very small. Big scale companies have 250 or more employees and turnover more than 40 million euros. Medium company consist from 50-249 employees and has a turnover from 7million – 39 million EUR. Small scale company have 10-49 employees and turnover 2-6,9 million EUR. Very small company consists of 1-9 employees with turnover from 0,2 – 1,9 million EUR [9].

As mentioned before the leading ERP systems within big scale companies are “SAP”, “Bann”, „TD Edwards“, „Oracle“ and „People soft“. These systems can process huge amount of data and it is best suiting solution for the big scale companies. Medium scale companies usually choose ERP systems such as: Microsoft Dynamics“, „Scala“, „R&B FORB“, „Monitor“ or „Hansa“. These systems provide flexibility, user friendly environment so it is best suiting for medium scale companies.

Here it is going to be described the main Enterprise Resource Planning systems that are used in Lithuanian industrial companies. Industry fields differ: food, wood, metal, textile, etc. industries are taken into account. Below is given comparison of ERP systems: local, that are created by Lithuanian IT specialists: “Būtent” and “Contour Enterprise”, and global ERP systems such as “Microsoft Dynamics XA”, “SAP” and “QAD” and that are used in different Lithuanian manufacturing companies.

Būtent

This ERP system is created by Lithuanian IT Company UAB “Būtent”. Process automation, maintenance and development system for manufacturing companies. Būtent ERP system allows entering technological processes to the data base, track already existing fragments of the processes in order to create new processes, track existing process data in order to get copies, getting visual information (CAD drawings, etc.) related with processes, auto-generating specification of technological process, etc. The unique feature of this programme is the interface of the programme is understandable and convenient for an engineer – technician. That allows to increase the speed of data processing [10].

Examples of Lithuanian manufacturing enterprises that use Būtent ERP system are the following: “Metalika”, “Stevila”, “Agro Teka”, etc.

Contour Enterprise

Contour Enterprise system has different modules for different market fields. For manufacturing enterprises Contour Enterprise system implements all processes, documentation, database, workshop information, etc. in manufacturing companies. Also it is possible to use different interfaces. Each and every manufacturing process reflects in documentation, accounting, etc. It allows to track all processes and to improve efficiency of the company. Contour Enterprise has information and certain functions required for sales, clients database, internal orders, etc. [11].

Lithuanian enterprises that use Contour Enterprise are Amalva, EMP recycling, Pharmacels, Altis, Stadox, etc.

Microsoft Dynamics AX

Dynamics AX is one of Microsoft's enterprise resource planning software products. It is part of the Microsoft Dynamic family.

Enterprise resource planning (ERP) designed specifically for manufacturing operations can include supply chain management and finance, manufacturing resource planning (MRP), human resources, and operations management. Basically these are all standard modules mentioned earlier as well.

Possibilities of Microsoft Dynamics AX are very wide. It provides manufacturers a solution that is architected with flexibility and change in mind, built with operational excellence at its core, and focused on allowing you to drive innovation and be the market leader [12].

Below in Fig. 1.4 there is provided the interface of the Microsoft Dynamics AX software. As it is seen it is possible to see graphical information, manufacturing times, process distribution, etc.

Lithuanian enterprises that use Microsoft Dynamics AX are the following: “ACHEMA”, AB Grigiškės, UAB “Klaipėdos Kartonas”, “Baltic Amadeus“, etc. [12, 13].

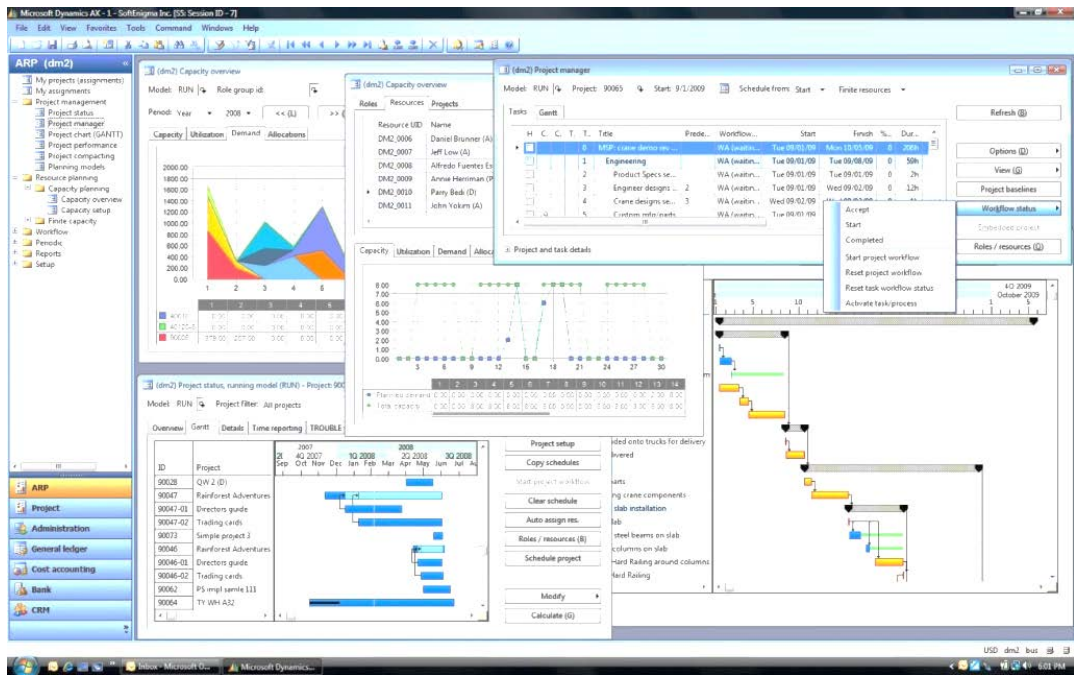


Fig. 1.4. Microsoft Dynamics AX interface [14]

SAP ERP

SAP is the world’s largest enterprise applications software company - as measured by software and service-related revenue - with 172,000 customers around the globe. SAP offers a wide range of ERP applications including customer relationship management, financial management, human capital management, product lifecycle management, and supply chain management [15]. Below in Fig. 1.5 there is provided interface of SAP functions. SAP has one interface which is almost the same in any transaction it is used. However it is not as convenient design as compared with the Microsoft Dynamics AX.

Lithuanian enterprises that use SAP ERP are the following [16]:

- Furniture production - UAB “SBA“, AB “Šilutės baldai“, UAB “SBA baldų kompanija“, UAB “Klaipėdos baldai“, UAB “Kauno baldai“;
- Other industries - UAB “Yazaki Wiring Technologies Lietuva“, “Philip Morris Lietuva“, “Shmitz“, UAB “Vakarų laivų gamykla“ etc.

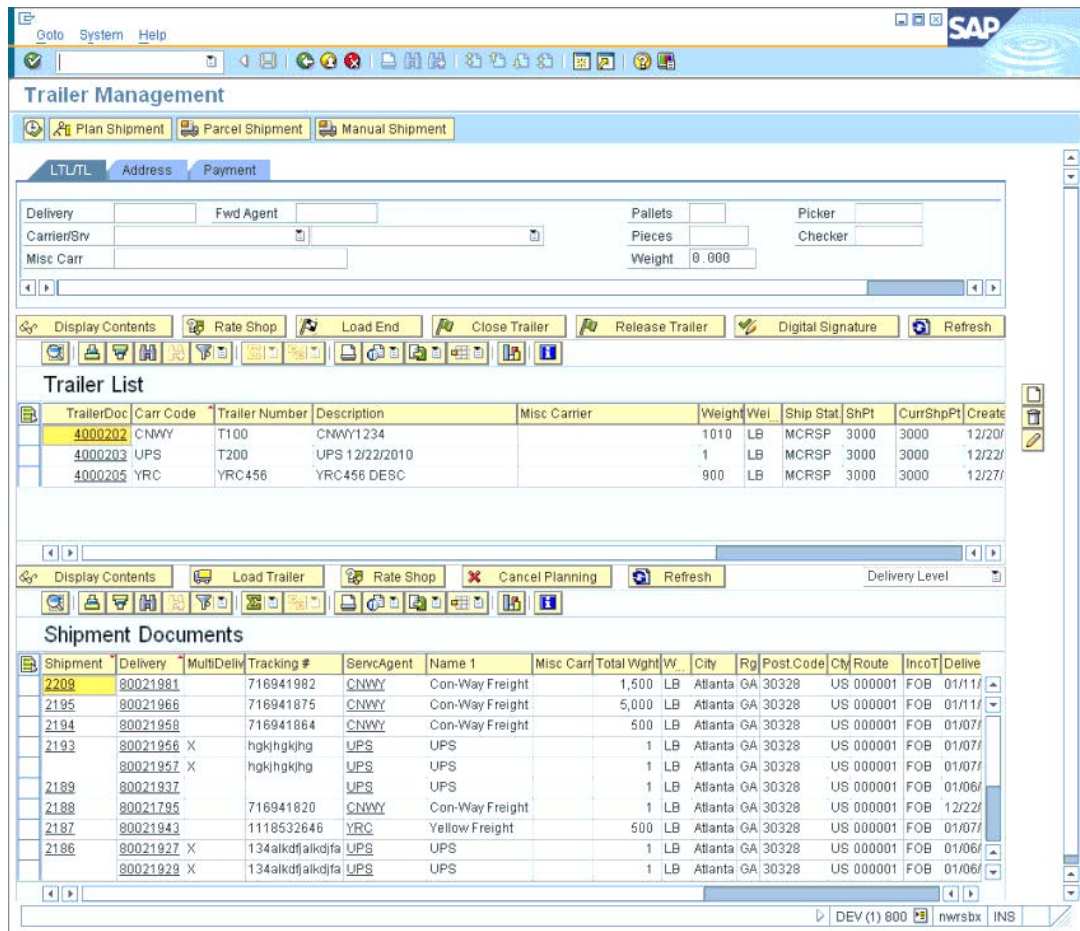


Fig. 1.5. SAP interface [17]

All documents that are uploaded in SAP can be linked together within the system of various transactions and departments of the company. For instance if it is a manufacturing company that is producing some certain goods can record their customers in the system. The quotations for the produced good can be recorded. Sales of these goods can be also be saved and implemented within SAP. Various customers can have different features and prices for the same goods. The processes are optimized and improved using one system such as SAP.

QAD ERP

Main function of QAD enterprise Applications is a complete suite of software designed to support all of the key processes of global manufacturers. The software is in use at over 5,500 sites worldwide. QAD enterprise Applications enables measurement and control of all key business processes, and utilizes industry specific best practices to support companies, whether in a single plant or across an entire global organization [18]. Below in the Fig. 1.6 the interface of QAD is provided. As it is seen it is similar to other ERP systems, especially it is similar to SAP.

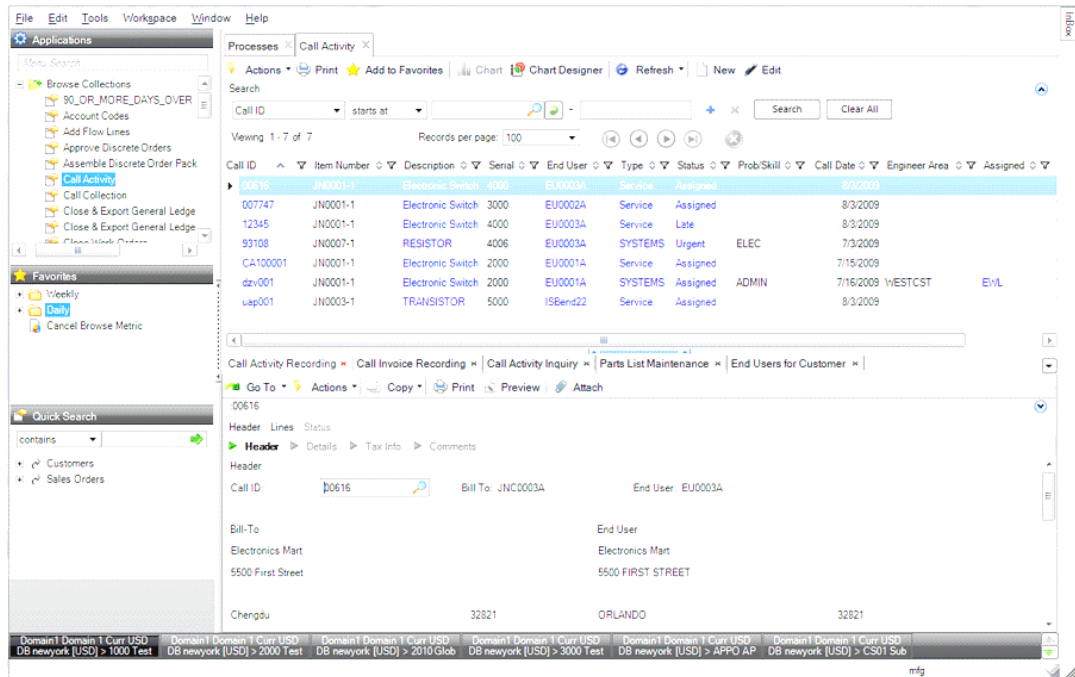


Fig. 1.6. QAD ERP interface [19]

QAD has been developing to various industrial sectors such as: automotive industry, consumer products, food and beverage, high technologies, industrial sector and life sciences. In addition to that company is providing various consultancy and training services.

Lithuanian enterprises mainly focus on food sector for QADERP:

- “Kauno Grūdai” – business of flour and crop production, pet food, raw materials, instant noodles production, etc.
- “Pieno žvaigždės” – curd, milk, yogurt and other milk products productions
- “Laima” – chocolate and sweets production sector.

Summary of ERP selection possibilities

In general there are various possibilities introduced by various ERP suppliers. One of the main features how to choose required ERP is the size of the company. ERP systems are available worldwide, as seen from few examples itself the variety of countries is great. Also the scope of the ERP system itself differs a lot. For example “SAP AG” is not even focusing to Small enterprises directly targeting Big and Medium companies. On the other hand UAB “Būtenta” has modules for various size enterprises – big, medium and small as well. Cost is also very important factor. In general the bigger the ERP possibilities and functions the more expensive it is.

Table 1.2 Overview of ERP systems that are used in Lithuanian enterprises [2; 9]

ERP system	Manufacturer	Country of Origin	Cost	Company size that ERP system is meant for
Būtent	UAB “Būtenta”	Lithuania	From ~1000 EUR	Big, Medium, Small
Contour Enterprise	UAB “Contour Lab”	Lithuania	Free*	Big, Medium, Small, Very small
Microsoft Dynamics AX	Microsoft	USA	From ~1500 EUR	Big, Medium, Small, Very small
SAP ERP	SAP AG	Germany	From ~4000 EUR	Big, Medium
QAD ERP	QAD	USA	From ~2000 EUR	Big, Medium

*Free software but service maintenance and consultancy is charged

1.3. ERP system implementation analysis within an enterprise

Nowadays there is a high demand for ERP systems in various companies worldwide. However, to successfully implement ERP system in the company it is a very big challenge. There are various methods and techniques developed in order to successfully integrate ERP system within the company. ERP systems are different from traditional systems in scale, complexity, organisational impact, cost and subsequent business impact. ERP systems typically impact the entire organisation and are almost always associated with the business process re-engineering. Organisations that implement ERP must be ready to do so and many have run into difficulty because they were not organised in the correct fashion to benefit from the implementation. The costs associated with ERP systems are significantly higher than those of traditional systems and mistakes such as these can be extremely costly – for example, Dell Computers spent millions of dollars on an ERP system that had to be scrapped as it was too rigid for the expanding nature of the company [19].

If the company wants to extract the benefits of the ERP system it should focus on how to maximize ERP performance possibilities. In addition to this the company should focus more on the quality and scope of the ERP system matching with the needs of an enterprise. For this purpose, well defined functions and the right software are mandatory, similar to increasing usefulness of the system. A more realistic schedule and budget should be planned to minimize the negative effects on the quality of the system. This method can satisfy the company in both progress and quality of the ERP project. In addition to this, choosing strong consulting partners is required for ERP project success. They can lead the company in the right direction to have a successful ERP implementation in both progress and quality. Internal support is the main determinant of the progress of the ERP project. To complete the project on time and within the budget as initially planned, top management support, training and good project planning are required during ERP implementation [20].

