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PECULLARITIES OF ERP IMPLEMENTATION PROJECTS UNDER THE AGILITY CONDITIONS AND MODELLING THE SUPPORT OF THEIR IMPLEMENTATION

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Abstract. In the dynamic society of today enterprise has to be smart and agile. IT and business alignment has become of the strategic importance and the enterprise is forced to be able to perform well under the abundance of information and hyper competition conditions. The information has become a strategic corporate resource and encourages business to invest in ERP projects as ERP systems can integrate all the business processes and help to improve the effectiveness of them. ERP implementation projects are characterized by complexity, variety of processes and managerial decisions which in most of the cases tend to be irrational because of weak participation in the implementation, imperfect existing ERP implementation models, lack of experience and knowledge how to implement them correctly. Thus, advanced model development to support ERP implementation process is needed. To achieve this purpose worldwide insight on this issue should be made, practical value of existing ERP implementation models should be evaluated and demand for ERP implementation support should be assessed.

Keywords: business agility, IT and business alignment, Enterprise Resource Planning (ERP), ERP implementation model, ERP implementation support.

Introduction

In the agile Information Technology (IT) society of today, there have been various changes in the organization behaviour. The basis of the enterprise survival in the market and the core development factors are innovation, improving efficiency, reducing costs and increasing competitive advantage by effectively managing business processes under the abundance of information and hyper competition conditions. Thus, there is today an obvious demand for continuous improvement as well as for business and IT alignment in enterprises.

Enterprise Resource Planning (ERP) is a good solution to integrate all the enterprise processes. It allows controlling and optimizing the business and its individual processes. Nevertheless, whether enterprise can integrate information technology with its organization, overall management, in order to advance its core competition ability, lies on the effective management during the ERP implementation process. However, there are number of examples where enterprises, which invested in the ERP systems and informationization, fail to fully realize their original purpose (Xu *et al*. 2008). In fact, the ERP implementation projects success rate mostly depends on the level of the enterprises participation in these projects. However, the problem of enterprises involvement and active participation in the ERP implementation projects occurs.

The main reasons of lack of active enterprises involvement are weak ERP projects knowledge, passive interest in this area and transferring the responsibility for the project results to vendors and consultants. Actually, the target of consultants and vendors is to enable appropriate knowledge transfer, but enterprises have to be ready to receive this knowledge and to use it to improve ERP implementation project results.

What is more, existing ERP implementation models are imperfect and do not fully adaptive. Therefore, enterprises ERP implementation projects should be encouraged as well as supported by improved and complex models, which would encourage enterprises involvement.

The aim of this paper is to develop advanced support model of the ERP implementation projects, which would ensure active enterprises participation and better ERP implementation projects results under the agility conditions.

For this reason, value of business and IT alignment as well as peculiarities of ERP implementation projects are analyzed in this paper. After the insights on worldwide ERP projects researches, practical adaptation

possibilities of existing ERP implementation models are evaluated, demand for the modelling and supporting ERP projects is assessed by analyzing results of ERP experts and users surveys. Improved ERP implementation projects support model is proposed. Methods used: scientific literature analysis, generalization of worldwide researches, evaluation, survey analysis, modelling.

Business Value of Business and IT Alignment

In an environment marked by continual transformation, competitive organizations increasingly rely on the business and IT alignment based on agility. To survive and thrive, enterprises must capture and exploit new business and IT opportunities before competitors do (Mendez 2010).

Business agility refers to the ability of an organization to rapidly adapt to change in productive and cost-effective ways through two key capabilities: 1) timely adjustments to supporting business structures, processes, and systems and 2) effective organization and use of human resources (Allee 2010). The more agile enterprise is, the higher value and competitive advantage is. Obviously, those firms who use IT to create business agility will be the clear winners. However, alignment can only be successful if it comes from both sides (Oracle 2009). It means that IT agility enables business agility as well as business agility enables IT agility. Therefore, business and IT agility are inextricably linked.

Business and IT alignment is closely associated with attempts to improve the business value. Thus, business and IT alignment let organizations successfully deal with unpredictable, dynamic, and constantly changing internal and external environments.

