

EDI Implementation: The EDI Clusters Program in Greece

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Abstract

The rapid change in technology and other skills added to customers requiring highly specific and customized products, has lead to the need for far greater cooperation within and between firms. Electronic Data Interchange (EDI) is one of the tools that can help and change the way in which many companies communicate between each other. In this paper, the introduction and adoption of EDI in Greek companies are examined with a focus on the EDI Clusters Program. The objectives and management of the program, the profile of the participating companies, the barriers and the benefits during the pre-implementation and the implementation stages are analyzed. According to the findings, the main problems of EDI implementation are mainly related to legal issues due to lack of institutional framework, to organizational and human where lack of experience in the management of funded projects, and coordination difficulties were the main obstacles. Additionally, different administrative and information technology environments, required reengineering of the business processes, but with insufficient training created insecurities, resistance to change and poor users commitment. Due to the above obstacles benefits realized were fewer than anticipated and are mostly operational, such as formulation and realization of business processes, motivation for communication with business partners and upgrade of technological and organizational infrastructure.

Keywords: EDI implementation, e-commerce, business clusters.

Introduction

The evolution of information technologies and communications, the globalization of the markets, the necessity of relationship marketing, and the nature of competition are forcing enterprises to rethink business strategic options. Business processes shift from adversarial to more cooperative practices. The premise of EDI is to facilitate commerce by tying business applications between trading partners together (Kearney, 1992). Use of interorganizational linkages such as EDI would enable new forms of organizations and reduce the coordination costs of increasingly market-driven organizations (Malone, and Crowston, 1991, Walton, 1996, Anderson, 1998). Electronic linkages are becoming the necessary condition of doing businesses (Keen, 1991).

Electronic Data Interchange (EDI) is defined as the interorganizational computer-to-computer exchange of structured information in a standard, machine-processable format (UNECE, 2001).

Most authors (for example Cameron, 1997, Doukidis et al, 1998, Minoli and Minoli, 1998) classify EDI as a technology for electronic commerce, especially for business-to-business transactions. Other authors and especially practitioners, consider EDI as the essential prerequisite for doing e-commerce. Raman (1996) goes further and characterizes EDI as the backbone of e-commerce, having realized the significant benefits of its use. The importance of EDI is also highlighted in a survey made by Penske Logistics (1998), where EDI is treated as one of the most imminent simplifications in the supply chain, in a survey among 250 key executives in top US corporations.

EDI seems to be a valuable component of Electronic Commerce creating numerous benefits and advantages, and added value services that bear direct positive effects on business processes in numerous companies (Senn, 1998). Generally, it is the cause of positive and negative effects on organizational structures. The integration of information with internal system and the development of a nonhierarchical structure of trading relations create real cost and competitive advantages. A true cost-benefit analysis of the effects of EDI can be difficult to assess, however the costs become much easier to quantify than the benefits. EDI changes the nature of jobs and often requires a heavy organizational redesign. For an EDI implementation to be successful, it needs to be the direct cause of improved productivity and internal operations, create closer customer and vendor relations, provide a competitive advantage in the marketplace, and open up the procurement process.

The aim of this paper is to examine and analyze the first attempts for introducing and adopting EDI in Greece with a focus on the EDI Clusters program. Especially the objectives and management of the program are presented and the profile of the participating companies is analyzed. Furthermore, an analysis of the EDI clusters program is performed in two stages: The pre-implementation and the implementation stage. Comparison of the results is performed in order to identify and evaluate the achievement of the program's expectations.

The EDI Clusters Program

Since 1985, many initiatives and funded programs have taken place, aiming at the introduction and implementation of EDI within the European business context. (Doukidis et al., 1998, Doukidis et al., 1993).

In Greece, the first attempts for introducing and adopting EDI have started in the early 90's by some companies that participated in European projects (e.g. TEDIS). Meanwhile, organizations of the Greek public sector participated in various European projects.

In the private sector, efforts are mainly made through funded projects and programs, like the Operational Program for Research and Technology (EPET) and RETEX (REstructuring the TEXTile Industry). In these programs, companies are financially supported in order to obtain hardware, software, technical support and consulting services to install EDI systems (BCDC Archives, 2000).

The main coordinated effort to introduce and implement EDI in Greece is made through the EDI CLUSTERS program, which is the focus of this study. The program is carried out under the National Industry Operational Program and aims at EDI implementation in industry groups and supply chains (Call for tenders, Greek Ministry of Development, 1997).

