ERP Problems and Application Integration Issues: An Empirical Survey

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Abstract

Enterprise Resource Planning (ERP) systems were introduced into companies to solve various organisational problems, and to provide an integrated infrastructure. Although ERP packages offer advantages to enterprises, they have not achieved many of their anticipated benefits. Autonomous and heterogeneous applications co-exist in companies with ERP systems and integration problem having not been addressed. This paper seeks to make contribution to this area by studying and analysing ERP problems through an Internet based survey. Responses are analysed in detail and a new approach to integration problem; the Enterprise Application Integration (EAI) is examined. EAI is a new class of integration software that leads to the development of strategic business solutions by securely incorporate functionality from disparate applications. EAI could be the solution to ERP's integration problems.

1. Introduction

During the last decades, enterprises have focused on Information Technology (IT) and implemented various applications to automate their business processes. These applications were not developed in a co-ordinated way but have evolved as a result of the latest technological innovation (Themistocleous and Irani, 2000). The IT infrastructure in several organisations consists of autonomous and in many cases heterogeneous solutions (Klasell and Dudgeon, 1998). This situation has caused various integration problems as applications could not co-operate and disparate IT solutions could not bind together.

During the 1990's, Enterprise Resource Planning (ERP) systems were introduced as *"integrated suites"* that automate core corporate activities such as finance, human resources, manufacturing, supply and distribution (Gibson *et al.*, 1999). ERP systems let a company share common data and practices across the enterprise and allow the access of information in a real-time environment. According to Davenport (1998) ERP solutions are designed to solve the fragmentation of information in large business organisations, and integrate *all* the information flowing within a company.

ERP applications provide several benefits including

- solutions to the problems of legacy systems (Holland and Light, 1999),
- reduced development risk (Kelly et al., 1999),
- increase global competitiveness (Holland *et al.*, 1999)
- and business efficiency (Markus and Tanis, 1999).

However, ERP packages have also many drawbacks such as:

- implementation complexity (Martin, 1998),
- integration problems (Linthicum, 1999)
- customisation problems (Glass and Vessey, 1999)
- over budget and late projects *(Davenport, 1998)*,
- organisational change and resistance to change (Sumner, 1999)
- problems with business strategy and competitive advantage (Davenport, 1998) etc.

The need for integration still exists as ERP packages can not address effectively this problem and a number of autonomous applications co-exist into companies (Duke *et al.*, 1999). The incorporation of enterprise

applications as well as interorganisational systems can be facilitated by a new class of integration software called Enterprise Application Integration (EAI) or simply Application Integration (AI) (Sprott, 2000). Case studies have shown that AI can be used to address various integration problems such as (a) autonomous applications, (b) customer relationship management, (c) ebusiness, (d) ERP-to-ERP, (f) supply chain management, (g) data, (h) component and (i) process integration (Edwards and Newing, 2000).

This paper explains why ERP systems can not provide a solution to integration problem. The objectives of this study are to identify, analyse and present the problems of ERP systems as well as to examine new approaches for application integration. The focus of this analysis is on the technical problems of ERP systems and especially on integration issues. The section 2 of this paper focuses on ERP systems failure, section 3 describes the methodology used in this survey and section 4 presents the responses and analyses the findings of the study. Section 5 discusses the Application Integration area

2. ERP Systems Failure

Rao (2000) estimates that the 96.4% of ERP implementations fail whereas Al-Mashari (2000) reports that the 70% of ERP implementations do not achieve their estimated benefits.

The complexity of ERP has forced organisations to collaborate with external consultants in order to adopt an ERP solution. Discrepancies on the approach of implementation as well as cost overruns and project delays usually causes serious conflicts between organisations and consultants and lead to failure (Motsios, 1999). Furthermore, many employees resist changing and often causing serious problems to companies. Stefanou (2000) mentions that about the half of ERP implementations fail to meet expectations due to underestimation of change management.

One of the main problems of ERP systems is the conflict with the business strategy (Loinsky, 1995). The non-flexible nature of ERP solutions forces organisations to fit the package and abandon their way of doing business. This problem affects companies and in some cases has led organisations, like FoxMayer, to bankruptcy or failure (Davenport, 1998). Companies make minimum changes to ERP solutions (Holland *et al*, 1999), as the enterprise packages are complicated and hardly "allow" changes. Additionally, if a company alters an ERP package, it has problems with the internal integration of ERP modules.