In today's business climate, where trust between business and IT in most companies has never been more fragile, possibilities to completely rethink IT have to be found, and IT have to be transformed into a strategic asset for the companies. Moreover, IT needs to become more tightly integrated with the broader business, not just aligned with it, and that means embedding IT throughout the organization (Klaus *et al.* 2000; Hinssen 2008).

However, business and IT alignment allows the company to create higher value only when there is technology, management and operational excellence (Fig. 1).

Most people are familiar with the term operational excellence; optimizing cost, quality, and speed. It has become a prerequisite to fuel the next level of competitive differentiation - management excellence - which is characterized by three other attributes; smart, agile, and aligned. Neither can be achieved without technology excellence; an IT strategy that focuses on being complete, open, and integrated (Vlek 2010, Oracle 2009).

Different measures are used to support the information and management of different business processes. Among the variety of IT and information solutions ERP systems are one of the best alternative to cope with the enterprise processes integration, control and optimization.

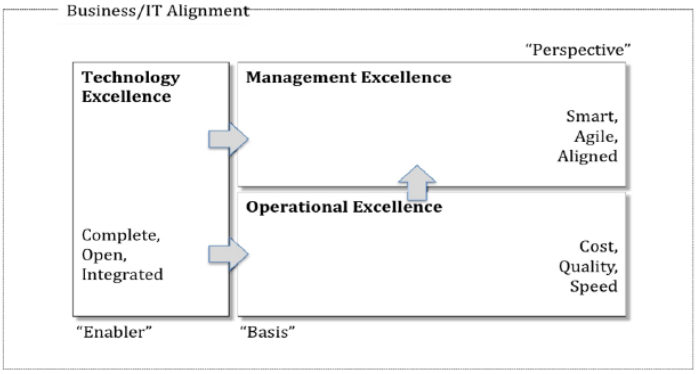

Fig. 1. Business/IT alignment (Source: Vlek 2010, Oracle 2009)

ERP allows companies to operate more efficiently and move on to the next and higher quality stage as well as to increase business value.

Investigation of the Impact of ERP on Corporate Performance

ERP can be defined as "all in one" (Davidavičienė *et al.* 2009) and as a strategic tool which helps companies gain a competitive edge. ERP system is usually consist of many modules such as CRM – Customer Relationship Management, HRM – Human Resource Management, SCM – Supply Chain Management, EPM – Enterprise Performance Management, BI – Business Intelligence and other modules adapted to a wide range of business segments. In most cases ERP software is flexible and allows company to add functionality to the system by adding new modules in the future.

As implementations of ERP systems are one of the most difficult investment projects because of the complexity, high cost and adaptation risks, there are number of studies on different ERP issues, on how ERP systems influence corporate performance. The most popular are worldwide studies of such international technology evaluation companies as Aberdeen Group, Panorama Consulting Group, Gartner Group and others.

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According to the Aberdeen Group survey conducted in 2009-2010 years among over 1100 small to midsize businesses worldwide, companies which implemented ERP are able to perform better and improve the various performance indicators (Table 1).

Data from Panorama Consulting Group ERP report 2011 (sample size is 185 companies from 57 countries which implemented ERP within the past year) indicates that although companies were forced to lower ERP projects implementation budgets, shorten durations and more tightly control their ERP projects in 2010, they also realized significantly higher business benefits and slightly shortened ERP payback periods than they did in 2009 (ERP report 2011).

Table 1. Sample business benefits derived from ERP (Source: Aberdeen Group 2010)
* Manufacturing and distribution companies only

Definition of Maturity Class	Mean Class Performance
Best-in-Class: Top 20% of aggregate performance scorers	▪ 21% reduction in operating costs ▪ 19% reduction in administrative costs ▪ 17% reduction in inventory* ▪ 16% improvement in schedule compliance* ▪ 17% improvement in complete & on-time delivery
Industry Average: Middle 50% of aggregate performance scorers	▪ 14% reduction in operating costs ▪ 10% reduction in administrative costs ▪ 11% reduction in inventory* ▪ 14% improvement in schedule compliance* ▪ 14% improvement in complete & on-time delivery
Laggard: Bottom 30% of aggregate performance scorers	▪ 9% reduction in operating costs ▪ 5% reduction in administrative costs ▪ 11% reduction in inventory* ▪ 13% improvement in schedule compliance* ▪ 7% improvement in complete & on-time delivery

Thus, worldwide statistics show that ERP are worth to implement in order to increase enterprise performance and to gain higher business value.