1.3.1. Success factors of ERP system implementation in an enterprise

Based on various researches made there are conducted the main five factor groups that lead ERP system implementation process to success are the following: project management, change management, business alignment with information system, internal audit activities and consulting and

planning activities. Fishbone diagram of ERP implementation success factors is presented in Fig. 1.7 [21].

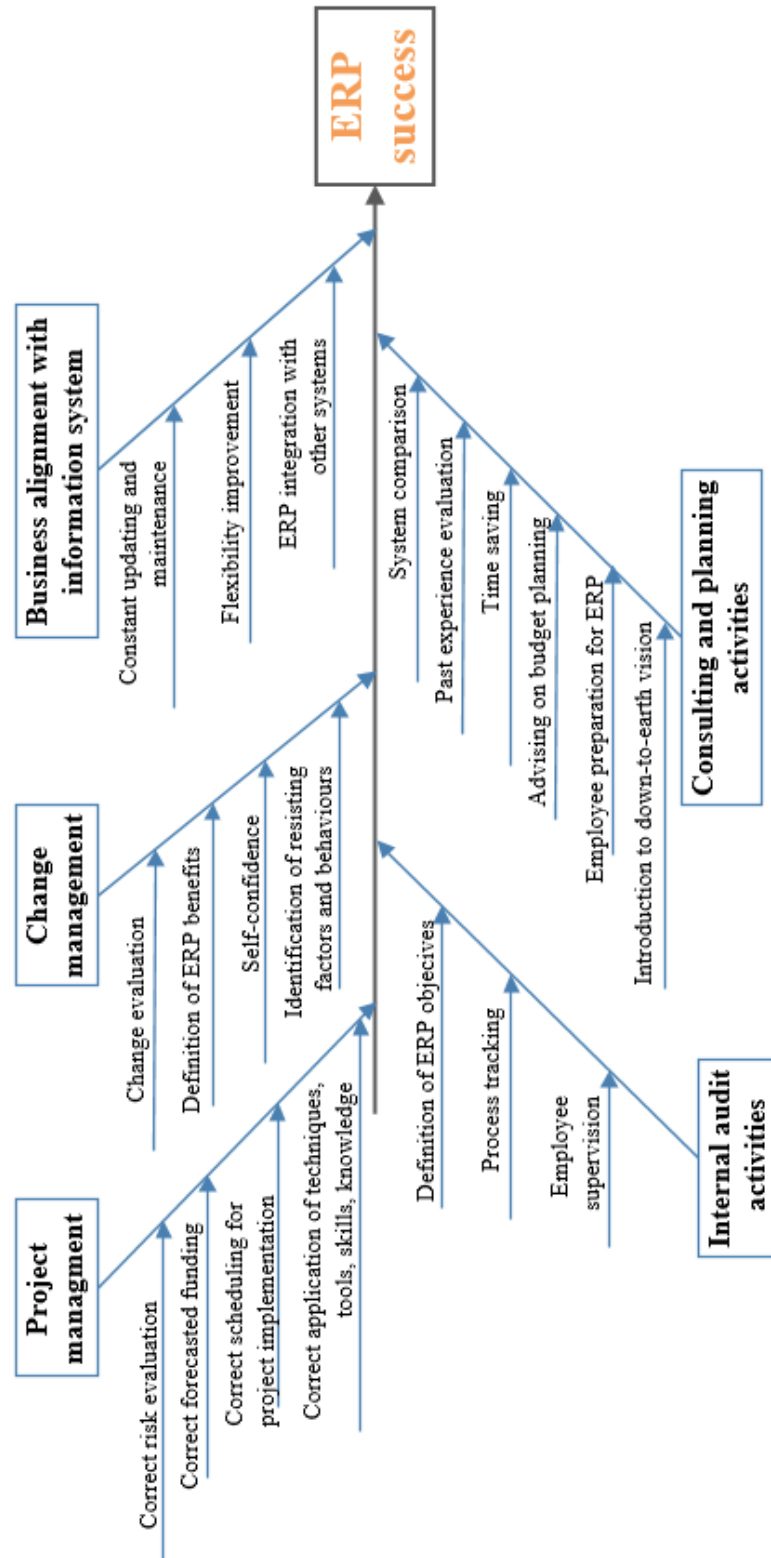


Fig. 1.7 ERP implementation success factors

Project management

The implementation of ERP projects involves various management functions, which inevitably leads to different levels of management reorganizations [22]. Successful project management is about managing the risk. Project Management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements. This can be done by using a formal project management structure (PMS).

The top 10 ERP management headaches rank issues are [23]:

1. Project size;
2. Staffing;
3. Risk management;
4. Unreasonable deadlines;
5. Funding;
6. Organizational politics;
7. Scope creep;
8. Unexpected gaps;
9. Interfaces;
10. Resistance to change.

One of the basic principles for assuring the ERP implementation success is the appointment of the project manager, who should be most talented business manager.

The characteristics of a successful project manager are [24]:

- flexible,
- disciplined,
- quick learner,
- good decision maker,
- ERP expert,
- having business experience,
- political clout,
- good formal education,
- well liked,
- motivates staff

Change management

Improvement strategies, such as ERP implementation, commonly involve change. Hence, responsiveness to internal customers is critical for an organization to avoid the difficulties associated with this change. To assist top management with the complex organizational problem of workers' resistance to ERP implementation (Fig. 1.8), it is suggested an integrated, process-oriented conceptual framework consisting of three phases [25]:

1. Knowledge formulation – identifying the resisting factors, identifying behaviours;
2. Strategy implementation – communication information on ERP benefits;
3. Hands-on training and status evaluation – process of monitoring and evaluating change management strategies for ERP implementation

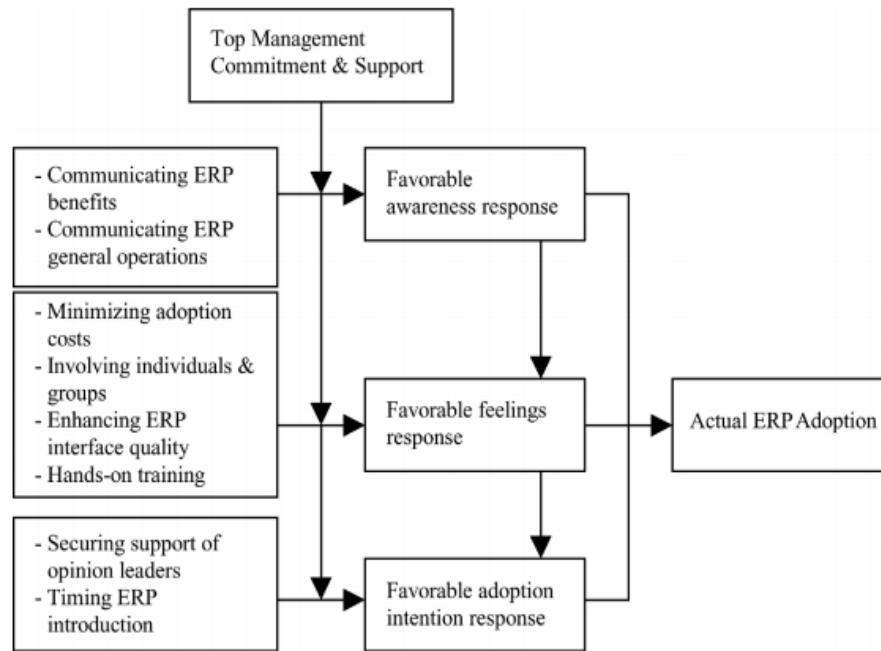


Fig. 1.8 Change management strategy [25]

Business alignment with information system

ERP systems optimize the internal value chain, streamline organizational structures, improve communications, and ensure that up-to-the-minute information is available at all times. They deliver reliable, measurable results in terms of the bottom line, and lay the foundations for sound decision-making and prompt follow-through. It is vital not only that they run smoothly, but also that they are adaptable enough to easily accommodate new business models or production methods, more stringent statutory requirements, or changes to supplier or partner relationships. This means they must be constantly updated and upgraded and, where necessary, smoothly integrated with other systems [26].

Internal audit activities

In order to track the need and the function of the company it is important to include internal audit activities. Throughout an ERP implementation, internal audit can help identify and communicate risks by having them addressed throughout the project instead of as an afterthought. By understanding the major phases and objectives of an ERP implementation, internal audit can objectively raise issues that, if overlooked, could jeopardize a project's success. Internal auditors can also articulate the risks from a management perspective [27].

Consultant and planning activities

By consulting with various ERP consultancy companies and trusting their experience it can help to identify the exact need and working principle of ERP system to the enterprise. That would ease the selection of ERP system itself, project management, staff preparation, etc. When the possibilities are provided it is easier to make a plan and have a better down-to earth vision what it is actually required [28].

1.3.2. Failure factors of ERP system implementation in an enterprise

ERP system integration process can fail in the company due to many reasons. There are divided four more groups representing the failure factors of ERP system implementation (Fig 1.9): process failure, expectation failure, interaction failure and correspondence failure in an enterprise.

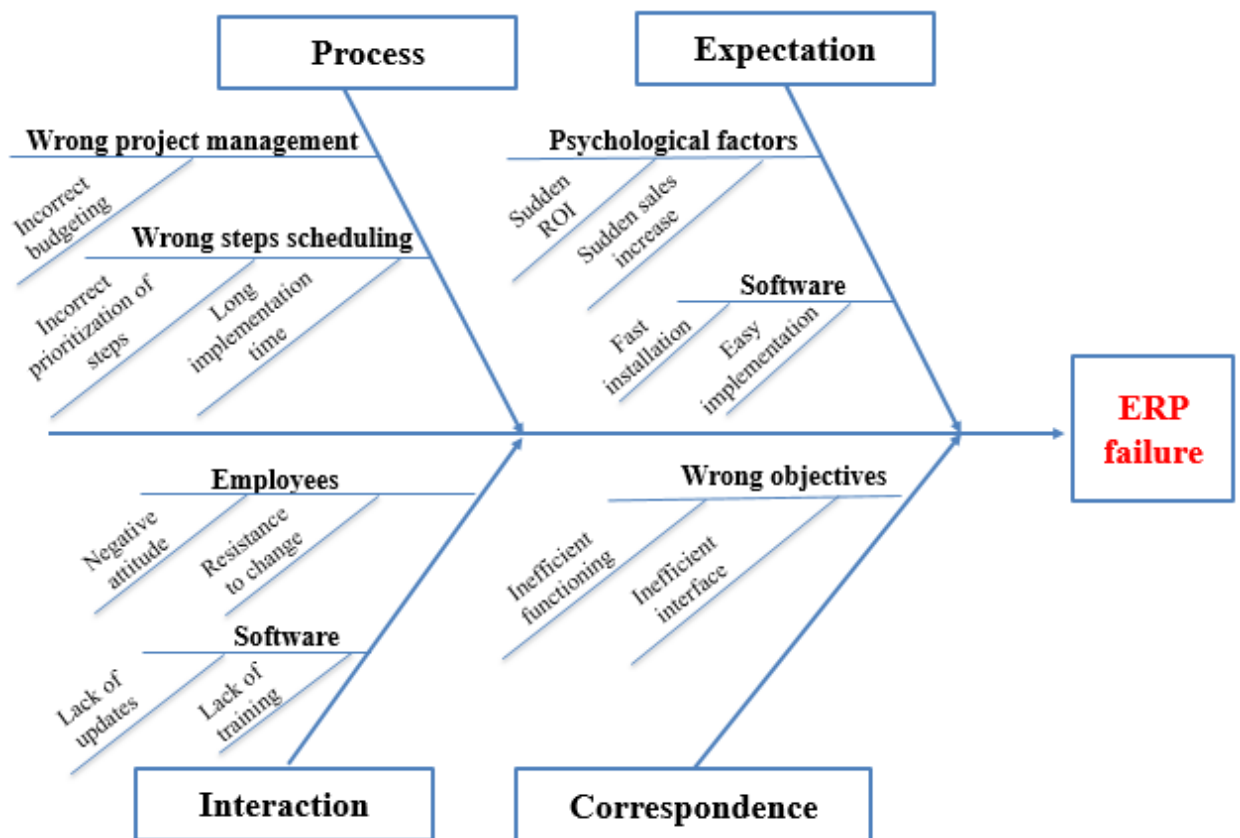


Fig 1.9 ERP implementation failure factors

Process failure

Process failure appears when project is not completed within the time and budget [29]. That means the project has exceeded time scale and it took longer than expected to implement ERP system.

Usually in business time means money. If the process consumes more time it ends up being not profitable for the company.

Expectation failure

ERP system do not match expectations of the company. Companies expect result too immediate sales increase due to the use of ERP software. It is expected that software can be implemented in relatively little time, cost, and risk. For example, while Panorama Consulting experience and research shows that the average implementation takes 14 months and significantly longer for larger and multi-national companies [29].

Interaction failure

Users' attitude towards the ERP system is negative. The employees are not well trained to use the system. They are resisting to the change and are struggling to start using different methods that they were using before. Especially this is a very common factor in developing countries such as Lithuania.

So the companies in the developing countries usually seek to be stable and are scared of change and taking risk [30, 31].

Correspondence failure

When there is no match between ERP system and planned objectives and development of implementation process, some issued can appear concerning correspondence between supplier and company. That can be the cause of poor ERP system package selection, inadequate requirement specifications, etc.

2. SURVEY OF ERP SYSTEM USAGE AND IMPLEMENTATION IN MANUFACTURING ENTERPRISES IN LITHUANIA

The survey regarding the usage of ERP system was conducted in various manufacturing companies in Lithuania. The main aim of this survey was to analyze the tendencies of ERP system implementation in Lithuanian companies. In addition to this, the analysis was focused on finding the biggest challenges of ERP system integration in medium and large scale enterprises in Lithuania.

The change of the processes and operations in the enterprise was analyzed after the ERP system implementation in the company. Results were conducted of 16 various scale manufacturing enterprises in Lithuania including: metal manufacturing, chemistry, electrical components manufacturing, wood manufacturing, metal processing, textile industry, etc. In general the various innovative systems are more commonly used in manufacturing companies [32]. Manufacturing field was chosen due to the reason that ERP system can be utilized maximum in manufacturing company, because such system can involve all the departments of the company in daily processes, including manufacturing itself.

The scales of companies that responded to the survey is presented in the Fig. 2.1. One company is having more than 1000 employees, 2 companies are very large as well 501-1000 employees and the maximum amount of respondents (7 companies) are containing 101-500 employees which means that the biggest part of respondents represent medium or large scale enterprise. Taking these numbers into account we can see that enterprises are really big and important in Lithuanian manufacturing industry, knowing the fact that Lithuania is developing country, so the evaluation how they use and implement ERP system is very valuable as well.

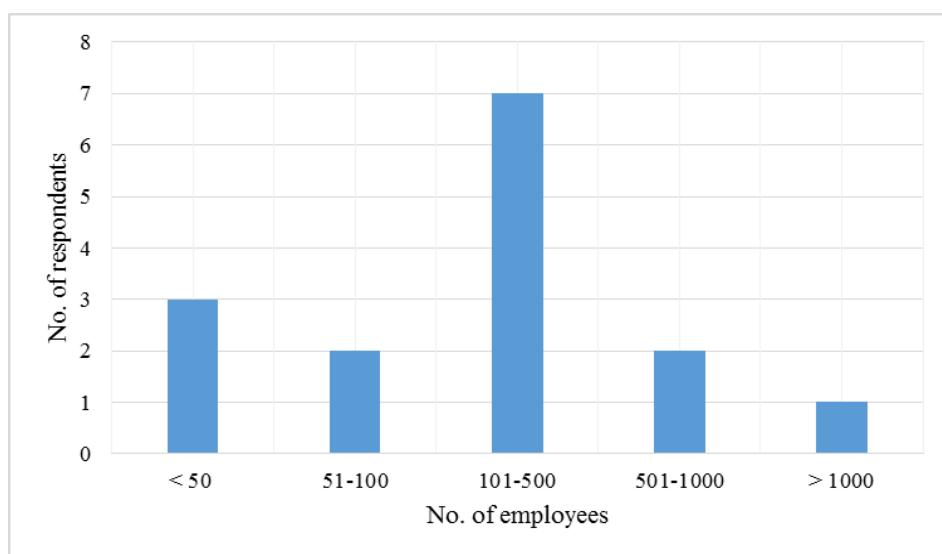


Fig. 2.1 Survey overview of respondent's size (companies size per number of employees)

In general ERP system is required in order to fasten and optimize all the processes that are being held in the company. So naturally companies believe that using ERP system can be very profitable and efficient for them.