Objectives and management

More specifically, the objectives of the program are:

- To force companies create groups and work together
- To highlight the importance of EDI and introduce its use in the Greek marketplace
- To create a “critical mass” of EDI users
- To create the necessary infrastructure for e-commerce
- To act as a pilot for future projects.

The official call for tenders from the Greek Ministry of Development was made on 29/01/1997, where guidelines for the project proposals were provided. According to the guidelines, groups of companies (clusters) should be formed in order to carry out the EDI project. Each cluster should be comprised of at least six (6) companies participating in a specific supply chain as suppliers, manufacturers and resellers. Additionally, financial institutions, transportation companies, insurance agents and public organizations could be included in each cluster. One of the participating companies should be assigned as the project leader. As far as the project’s budget was concerned, it should not exceed the limit of 130.000.000 drachmas (about 335.000 US dollars). Furthermore, a 5% of the total budget of every project was the minimum amount required for each company’s participation.

Each project was supported by the Greek State and the European Union for up to the 60% of its total budget, while the remaining 40% was provided by the participating companies. The project’s budget was divided into six eligible categories, based on the nature of the expenses: salaries, cost of consulting services, hardware cost, cost of EDI software, cost of telecommunication services, project dissemination costs (e.g. newsletters, conferences etc.) and other expenses (courier, telephone costs, consumables etc.).

The call for tenders provided the following (indicative) framework and timetable:

Table 1. Indicative project timetable in months.

PHASE / STAGE OF THE PROJECT	DURATION
Creation of the strategic project plan and establishment of the necessary organizational links and structures	1
Analysis of organizational needs and system requirements	3
Installation and pilot implementation	6
Implementation-integration	6
Dissemination of the results and benefits of the project	5

(Source: Call for tenders, Greek Ministry of Development, 1997)

Thirty-four (34) project proposals were submitted by the project leader of each cluster, with a total number of 325 companies. A special committee of the Ministry of Development carried out the evaluation of the proposals, based on criteria related to the content of the project proposal (50%) and the companies profile (50%):

Content of the project proposal:

- Solution to organizational needs and contribution to the industry group and the national economy 5%
- Number of EDI messages and integration of supply chains 15%
- Technical characteristics of the system 5%
- Technical and organizational integration 5%
- Top management support and adoption of innovative business techniques, such as business process reengineering 5%
- Use of methodology and project management quality 5%
- Strategy for the dissemination of the project results 10%

Companies profile:

- Maturity and readiness of users to carry out the project 5%
- Horizontal and vertical integration within the industry group 10%
- Participation of industrial associations 5%
- Participation of small and medium companies 5%
- Experience of technological providers and EDI consultants 10%
- Ability in project management 5%
- Project manager experience 5%
- Geographic dispersion of the participating companies 5%

Due to the fact that over 80% of Greek companies are considered as small/medium (SME's), positive points were given for their participation in order to be able to create a critical mass of EDI users.

In 25/08/1997 the approval of 27 out of 34 proposals was announced with a total budget of 2.733.000.000 drachmas (over 7 million US dollars) and a total number of 253 participating companies. Coordination and communication problems resulted in the dissolvment of six clusters at the beginning of the project. The total budget of the remaining clusters came to 2.057.869.886 drachmas (about 5.5 million US dollars) with a total number of 200 participating companies.

The 21 projects started at the end of 1998 and were expected to finish the end of 2000 according to the initial timetable. An extension of six months was given due to organizational, human, technological and legal problems in the implementation stage. The progress of the project of EDI implementation was audited quarterly, and quantitative and qualitative data were collected and analyzed (BCDC archives, 2000, 2001). The project was coordinated by the Business and Cultural Development Center (B.C.D.C.), which was appointed after an evaluation and selection procedure by the Ministry of Development.

Profile of participating companies

The 21 clusters were classified according to the output contribution of the specific supply chain. The classification is presented in the following table:

Table 2. Cluster classification

SECTORS	CLUSTERS	COMPANIES
Dairy products	1	14
Food and drinks	2	27
Pharmaceutical-cosmetics	3	33
Furniture	1	6
Home electric appliances	1	6
Oil products	1	8
Textile	2	16
Computer hardware and software	2	31
Leather garments	1	6
Agricultural products	2	17
Metallic and Aluminium products	3	22
Paper products	1	8
Recycling	1	6
Total	21	200

(Source: BCDC archives, 2000)

The average number of companies in each cluster is ten. One cluster included 19 companies (maximum), while seven clusters had 6 participating companies (minimum).