Current Challenges in ERP Implementation Projects

Despite the fact that ERP implementation can improve different business processes and to improve various key performance indicators, there are ERP implementation problems due to which ERP benefits decrease and companies fail to fully realize their original purpose of ERP implementation.

There are several reasons for failure of ERP implementation. Enterprises lack of the knowledge and experience of project management ERP system implementation is thought to be the major reason for project failure which causes another ERP implementation issues (Bulotienė 2010).

Different companies are at the different stages of maturity to implement ERP systems. Companies with different organizational maturity levels (Fig. 2) gain different benefits from ERP implementation. The higher organizational maturity level, the more benefits can be achieved by implementing ERP (Paškevičiūtė 2010). This means that, first of all, ERP implementation decision cannot be spontaneous and company should answer the question: at what level of capability maturity is the organisation placed to support ERP tools? In ERP implementation experts opinion, the biggest part of companies implementing ERP are the companies from the second to third organisational maturity stage and these companies make ERP implementation statistics worse just because they are not able to gain more benefits from ERP (Paškevičiūtė 2010).

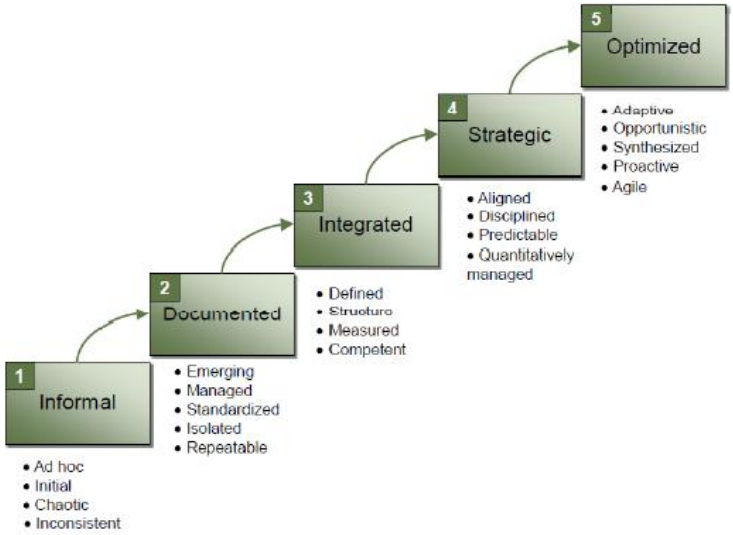

Fig. 2. Organizational Maturity Model to implement ERP (Source: Paškevičiūtė 2010)

So the most common ERP implementation project problems are inadequate feasibility studies and organizational maturity level evaluation, change management and training issues, weak project management, inadequate ERP software (which does not meet the needs of company) selection, underlining only ERP technical possibilities, rather than the emphasis on the needs of business processes, poor top management support, over-expectations, passive enterprises participation and involvement etc. (Bulotienė 2010; Paliulis 2010; Panorama Consulting Group 2011; Paškevičiūtė 2010). Thus, the main risk factors are internal and depend on the abilities of companies to use and to manage existing and newly acquired knowledge in this field.

As it was mentioned, experience shows that enterprises knowledge in ERP implementation field is too narrow and lack of interest in ERP implementation project aspects is noteworthy. ERP users mostly rely on ERP vendors and consulting companies' consultants. However, it is worth noting that company inside information is very valuable and is helpful in every step of ERP implementation project. Each wrong step may destroy a bunch of successful previous steps independently whether it caused by lack of internal information. All those reduce return on investment and benefit take-up rate. For these reasons, author believes that active participation in ERP implementation project is essential to increase benefit take-up rate. Thus it is not enough to rely solely on ERP vendors and consultants for high ERP implementation project results and ERP implementation model is needed to support not experienced companies.

