Last-mile Supply Chain Integration: Easy Connection and Information Exchange between Suppliers and Retailers

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Abstract

Integrating and automating information exchange (like catalog, orders, invoices, etc) across the entire Retail Chain by connecting Suppliers, Retailers, Warehouses, Retail Stores and other players has been a complicated, expensive and time consuming task and – as such – has only been employed by larger enterprises. A flexible Integration and Business Process Automation service enabling rapid and intelligent consolidation of business documents exchange among business partners is needed. By utilizing the latest Internet technologies and standards, multiple disparate internal applications can "speak out" to those of their business partners, resulting in a large business network of loosely connected business partners. Compatibility with existing systems and technologies (like EDI-based systems) secures the investment. This Enterprise Application Integration (EAI) service has been specially designed so as to allow Small-Medium Enterprises (SMEs) catch up with the new business culture (in the most economic way) as well as to allow for further proliferation by allowing them to adopt intelligent added-value services.

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The Past: Developing the Need

Many contemporary Small-Medium Enterprises (SMEs), have been investing in IT solutions over the past few years in order to automate and streamline their internal business processes, following the trend of larger, national and multi-national organizations. Even though these enterprises have been successful (in one way or another) in maintaining inventories, semi-automating their ordering systems and customer management, they still lack the ability to leverage the real power of interconnectivity and *external* automation with their business partners.

Indicatively, some of the issues that concern businesses – regarding the external automation of their processes – are summarized here:

1. Minimize costs of receiving/sending/processing thousands of business messages monthly (like data-entry, administrative tasks, etc.)
2. Automatically update inventories, in order to minimize manual inventory measurements
3. Have accurate information for category management
4. Reduce lead times (order-delivery, introduction of new products, promotions, payments, etc.)
5. Have real-time information on their business associations (like buyers, suppliers, logistics, distributors, representatives, etc.)
6. Receive and process real sales data (like from POS, etc.), and others

Both Suppliers and Retailers have had a clear view that the business process automation could eventually result into faster lead times, less cost and price reductions. And even though some of them (the larger ones - mostly multinationals) have planned to strategically tackle with these issues by adopting (mainly) EDI technologies, it was not clear how the smaller ones could follow on with it – especially due to the high costs (new investments in costly IT solutions, replacement of existing infrastructure, exclusive connections to proprietary VANs, large administrational cost, lack of appropriate personnel skills, long-running implementations, etc.) such a move would incur. This resulted into a "two-speed" marketplace with serious problems. EDI has only been used by the "elite" to allow business communication "between the members of the team", while – on the other hand – they still need to do business traditionally with the bulk of smaller Suppliers that only have faxes and telephones.