Integration is another important problem of ERP solutions. Although ERP packages were described and promoted as "integrated suites" (Davenport, 1998), they face serious integration problems. These problems are faced as ERP packages are not designed to tie up other autonomous applications (Schonefeld and Vering, 2000). As a result a number of disparate applications co-exist with ERP systems in companies and ERP packages fail to provide an integrated IT infrastructure.

3. Methodology

The research methodology used in this study is separated in two phases. *In phase one, a Web-based research task was performed* and summarised below:

- *Literature Review.* Initially, a literature review on ERP area took place and focused on categorising the ERP problems.
- *Questionnaire's Design*. Based on the literature findings a questionnaire was designed. The questionnaire has an embedded triangulation structure to reduce bias (Jick, 1979). The *questionnaire had a triangulated multiple-choice format* and it was divided into the following sections:
  - *Demographic,* in order to better comprehend the responder and his company.
  - *Business and Management***,** so as to understand the business benefits of ERP technology as well as to collect data regarding the management problems that companies face
  - *Technical***,** in order to apprehend, analyse and come up to a conclusion regarding the problems that companies face after their ERP applications go live.
- *Target's Group Specification.* A number of Internet links for ERP email-lists, groups and forums were collected through Internet based search engines and ERP magazines. Next, researchers posed a number of questions to these ERP links and collected their answers. Responses were evaluated and researchers exclude two

email-lists as the knowledge level of the members of these lists were relatively low.

- *Questionnaire's Distribution.* After specifying the right target group, the questionnaire was loaded on a Web server and distributed to the members (ERP specialists) of the selected Internet links. In addition an email was send to all the participants explaining them the purpose of the survey.
- *Responses' Collection. Responders filled in and submitted on-line the questionnaire and r*esponses were stored in a Web-database. Responders were allowed to remain anonymous, although they were invited to include their name and email address if they wanted to receive a copy of the findings.

In phase two, responses were analysed and reported. The basic steps of this phase include:

- *Reliability Control:* The reliability of the responders was checked through IP analysers and data analysis. The result of IP analyser and the four triangulated questions of the questionnaire formed the reliability criteria. In case the responses of a participant exceeded the limit of reliability criteria, the questionnaire was excluded. Reliability limit was set up to two wrong answers at specific questions or one wrong response to these questions and *false* IP address. Microsoft's Site Server tool was used for analysing IP addresses and resolving the responders' location. The location was contrasted with the result of a specific question in the questionnaire. In case there was a difference in the result, the IP result was *false*. In addition, a data analysis method was used. Based on the structure of the questionnaire it was easy to check whether the responses were reliable or not.
- *Data Analysis.* After reducing bias, by excluding unreliable responses, the remaining questionnaires were analysed using spreadsheets. Cross checks used in many cases in order to extract the correct information. The main findings of this empirical study are reported in section 4.

4. Survey Findings

The survey took place between March 2000 and April 2000 and 67 specialists filled in the questionnaire and submitted their answers. Responders' reliability was checked through data analysis and IP analysers. Initially, responders had to report their current location as well as their office location. In contrast with the result of the IP analyser, 11 responses reported a different location. In addition, the in depth data analysis of these 11 responders proved that their answers were *not* reliable as they had no logical sequence. For example, they reported that basically their company adopted an ERP solution to solve the Year 2000 (Y2K) problem but, although the ERP package did not solve this problem their company was satisfied from the ERP solution. Clearly, data triangulation proved an embedded mechanism to reduce bias. Moreover, 6 out of these 11 responders and another 4 from the rest 56 ticked the same answer box for all the questions, which again shows that these answers were unreliable. Furthermore, there were a lot of questions regarding the answers of another two responders. Finally, only 50 out of 67 responses were formed the data sample as the 17 unreliable answers were extracted.