Table 2. ERP implementation models (Source: Vilpola 2008)

Author(s)	ERP implementation model	Notes
Bancroft et al. (1998)	(1) Focus, (2) Creating As-Is picture, (3) Creating of the To-Be design, (4) Construction and testing, and (5) Actual Implementation	
Kuruppuarachchi et al. (2002)	(1) Initiation, (2) Requirement definition, (3) Acquisition/development, (4) Implementation, and (5) Termination	A model of IT projects
Markus and Tanis (2000)	(1) Project chartering, (2) The project, (3) Shakedown, and (4) Onward and upward	
Mäkipää (2003)	(1) Initiative, (2) Evaluation, (3) Selection, (4) Modification, Business Process Reengineering, and Conversion of Data, (5) Training, (6) Go-Live, (7) Termination, and (8) Exploitation and Development	Three parallel phases in phase number 4.
Parr and Shanks (2000a)	(1) Planning, (2) Project: a. setup, b. reengineer, c. design, d. configuration & testing, e. installation, (3) Enhancement	
Rajagopal (2002)	(1) Initiation, (2) Adoption, (3) Adaptation, (4) Acceptance, (5) Routinisation, and (6) Infusion	Applied from Kwon and Zmud's (1987) model of IT implementation
Ross (1999)	(1) Design, (2) Implementation, (3) Stabilisation, (4) Continuous improvement, and (5) Transformation.	
Shields (2001)	Rapid implementation model of three phases and 12 major activities	
Umble et al. (2003)	(1) Review the pre-implementation process to date, (2) Install and test any new hardware (3) Install the software and perform the computer room pilot, (4) Attend system training, (5) Train on the conference room pilot, (6) Establish security and necessary permissions, (7) Ensure that all data bridges are sufficiently robust and the data are sufficiently accurate, (8) Document policies and procedures, (9) Bring the entire organisation on-line, either in a total cutover or in a phased approach, (10) Celebrate, and (11) Improve continually.	
Verville and Halingten (2003)	(1) Planning, (2) Information search, (3) Selection, (4) Evaluations, and (5) Negotiation	Model of the ERP Acquisition Process (MERPAP)

Numbers of ERP implementation models were proposed (Table 2).

In author opinion, the main disadvantages of existing ERP implementation models:

– *Existing models are incomplete*. Usually few installation steps are proposed and short list of each step tasks is presented. It is not an appropriate kind of support for the enterprises with no or very little knowledge in ERP implementation projects field. Thus, such models cannot fully support enterprises, which are eager to participate in ERP implementation project actively.

– *Existing models focuses on specific area*. Usually they are vendors created models that focus on technical rather than managerial issues of ERP implementation. Thus, these models are created to support ERP vendors, but not ERP users.

More complex support model based on the active enterprise participation and involvement as well as maximization of ERP implementation project benefit take-up rate should be proposed.

ERP Implementation Experts and Users Surveys

There are not so many researches on ERP implementation projects theme in Lithuania. The majority of information about ERP projects is from foreign sources and multinational companies' business cases or practice. However, before proposing of new ERP implementation support model, which will be applicable also in Lithuania, the demand for the support should be assessed.

In May 2011 Lithuanian ERP experts and users surveys concerning ERP implementation projects were conducted (Marcinkevič, Tamošiūnienė 2011). The results of surveyd 16 ERP implementation experts from „Affecto Lietuva", „ERP", „IT technologijos", „Proginta", „CID Baltic", other companies and 33 companies-ERP users (the majority of them are midsize or large companies) were presented. According to the data of these surveys, these two groups of respondents' opinion about the critical ERP implementation project success factors is very similar (Table 3). The average value (from 1 to 5) of each factor was estimated and the difference between the values from the perspective of two groups of respondents was estimated. Summing up, both groups of respondents agree that the most important three factors are:

– *Complex and clear ERP implementation model*.

– *Effective project management*.

– *ERP implementation resources* (financial, time, HR and other).

Moreover, the majority of the respondents from two group of them agree that ERP implementation projects support model would be of a great value both for the companies implementing ERP and for the ERP vendors.