It is worth noting, that 74% of the companies are based in only two (2) prefectures (Attiki and Thessaloniki), while the remaining 26% is dispersed in other 21 prefectures (figure 1):

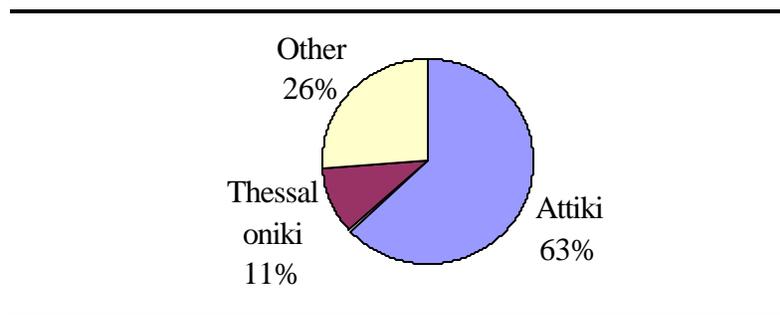


Figure 1. Geographic segmentation of the participating companies

The fact that most of the participating companies are based on the two most populated areas of Greece shows the general problem of centralization, especially when innovative projects are concerned. The relative small size of the companies, the lack of skills and adequate expertise, the limited access to information regarding funded programs, the lack of technical and organizational consulting support and finally the non-innovative organizational structure and culture, explain the limited number of participating companies from other areas of Greece.

Another issue concerning the profile of the participating companies is the number of employees. As shown in figure 2, 82% of the participating companies are small (up to 50 employees) and medium (between 50 and 250), while only 18% are large.

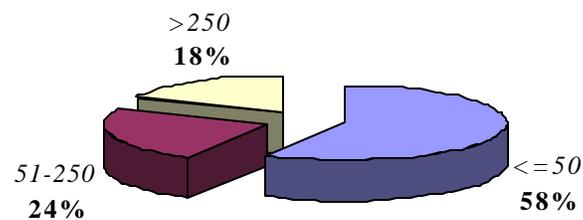


Figure 2. Classification of companies according to the number of employees

Finally, concerning the level of IS infrastructure of the participating companies before the beginning of the EDI project, three groups were identified:

- a) No IS infrastructure (13%) - lack of any information system at all
- b) Limited use of IS (50%) - mainly use of transaction processing systems and/or accounting information systems
- c) Extensive use of IS (37%) - use of management information systems (MIS), decision support systems (DSS), enterprise resource planning systems (ERP) etc.

It should be noted that every cluster included companies from all the above-mentioned categories, something that caused extra problems that will be discussed in the implementation stage.

Findings-Discussion

The overall approach of this study is to examine and evaluate the EDI CLUSTERS project in two stages, the pre-implementation and the implementation stage, based on the following criteria for the analysis and comparison of the above stages: Methodology for the implementation of each project, objectives/benefits for the participating companies, dissemination activities/strategy, EDI messages, telecommunication network for the transaction of the EDI messages and problems

encountered/suggested solutions. Quantitative and qualitative data is used to examine both stages. The main results of the study are summarized in table 3.

Table 3. Criteria for the evaluation of the EDI Clusters Program

	PRE-IMPLEMENTATION	IMPLEMENTATION
METHODOLOGY	SSADM 43% Customized 33% Emmelhainz 19% IDEFO 5%	SSADM 24% Customized 67% Emmelhaiz 9% IDEFO 0%
OBJECTIVES-BENEFITS	Operational Strategic	Operational: mostly achieved, but fewer than anticipated Strategic: not yet fully assessed
DISSEMINATION ACTIVITIES	Meetings, seminars, workshops 100% Newsletters 95% Articles 71% Best Practices Guide 62% Industry Association 38% Web pages 24% National, international conference participation 10%	Meetings, seminars, workshops 100% Newsletters 45% Articles 20% Best Practices Guide 62% Industry Association 0% Web pages 24% National, international conference participation 0%
EDI MESSAGES	Intent to use ranking Trade Payment, Transport Construction General-statistics	Actual use ranking Trade Transport, Construction Payment General-statistics
TELECOM. NETWORK	VAN 52% X.400 33% Combination 14%	VAN 52% X.400 33% Combination 14%
PROBLEMS	Organizational 67% Financial 2% Human 67% Technological 38% Legal 95%	Organizational 82% Financial 20% Human 65% Technological 65% Legal 95%

Pre-implementation stage

The purpose of examining the pre-implementation stage is to recognize the groups' expectations and potentials before the beginning of the project. Analysis on this stage is based on data collected from the proposals of the 21 projects.