4.1 Demographic Data

The first part of the questionnaire addressed demographics of both people responding to the survey, and the companies they represent. Responses to this set of questions show that:

- Responders form a representative sample, as they came from wide range of countries such as USA (20%), UK (16%), Germany (12%), Australia (10%), France (10%), Canada(6%), Japan(6%), India(4%) etc
- The companies of the responders form a representative sample also, as they cover 11 different sectors like manufacturing (20%), retail (18%), banking and finance (14%), computer (hardware) (10%), computer (software) (10%), whole sale & distribution (8%), communications (6%), consultants & services (6%), food, beverage and tobacco (4%), health (4%)
- Job titles of the responders were spread over business or system analyst (40%), chief technology officer (24%), IT manager (12%), Internet specialist (6%), programmer (6%), senior manager (6%), database administrator (4%) and chief executive officer (2%).

4.2 Business and Management Data

The second section of the questions addressed business and management features. Questions answered in this set deal with the:

- department that initiated the idea or took the decision to implement an ERP system,
- business benefits that came up from the implementation of such system and
- management problems that faced during the implementation period.

A little more than the 1/3 of the responders (36%) reported that technical reasons (e.g. Y2K problems, legacy systems maintenance) were the main motivation behind the decision for adopting an ERP system. Moreover, the 30% believed business reasons like global corporate decision making or competition were motivations. A percentage of 18% believed that functional reasons (e.g. process automation, process redesign) are behind the decision to implement an ERP whereas the 16% mentioned costs saving and other financials reasons as the main motivation. These responses confirm literature findings as Ross (1998) reports that companies adopt ERP systems for many different reasons. Markus and Tanis (1999) mention that technical and business reasons are the main motivation behind the decision for adopting an ERP system. Furthermore, Parr and Shanks (2000) devise the motivation for ERP implementation in three categories: a) technical, b) operational and c) strategic.

The 38% of responders answered that IT department initiated the idea for the adoption of an ERP solution whereas the 30% reported the senior management and the 2% the finance department. Moreover, the 28% of the responders indicated that third parties like consultants (16%) and ERP vendors (12%) initiated this idea. Finally, the decision for implementing an ERP solution was taken, in 44 cases, by senior management (88%). However, in 6 extreme cases IT department (6%) and finance department (6%) took this decision.

In the multi-answer question: *"How has ERP been beneficial to your organisation?"* the majority of the responders (74%) indicated that ERP system solved the Y2K problems. In addition, ERP specialists stated that ERP application led to supplier (54%) and customer (36%) satisfaction and increased the overall productivity (46%). Unfortunately, the return on ERP investment (ROI) was quite low (34%) but this result is harmonised with literature findings (Markus and Tanis, 1999).

The last question of this section was aiming to investigate the managerial problems faced during (or after) the implementation period of the ERP system. Table 1 presents the answers of this (multi-answer) question.

Table 1: Managerial problems during and after ERP implementation

Type of Problem	Percentage
Project Cost Overruns	66%
Project Delays	58%
Conflicts with business strategy	42%
Employees Resistance to Change	42%
Conflicts with Consultants	38%
Internal Conflicts	34%
Conflicts with Vendors	30%

As can be seen from Table 1, project cost overruns and delays were significant problems and affect seriously the implementation phase and the whole project. These two types of problems are correlated as *project delays increase the project cost*. Other kinds of problems that caused during the implementation phase were conflicts with external entities such as consultants (42%) and ERP vendors (30%) as well as internal conflicts (34%). Each time a conflict with an external or internal entity occurred, a project delay was caused. It is clear that these types of conflicts cause project delays and cost overruns. As a result it can be said that *there is a correlation between conflicts with external or internal entity, project delays and project cost overruns.* Moreover, companies phased major problems after rolls out ERP. A little more than 4/10 of the companies surveyed (42%) faced serious problems with their business strategies, as the ERP system imposed its own way of doing business (Davenport, 1998). In addition, ERP solutions caused organisational restructuring and led to employee's resistance to change (42%). Sumner (1999) urges that there is major resistance to change after a company rolls out ERP. In many cases companies face employees' resistance during the implementation period (Motsios, 1999). This type of resistance may also lead to project delays as employees do not support efficiently the implementation process. Literature findings (Martin, 1998, Gibson *et al.*, 1999) suggest that 90% of ERP projects end up late. Furthermore, Rao (2000) reports that only 3.6% of ERP projects have been successfully implemented. This means that only 3.6 of ERP projects have finished on time, on budget, without technical problems and achieved their objectives.