The reasons why ERP systems are required for the enterprises are listed in the Fig. 2.2 Analysis of survey revealed that 44% of respondents use ERP system due to the need to plan their processes and daily operations such as: manufacturing, purchases, sales, etc. So this should be the main reason why manufacturing enterprises need ERP system. 19% respondents need ERP system because they feel the increasing requirement of Computer Aided Manufacturing and Management systems used in companies. Application of such systems naturally increases the competitive advantage of the company. However, only 3% of respondents are taking initiative to try new technologies and implement ERP system. The reason why this number is very low is that ERP system is quite risky investment, companies want to be safe and choose ERP system only after careful investigation and analysis. In addition to this 16% of companies require ERP system for material planning and control, i.e. the raw material flows and conversion to the final product need to be tracked efficiently also the waste and damage can be measured and recorded using ERP system. Other important factors are the need to improve the product and process quality (9%) and in general the need to improve the productivity of the company (9%). The information recorded in ERP system should help to improve operations performed in the enterprise. It should help systemize the processes performed daily in the company.

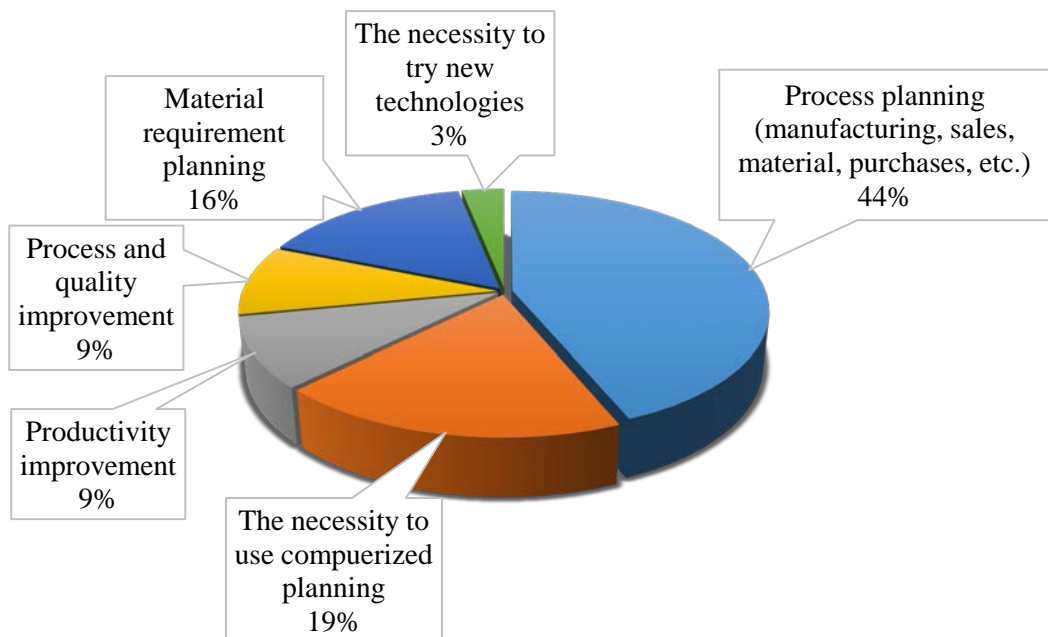


Fig. 2.2 Respondents view on the need for ERP system in their enterprise

All factors mentioned in Fig. 2.2 lead to the increasing usage of ERP system implementation in various manufacturing companies in Lithuania. Below illustration presents the variety of opinions of the respondents, why ERP system is required in the company.

Fig. 2.3 shows the variety of different ERP systems that are being used by the respondents of the survey. It is clearly seen that there is no single ERP system that is the most or least favourite within manufacturing enterprises in Lithuania.

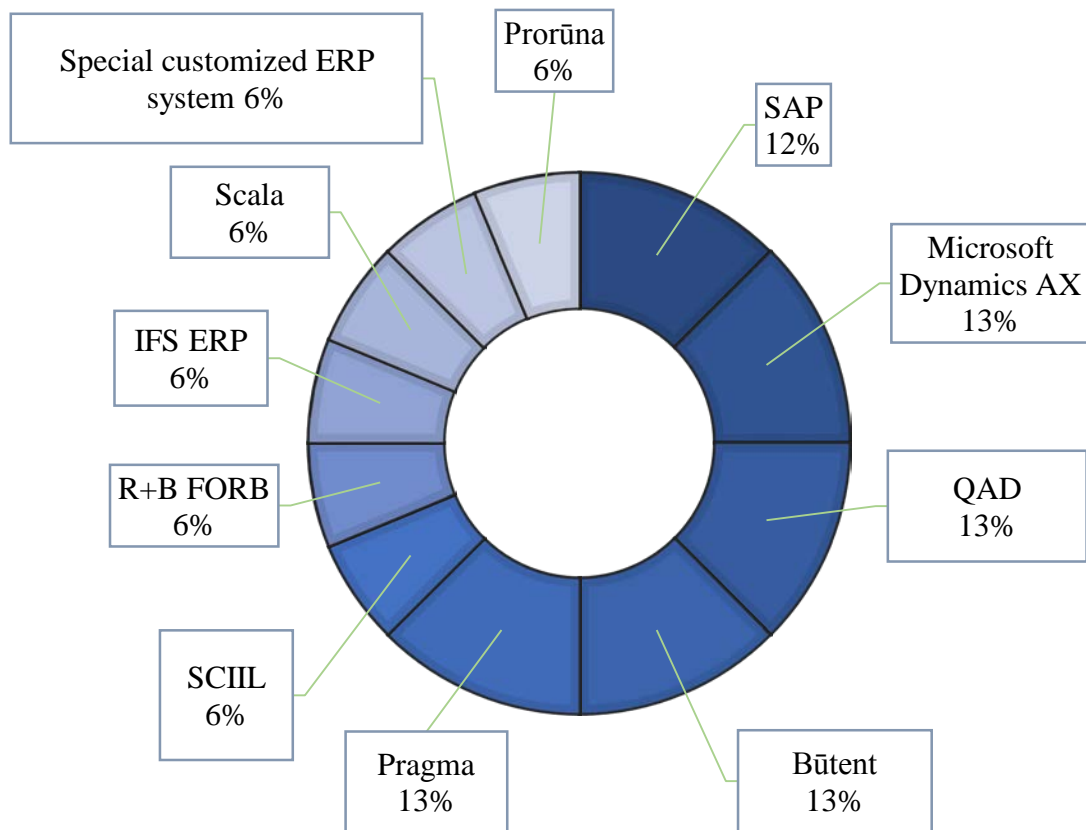


Fig. 2.3 The variety of ERP systems that are used in Lithuanian manufacturing enterprises

Almost all respondents are using different ERP systems. That is due to the various factors. The respondent companies are various scale companies including small, medium and large scale companies. For example ERP systems such as: SAP, QAD, Microsoft Dynamics AX are chosen by the large scale companies. ERP systems such as: Prorūna, Būtent, Scala are chosen by small or medium scale companies.

Some of the systems are having various modules that can combine different features such as quality control option is available in SCIIL system. Also Būtent or Prorūna are the ERP systems that are being developed in Lithuania itself. That means they are locally available, they have their

development departments nearby and naturally it is cheaper as combined with some international ERP systems such as SAP, or QAD that is why smaller companies are choosing such ERP systems.

So basically evaluating the distribution of various types of ERP systems it can be noted that dependent on the needs and possibilities of the company the ERP system is chosen and implemented.

2.1. ERP implementation problems in Lithuanian enterprises

With the increasing need of ERP system requirement it is quite obvious that implementation process can be quite complicated. It might cause some problems for the enterprises, especially when there many employees working in various departments. To integrate the company under one main IT system can be very challenging.

One of the major challenges that is being faced is long implementation period. Fig. 2.4 presents the ERP system implementation time of the respondents of ERP application survey.

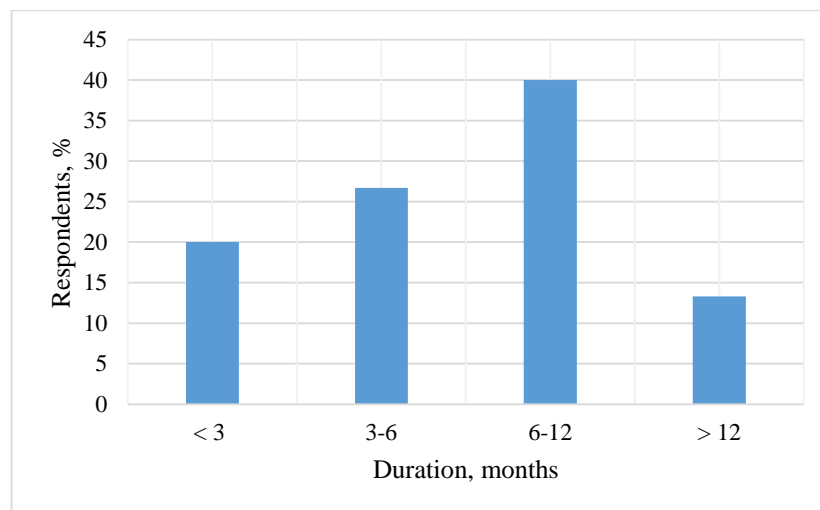


Fig. 2.4 Duration of ERP implementation

For six enterprises it took from 6 till 12 months to integrate ERP system in their companies. Two companies took more than a year and four companies took 3-6 months for system implementation. The duration varies mainly because of the different scales of the companies

Indirect factor influencing ERP implementation process is also the size of the company. Survey revealed that most of the respondents are big companies and the duration of ERP implementation in these companies vary mainly from 6 months to more than 12 months. The older and bigger the company the more complicated to implement ERP system. So following to that ERP should be implemented as early as possible in the enterprise when the company is not yet expanded and the

sectors can be joined together under ERP system comparatively easier than implementing ERP to the company that is already developed and having for example 300 employees.

Other reason for long implementation time is the purpose of ERP system application in the company. One company will use only few modules and functions of the ERP system and other will be joining whole company and its departments to one system, so it can result in long implementation time.

Other main ERP implementation problems, expressed by respondents of the survey, are provided in Fig. 2.5. Looking to the problems in more details the following can be analysed:

1. Employee training problems (33%). Usually it is required to provide additional training and courses for the employees that are using ERP system. If there are many employees in the company it can take more time to teach everybody how to use software. In addition to that, it can be difficult to change workers mind and understanding the advantages and value of ERP system application in the company.

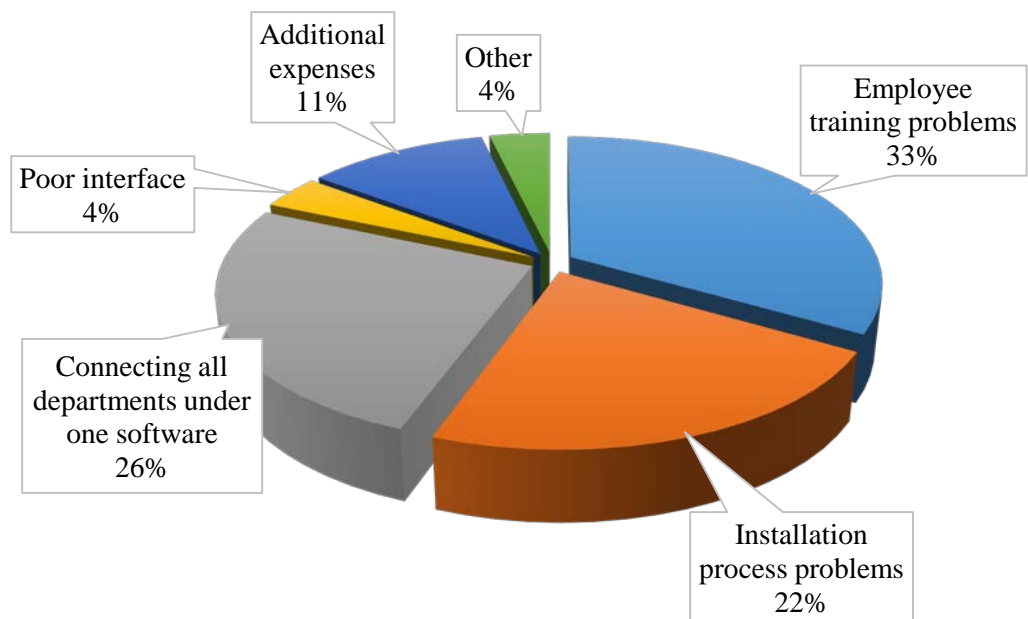


Fig. 2.5 ERP implementation problems

2. The difficulties to connect the whole company and all the departments to one system (26%). The bigger the company the greater the challenge to join all departments of the company to one system. Also as mentioned before if the company desires to implement ERP system completely in all the departments (manufacturing, finance, human resource, sales, etc.) there is a greater possibility of facing some joining issues.

3. Installation problems (22%). The installation process is quite slow in most of the companies; it takes from 6 to 12 month period to complete the installation. It is required to do some test runs of the system, investigate the performance of the ERP system. Continuous updates and program improvements have to be maintained as well.

4. Additional expenses (11%). Usually ERP system requires continuous learning and understanding of the working principles. So trainings for employees have to be organized regularly. In addition to this, system requires certain updates regularly. These all services are quite expensive so companies should be prepared for this issue in advance by planning their budget. For example, consulting expense usually is 30-50% of investment. The total service charge for installed ERP systems consultations in Lithuania vary from 150 till 500 Euros to local systems, and for “SAP” or “Oracle” usually costs around 1000-1200 Euros. The amount can vary dependently how many employees are using the system and what is the nature of appearing problems. [33].

These all issues appear due to the fact that the company has to sufficiently prepare for ERP installation beforehand, taking into account efficient project management, change management techniques. Internal audit should be carried out in order to know what exactly is required for the company. And lastly, companies should consult ERP consultancy companies regarding preparation to ERP system. Efficiently using suggested techniques amount of occurring problems could be eliminated or reduced [34].

2.2. ERP benefits in Lithuanian enterprises

Undergoing all the problems and challenges once the companies successfully integrate the ERP system in their company the benefits are clear and promising. Fig. 2.6 presents the results of the respondents' evaluation of change in daily processes of an enterprise after implementing ERP system in their company, which are the following:

1. The production quality has improved by 5 % for 7 enterprises and by 10 % for 6 enterprises. That means that the quality of the goods that they are producing have improved and there are less defective products due to the implemented ERP system.
2. Employee behaviour improved as well. 6 companies noticed 10 %, 4 enterprises – even 20 % and 4 companies – 5 % improvement. That means that after implementing ERP system employees has higher responsibility and their attitude towards their work in general has improved.
3. One of the greatest benefits is process efficiency increment. More than 66 % of respondents claimed that their process efficiency improved by 20 % and approx. 27 % respondents – by 5 %.

This is very promising number evaluating the factor that only ERP system was implemented in the company. In general process efficiency is what the companies are looking for to begin with. And it can be stated that ERP system clearly improves the process efficiency.

4. Customer and partner relations and competitive advantage of the company seems to be unchanged for most of the companies even though having ERP system implemented in the company is one of the features of being modern and advanced company being able to compete with global leaders. The competitive advantage and change in customer relations is rather subjective measure that is why it is quite complicated to actually measure it. And that is the reason why not many companies notice the improvement in this field.