Concerning the proposed methodology for the project implementation, 43% of the clusters stated they would use SSADM (Structured Systems Analysis and Design Method-Yourdon, 1989), 33% would use a customized methodology (tailored to the specific project needs), 19% would follow the Emmelhainz methodology (Emmelhainz, 1993) and the remaining 5% (1 project) would adopt the IDEF0 methodology.

The benefits that each project and each participating company anticipated from the projects, are classified into operational and strategic ones. Operational benefits include: Reduction in paperwork, communication (telephone, fax, mail) and data entry-processing costs, better and more effective communication between business partners, improved inventory management, Just-In-Time production, and better delivery planning, timeliness in distribution channels, staff reduction or replacement and sales monitoring. Strategic benefits expected by the participants, are improved customers service through business process reengineering and ability to cooperate with foreign companies that already use EDI. Additionally strategic benefits/objectives recorded in this stage are quick response to changing market needs, acquisition of e-commerce prerequisites, skills improvement as well as sales efficiency and control.

Various dissemination activities were suggested by the participants of the project, in order to acknowledge the EDI cluster program outcome, and are included in table 3.

The proposed EDI messages are ranked according to the participants intention of use based on the type of data contained in these messages and the specific activity within the supply chain that this data concerns. EDI messages related to trade, payment and transport are regarded more popular than construction and general-statistics ones.

In order to send and receive the EDI messages, a telecommunication network must be used. As shown in the following figure, most of the 21 projects proposed the use of a Value-Added-Network (VAN). In one third of the projects a X.400 network was suggested, while only few of the projects preferred the adoption of both solutions (fig. 3).

In our study the specific problems are classified in the following general categories: Organizational, financial, human, technological and legal. According to our findings legal (lack of framework) and organizational problems were considered in this stage as the most important ones. Organizational problems refer to organizational structure, change management and top management support. Human problems, and in particular resistance to change and poor users commitment were considered very likely to occur. Technological problems (compatibility of EDI with existing applications), as well as trust among participating companies, were not regarded very important before the beginning of the project.

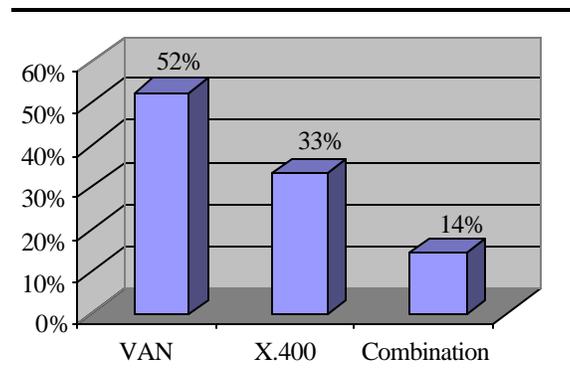


Figure 3. Proposed telecommunication network

Implementation stage

In this stage, the analysis is based on the same six categories presented at the pre-implementation stage. Data was gathered by using three different (but complementary) sources: i) The Analytical Progress Reports that each cluster submits to the BCDC, ii) The audits of the participating companies of each cluster and iii) An official meeting between BCDC program coordinators with the project managers, technical suppliers and consultants of all the 21 clusters.

Based on the above data, it is found that SSADM is used in five clusters (24%), Emmelhainz in two (9%), whereas a customized methodology, tailored to the specific business needs, is used in the rest of the projects (67%). A comparison between the percentages in the two stages proves that, when developing an IS/IT project, it is difficult to follow exactly a specific methodology, due to the unique characteristics of every project.

The benefits achieved from the participating companies in the implementation stage are definitely fewer than the anticipated ones. The benefits realized by the participating companies are mostly operational and short/mid term, such as: development and/or upgrade of IS/IT infrastructure, acquisition of EDI software, formulation and realization of business processes, motivation for communication and coordination among business partners and experience in the management of funded projects. Long-term or strategic benefits, such as improved customer satisfaction or companies' competitiveness, cannot be assessed yet since the projects have just been completed.

Meetings, seminars, workshops, best practices guide and web pages, are the disseminating activities performed as planned. The remaining activities were partially executed, resulting in the reduction of the final budget.