4.3 Technical Data

The third part of the questionnaire was aiming at identifying significant technical issues and focused on customisation and integration problems. This section included twelve questions that asked about:

- scope data such as the type of the ERP solution and the number of modules that were implemented
- technical problems that were faced during the implementation (e.g. customisation, Y2K)
- integration problems (e.g. which systems caused integration problems, what the solution was (if any) etc)

The majority of the responders selected an *all in one* ERP[1] solution (72%) and the rest 28% adopted the *best of breed*[2] approach. The 56% of the ERP specialists reported that their companies used SAP's ERP system. The 16% of the companies used ORACLE, the 10% JD Edwards, the 10% Baan and another 8% Peoplesoft These answers mean that the results are alike the total population of ERP users. According to Sherlund *et al.* (1999) the market share among the leading ERP vendors was SAP 56%, ORACLE 13%, JD Edwards 11% Baan 7% and Peoplesoft 12%.

The third question of section 2 focused on the ERP modules that were adopted by companies. As can be seen from Table 2, nearly all the companies (92%) have adopted financials modules such as general ledger, assets, costing, etc. A significant percentage of 42% have implemented operations and logistics modules (e.g. inventory management), whereas other 18 (36%) and 19 (38%) companies human resources (i.e. payroll, personnel planning) and production and manufacturing (e.g. production management, quality management). In addition, the 26% of companies have adopted sales and marketing (i.e. order management and sales management) and the 8% research and development.

[1] In an *all in one* ERP solution, companies purchase all their ERP software from a single ERP vendor.

[2] In best of breed approach companies purchase the "best" ERP modules. This means that companies combine modules from different vendors.

Table 2: Adopted ERP modules

Module	Percentage
Financials	92%
Operations and Logistics	42%
Production and Manufacturing	38%
Human Resources	36%
Sales and Marketing	26%
Research & Development	8%
Other	2%

The 72% of ERP specialists believe that the adopted ERP solution fulfils less than 50% of their business IT requirements. As can been seen from Table 3, the 22% believes that the ERP application fulfils only the 30%-40% of the IT infrastructure whereas the 50% of the responders reports that this percentage is between 40% and 50%. Furthermore, 13 specialists (26%) reply that the ERP solution is quit good and fulfils the 50%-60%. In addition, only one responder said that the adopted system fulfils the 60%-70% of his/her company's IT requirements.

Table 3: In what percent does the ERP solution fulfil the IT requirements?

Level of IT requirements covered by ERP solution	Percentage
Highest (80%-100%)	0%
Higher (70% - 80%)	0%
High (60% - 70%)	2%
Medium (50% - 60%)	26%
Low (40% - 50%)	50%
Lower (30% - 40%)	22%
Lowest (0-30%)	0%

Table 4: Literature findings

Literature Findings	Percentage
(Makey, 1998)	80%
Kelly *et al.* 1999	80%
Holland *et al* 1999	70 - 80%
Seeley, 1999	30%
Klasell and Dudgeon, 1998	30%

These numbers are unlike with previous literature findings (e.g. Holland *et al,* 1999), which reported that ERP systems cover the 70%-80% of a company's IT infrastructure. There is also difference between these findings and other literature findings (e.g. Seeley,

1999), which reported that ERP applications fulfil only the 30% of IT requirements of an enterprise. Literature findings are summarised on Table 4.

The fifth question was aiming to identify technical problems caused during (or after) the implementation period. Table 5 presents the results of this multi-answer question. As can be seen in Table 5, only 4% of the 50 specialists report problems with the Y2K problem. This indicates that the ERP vendors managed to totally solve this problem. Other technical problems faced by responders were the single European currency problem (35%) and security issues (40%). The most serious problems focus on the integration of the ERP solution with existing applications such as legacy systems (82%), or with new business software (e.g. supply chain management, e-commerce applications etc) (46%). Therefore, integration is extremely difficult to be achieved through these integrated "suites". Enterprise Resource planning systems may offer a partial solution to integration problem (Ring and Ward-Dutton, 1999). However, integration problem can be solved through the Application Integration (AI) technology (Themistocleous and Irani, 2000).