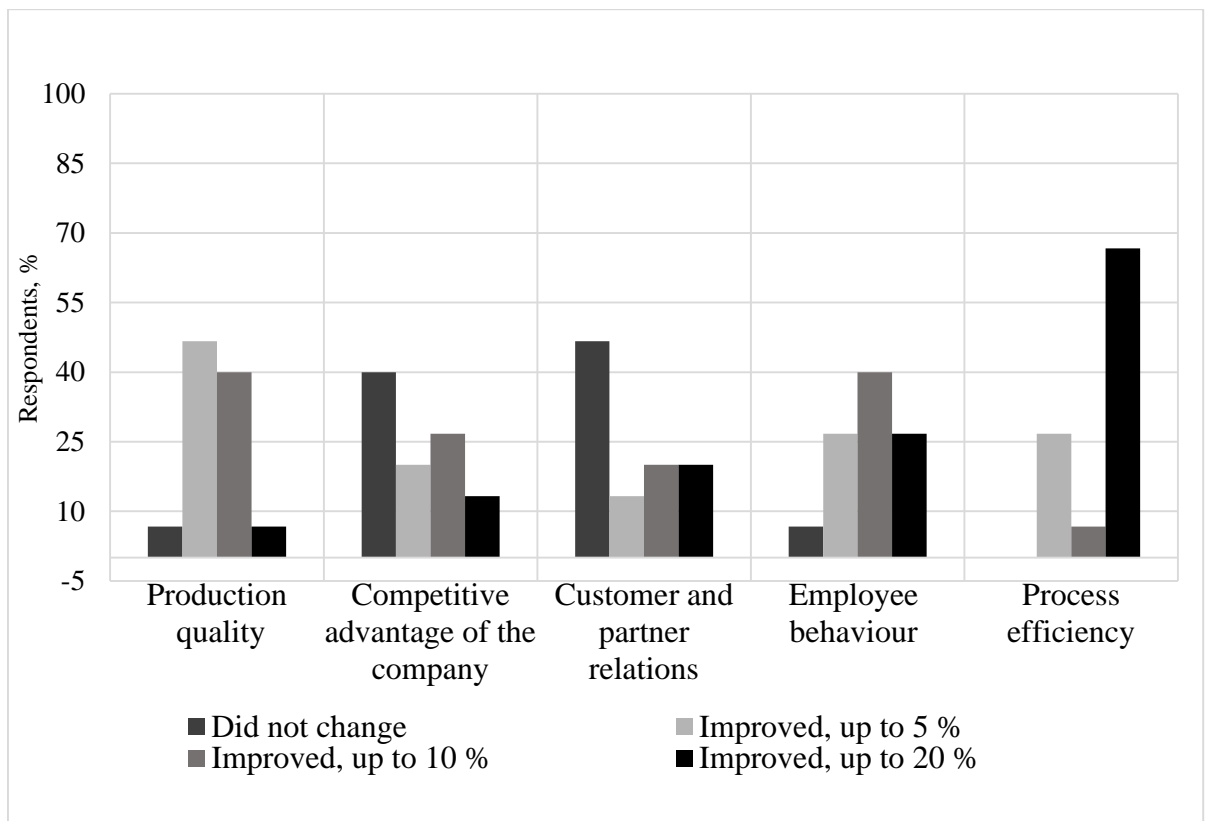


Fig. 2.6 Improvement in the company after ERP implementation

Taking into account the change presented in Fig. 2.5 it can be stated that the decision to implement ERP system for these enterprises is quite beneficial and worth investing especially to improve process efficiency, employee behaviour and production quality.

2.3. ERP implementation from enterprise perspective

Taking the survey results into consideration there was found out that there is no single favourite ERP system used in Lithuanian enterprises. The variety is big, dependently on the company's requirements and capacity.

The main issues concerning ERP system implementation are the following:

- time consumption,
- employee training problems,
- additional expenses,
- integration of whole company to one system process, etc.

As mentioned before it is advised for the company to prepare beforehand and to analyse in depth what is the ERP implementation process. All advantages and disadvantages should be kept in mind in order to follow the pattern of successful implementation.

Despite all the problems companies notice sufficient increase in process efficiency, customer and partners relationships as well as production quality.

2.4. Case study: risk evaluation of the investment on ERP in manufacturing company

In this part it is going to be analysed the case study of one company that have participated in survey. The name of the company is going to be used as Company "X" due to the confidentiality agreement. Company "X" is small-scale company (<50 employees) and it is manufacturing pillows, blankets, etc. from various fabrics and materials. The company is running since 2000. And started implementing ERP system since 2002. The ERP system is called "Prorūna" and developed by the IT solutions company under the same name "Prorūna" [35]. The representatives of the Company "X" states that after implementing the ERP system in their company the following change has been noticed:

- The processes has improved by 10%.
- The communications with partners improved by 5%.
- The workers attitude toward the work increased by 5% as well.

So in general the work environment after implementing ERP system "Prorūna" seems to be quite successful for the Company "X". This ERP system is customized and implemented in this

particular company. The Table 2.1 is indicating the timeframe how the company was developing the ERP system and what expenses were required for the integration steps.

Table 2.1 “Prorūna” ERP system application in the company “X”

	Year	Description	Cost, EUR
1.	2002	ERP pack DOS for accounting	434
2.	2003	ERP update (book-keeping functions)	87
3.	2004	ERP update (VAT implementation)	87
4.	2005	Update (changes of standards)	72
5.	2006	ERP update (adding raw material flows)	433
6.	2010	ERP update (adding accounting) (151 EUR) + monthly service charge for updates (23EUR)	174
7.	2014	ERP update (currency conversion to EUR)	222
8.	2015	ERP update raw material traceability in warehouse	500
9.	2015	Total Service charge for 5 years (since 2010-2015)	1390
		Total	3399

First of all the ERP was running in primitive DOS version meant for tracking simple companies operations and invoices. This was very basic and simple form of the ERP system which is only first steps of the ERP itself. It was comparatively cheap and cost 434 EUR in 2002. That time the currency was Litas and it was equal to 1500 LTL. And later on, year by year the ERP features were implemented, such as book-keeping in 2003, VAT (Value Added Tax) implementation in 2004, Raw materials flows added in 2006 for 433EUR. Later on in 2010 accounting updates were introduced and IT Company offered a contract for monthly 23EUR payment supply system updates and news.

Second, Lithuania has converted its currency Litas to Euro in 2014, so all the companies needed to convert their systems to Euros as well. And as it seen the ERP supplier’s required quite big amount of money (222 EUR) in order to convert the currency in the system. This kind of update is external factor, indirectly affecting the investment cost of the ERP system to the Company “X”.

In addition to this the Company “X” in 2015 implemented traceability function. The function is used in order to trace the location of the material in the warehouse. This was one of the most complicated updates that was evaluated by 500 EUR.

After this feature it can be stated that the Company “X” is using fully functioning ERP system in their daily processes. This information reveals that the Company “X” is slowly implementing various ERP features to the company and do not take any risks in their business. The ERP implementation long-term investment that in total it ended up in 3399 EUR for the company “X”. So the company is choosing safe strategy.

As mentioned before the company started functioning in 2000 and implemented ERP system in 2002. Table 2.2 presents the yearly income of the company in the time period of 2000-2015 and ERP development steps along.

Table 2.2 Comparison of the Company “X” income with the ERP cost

Year	Income, EUR	ERP costs, EUR	Ratio %
2000	-62437	0	0
2001	5805	0	0
2002	25073	434	1.7
2003	36312	87	0.2
2004	7364	87	1.2
2005	111869	72	0.1
2006	41547	433	1.0
2007	12904	0	0.0
2008	24036	0	0.0
2009	66900	0	0.0
2010	21536	174	0.8
2011	-1887	0	0.0
2012	37647	0	0.0
2013	56319	0	0.0
2014	370366	222	0.1
2015	139742	1890	1.4
Total, EUR	893097	3399	0.4

The table reveals that for the Company “X” ERP oriented expenses take only 0,4% of the total income of the company. Also the implementation process is long – it took 15 years for the ERP to become to what is called today an Enterprise Resource Planning system. So progressing in such scenario company took very safe pattern and did not focus on the ERP system as a main investment

of the company, just step by step implemented ERP system in order to be more productive and efficient.

Looking to the same ERP system cost today it can be seen that ERP supplier has fixed prices for various modules and services. Today the same ERP system “Prorūna” for the same company would cost including the following:

- Accounting module – 230 EUR;
- Long term book-keeping module – 230 EUR;
- Warehousing module – 230 EUR;
- Salary calculator module – 230 EUR;
- Material traceability module – 500 EUR;
- VAT invoice module – 60 EUR;
- Installation work, consultations – 185 EUR (planned time around 8h).

In total ERP package would cost **1480** EUR.

Table 2.3 Comparison of ERP pricelist (old and new version of "PRORŪNA" ERP system)

Description	Cost, EUR	
	Old	New
ERP package	434	415
ERP update (book-keeping functions)	87	230
ERP update (VAT implementation)	87	60
ERP update (adding raw material flows)	433	230
ERP update (adding accounting)	174	230
ERP update (raw material traceability in warehouse)	500	500
Total	1715	1480

Comparing the prices it can be seen that to implement ERP system would be cheaper today. First, the old ERP version was developed in many years step by step and various updates were tested and implemented. And today the implementation process became easier and structured. The computer technologies changed a lot since 2002. So it became a little easier to find solutions as there are many ERP systems developed today. Second, ERP supplier has to maintain the competitive advantage in comparison with other ERP suppliers so it has to offer competitive prices in order to maintain the customers. And last, the offer for 1480 EUR is the cost that would be required if the ERP system would be implemented at once with the above mentioned modules. That is why it is total price of ERP package today is cheaper.

3. ANALYSIS OF ERP SYSTEM IMPLEMENTATION PROCESS FROM ERP SYSTEM SUPPLIERS PERSPECTIVE

Enterprise resource management system integration in various enterprises is a quite complicated and quite long process. It is obvious when implementing completely new system to the enterprise some challenges and issues will come up that will have to be solved during the time. Various IT companies are developing ERP system modules and continuously investigating how to successfully integrate the new ERP system to the company or how to adapt the previous system to the current system.

In order to reveal what are the greatest challenges that IT companies are facing while implementing ERP systems there was a research made on several IT companies that provide ERP systems and implement them in various manufacturing enterprises in Lithuania and worldwide.

Firstly, analysis of IT Solution Company “ContourLab” processes was made. They provide “Contour Enterprise” ERP system. This system is made in Lithuania and being provided only for Lithuanian enterprises.

Secondly, situation was investigated in IT Solution Company “Pralo”. Even though this is also IT Company based in Lithuania they provide their “QAD ERP” product worldwide.

And thirdly, IT solution company “SCIIL AG” are providing Quality Control Systems “SCIIL” and integrating them together with various ERP systems such as SAP, Oracle etc. This company is providing their product worldwide. This research will reveal the biggest challenges in ERP integration process from IT Solution Company perspective.

3.1. Contour Enterprise implementation process in Lithuanian enterprises

In this chapter it is investigated how “ContourLab” is integrating their ERP system to various enterprises. Short introduction about the company is presented. There is given a small introduction to the strategy of the company and the main interest is oriented to the challenges of their ERP system “Contour Enterprise” implementation in enterprises.

About the company “Contour Lab”

“ContourLab” is IT Company that is based in Vilnius. They are providing their product -ERP system to the different enterprises and consultancy services regarding their ERP system “Contour Enterprise”. In addition to this “ContourLab” has a module specially created for manufacturing enterprises such as: textile manufacturing, food and beverage industry, window manufacturing, ventilation systems manufacturing, etc. [36].

According to the company within the years the demand for ERP systems in Lithuania is increasing. In the future this company is planning to create modules available in other languages so that the company could provide their product internationally. That would give a great competitive advantage to the company, however new challenges would appear as well due to the higher competition abroad. Ability to maintain the international standard by providing the services for international companies will be one of the greatest challenges.

Free of charge strategy

“ContourLab” are trying to prove that all work with one integrated system is way easier, less mistakes will occur and companies will result in improved quality and total productivity. This is being done by offering ERP system packages free of charge. Such a strategy in a developing country such as Lithuania is quite unique and promising. In that way companies can download service packages themselves and approach “Contour Lab” for consultancy purposes. That is the main focus of the IT Company: to consult, update systems, provide training, etc. [36].

ERP implementation process problems

Despite the fact that ERP systems are free of charge still some implementation problems occur and are recorded in “ContourLab”. According to the “ContourLab” representatives, the most common problems identified by the company are the following:

- Communication,
- Customer behaviour (demanding attitude, lack of knowledge),
- Wrong concept
- Fear of change

Communication problem. Usually communication issues appear when customers and retailers understand the requirements differently. Customer is expecting to get one function, and developer understands the need of the function in other way and at the end expectations do not match the requirements of the customer. Furthermore it takes time to find the routes of the problem, solve and explain to the customer.

Customer behaviour problem. Other issue that is foreseen is behaviour of the customer. While trying to agree on required conditions sometimes customer is demanding the impossible. There can be two different reasons why customer is behaving in such manner:

1) Strategy of “demand for impossible and get maximum”. Such customer is giving an unreasonably high expectation and requirements for the software installers in order to get the best

possible result. This concept is not exactly correct because it should be known and understood by the customer itself what he requires and what he wants.

2) “Demand for impossible” due to the lack of technical understanding. Such customers sometimes do not understand that system have limitation and restrictions and some solutions are not possible to be implemented in the enterprise.

Wrong concept. Customers are having wrong concept how ERP system should be implemented in the company. They have a vision of particular ERP system but they are unaware of the exact functions and purpose of that ERP. Then the customer is trying to bring about the required functions to the system, when sometimes that system is not meant to function in such way. Customer should know the exact need and imagine what functionality level he wants to achieve and then search for possible solutions not vice-versa.

Fear of change. As mentioned before Lithuania is developing country so many enterprises are still scared of changing and taking risks. In general companies understand the need and the requirement of ERP system integration in their company in order to keep competitive advantage in comparison with other companies. However there are still some companies that are willing to use separate software and solutions for different processes of the company as it was done in the past. They are thinking that separate software integration and implementation is easier. Companies do not need to change the system and management of the operations in general.

Problems created by “ContourLab”

Developers agree that sometimes they are rushing their customers to provide required features as soon as possible. Usually this happens because it takes long time to exactly agree on required conditions. When company is running daily sometimes due to some human factor (forgot, no time to inform, other factors) the definition of required ERP system can be delayed. In that case IT Company will also forget what was dealt before the required functions will be standardized and put to one system as a whole. In such cases it can lead to the loss of the client request, which would lead to loss of customer, product and profit for developers.

3.2. QAD ERP system implementation process internationally

In this chapter there is going to be investigated how IT-based Company “Pralo” is implementing the ERP system QAD ERP in various manufacturing companies. There is short description provided about the company, the process of integration of QAD is introduced and explained also the biggest implementation problems are identified.

About the company “Pralo”

“Pralo” is the IT based company is mainly interested in IT system integration in industry and logistics enterprises. Company is mainly focused in three main activities:

1. Integration of specialized ERP for manufacturing companies;
2. Distribution of worldwide acknowledged equipment;
3. Consulting, IT systems installation and maintenance services.

The company has long lasting cooperation with QAD Corporation (USA) which develop software products exclusively for manufacturing companies. It is QAD alliance partner and authorized solution centre in Lithuania, Latvia, Estonia and Belorussia [37].

QAD ERP implementation process

QAD Enterprise Applications Manufacturing suite is a complete and feature-rich suite addressing simultaneous, multi-mode manufacturing and provides full shop floor control of orders through the entire manufacturing process. It provides for mass customization of products in response to customer’s specific requirements, and measures and tracks performance and quality.

The solution provides tools for planning, scheduling, cost management, material control, shop floor control and reporting in, discrete, repetitive, multi- and mixed-mode, Kanban, flow, batch and formula process and co-product/by-products manufacturing basically all ERP modules are included. Streamline manufacturing planning and execution focuses on [38]:

- Incorporating best practices and enabling efficient coordination.
- Improving response time: enabling timely access to accurate planning information.
- Increasing customer satisfaction: allowing faster response to demand changes.
- Driving performance: measures performance to strategic goals and facilitates adoption of tactical plans.