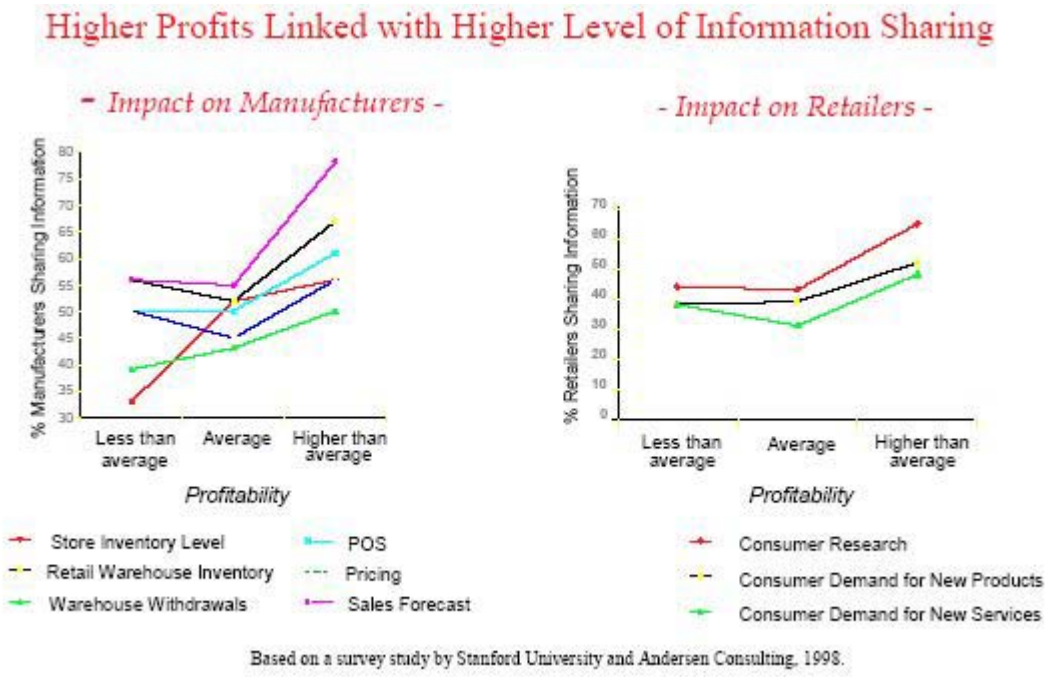

Fig. 1. Higher Profits Linked with Higher Level of Information Sharing (Andersen Consulting, 1998)

Talking specifically about the Greek market and after ten (10) years of EDI in Greece, this technology did not have the initially awaited results. Its penetration is minimal, which is due to many reasons:

- the total implementation and maintenance cost is prohibitive for the majority of Greek enterprises (like 99,7% SMEs)
- requires dedicated IT personnel for maintaining the systems
- requires EDI-aware software, which can be a tremendous problem for enterprises who want to use it, without having to replace their complete internal infrastructure and without re-educating their personnel
- requires a lot of customization to actually work: using a common standard is not always the key to success, since separate customization, data analysis and – sometimes – development is required. EDI enforces standards that, sometimes, not everyone can follow
- traditionally EDI and the existing transaction networks do not support intelligent mapping from one business document (catalog, order, invoice, etc) but rather simplified business logic without embedding business rules (like minimum order quantity, promotional product codes mapping, etc) when exchanging data
- assuming an enterprise is already using EDI, adding a new business partner requires additional work. As a result, multiple (N*N) connections are still required, resulting into overall system complexity and advanced risk of malfunction

A Market Approach

SME's play a major role in the European Union's business economy (see fig. 1 below), accounting for approximately two-thirds of employment and 60% of value added in the EU.

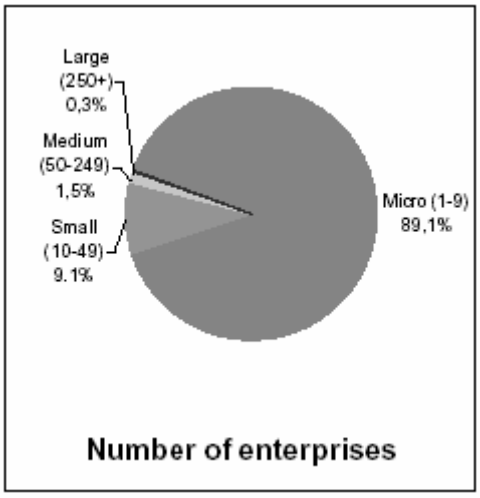

Fig. 2. SMEs in European Union

If we were to discuss about the Retail sector we would find out that is characterized by the intense competition at a pan-European level, especially for SMEs. Nowadays, SMEs have to face major problems such as: sales decrease, mistakes and problems from inefficient collaboration with their business partners, cost rises due to the incomplete fulfilment of orders, decrease of profit margins and, overall, complexity of commercial transactions.