Table 5: Technical problems

Type of Problem	Percentage
Integration with existing systems	82%
Customization	72%
Integration with other applications	46%
European currency	42%
Security	34%
Other	14%
Y2K	4%

Customisation is also a serious technical problem. The 72% ERP specialists report that serious customisation problems were caused both during implementation period and afterwards. These responses are similar to the literature findings of Sumner (1999) who suggests that it is better to fit the ERP package rather than trying to customise it.

The majority of companies followed a *Vanilla* approach (Holland *et al*, 1999) when customised the system. *Vanilla* approach is a general rule recommending that companies should make the minimum changes in order to parameterise the package. The 66% of companies made only a few changes to parameterise the modules where needed. This result is alike the total population as the majority of enterprises make minimum changes on ERP packages (Makey, 1998). The rest 36% modified significantly the system to align with specific business needs. The 80% of those companies that made a lot of changes on the system reported also integration problems. Integration problems were faced when companies attempted to tie up the ERP system with a number of existing applications (e.g. best-of-breed modules).

The 58% of companies did not manage to integrate their ERP solution with existing systems. Responders denoted the integration procedure was unsuccessful (23%) or their companies did not attempted to incorporate their applications, as integration is a complex, cost and time consuming process (71%). The 4% of these twenty-nine companies did not take any decision regarding integration and the 2% of the responders did not answer in this question.

The 42% of companies integrated one or more systems with their ERP solution. Here, 81% of them incorporated Electronic Data Interchange (EDI) applications (e.g. procurement, ordering and invoicing) with their ERP system. This high percentage is attributed to EDI applications following global standards (e.g. UN/EDIFACT) and are based on common *rules*. Moreover, the concept of EDI technology is based on *extracting, translating, formatting and exchanging data* between disparate applications using computer networks. As can be seen in Figures 1 and Figure 2 *the same concepts are used by Application Integration technology* (AI) in a more advanced way. Application Integration extracts data from one data-source (database, application). Once the data is extracted, it has to be translated into a form recognisable by the target. Vendors use mapping techniques or intermediary languages to achieve this translation and format the extracted data. Each conversion has to be translated twice, once from the source format into the intermediary language and one from intermediary language to target format. Once the data translated into target format, are inputted into the target database, data stream, application or object (Klasell and Dudgeon, 1998). It can be concluded that this high incorporation rate between ERP and EDI applications is based more on the integration concepts of EDI technology rather than on ERP systems. Apart from EDI applications a number of other systems were integrated with ERP solutions.