QAD ERP implementation problems

Enterprise resource planning vendors that understand the compliance requirements, support customers' growth both globally and regionally, and deliver a unified and flexible cloud based solution capable of adapting to evolving business models will likely gain a strong leadership position in the market. QAD Cloud ERP meets those criteria. However some problems are still recorded and identified [40]:

- 1) *Insufficient information technology resources.* Automotive industry challenges vary depending on company size. At the lower end of the supply chain, companies often have insufficient IT resources, with one person often handling multiple roles. IT systems are not very well developed in the company.
- 2) *Lack of knowledge.* Some employees do not have time to develop a comprehensive understanding of and technical know-how pertaining to automotive manufacturing IT requirements. Conversely, multi-national corporations (MNCs) with headquarters in either North America or Europe struggle with global launch strategies. For instance, to establish a base in China, MNCs may need the supplier to outsource IT work so they can focus on more strategic matters.
- 3) *Compliance cost.* Irrespective of size, automotive companies must address global automotive industry cost concerns and compliance requirements. Compliance is critical and companies must also ensure they can meet all the quality and delivery standards prevalent in the global automotive industry. In addition, as automotive manufacturers grow, they must obtain comprehensive and real-time visibility across the different organizations and businesses they add.

3.3. ERP and Computer-Aided Quality assurance integration

In this part there is going to be presented Lithuanian IT Company “SCIIL” that is mainly orientated in Computer-Aided Quality Assurance (CAQ) process implementation in various manufacturing companies. Quality Assurance and ERP systems are very closely interrelated with each other. So the analysis of the integration process and problems occurring with the “SCIIL” software are analysed as well.

About the company “SCIIL AG”

The company was started 1999 in Lithuania, with a focus on IT services and software development in the Computer-aided Quality sector. Today headquarter of “SCIIL AG” is in Neuwied (Germany), Branch offices in Kaunas/Lithuania, Teda Tianjin (China South) and Wuhu (China North) and further local support offices in Australia, Italy and Russia. 90% of company’s customers are from automotive sectors such as: plastics, metal, injection moulding, electronic, components, seating, interiors, just-in-time and 10% other industries such as: medical apparatus, scientific institutes, railways [40].

The main industries of “SCIIL AG”

The automotive industry is the main focus of the company “SCIIL AG”. And the reason why automotive industry is the main interest is because that is extremely wide field connecting together different elements and products (for example the whole factory can be manufacturing only one part of one model of car such as car seat, engine or petrol bunk of the car). And especially in this field, many quality control systems and tools are used for factory automation and optimization, such as following standards - QS:9000 (It is a company level certification based on quality system requirements related specifically to the automotive industry. These standards were developed by the larger automotive companies including Ford, General Motors and DaimlerChrysler. This standard is obsolete and has been replaced by either ISO/TS 16949 or ISO 9001 [41], Lean Six Sigma (it is a managerial approach that combines Six Sigma methods and tools and the lean manufacturing/lean enterprise philosophy, striving to eliminate waste of physical resources, time, effort and talent, while assuring quality in production and organizational processes [42], etc.

In that case automotive industry is very effective so it is really beneficial to develop additional tools in order to improve processes. So the ERP and quality control software SCIIL is mainly focusing in this. In addition to this the company with its software “SCIIL AG” are already acknowledged in worldwide market.

Integration in foreign capital companies worldwide

“SCIIL AG” is having clients worldwide: Europe, Asia. The main clients are: Johnsons Controls – vehicle seat manufacturers and Federal Mogul – engine piston manufacturers. “SCIIL AG” is developing Manufacturing Execution System which is related with ERP system that is implemented in the companies. These systems are closely related with each other via database, communication between files and so on. Especially it is having very well developed communication with SAP ERP.

Integration in Lithuanian enterprises

At the moment there is only one client in Lithuania that is using SCIIL modules. It is “ACCEL electronics”. This company is manufacturing electrical components and sensors for vehicles. They are using Traceability module of SCIIL which is interrelated with SAP ERP system. This module is used for manufacturing orders.

The greatest benefit that collaborating with Lithuanian companies “SCIIL AG” is being a part of country development. In addition to this it is not required to communicate through Germany regarding some special issues and required specifications. The communication can be direct in Lithuanian because the SCIIL software developers are based in Lithuania itself.

“SCIIL AG” is having only one Lithuanian company as a client due to the reason that it is German based company and it is forcing more developed countries and companies. Unfortunately there is not enough information spread regarding the software SCIIL in Lithuania so companies do not know about the possibility to integrate such software. That is the reason why at the moment SCIIL is approaching Lithuanian Universities and provided some licenses. In this way some publicity will be gained and “SCIIL AG” can develop more in Lithuania as well.

At the moment company is spreading in China market. There are already few major customers using SCIIL software such as: “Yapp” – manufacturing petrol tanks for vehicles, “Yuan Wang” – manufacturing different tools and equipment for vehicle component production. In addition to this they have already opened a department in China “SCIIL Asia“. The overall future forecast of “SCIIL AG” is to increase the amount of customers worldwide and to give more importance to Lithuania as well.

SCIIL implementation problems

The main problems that SCILL is facing in its system integration within other systems are the following: Staff competence problems and fast employee change and sometimes language problems.

- 1) *Staff competence problems.* Sometimes employees are not able to exactly understand the working principles and function of the implemented system. This appears due to the lack of competence. Employees lack of training and understanding.
- 2) *Staff change.* Some companies are not able to maintain their employees for a long period of time so it is required to continuously train the enterprise staff by consulting about the same issues questions and working principles.
- 3) *Language problems.* There are not many problems with language usage. However some problems sometimes appear with the customers in Turkey or India where in some factories workers are unaware of English language. In Europe there are nearly no problems regarding language issue.

In addition to this there is one human factor related with the language. If the client is not speaking required language and there appears some errors or mistakes in the system sometimes customer will not inform due to the absence of common communication language.

- 4) *Distance.* Similarly as per absence of common language, when the distance is very big between enterprise where the system is implemented and IT Company some clients tend to not inform about the occurring errors or mistakes and later on it would lead to higher amount of malfunctions or damage of the system or production.

There was an example when in Sweden one company using SCIIL software informed that there is mistake occurring in the system. While checking online from the IT company there is no error seen and everything seems to be functioning just fine. In the end, when IT suppliers visited the factory the reason was found that some employees were manually proceeding some operations incorrectly in such a way that system cannot see the non-performance of an operation. That resulted in the loss of balance and optimization of the whole process.

3.4. Problems of ERP implementation from IT company perspective

As it is summarized in the table the main issues occurring in ERP implementation process from the IT companies' perspective are the following:

- Communication problems,
- Customer behaviour problems (lack of knowledge, lack of competence, language, etc.).
- Fear of change

Table 3.1 Summary of occurring problems from IT companies perspective

Company	Software	ERP client location	Identified Problems
“ContourLab”	Contour Enterprise	Lithuania	<ol style="list-style-type: none"> 1. Communication problem. 2. Customer behaviour problem. 3. Wrong concept. 4. Fear of change. 5. Rush.
“Pralo”	QAD ERP	International (Lithuania, Latvia, Estonia, Belarus, USA, etc)	<ol style="list-style-type: none"> 1. Insufficient IT resources. 2. Lack of knowledge. 3. Compliance costs.
“SCIIL AG”	SCIIL (ERP + CAQ)	International (Germany, China, India, Turkey, Lithuania, etc)	<ol style="list-style-type: none"> 1. Competence problems. 2. Staff change. 3. Language. 4. Distance.

Each ERP provided is having their particular problems specific to their situation and condition. “Contour Lab” phases many other local problems as they provide their ERP system free of charge many customers misunderstand the possibilities, are not very patient and tend to not trust the ERP system provider. On the other hand “SCIIL AG” faces language and distance problem because they work internationally. And “Pralo” with their QAD ERP system mainly have issues with companies IT resources, as well as costs.

3.5. ERP implementation and evaluation steps using process planning techniques

In order to find the core of the uprising problems the graphical depiction is very useful. Based on the analysis of ERP implementation process the main process steps can be identified:

- Ordering process (agreeing conditions, costs, modifications);
- Installation process (installing, testing, checking errors)
- Maintenance (checking performance, updating)
- Consultancy service process.

This process is visualized in Flow chart Fig. 3.1 below.

Within the process the distribution of tasks can be revealed. The orange colour boxes are indicating direct responsibilities of ERP system supplier and blue colour boxes indicate the steps and actions required to be developed by the company. It can be seen that more tasks are required to be done for the ERP supplier. Here is the analysis of the main steps given below.

Ordering process

Order received in sales management department. Usually companies are selling readymade software and it is required to integrate it in appropriate enterprise or adapt to some modules. In the case when order is completely new there is required to gather the full information: process plan, assembly lines, standards and specifications of the company, etc. Usually communication is being gathered via e-mail or telephone. Sometimes there are only guidelines provided. In that case project managers have to create a form/questionnaire to the customer and gather as much as possible information required for the application of the software. When order conditions are arranged the customer is providing some modifications from their own perspective till the agreement with final conditions is made. The cost of installation, development and integration is being discussed throughout all planning phase. Once the order is confirmed demo version is prepared and run. The communication with each customer differ dependently of the future prospects and type of modules required (standard, non-standard), etc.

Installation process

Installation equipment, hardware and inventory required for ERP system has to be prepared by the enterprise. Without a doubt, IT companies are providing the consultancy service regarding the installation requirements. Dependently from the project size the real installation of the ERP system can take up to ~2 weeks. Later on, testing works are being executed: optimization, errors eliminations, etc. After test run the IT developers track for some time the new integrated system process to make sure it runs all right.

Maintenance process

Maintenance should be performed regularly. Sometimes it is more beneficial to visit enterprise and see the real situation rather than connecting via Internet. When the technician is in place there is a higher possibility that errors will be resolved, some other damage causing factors will be found and eliminated at once.

Consultancy process

Consulting process is never-ending. Installation requirements, training, maintenance, etc. is required every time. Even though usually companies prepare for the enterprise staff operating and maintenance instructions questions usually still come up due to the various reasons: lack of understanding and competence, behaviour, etc.

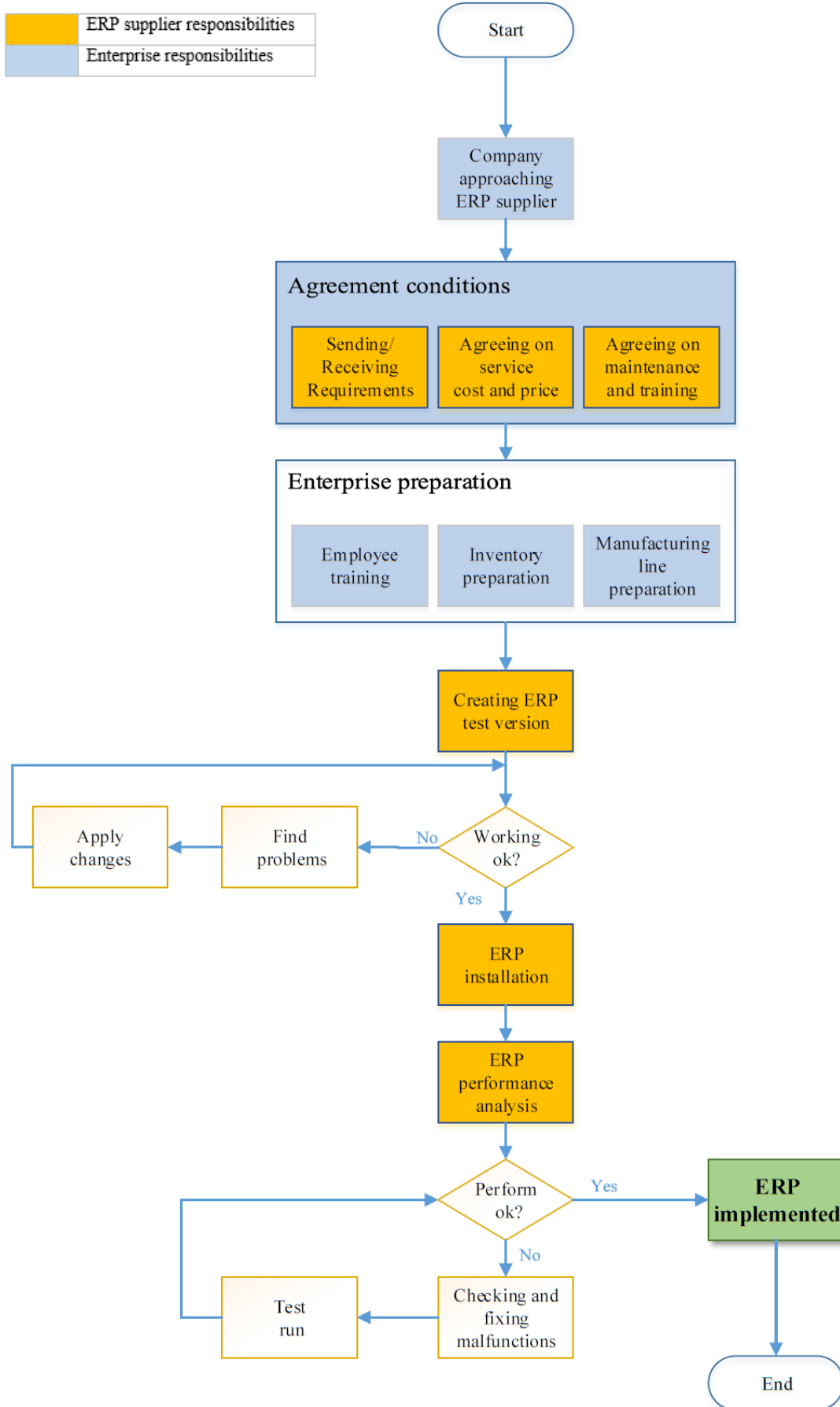


Fig. 3.1 Flow chart for ERP implementation process analysis

However the flow chart (in Fig. 3.1) did not reveal the time frame of each step so it cannot be seen which step is the most important and consuming the maximum amount of time. However the implementation time required can be revealed taking results from the survey provided to the companies earlier. Using the data Gantt chart has been created (Fig. 3.2) where the implementation time can be evaluated and investigated. The average time required for ERP system implementation taken into account is 12 months.

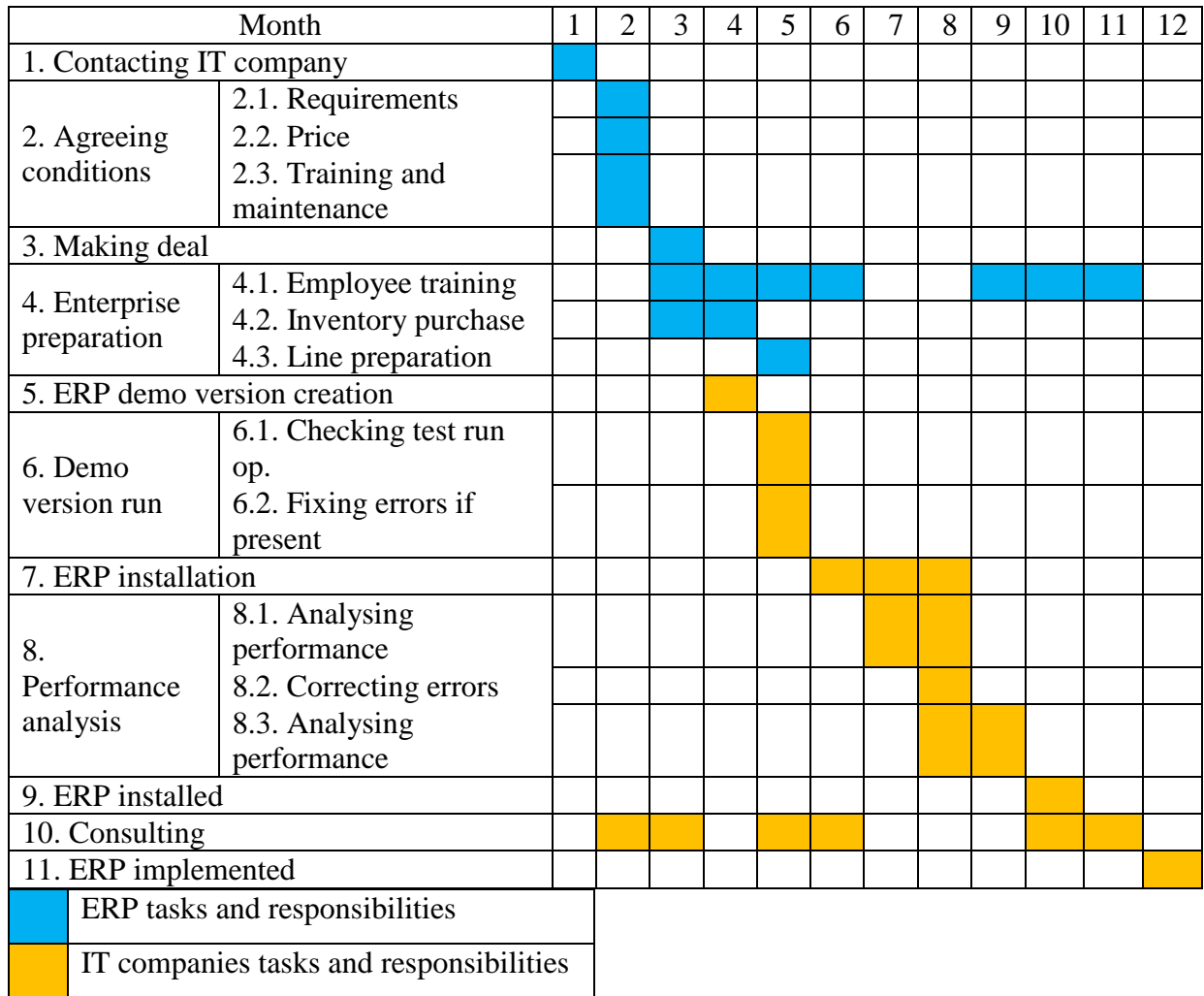


Fig. 3.2. Time and tasks distribution in ERP integration process using Gantt chart

Analysis using Gantt chart

Tasks 1-4 represent enterprise responsibilities, what it should do in order to fully integrate ERP system in the company. This should take into account that company should train and prepare employees, plan budget, purchase required inventory and so on.