The shift towards e-commerce has been dictated in a twofold way:

1. The concept of "e-business" refers to both e-commerce (buying and selling online) and restructuring business processes to make the best use of digital technologies. It is when information technologies transform traditional business procedures, products and services that e-business fulfils its potential. Clearly the responsibility for both activities lies with industry, but governments determine the **regulatory environment** that can either stimulate or undermine the development of e-businesses.
2. Information and Communication Technologies (ICTs), and particularly e-business, offer many opportunities for SMEs to grow and prosper. While some are embracing change very successfully, for the most part European SMEs find the **opportunities presented by ICTs difficult to grasp**. The obstacles are well documented. They include lack of technical and management skills in SMEs, lack of appropriate e-business solutions, the high cost of ownership of ICT equipment, concerns about security and privacy, and complex regulatory frameworks for e-commerce. Most significantly of all, many SMEs are not yet convinced of the appropriateness of e-business for their particular circumstances. They are seeking highly specific information on which to build a business case, and so make informed and realistic investment decisions.[1]

A *Greek* Market Approach

Specifically for the Greek market, SMEs account to almost 99.7% of the total Greek companies.

Even though EDI has existed in Greece for almost 10 years, the number of enterprises using the services is only about 35. According to a survey we conducted, especially for the Retail Sector we find that there is an enormous market that is not currently being served.

[1] Brussels, 21.1.2003 SEC(2003) 58, COMMISSION STAFF WORKING PAPER: Creating an entrepreneurial Europe, The activities of the European Union for small and medium-sized enterprises (SMEs)

	Suppliers	EDI	i@connect	Not served	% not served
1. Pure Grocery	405	13	20	372	91,85%
2. Fresh Assisted sales	424	3	3	418	98,58%
3. Fresh Self Service	175	8	3	164	93,71%
4. Bazaar	274	5	25	244	89,05%
5. Electric Appliance	112	4	0	108	96,43%
6. Textile	89	0	0	89	100,00%
Total	1479	33	51	1395	94,32%

Table 1. Supermarkets/Grocery Retail Market not being served

EDI: number of suppliers using traditional EDI solutions (mostly large enterprises having already an investment on EDI).

i@connect: New electronic connections through the i@connect service achieved during the last 9 months

Not server= Supermarket Suppliers in Greece – (Existing+i@connect)

It is clear that both at a European level and locally (in Greece), there is a tremendous number of SMEs that would like to automate their business exchanges but *lack the enablement service*.

Holding On To the E.U. Directives

Not only the marketplace itself dictates a shift towards electronic business; Both the European Union as well as independent researchers have realized the related benefits.

The guidelines sent by the European Commission to the General Secretariat Of Industry SMEs Directorate of the Greek Ministry Of Development for the **"European Charter for Small Enterprises"** urges (at Chapter 8) that *"technology dissemination be promoted towards small enterprises"* and that "***pan-European co-operation between small enterprises using information technologies (should be) enhanced"**, etc.*

The proposed actions of the **eEurope 2005 Action Plan** (in sector 3.1.2 – A dynamic e-business environment) - and more specifically the recommendation for Interoperability – dictate that *"By end 2003, the private sector should, supported by the Commission and Member States, have developed interoperable e-business solutions for transactions, security, signatures, procurement and payments".*

The CEN/ISSS eBusiness Standards Focus Group[2] has investigated and identified several strategic aspects for e-commerce, which include *"cross-border interoperability", "integration of eBusiness processes", "Web Services", "Adaptability", "Trust and Confidence"***.**

The Present: Realizing the Shift

Currently worldwide, new transactional networks are emerging, providing alternatives to EDI solutions by enabling enterprises to interconnect over the public Internet. However, the majority of these networks do not provide any value-added services (which are required

[2] CEN/ISSS Roadmap for addressing key eBusiness standards issues 2003-2005 - 25 June 2003

especially by Suppliers). For example, most of these networks provide form-based EDI (or WebEDI) or plain EDI exchange over the Internet; the former is a limited solution, since the receiver still needs to do manual data-entry; the latter simply avoids the networking cost (of the private VAN) but still requires a lot of investment in EDI-aware software at each end (which – of course costs). WebEDI is like "web fax", meaning that it is not actually a flexible solution since it benefits only the retailers (or – in general – "information senders" that have already invested in it) without really taking into account the *service* it provides to the suppliers (or – in general – "information receivers").