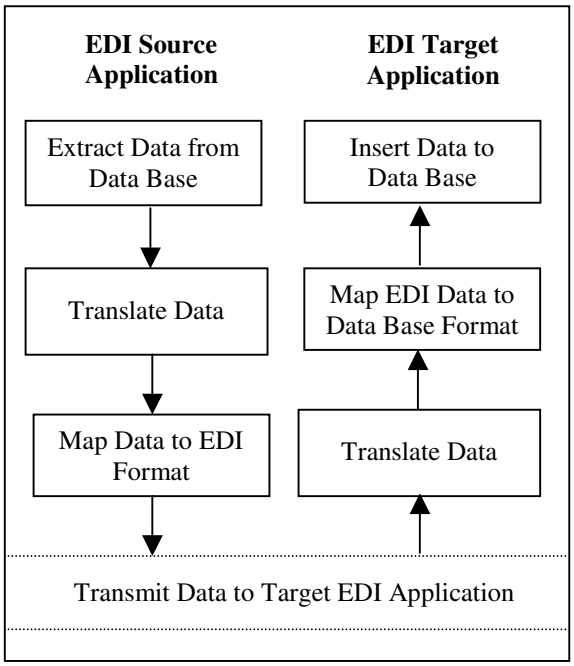

Figure 1: EDI Integration Concepts

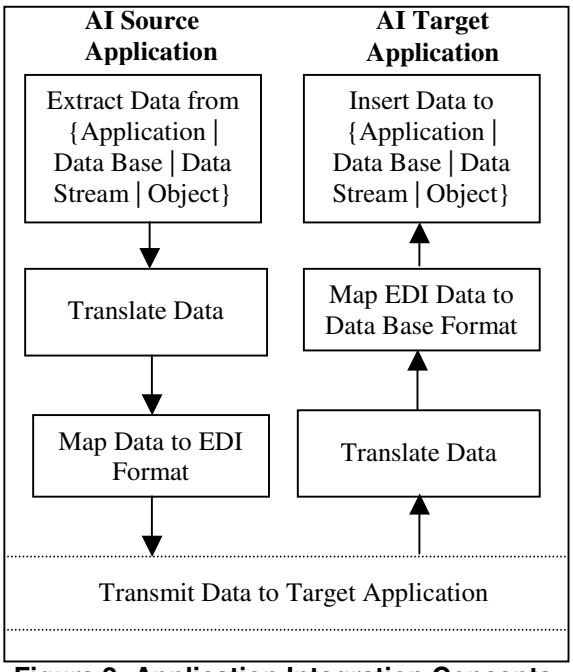

Figure 2: Application Integration Concepts

These applications include legacy systems (5%), Supply Chain Management (14%), Customer Relationship Management (5%), Electronic Commerce applications such as e-stores (28%) and Best-of-Breed (19%).

A little more than 6/10 of the companies (62%) abandoned their legacy systems after adopting an ERP solution. The rest 38% of companies continue working with both systems as ERP application did not replace their legacy systems. The 73% of these companies that did not replace their legacy systems faced *serious problems* when they attempted to integrate legacy systems with ERP applications. The 11% of companies reported *many integration problems*. The rest did not attempted to integrate legacy system with ERP solution. The 84% of enterprises that tried to integrate the two systems *suspended* this process as this hard procedure is time and cost consuming and requires a lot of effort. Finally, only 2 companies managed to incorporate the two systems.

Nearly all the companies (90%) that integrate ERP system with one or more applications achieved their targets through interconnectivity. In two cases integration was achieved through middleware software. All the responders (100%) do not accept interconnectivity as the best solution to their integration problem as it presents serious maintenance problems. In addition complexity is increased as the number of interconnected applications rises. It is estimated that for x applications a total of ***x*(x-1)/2*** connections are needed. This means that for 10 applications 45 connections are needed in order to achieve interconnectivity. These findings are alike the literature findings ((Stonebraker, 1999, Pender, 2000, Ring and Ward-Dutton, 1999)). A number of articles recommend that integration problem could be solved through Application Integration technology (Morgenthal, 1999). Application Integration Technology is described as a new means of system integration that focuses on both internal (e.g. ERP systems) and external (e.g. e-Business) applications using standardized middleware frameworks and object oriented technology. AI involves the development of new strategic business solutions, which securely integrate functionality from disparate applications (Themistocleous and Irani, 2000). AI adds value by placing business logic in the applications network and creating a more dynamic IT infrastructure that can evolve with a company (Linthicum, 1999).

5. Application Integration

All observations discussed above indicate that ERP systems can not be seen as a *reliable* solution to integration problems. The reason for this is that ERP modules co-exist with other applications (e.g. legacy, supply chain management etc). Therefore, literature (Loos, 2000, Meier *et al.*, 2000, Schonefeld and Vering, 2000) as well as the survey indicate that there is a need to integrate the *"integrated suites"* with the rest applications. AI technology may address this integration need (Linthicum, 1999, Hasselbring, 2000, Zahavi, 1999). According to the survey, the most popular category of applications be integrated with ERP systems is the EDI (81%). This high percentage is based on EDI technology following the same concepts as Application Integration technology. Loos (2000) reports the integration of ERP systems with other interoganisational applications can be done with XML, Javabeans and Middleware technologies. Moreover he mentions that XML is more efficient and flexible than traditional EDI technologies. Schonefeld and Vering (2000) indicate that the integration of other applications with ERP systems is often not supported. Schonefeld and Vering (2000) believe that integration can be facilitated using CORBA, XML and Screen Wrappers (Zahavi, 1999). Linthicum (1999) explains how Application Integration technology can be used to integrate best-of-breed modules as well as other applications (e.g. legacy systems) with ERP solutions. Duke et al. (1999), Grimson *et al.* (2000) and Hasselbring (2000) support that Application Integration technology is used to achieve integration between disparate ERP systems. Klasell and Dudgeon (1998), Linthicum (1999), Ring and Ward-Dutton (1999), Zahavi (1999), Edwards and Newing (2000) and Pender (2000) report that Application Integration technology includes also a number of other technologies and techniques such as XML, Middleware, CORBA, DCOM, Screen Wrappers, Javabeans etc. To sum up, the undertaken survey supported by literature indicates that ERP systems provide partial integration to companies. As a result a number of applications co-exist with ERP systems and Application Integration technology can address more effectively this problem.