As it is seen in the Gantt chart the longest process for the enterprise is the training process. That includes changing the mind-set of the employees, providing knowledge and understanding of ERP system, etc. Employee training should be performed regularly. Even though the training process

is one of the longest processes based on the information provided from ERP suppliers there are still many miscommunications and lack of knowledge as given in chapter 3.4. That means either employees are having too short time period for trainings or the training courses are inefficient.

In addition to this enterprises have to purchase (if required) new inventory such as computers, sensors, software, etc. in order to have efficiently running ERP system. The information what kind of inventory is required should be clearly defined by ERP supplier.

Tasks 5-11 represent the responsibilities of the IT Company. These include the following: consulting throughout the while process preparation and integration; installing the system, testing the system, analysing performance of the system and so on. From the ERP supplier point of view the longest process is providing consultations for the enterprise, and installing the software to the actual company.

ERP implementation process evaluation via Flow chart and Gantt chart

Flow chart provides the visual understanding what is the ERP implementation process and what are the steps required. Gantt chart shows the responsibilities of both parties distributed over the time. As it is seen in the Gantt chart the longest process for the enterprise is the training process. That includes changing the mind-set of the employees, providing knowledge and understanding of ERP system, etc. From the ERP supplier point of view the longest process is providing consultations for the enterprise, and installing the software to the actual company.

As it can be evaluated ERP system integration is two way process: both IT company and enterprise should cooperate together and be willing to understand each other in order to achieve successful ERP implementation faster and more efficient.

3.6. Improvement steps of the ERP system implementation process for future development

In order to improve the ERP implementation process in the companies the main problems should be carried out. Many problems were identified earlier in this work both from ERP users and ERP supplier's point of view.

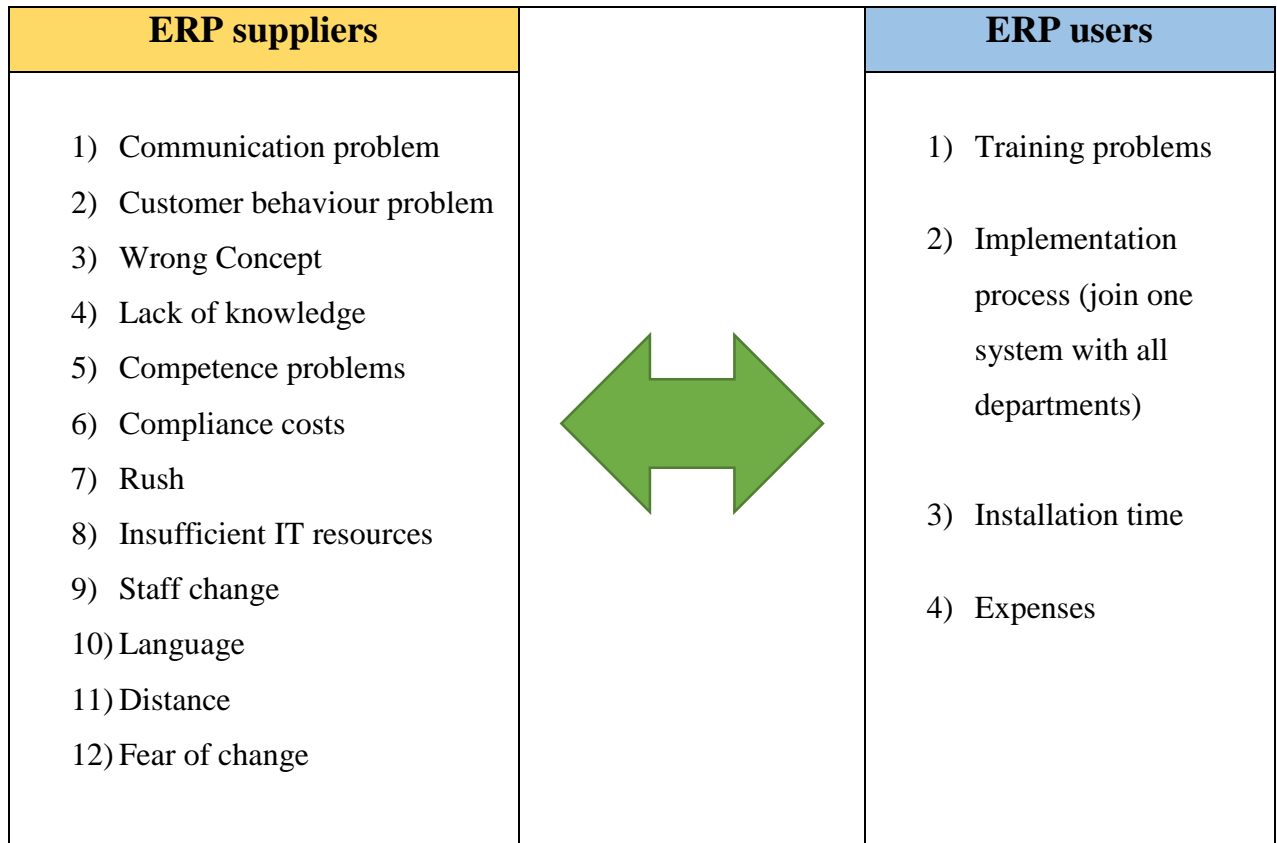


Fig. 3.3 Summary of ERP implementation problems

ERP suppliers revealed even 12 major problems in implementation process. And survey results provided in part 2 of this research revealed 4 main issues from ERP users. As it is seen from both sides problems are interrelated, just the information from ERP suppliers is more specific. However essential problems would be as follows:

1. Lack of training (or inefficient training), with lack of training comes lack of knowledge, wrong concept and customer behaviour problems.
2. Usually extra expenses are required for purchasing inventory as the users are having insufficient IT resources in their companies.
3. Customers are rushing and want implementation to be faster that is why sometimes also they can be rude and misunderstand required implementation steps.

4. Some other problems such as fear of change, common staff change. Sometimes even distance between supplier and end user can be a major issue.

Evaluating both the sides, the following suggestions and recommendations for future implementation process, are made: strict scheduling, standardization of request form and maximizing communication and involvement between ERP user and supplier.

Strict Schedule

Scheduling of the ERP implementation process. As it is seen schedule of the process steps is very important. To know the deadlines and forecasts of your process has to be implemented. Without scheduling the ERP process can take longer, and cost more. The enterprises as well as ERP suppliers should plan the time of implementation mutually, discuss about the deadlines and the most time consuming factors, such as training, etc.

After speaking with ERP suppliers it has been revealed that usually companies want to get ERP system as soon as possible. However that is not possible. The process should be the opposite – companies should strictly plan the implementation time frame. An example of ERP system implementation steps scheduling Gantt chart could be used (chapter 3.5).

Request form standardization

Introducing standard request form for each new project could improve implementation process. Every ERP supplier should have a structured request form where the enterprise identifies their needs and requirements for an ERP system. The form should contain of the project name, requirement, description and all the relevant and important information. The best form would be the survey concluding of closed questions (yes/no). In addition to this, companies should provide the process flow diagrams for ERP suppliers to get idea of how the company is working so get the better idea what features are required.

The example of the request form is given in Appendix 3. A request form of the SCIIL company for some modifications required to be implemented in some certain company. Such approach is a very successful in order to save time and fasten the processes. Not all the ERP suppliers are using the request form which sometimes ends up in miscommunication between the ERP supplier and the enterprise.

Maximising communication and involvement

Maximizing involvement and communication between supplier and enterprise. Both sides should be communicating and understanding the needs of each other. So that the enterprise prepares efficiently for ERP system as well the ERP supplier prepares for the implementation process.

This can be done by setting daily/weekly meetings and consultations. The ERP user should not be afraid to ask and explain its vision as well as ERP supplier should be willing to listen and understand the needs of the user as vice versa. Only then the successful and improved implementation can be obtained. Very often end users are not confident to ask some doubts after the implementation is done. That can end up in increase in errors and mistakes. That is why compulsory communication should be held regularly. As well as the mind-set of the users should be focused to the result and not fear of change.

CONCLUSIONS

Nowadays the tendency of having ERP system in an enterprise is a need and a requirement. But it is quite challenging to implement such a big system to entire company. In this research the implementation process of Enterprise Resource Planning systems in Lithuanian manufacturing companies was analysed.

In order to analyse ERP implementation process and detect the occurring problems the tasks that were developed in the beginning of the research revealed the following:

1. Overview revealed the ongoing trends in Lithuania – the industry is developing and companies are using ERP systems. The ERP systems in the Lithuanian enterprises are required for: planning daily processes (manufacturing, sales, finances, lab or, etc.), material requirement planning; quality, process and productivity improvement.
2. Success and failure factors of ERP implementation are the following: a) Success factors: good project management, change management implementation, undergoing internal audit. b) Failure factors: fear of change, interaction failure, correspondence failure, etc.
3. Analysis of the ERP system implementation process from enterprise perspective as well as from ERP supplier perspective was made.
 - a) Survey revealed the following information from enterprise perspective:
 - The main problems occurring in the enterprise: employee training problems, time consumption, additional expenses and integration of whole company to one system process.
 - The change in enterprises after implementing ERP system is the following: 5-10 % increase of quality, 10-20 % improvement of employee behaviour, process efficiency increment mainly by 20%.
 - On the other hand competitive advantage and customer relationships slightly improved or has not changed due to the fact that it is subjective factor and it is complicated to measure it.
 - b) ERP supplier issues where revealed by interviewing three ERP supplier companies providing ERP system to the enterprises. The main issues are the following: lack of understanding of staff; communication problems, wrong concept; fear of change, lack of competence, distance.
 - c) The analysis and evaluation of ERP system integration process using process planning tools was made. This revealed the repeating factor that integration of ERP system is

mutual and both parties should be willing to understand and communicate with each other as much as possible in order to achieve successful ERP implementation.

4. Future suggestions for improvements were made and investigated, the most effective improvement plan would be the following: ERP implementation scheduling, implementing request form in order to understand the mutual needs; maximize the involvement of the ERP supplier and enterprise by compulsory setting meetings and discussion times.

Taking everything into consideration this research has been done in order to reveal the both sides ERP users and ERP suppliers and suggest implement mutual improvement plan so ERP systems could function more efficiently. If suggestions for process improvements would be followed this pattern can become a successful way to help to develop Lithuanian enterprises as well as country itself faster.

REFERENCES

1. Enterprise Resource Planning definition. [accessed 2015-04-10] www.whatis.com
2. Senkuvienė I., Mankutė R. Computer aided manufacturing and quality management systems [e-source]: learning book, Kaunas university of technology, Department of manufacturing technologies, Kaunas : Technologija, 2013, 1 internet source (73 p.), ISBN 9786090210222. (in Lithuanian)
3. Verslilietuva.lt. [accessed 2015-04-25]. <http://www.enterpriselithuania.com>
4. Enterprise Solutions. [accessed 2015-04-25] <http://www.erp-is.com/solutions>
5. Oficialus statistikos portalas. [accessed 2015-04-27] <http://osp.stat.gov.lt/>.
6. Worldbank. [accessed 2015-05-05] <http://www.worldbank.org>
7. Mankutė R., Bargelis A. 2010. Inter-Countries Research for Manufacturing Advancement in Lithuania, Proceedings of 15th Int. Conf. Mechanika-2010, Kaunas University of Technology, Lithuania, 287-292
8. Verslilietuva.lt. [accessed 2015-05-25]. <http://www.enterpriselithuania.com>
9. Verso valdymo sistemų gidas. [accessed 2015-06-01] <http://www.vvsgidas.lt/>
10. Būtent programos. [accessed 2015-04-27] <http://www.butent.lt/>
11. Gamybos Kompanijoms - Apskaitos Ir Verslo Valdymo Sistema Apskaitos Ir Verslo Valdymo Sistema. [accessed 2015-04-28] <http://contourenterprise.lt/>
12. Manufacturing and Distribution. Microsoft Dynamics. [accessed 2015-04-25] <http://www.microsoft.com/en-us/dynamics/manufacturing.aspx>
13. Projektas įmonių Grupėje „Grigiškės“: atnaujinta MS Dynamics AX Versija ir įdiegta Sistema įmonėje „Klaipėdos Kartonai“. [accessed 2015-04-28] <http://www.blu-e.lt>
14. Microsoft Dynamics AX Reviews. [accessed 2015-04-25] <http://technologyadvice.com/>
15. Enterprise Management. SAP ERP. [accessed 2015-04-26] <http://go.sap.com/product/>
16. Sprendimai Verslui. [accessed 2015-04-25] <http://www.spreadway.lt/2f1/JV%204v.pdf>
17. SAP ERP reviews. [accessed 2015-04-26] <http://technologyadvice.com/sap-erp-reviews/>
18. Gamybos Valdymo Sistema QAD. [accessed 2015-04-25] <http://www.softconsulting.lt/>
19. Enterprise Solutions. [accessed 2015-04-25] <http://www.erp-is.com/solutions>
20. Grabski S., Leach S., Sangster A. 2009. Management Accounting in Enterprise Resource Planning Systems. Amsterdam. p. 10
21. BooYoung C., An analysis of success and failure factors for ERP systems in engineering and construction firms, 2007 p.150
22. Grabski S., Leach S., Sangster A. 2009. Management Accounting in Enterprise Resource Planning Systems. Amsterdam. p. 11

23. Shi. Y. 2010 Application research of project management in ERP system implementation process. Emergency Management and Management Sciences, IEEE International Conference on, Beijing p. 68 - 71.
24. Trepper. C., 1999 “ERP Project Management Is Key to a Successful Implementation”.
25. Anees A., The Role and Impact of Project Management in ERP Project Implementation Life Cycle. Change management models. [accessed 2016-01-16] <http://citeseerx.ist.psu.edu>
26. Enterprise Resource Planning Well-aligned with Business Processes. [accessed 2016-01-19]
27. Manahan A., Chan W. Internal Audit’s Role in ERP Implementations [accessed 2016-01-19] <http://www.crowehorwath.com>.
28. Panorama Consulting Solutions. [accessed 2016-01-19] <http://panorama-consulting.com>
29. Grabski S., Leach S., Sangster A. 2009. Management Accounting in Enterprise Resource Planning Systems. Amsterdam p. 12
30. The Real Reasons Why ERP Implementations Fail to Deliver to Expectations. [accessed 2016-01-19] <http://panorama-consulting.com>
31. Yangsheng Zhong. The Economic Theory of Developing Countries' Rise 2005. p. 233
32. Pabrėžaitė G., Mankutė R. 2016 Investigation of ERP system application in Lithuanian Enterprises, Proceedings of 21st International Conference. Mechanika. 2016, Kaunas University of Technology, Lithuania
33. Enterprise solutions [accessed 2016-02.16] <http://www.erp-is.com/solutions>.
34. Grabski S., Leach S., Sangster A. 2009. Management Accounting in Enterprise Resource Planning Systems. Amsterdam 149p.
35. Prorūna. [accessed 2016-05-02] www.proruna.lt
36. Contour Enterprise. Apskaitos Ir Verslo Valdymo Sistema. [accessed 2016-01-19] www.countourenterprise.lt
37. About Us – Pralo [accessed 2016-01-19] www.pralo.lt
38. Guide for Investigator Initiated Trials [accessed 2016-04-23] <http://www.pralo.lt/uploads/>
39. QAD Customer Case Study. [accessed 2016-02-20] <http://www.qad.com/documents/case-studies/uptime-parts-qad-case-study.pdf>
40. Sciil. [accessed 2015-05-20] <http://www.sciil.eu/>
41. Certifications. [accessed 2016-05-14] <http://certifications.thomasnet.com/certifications>
42. Lean six sigma. [accessed 2016-05-15] <http://www.investopedia.com/terms/l/lean-six-sigma.asp>

APPENDICES

1. Pabrėžaitė G., Mankutė R “Investigation of ERP system application in Lithuanian Enterprises”, Proceedings of 21st International Conference. Mechanika. 2016, Kaunas University of Technology, Lithuania (5 pages)
2. Questions of the survey “ERP system implementation” (4 pages)
3. Questionnaire given to the representatives of ERP suppliers (1 page)
4. Example of standard project form from company SCIIL (2 pages)

Investigation of ERP system application in Lithuanian Enterprises

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1. Introduction

Enterprise Resource Planning (ERP) is the system that provides an integrated view of core business processes. It is required to use common databases maintained by a database management system. ERP systems track business resources – cash, raw materials, production capacity – and the status of business commitments: orders, purchase orders, and payroll. Today ERP systems are becoming inevitable and very important in manufacturing enterprises [1]. Such systems are being developed by various IT solution companies according the requirements on an enterprise.