Both these approaches lack one important factor: they lack *intelligence* between the ends: in an ideal world both Suppliers and Retailers would share the correct information, there would not be any need for intelligence at the Provider level. However, since this is not the case, Providers (like Information Systems Impact with its @connect services) can apply *intelligent business rules* (like product mapping control, order checks like minimum order quantity, packaging issues, etc) in order to provide true end-to-end integration between Suppliers and Retailers.

These intelligent business rules apply regardless of the *format* required by each end: for example, in the EDI world everyone had to understand the specific EDI version per message type (like EDIFACT ORDER D96A); in case a peer (Supplier or Retailer) decided to upgrade to a new format (like ORDER D97B), then *n* peers will have to also upgrade their systems to support the new standard. This *lack of flexibility* has started affecting existing EDI customers, who want to be focused more in their business than in the supported EDI formats. As such, the new business exchange services require that *communication is irrelevant to the language of the exchanged information*, since there is an in-between translator that can speak the respective "languages". For example, a successful contemporary scenario would call for an organization standardizing on a format (of their choice, like – let's say - XML) but being able to exchange business information with *any* business partner, regardless of the standard format each partner uses (like EDI, XML, ASCII, Excel, Access, etc.). The success of such scenario depends on the capabilities of the Provider to bridge the chasm of communication ("language") among the partners.