The results of these ERP implementation experts and users surveys show the importance of new complex ERP implementation projects support and repeatedly proves the high demand for supporting companies.

Table 3. Critical success factors of ERP implementation projects (Source: Marcinkevič, Tamošiūnienė 2011)

No	ERP critical success factors	Average value (experts)	Average value (users)	Difference between values
1	Complex and clear ERP implementation model	4,57	4,69	0,1
2	Top management support	4,36	4,69	0,33
3	ERP implementation strategy	4,36	4,23	0,13
4	Effective project management	4,50	4,62	0,12
5	ERP project manager leadership	4,43	4,31	0,12
6	Business processes reengineering	3,86	4,08	0,22
7	Change management	4,36	4,23	0,13
8	ERP implementation resources	4,50	4,38	0,12
9	ERP vendor support	4,29	3,92	0,37
10	ERP vendor experience	4,50	4,31	0,12
11	Clear ERP selection criteria	4,00	3,62	0,38
12	ERP compatibility with existing information system	3,29	3,85	0,56
13	ERP users training quality	3,93	3,85	0,08
14	Effective communication	4,43	4,23	0,20
15	Consulting firm competence	3,86	4,00	0,14

Support Model for ERP Implementation Projects

Author offers new advanced ERP implementation project support model (model) which includes quantitative as well as qualitative techniques. This model contains the best implementation of ERP practice in foreign scientific literature as well as the experience of Lithuanian and worldwide experts. Model consists of four stages – identification of investment opportunities, ERP implementation project planning, ERP project implementation, ERP exploitation (Fig. 3).

In the identification of investment opportunities stage company assesses the level of need and preparedness to ERP implementation projects. Company can predict the level of benefit take-up by determining organizational maturity level. The higher level of maturity, the more benefit company gains.

In ERP implementation project planning stage project sketch is designed, detailed task list is made, responsible persons and their roles are appointed, risk management plan, budget plan, communication plan, change management, training plan, monitoring plan and corrective action plan is prepared.

In ERP implementation stage concrete action sequence of ERP software and ERP vendor selection is proposed, the role or project team during ERP implementation is described, effective training is characterized, importance of business process reengineering (BPR) is emphasised.

In ERP exploitation stage continuous process improvement approach is proposed and concrete ERP benefit realization level control and improvement methodology.

First of all, proposed model is informational as ERP users learn about various ERP implementation project aspects. Secondly, proposed model is support measure as different qualitative and quantitative tools (organizational maturity level, concrete risk management methodology, force-field diagram in change management etc.), concrete action sequence to increase the benefits are proposed.

Strengths of proposed model: complexity, in formativeness, quantitative and qualitative tools, and promotion of active enterprise participation in ERP implementation project. Higher level of opportunity control of progress of project allow enterprises increase benefit take-up rate.

Using this model, company acquires the knowledge in ERP implementation project field and is able to apply this knowledge to achieve maximum benefit.