Today there are hundreds of systems available and it is quite challenging to know which system would suit the best needs of the company. The companies can choose from various ERP system suppliers locally or internationally. One of the most widely spread ERP system users are manufacturing companies. That is because in various modules of ERP system not only financing and accounting, but also the manufacturing process and raw materials are recorded. So it is important to investigate how ERP systems are used in order to understand where the greatest challenges of application appear.

One of the main targets of this work is to provide an investigation of tendencies of computerization process of Lithuanian Enterprises and to get an idea how efficiently ERP systems are used in Lithuania.

2. Overview of ERP systems usage in Lithuanian Enterprises

ERP systems are being more and more popular in various enterprises in Lithuania. Investigation of ERP systems development and application in Lithuanian En-

terprises revealed that there are over 300 local Lithuanian IT companies that are developing, selling and installing over 900 local and foreign ERP systems, such as: UAB Būtentā provide their own ERP system called under the name “Būtentā”; UAB Contour Lab offer “Counter Enterprise system”; UAB Baltijos kompiuterių centras offer “ERP DAFO system”, etc. International ERP systems are used in Lithuanian Enterprises as well. For example UAB Epicor Software Lietuva offers “Epicor Vantage” software, UAB Microsoft Lietuva offers “Microsoft Dynamics NAV” or “Microsoft Dynamics XA”. However the leading ERP systems within large scale companies are „SAP”, “Bann”, “TD Edwards“, “Oracle“ and “People soft“. These systems can process huge amount of data and it is best suiting solution for the big scale companies. Medium scale companies usually choose ERP systems such as: “Microsoft Dynamics“, “Scala”, “R&B FORB“, “Monitor” or “Hansa”. These systems provide flexibility, user friendly environment so it is best suiting for medium scale companies [2].

Cost of license of complex systems in Lithuania is usually smaller because the cost of additional installation, testing, loading work is higher. International universal ERP system license price vary: “SAP” approximately 4000 Euros, “Oracle E-Business Suite” – from 1500 Euros for small and medium companies till 4000 Euros for big scale companies, “Microsoft Dynamics” – around 1500 Euros. For micro companies ERP license price is smaller and can vary from few hundreds till few thousand Euros [3].

The comparison of ERP usage in Lithuanian enterprises by the size of the company, based on information provided in Lithuanian Statistics department, is presented in Fig. 1.

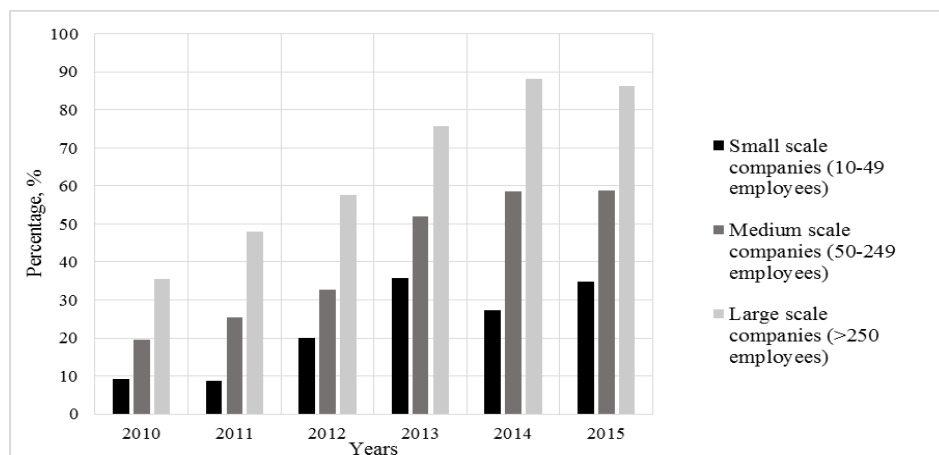


Fig. 1 ERP usage in Lithuanian Enterprises by the size of the company [4]

For small scale enterprises (10-49 employees) from 2010 to 2015 the usage has increased from approximately 9% to nearly 35%, in medium scale companies (50-249 employees) – from approx. 20% to nearly 59%. And if the enterprise is large scale it is nearly impossible to not have an ERP system implemented in the company. Analysis revealed that more than 86% of large enterprises (>250 employees) in 2015 were using ERP system [4]. It is seen that the ERP usage increased 2.4 times comparing with the result in 2010 when the ERP usage was around 36%.

Evaluating the tendencies it can be stated that the bigger the company the higher the need and the requirement of having and implementing ERP system in an enterprise.

3. Survey analysis: ERP system utilization in Lithuanian Manufacturing Enterprises

The survey regarding the usage of ERP system was conducted in various manufacturing companies in Lithuania. The main aim of this survey was to analyze the tendencies of ERP system implementation in Lithuanian companies. In addition to this, the analysis was focused on finding the biggest challenges of ERP system integration in medium and large scale enterprises in Lithuania.

The change of the processes and operations in the enterprise was analyzed after the ERP system implementation in the company. Results were conducted of 15 various scale manufacturing enterprises in Lithuania including: metal manufacturing, chemistry, electrical components manufacturing, wood manufacturing, metal processing, textile industry, etc. In general the various innovative systems are more commonly used in manufacturing companies [5]. Manufacturing field was chosen due to the reason that ERP system can be utilized maximum in manufacturing company, because such system can involve all the departments of the company in daily processes, including manufacturing itself.

The scales of companies that responded to the survey is presented in the Fig. 2. One company is having more than 1000 employees, 2 companies are very large as well 501-1000 employees and the maximum amount of respondents (7 companies) are containing 101-500 employees which means that the biggest part of respondents represent medium or large scale enterprise. Taking these numbers into account we can see that enterprises are really big and important in Lithuanian manufacturing industry, knowing the fact that Lithuania is developing country, so the evaluation how they use and implement ERP system is very valuable as well.

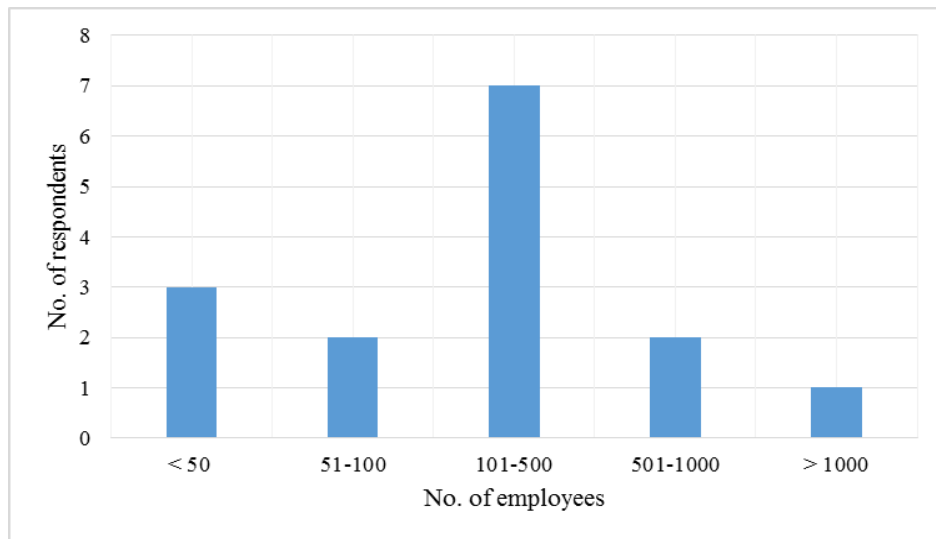


Fig. 2 Company size per number of employees

3.1. Reasons of choosing ERP system

In general ERP system is required in order to fasten and optimize all the processes that are being held in the company. So naturally companies believe that using ERP system can be very profitable and efficient for them. The reasons why ERP systems are required for the enterprises are listed in the Fig. 3.

Analysis of survey revealed that 44% of respondents use ERP system due to the need to plan their processes and daily operations such as: manufacturing, purchases, sales, etc. So this should be the main reason why manufacturing enterprises need ERP system. 19% respondents need ERP system because they feel the increasing requirement of Computer Aided Manufacturing and Management systems used in companies. Application

of such systems naturally increases the competitive advantage of the company. However, only 3% of respondents are taking initiative to try new technologies and implement ERP system. The reason why this number is very low is that ERP system is quite risky investment, companies want to be safe and choose ERP system only after careful investigation and analysis. In addition to this 16% of companies require ERP system for material planning and control, i.e. the raw material flows and conversion to the final product need to be tracked efficiently also the waste and damage can be measured and recorded using ERP system. Other important factors are the need to improve the product and process quality (9%) and in general the need to improve the productivity of the company (9%). The information recorded in ERP system should help to improve operations performed in the enterprise. It

should help systemize the processes performed daily in the company.

All factors mentioned in Fig 3 lead to the increasing usage of ERP system implementation in various manufacturing companies in Lithuania.

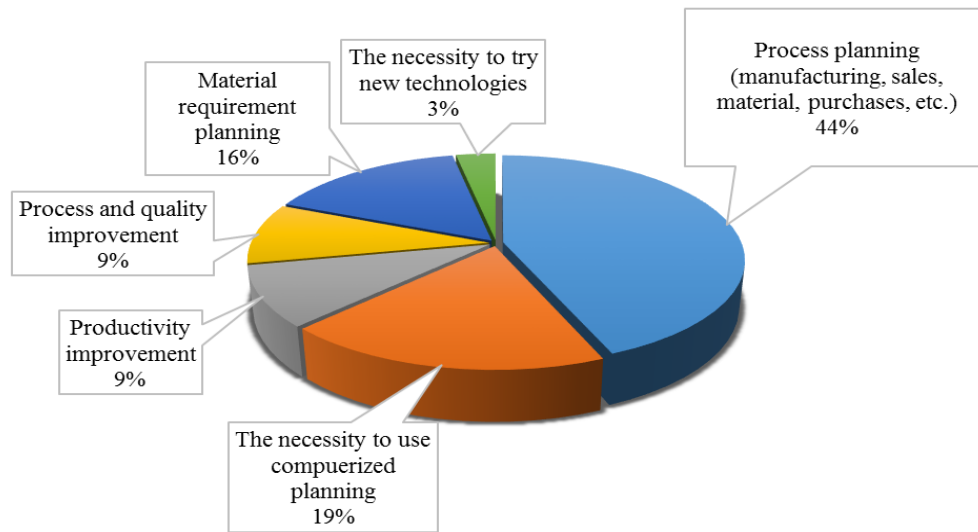


Fig. 3 The need for ERP system in the enterprise

3.2. ERP implementation problems in Lithuanian enterprises

With the increasing need of ERP system requirement it is quite obvious that implementation process can be quite complicated. It might cause some problems for the enterprises, especially when there many employees working in various departments. To integrate the company under one main IT system can be very challenging.

One of the major challenges that is being faced is long implementation period. Fig. 4 presents the ERP

system implementation time of the respondents of ERP application survey. For six enterprises it took from 6 till 12 months to integrate ERP system in their companies. Two companies took more than a year and four companies took 3-6 months for system implementation. The duration varies mainly because of the different scales of the companies. Other reason for long implementation time is the purpose of ERP system application in the company. One company will use only few modules and functions of the ERP system and other will be joining whole company and its departments to one system, so it can result in long implementation time.

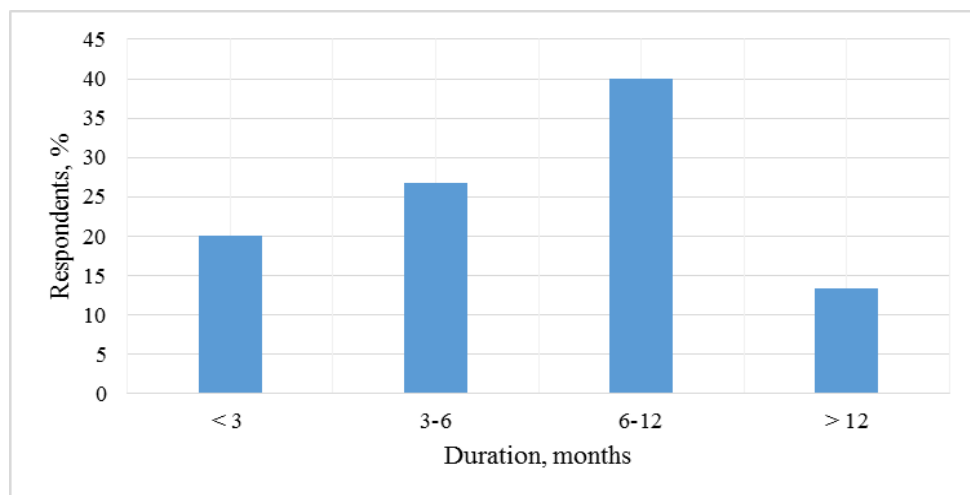


Fig. 4 Duration of ERP implementation

Analysis of survey results is given in Fig. 5 and Fig. 6. In Fig. 5 there are listed another challenges that enterprises usually face while implementing ERP system:

1. Employee training problems (33%). Usually it is required to provide additional training and courses for the employees that are using ERP system. If there are many employees in the company it can take more time to teach everybody how to use software. In addition to that,

it can be difficult to change workers mind and understanding the advantages and value of ERP system application in the company.

2. The difficulties to connect the whole company and all the departments to one system (26%). The bigger the company the greater the challenge to join all departments of the company to one system. Also as mentioned before if the company desires to implement ERP system

completely in all the departments (manufacturing, finance, human recourse, sales, etc.) there is a greater possibility of facing some joining issues.

3. Installation problems (22%). The installation process is quite slow in most of the companies; it takes from 6 to 12 month period to complete the installation. It is required to do some test runs of the system, investigate the performance of the ERP system. Continuous updates and program improvements have to be maintained as well.