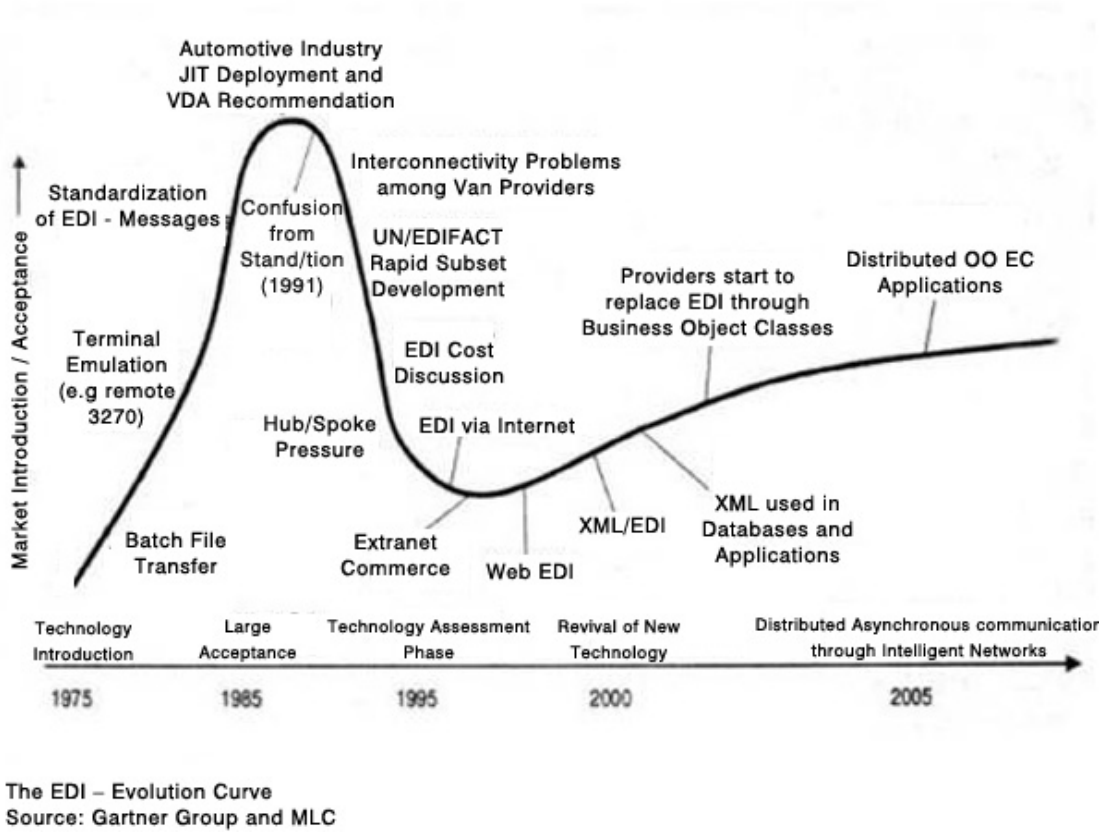

Fig. 3. Replacement of EDI

As depicted in Figure 2, after the EDI blow and deflation, there has been a steady – though low – uptake of evolved electronic exchange services that take advantage of relatively new technologies like the World Wide Web, XML and Distributed programming. The development of intelligent thin clients that can operate in accordance to a central service is the next step, where enterprises outsource the difficult tasks of internally maintaining one-to-one electronic relationships.

Moving towards distributed applications that leverage all the new IT developments gradually replace EDI as a standard for electronic document exchange and open the market for new intelligent transaction networks that are flexible enough to operate on multiple document standards and format with a focus on XML. This is also the paradigm of i@connect.

The New Trading Exchange Paradigm (i@connect)

i@connect combines the benefits of EDI (structured data formats) and WebEDI (Internet-based delivery) and extends these by adding intelligent transportation, transformation, tracking and notifications services, in order to provide a complete, easy-to-use and flexible integration platform that is attractive to both large and smaller enterprises. Additionally, i@connect is the basis for extra value-added services, like CRP (Continuous Replenishment), VMI (Vendor-Managed Inventory), etc.

This section provides insight on the service in terms of the issues discussed in the previous chapters.

Concept Overview

i@connect[3] is a service-oriented solution (that can apply to multiple business sectors like Retail, Pharmaceutical, Automotive, etc.) that provides intelligent integration services among business partners, across the entire Supply Chain. i@connect allows for easy and secure business documents exchange between multiple business partners, disparate data formats and heterogeneous systems, providing simple yet powerful business document integration between enterprise applications.

i@connect is a member of a set of services:
1. Enterprise Connectivity Services
2. Other Enterprise Services, such as business connectivity among special business partners also known as local distributors or representatives

The major goal of i@connect service is to establish an electronic data exchange network for secure and reliable business document exchange among business partners that is simple to use and requires minimum initial investment. From an IT perspective, this service provides a set of transportation and transformation services at a central processing "hub" as well as a set of client tools at each participating business partner ("spoke"), providing simple yet powerful application integration between enterprise applications. It realizes a fundamental transformation in the way businesses transact in order to:
- allow businesses to achieve better control over their business processes, in a managed, automated way, find inefficiencies in the existing processes and eliminate them, gain cost reductions through an inexpensive channel, augment personnel productivity
- allow businesses to maintain high quality information stored in the internal systems

The concept of i@connect is based on the following functionality layers:
1. Light, distributed, object-oriented (OO), Web Services enabled application: this thin client is able of handling communication (including transportation, transaction monitoring, security, polling, etc.) both with the Central Service (Hub) and the internal ERP/application.
2. Central Mapping Repository (CMP): working at the Hub level, it is the application that can handle (store, process, map, extract, etc.) disparate data formats, map fields among different specifications, generate outgoing files regardless of content
3. Intelligent Business Rules (IBR): this is the application add-on that can dynamically process incoming data, maintain and apply business rules (in terms of "condition-action" relationships) on incoming and outgoing data
4. Inter-organizational, Process-oriented Workflow (IPW): the application that manages the logical series of steps that need to be taken for a specific one-to-one business relationship
5. Advanced Notification Services (ANS): the application that communicates the outcome of specific steps that relate to the overall process workflow back to the original stakeholders
6. Real-time Monitoring (RTM): a (mostly internal) service that allows instant insight into the overall data processing, including status tracking, performance monitoring, etc.