As far as the EDI messages are concerned, a lot of them were not actually used by the companies, although they were proposed at the pre-implementation stage. Messages related to trade activities (price catalog, orders, order response, inventory and sales report,) are mostly used

comparing to the other activities (transport/distribution, payment, construction, general-statistics). Generally, the EDI messages mostly used, are the ones that refer to transactions that have already taken place between the participating companies. The information included in these messages was already transferred in other ways (telephone, Fax, mail), so the transition to EDI was not difficult. Finally, security fears and low levels of confidence and trust between the trading partners, hampered the use of messages related to payment activities (such as credit/debit advice, payment order etc.).

The percentage of telecommunication networks actually used for the transaction of the EDI messages in the implementation stage is the same as proposed in the pre-implementation stage. However, it should be noted that the subscription rates for a Value-Added-Network were and still are high and many small companies faced difficulties in affording the required amount. Therefore, many companies are expected to turn to less costly solutions such as the transmission of EDI messages through the Internet.

Several problems were encountered in the implementation stage, which were the main causes for the delay of the projects. Legal issues were considered the most important ones, since there is still a lack of legal framework. For example, in Greek legislation, documents like invoices are not yet legally "recognized" in the digital form of an EDI message. Thus, they also have to be sent manually in their physical form, in order to be valid. However, information about other activities of the trade cycle (for example price catalogue, order, inventory report, sales report etc.) can be interchanged within EDI messages without requiring a specific legal framework.

Another problem realized in this stage was the lack of experience in the management of funded projects. Most of the participating companies were involved for the first time in a funded project consequently, formal project management procedures were difficult to follow. External consultants were hired to overcome this problem, increasing as a result the total cost.

In all of the 21 clusters, the large number of participating companies required great efforts of coordination and commitment, something that was not considered in the pre-implementation stage. However, in the implementation stage it was realized that it is very difficult for so many different companies to collaborate and work together, particularly since contact persons in each participating company changed at least once. Therefore, a model with fewer participating companies (2-3) should be adopted.

Complexity was also added by the different administrative and Information Technology environments in each cluster. This practically means that in companies with sophisticated information systems (especially ERP), there were major technological problems in linking EDI to these systems. This led to additional employees' workload and additional resources. On the other hand, in companies with limited use of IS, the effort to implement EDI highlighted their weaknesses in IS/IT and revealed deficiencies in their internal organizational structure. Therefore, in order to carry on with the project and achieve the expected benefits, companies had to proceed in a review and reengineering of the business processes. The reorganization process combined with insufficient training created insecurities, resistance to change, and poor users commitment.

Conclusions

Competitive pressures create the need for information technology improvements. Today's businesses need progressive tools that will effectively handle the information overload in the most efficient manner. Electronic Data Interchange (EDI) is one of the tools that can help and change the way in which many large and small companies communicate between each other. EDI can create and enhance new forms of cooperation however, it cannot by itself cause immediate modifications in the organizational procedures.

In this paper, the attempts for introducing and adopting EDI in Greek companies were examined and analyzed with a focus on the EDI Clusters Program. The results showed that EDI was much more difficult to implement than expected. According to our findings, companies faced a number of problems. Organizational, financial and human are considered the most important ones. Problems generally were caused by the limited knowledge and understanding of EDI, legal barriers, high cost of set up and maintenance, lack of top management support and lack of innovative management of intra and extra organizational processes. Additionally, the inadequate IS/IT infrastructure and the problem of interfacing EDI with existing information systems and applications, created obstacles in the implementation of EDI, which in turn resulted in considerable delays of the project's progress.

Companies, having experience with EDI and funded projects, adequate IS/IT infrastructure and technical expertise, well-defined business processes and top management commitment realized the expected benefits. Such companies were mainly large ones and belonged in the dairy, food, pharmaceutical, computer hardware and software and textile clusters. In the remaining clusters, despite the problems that companies faced, considerable operational benefits from EDI implementation were gained, such as formulation and realization of business processes, motivation for communication with business partners and upgrade of technological and organizational infrastructure.

Even though information technology is involved, EDI is more of a business issue than a technological one, since it needs a detailed review and reengineering of intra and inter organizational business processes. Furthermore, it requires careful selection of business partners, continuous training and commitment of users, top management support and adequate funding. Business redesign and technological innovations like Web-EDI and XML/EDI, are creating an environment to bring EDI to SME's cheaply, generating potential cost-savings and efficiencies for a larger audience.

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