4. Additional expenses (11%). Usually ERP system requires continuous learning and understanding of

the working principles. So trainings for employees have to be organized regularly. In addition to this, system requires certain updates regularly. These all services are quite expensive so companies should be prepared for this issue in advance by planning their budget. For example, consulting expense usually is 30-50% of investment. The total service charge for installed ERP systems consultations in Lithuania vary from 150 till 500 Euros to local systems, and for "SAP" or "Oracle" usually costs around 1000-1200 Euros. The amount can vary dependently how many employees are using the system and what is the nature of appearing problems. [3].

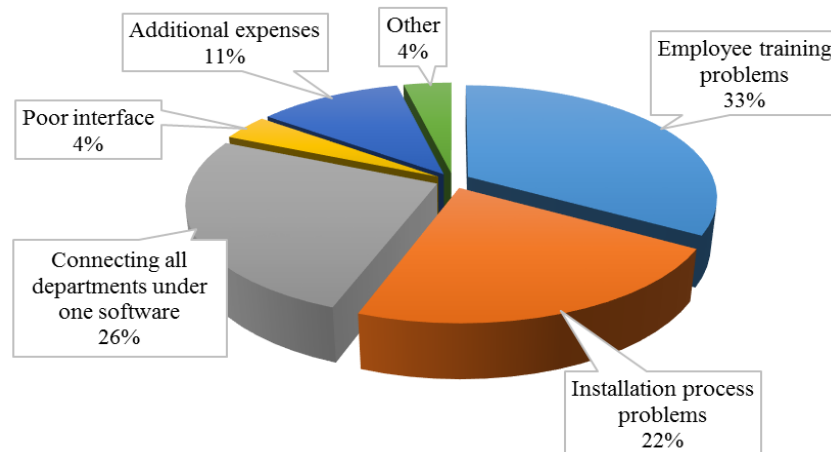


Fig. 5 ERP implementation problems

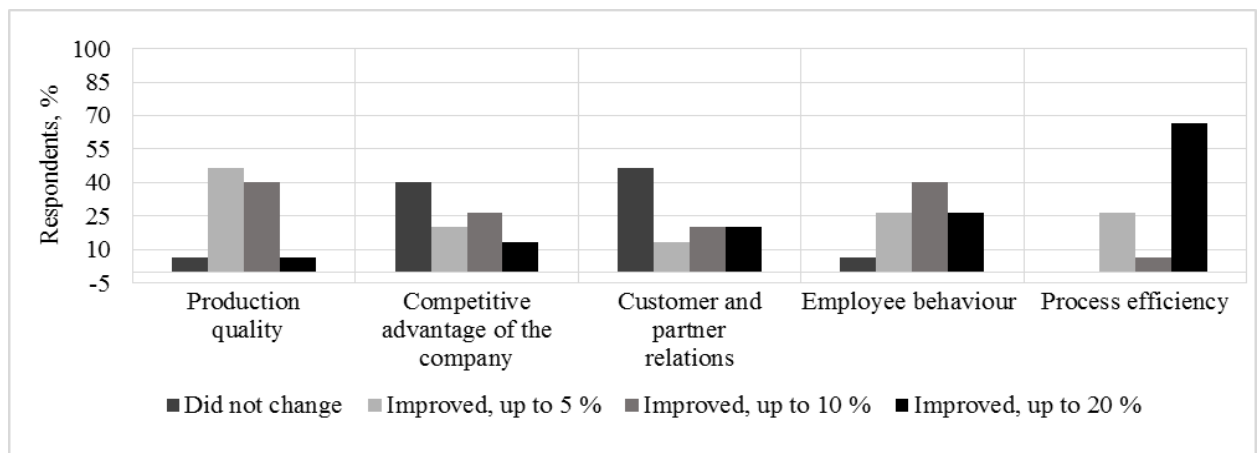


Fig. 6 Improvement in the company after ERP implementation

These all issues appear due to the fact that the company has to sufficiently prepare for ERP installation beforehand, taking into account efficient project management, change management techniques. Internal audit should be carried out in order to know what exactly is required for the company. And lastly, companies should consult ERP consultancy companies regarding preparation to ERP system. Efficiently using suggested techniques amount of occurring problems could be eliminated or reduced [6].

3.3. ERP system advantages in Lithuanian enterprises

Undergoing all the problems and challenges once the companies successfully integrate the ERP system in their company the benefits are clear and promis-

ing. Fig. 6 presents the results of the respondents' evaluation of change in daily processes of an enterprise after implementing ERP system in their company, which are the following:

1. The production quality has improved by 5% for 7 enterprises and by 10% for 6 enterprises. That means that the quality of the goods that they are producing have improved and there are less defective products due to the implemented ERP system.

2. Employee behaviour improved as well. 6 companies noticed 10%, 4 enterprises – even 20% and 4 companies – 5% improvement. That means that after implementing ERP system employees has higher responsibility and their attitude towards their work in general has improved.

3. One of the greatest benefits is process efficiency increment. More than 66 % of respondents claimed that their process efficiency improved by 20 % and approx. 27 % respondents – by 5 %. This is very promising number evaluating the factor that only ERP system was implemented in the company. In general process efficiency is what the companies are looking for to begin with. And it can be stated that ERP system clearly improves the process efficiency.

4. Customer and partner relations and competitive advantage of the company seems to be unchanged for most of the companies even though having ERP system implemented in the company is one of the features of being modern and advanced company being able to compete with global leaders. The competitive advantage and change in customer relations is rather subjective measure that is why it is quite complicated to actually measure it. And that is the reason why not many companies notice the improvement in this field.

Taking into account the change presented in Fig. 6 it can be stated that the decision to implement ERP system for these enterprises is quite beneficial and worth investing especially to improve process efficiency, employee behaviour and production quality.

4. Conclusions

1. The overview revealed that ERP systems are quite commonly used in Lithuanian enterprises. Nearly 90 % of large enterprises are using ERP systems in Lithuania. The bigger scale of the company the more important it is to use ERP system.
2. The ERP systems in the Lithuanian enterprises are required for: planning daily processes (manufacturing, sales, finances, lab or, etc.), material requirement planning; quality, process and productivity improvement.
3. The problems occurring in ERP system implementation process are the following: employee training problems, time consumption, additional expenses and integration of whole company under one system process.
4. The change in enterprises after implementing ERP system is the following: 5-10 % increase of quality, 10-20 % improvement of employee behaviour, process efficiency increment mainly by 20%. On the other hand competitive advantage and customer relationships slightly improved or has not changed due to the fact that it is subjective factor and it is complicated to measure it.
5. Implementing ERP system to the company is quite challenging. Enterprises have to be ready for major changes in the company before implementing ERP system. Careful calculations and forecasts should be held regularly in order to have a successful implementation of an ERP system in a company.

References

1. What Is ERP (Enterprise Resource Planning)? [accessed 02.02.2016]. Available from Internet: <http://www.whatis.com>.

2. **Senkuvienė I., Mankutė R.** 2013. Computer aided manufacturing and quality management systems e-source]: learning book, Kaunas university of technology, Kaunas: Technologija, 73p., (in Lithuanian) [accessed 10.01.2016]. Available from Internet: <https://www.ebooks.ktu.lt/eb/1271/kompiuterinio-gamybos-ir-kokybes-valdymo-sistemas/>.
3. Enterprise Solutions [accessed 15.02.2016]. Available from Internet: <http://www.erp-is.com/solutions>.
4. Statistics Lithuania [accessed 10.02.2016]. Available from Internet: <http://www.stat.gov.lt/>.
5. **Mankutė R., Bargelis A.** 2010. Inter-Countries Research for Manufacturing Advancement in Lithuania, Proceedings of 15th Int. Conf. Mechanika-2010, Kaunas University of Technology, Lithuania, 287-292.
6. **Grabski S., Leech S., Sangster A.** 2009. Management Accounting in Enterprise Resource Planning Systems. Amsterdam, 149p.

G. Pabrėžaitė, R. Mankutė

INVESTIGATION OF ERP SYSTEM APPLICATION IN LITHUANIAN ENTERPRISES

S u m m a r y

This paper describes ERP system application in Lithuanian Enterprises. The overview of ERP system usage in Lithuanian Enterprises is provided. The survey was conducted in various manufacturing companies in Lithuania so the results of the survey are presented and investigated. The need for ERP system is revealed, occurring problems investigated and the improvement process after ERP system implementation is provided. Evaluation on ERP implementation process development is given.

Keywords: ERP system, implementation, usage, development.

1. Kokia Verslo valdymo sistema (Enterprise Resource Planning system) yra naudojama Jūsų įmonėje?

- | | |
|---|---|
| <input type="checkbox"/> SAP ERP | <input type="checkbox"/> Epicor |
| <input type="checkbox"/> Microsoft Dynamics NAV | <input type="checkbox"/> Labbis |
| <input type="checkbox"/> MS Dynamics AX | <input type="checkbox"/> Naviranta |
| <input type="checkbox"/> Oracle | <input type="checkbox"/> Pragma |
| <input type="checkbox"/> Contour Enterprise | <input type="checkbox"/> Rivilè |
| <input type="checkbox"/> QAD | <input type="checkbox"/> SCIL |
| <input type="checkbox"/> Būtent | <input type="checkbox"/> <input type="text"/> |

2. Ar tai pirma VVS, įdiegta Jūsų įmonėje?

- Taip
 Ne

3. Jei ne, tai kodėl nusprendėte pakeisti Verslo valdymo sistemą?

4. Kelintais metais Verslo valdymo sistema įdiegta Jūsų įmonėje?

- Iki 1995
 1995-1999
 1999-2003
 2003-2007
 2007-2010
 2010-2014
 Po 2014

5. Kokių tikslų išsigijote Verslo valdymo sistemą?

- Įmonės procesams (gamybai, pardavimams, sąnaudoms, pirkimams) planuoti
 Būtinybė kompiuterizuotai planuoti įmonės procesus
 Produktyvumui didinti
 Procesų bei gamybos kokybei gerinti
 Žaliavų apskaitai vesti
 Noras išbandyti naujas technologijas ir taikyti jas įmonėje

6. Kurias VVS funkcijas naudojate?

- Gamybos planavimas
 Finansų planavimas
 Sandėliavimas
 Darbuotojų planavimas
 Žaliavų apskaitos planavimas
 Kokybės gerinimas bei planavimas
 Naudojamos visos funkcijos

7. Su kokiomis problemomis susidūrėte VVS sistemos diegimo ir integravimo metu? 

- Darbuotojų apmokymo problemas (reikalingi specialūs mokymai, supažindinimas)
- Diegimo sunkumai (lėtas procesas, reikalingi kompiuterinės įrangos sistemos atnaujinimai ir pan.)
- Įmonės sektorių apjungimo į vieną sistemą sunkumai (informacijos perkėlimas, planavimas ir pan.)
- Sistemos taikymo sunkumai (nepriimtina sistemos išvaizda, nepatogus ir sudėtingas darbas, neaiškios funkcijos....)
- Papildomos išlaidos (kompiuterinė įranga, atnaujinimai, mokymai)
-

8. Kiek laiko užtruko VVS diegimas įmonėje?

- Iki 3 mėn.
- 3-6 mėn.
- 6-12 mėn.
- Daugiau nei metus

9. VVS įvertinimas.

	Nepasi keitė	Pagerėjo, iki 5 %	Pagerėjo, iki 10%	Pagerėjo, iki 20%	Pablogėjo, iki 5%	Pablogėjo, iki 10%	Pablogė jo, iki 20%
Vykdomų pro- cesų našumas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Produkcijos kokybė	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Įmonės konku- rencingumas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ryšiai su partner- iais, užsakovais	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Darbuotojų požiūris (atsakingumas, suinteresuotumas, kvalifikacija, kompetencija, patirtis,...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10. Jūsų naudojamos ERP sistemos bendras įvertinimas.

	Puikiai	Gerai	Patenkinamai	Blogai
Funkcionalumas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kainos ir kokybės santykis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Naudojimo patogumas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Diegimo ir aptarnavimo konsultantų darbo kokybė	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bendras įvertinimas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. Jūsų įmonės veiklos trukmė (metai).

- iki 5
- 5-10
- 11-15
- 15-20
- 21-50
- daugiau nei 50

12. Jūsų įmonės darbuotojų skaičius.

- iki 10
- 11-50
- 51-100
- 101-500
- 501-1000
- daugiau nei 1000

13. Tiesiogiai su VVS dirbančių darbuotojų (ir padalinių?) skaičius.

14. Kompiuterinės sistemos ir įrenginiai, naudojami įmonėje.

	Intensyvus	Normalus	Retas	Nėra
Biuro programinė įranga ir sistemos (pvz. Microsoft Excel, Word.....)	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Verslo valdymo sistemos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Konstravimo sistemos (pvz. SolidWorks, SolidEdge, AutoCAD....)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technologijos procesų projektavimo sistemos (CAPP....)	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Programinio valdymo įrenginiai (CAM sistemos, CNC staklės)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kokybės valdymo sistemos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kita...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

15. Jūsų įmonės veiklos sritis.

- Metalo apdirbimas
- Medžio apdirbimas
- Chemijos pramonė
- Maisto pramonė
- Medicinos įrengimų/prietaisų gamyba
- Audinių/drabužių pramonė
- Elektronikos komponentų pramonė
-

16. Kaip manote, ar atsipirko/atsipirks investicija į ERP sistemos įdiegimą Jūsų įmonėje?

Klausimai ERP tiekėjams:

1. Kokios pagrindinės pramonės šakos (Lietuvoje, užsienyje) integruoja jūsų ERP sistemą? Kodėl?
2. Jūsų ERP sistemos integracija užsienio įmonėse (sunkumai, išūkiiai, privalumai) Jei yra.
3. Jūsų ERP sistemos integracija Lietuvos įmonėse (sunkuma, išūkiiai, privalumai)
4. Palyginimas Užsienio ir Lietuvos įmonių. Strategija, pritaikymai ir pan.
5. Kokios numatomos ateities perspektyvos ir kryptys?

Internal Change Document

Topic	BDE Addons – Operator Screen “Number of Rods”	
Customer	-----	
Project	AU10127	
Author	KH	
Date of Creation	27.04.2015	
Module & Version	2.8	
Change No.	1545	
Modules (D)	PDA	
Version / Release / Build	2.8.134.1	
Released for installation	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Date of Release		
Released by		

1 Motivation (P)

The motivation of this change is to make the production counters and progress more transparent for the operator.

In the production the material is handled on rods (= metal bars where the piston rings are put on) and the operator always receives rods of material from the previous production step. The goal is to make the display of produced parts more “visual” for the operator.

2 Requirements (P)

- A field to configure the quantity of “parts per rod” in the work plan for each operation
- New fields in the operator screen to display the qty of received and produced rods

3 Solution

3.1 Solution Proposal (P/D)

The number of rods should be calculated out of the received and produced parts. The “parts per rod” may refer to the previous (“prev. op.”) or the actual (“act. op.”) operation.

“Received Rods” = “Received Parts” / “Parts per Rod (prev. op.)”

“Produced Rods” = “Produced Parts” / “Parts per Rod (act. op.)”

Example – “received”:

- Received parts = 3010
- Parts per rod (prev. op.) = 500
- → 6 rods and 10 parts

Example – “produced”:

- Produced parts = 3003
- Parts per rod (act. op.) = 400
- → 7 rods and 203 parts

Received Rods	6	Received parts	10
Produced Rods	7	Produced parts	203

3.1.1 Work plan (routing)

We will implement a new field in the “Work plan tree” where we can configure the amount of parts on one rod (-> “parts per rod”). This will be implemented for each single operation, as this number may vary between operations.

The screenshot displays a software interface for managing a work plan. On the left, a tree view shows a sequence of operations from 50045 to 50022. The right-hand side features a 'Details' panel for the selected operation (50002), which includes fields for Element ID, Start Control (set to '1.0 - When Started'), Inspection Order (0.961.888.AJ30T2), Machine Group ID (AJ30T), Machine Type ID (04.43040000), and Cause Catalogue ID (50002). Below these fields, there are checkboxes for 'No Revisit', 'Auto Specialize', 'Use Inspection', and 'Use Trade Selection'. A 'Quantity Input Mode' field is set to 'GoodQty'. At the bottom of the interface, two callout boxes are present: one labeled 'Parts by Rods' and another containing the value '500'.