3 i@connect has gained **international recognition by Microsoft Europe** at the RAD (Retail Application Developer) Awards 2003. It has to be mentioned that more than 100 large international retail S/W providers have been competing in these awards

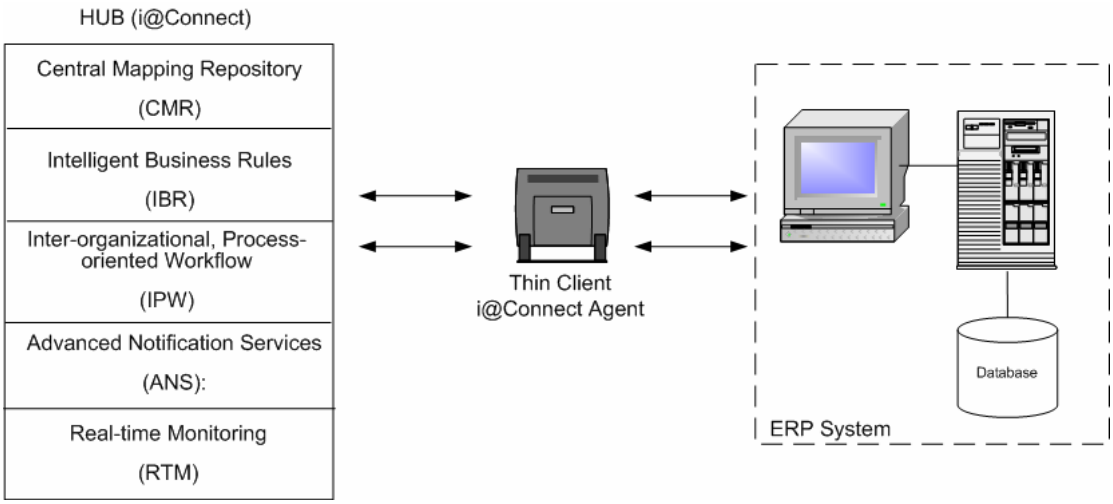

Fig. 4. Service concept

The **main features** of the secure network service are that this service:

1. is a turn-key solution (no additional investments – like IT Personnel, new hardware/software, etc. – are required)
2. is based on standard Internet technologies, so that it will able of integrating with any type of back office systems
3. works with standards but does not impose them
4. is based on the use of the latest security and trust technologies, in order to provide the best possible security, confidentiality and trustworthiness for the commercial transactions exchanged through the service
5. has interoperability as the main tenet, so that it can cooperate with all existing and future commercial applications that are based on standard industry technologies
6. provides easy integration
7. is the base solution required to move towards a full business supply chain integration solution
8. can be rapidly (in just 3-5 days) deployed in most standard SME cases
9. can be used with *any internet connection* (even dial-up) and *any entry-level PC*

i@connect is important since:

1. it provides rapid Return On Investment (ROI) - even from the first few months of usage - and tremendous cost reductions (by cutting down fixed administration costs or other related costs, e.g. data-entry)
2. its cost is affordable to everyone, even to SMEs
3. can directly connect with enterprises that have already invested in EDI
4. massively simplifies and improves the N*N model, by providing virtual 1*1 connections for all participating partners. In this way, an enterprise that has joined the service needs not modify *anything* to work with other business partners (that have joined the service as well). i@connect makes sure that information is going to be provided to each participating enterprise in an understandable format.