6. Conclusions

The undertaken survey was aiming at identifying problems of ERP systems and addresses a number of integration issues. This empirical survey was based on a structured questionnaire that was distributed over the Internet. Sixty-seven ERP specialists from different Internet based ERP lists, responded to this survey. The reliability of the responders was checked through IP analysers and data analysis. The reliability control has shown that the 17 out the 67 responders (25,3%) were unreliable and therefore excluded from the sample. Research findings were interesting as led to some important conclusions. Considering the research findings, there are several conclusions that can be drawn. Conclusions can be divided into business and technical.

In the category of *business conclusions*, it can be drawn:

- *ERP adoption***.** Companies adopt ERP systems for different reasons such as business and technical reasons.
- *Motivations.* The main motivation for the adoption of ERP systems was technical reasons. It can be said that technical problems were more important to companies the previous years as enterprises had to find a solution to Y2K problem. Therefore, it is estimated that technical and business motivations will be more balanced in future.
- *Benefits.* ERP systems helped organisations gain business benefits such as customer and supplier satisfaction and increase overall productivity.
- *ROI.* The return on investment is relatively low. It can be said that integration problems affect the ROI due to the fact that many disparate information systems co-exist into the company. This is related with extra operating costs (technical and functional). Thus, the so-called "integrated suites" failed to develop an integrated information infrastructure.
- *Managerial Problems.* Companies phased a number of managerial problems during and after implementation period. These problems can be divided in (a) project delays and costs problems, (b) conflicts with external entities, (c) internal conflicts and (d) conflicts with business strategy. Research findings indicate a project delays and costs overruns are affected by conflicts with external and internal entities.

In the category of *technical conclusions*, it can be drawn:

- *All-in-one Vs Best-of-Breed.* Companies prefer the all-in-one ERP solution to the Best-of-Breed.
- *Y2K.* ERP systems helped organisations overcome the Y2K problem

- *Adopted Modules***.** Companies adopted a number of different ERP modules in order to automate their process. Responses show that organisations adopted a subset of the ERP packages.
- *Technical Problems.* Nearly all the companies faced serious integration problems whereas the ¾ of the companies had customisation problems. Other problems reported include single European currency, security and Y2K.
- *Customisation.* Customisation problems did not allow companies to make serious changes on ERP package. As a result a Vanilla approach was adopted by the 2/3 of the companies.
- *IT requirements fulfilment.* The majority of responders (72%) reported that ERP system fulfils only the 30%-50% of IT requirements. As a result many companies did not abandon their legacy systems but they tend to integrate the functionality from disparate applications into a business infrastructure.
- *Integration***.** Based on the research findings, it can be said that *ERP technology* does not offer an integrated solution but it *amplifies the need for integration***.** Moreover, enterprises had serious integration problems when they attempted to incorporate other applications with ERP system. Only EDI applications were integrated successfully (81%) with ERP infrastructure. This high integration rate derives from the fact that EDI technology follows similar concepts to AI. The basic conclusion is that Application Integration technology could provide a reliable solution to integration problem as it securely incorporates functionality from disparate applications and leads to the development of new strategic business solutions. Application Integration is a new means of system integration that adds value by placing business logic in the applications network and creating a more dynamic IT infrastructure that can evolve with a company.

7. Limitations of the study

The reliability of Internet was a limitation of this study. In section 3, is mentioned that IP analyser tools and data analysis methods were used to exclude responses that were not reliable. In addition, the questionnaire included a number of triangulated questions that allowed researchers to identify any unreliable answers. However, it is not clear whether the responses are 100% accurate or not, as there is scant literature on evaluating the reliability of Internet based surveys.

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