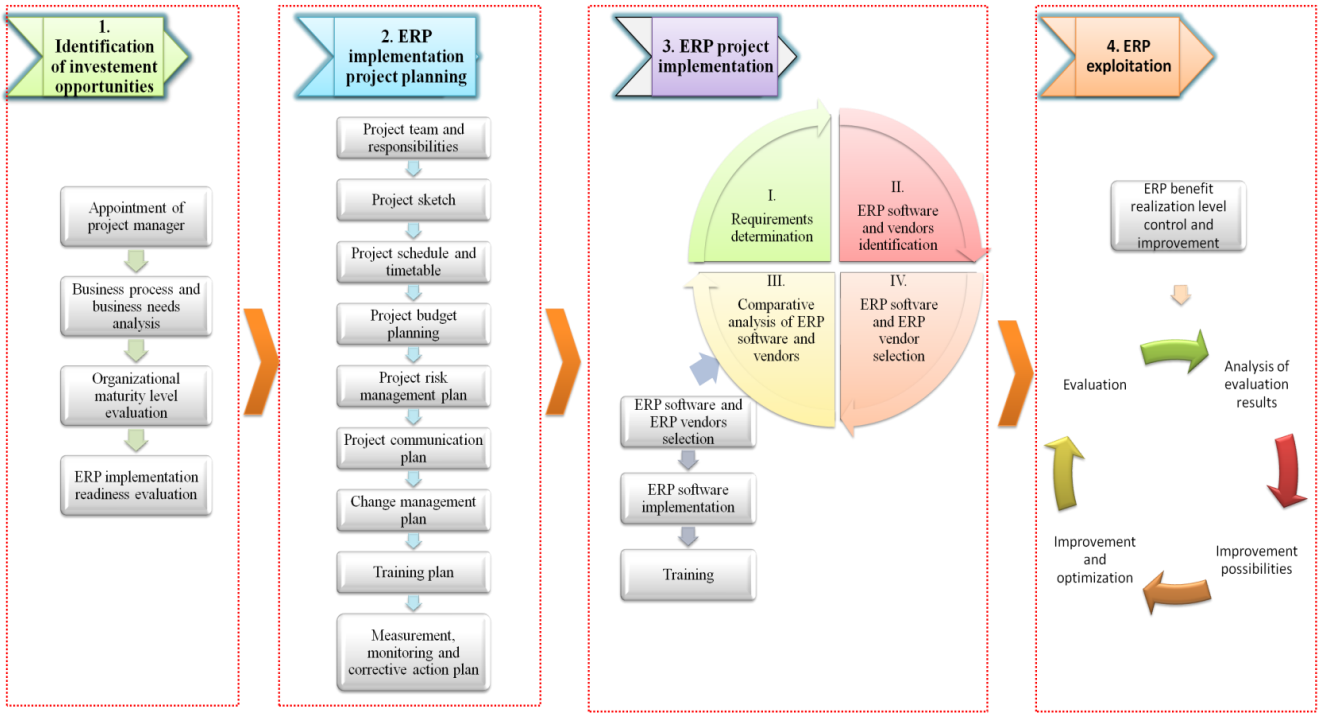

Fig. 3. ERP implementation project support model (Source: made by author)

Conclusions

IT sector is developing rapidly and provides new opportunities for business. Dynamic business conditions stimulate IT application in business as it is an effective way to maintain business agility and to gain a competitive advantage.

ERP implementation project is one of the examples of the IT application in business, which encourages business processes integration, improvement and increases business value. However, experience shows that knowledge in ERP implementation project is too narrow and support is needed to participate actively and fully realize original purpose of ERP implementation. Knowledge management problems in this field have to be resolved.

Proposed by author model is expected:

- to support ERP users to implement ERP.
- to achieve better ERP implementation results.
- to increase ERP benefit take-up level.

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VERSLO VALDYMO SISTEMŲ PROJEKTŲ DIEGIMO YPATUMAI VERSLO JUDRUMO SĄLYGOMIS IR JŲ DIEGIMO PARAMOS MODELIAVIMAS

A. Marcinkevič

Santrauka

Šiuolaikinėmis dinamiškų pokyčių sąlygomis įmonės turi būti sumanios ir judrios. IT ir verslo darna tapo strateginės reikšmės, o įmonės siekdamos išlikti rinkoje priverstos efektyviai veikti informacijos gausos ir hiperkonkurencijos sąlygomis. Informacija, tapusi strateginiu įmonių ištekliumi, skatina diegti ERP sistemas, integruojančias, kontroliuojančias ir tuo pačiu optimizuojančias įmonės veiklą. ERP diegimo projektai pasižymi sudėtingumu, procesų ir vadybinių sprendimų įvairove. Pastarieji dažniausiai būna neracionalūs dėl pasyvaus dalyvavimo diegiant ERP, netobulų esamų ERP diegimo modelių, patirties ERP diegimo srityje stokos. Dėl šių priežasčių reikalingas patobulintas ERP projektų diegimo paramos modelis. Straipsnyje analizuojamos pasaulinių tyrimų šia tematika įžvalgos, įvertinamas esamų ERP diegimo modelių praktinis pritaikomumas įvertinama paklausa ERP diegimo projektų paramos modeliui.

Reikšminiai žodžiai: verslo judrumas, IT ir verslo darna, verslo valdymo sistema (ERP), ERP diegimo modelis, ERP diegimo parama.