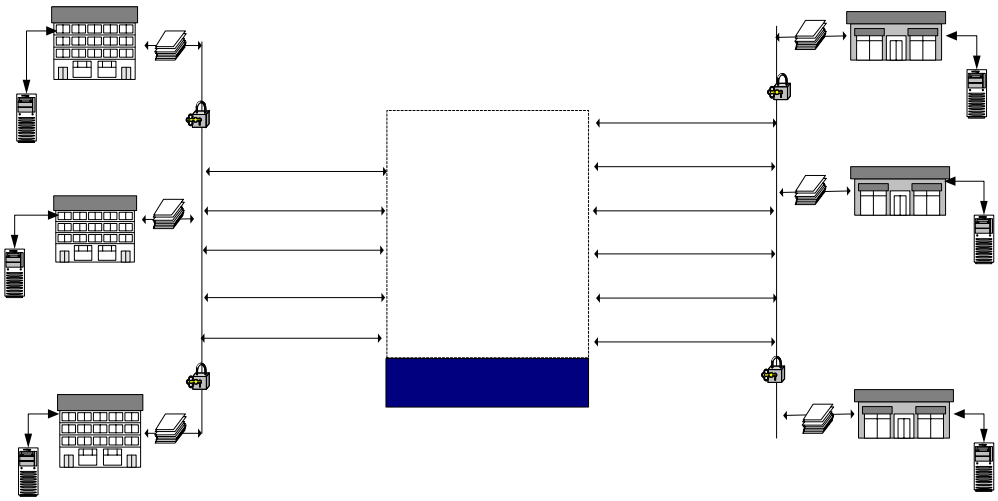

Fig. 5. i@connect business document exchange

Business Scenarios

i@connect can apply to multiple business scenarios, in order to streamline the dynamic data-exchange operations among business partners. Some usage scenarios are presented below:

- *Large buyer with its suppliers*: leading buyers (such as large supermarkets) can leverage the service in order to electronically: send orders to their suppliers, receive order proposals from their suppliers, receive delivery notes and invoices, send stock and sales information to their suppliers, receive product and price catalogues from their suppliers, etc. Apart from transporting this data, there is a large workload of data transformation involved (e.g. product code mappings between Supplier and Buyer SKU in case unique barcodes are not in place, etc.)
- *Supplier with its partners*: large suppliers can leverage the service in order to electronically exchange information with some or all of their partners. Here the partners are defined as "special business partners", in a meaning that they can be representatives, 3PL – distributors, resellers, etc. All these partners participate in the supply chain and exchange a large number of business documents (orders, delivery notes, invoices, etc.). All these documents can be electronically handled, so that the business partners can have instant access to information and shorter cycle times.
- *Supply Chain Integration scenario*: supply chain management solutions often lack the integration part of the solution. This may be due to several reasons, one of the most important being the fact that different partners most probably use different internal automation systems, including multiple file formats, etc. That is, even though large investments have been done in streamlining business processes, performing data alignment, etc. still the partners need to communicate in a way that hides the existing internal complexity and differentiation. As such, there is a specific need for value-added services that will overcome these differences and provide end-to-end connectivity solutions throughout the supply chain and the partners participate in specific business networks.
- *Hub-to-Hub scenario*: this scenario includes the provision of integration and connectivity between disparate "business hubs" that are not flexible enough to allow interoperability with others. The described service can act as a broker between these hubs, bringing together business partners that have already invested in other solutions. A concrete example is the EDI VAN users who – even though successfully send and receive business documents – they cannot, however, do the same with partners that do not use EDI. As such,

the described service can act as the "glue" that will bring the two – or more – service hubs together in a unified and manageable way.

From the above scenarios, it is clear that the business model includes all the actors that participate throughout the Supply Chain. More specifically, these are:

- Buyers
- Suppliers
- Special Business Partners (representatives, distributors, resellers, logistics companies, etc.)

It is very important to understand that each actor can have twofold roles, depending on the "view" of the Supply Chain. For example, an organization can be a supplier for its buyers and also act as a buyer for its own suppliers. A representative might act as a supplier for its buyers and also be a buyer for its supplier (the company it represents). The main idea behind the service is that -irrelevantly of what the business model and the actor interactions are- the service can support the dynamically changing business environment, allowing instant interoperability among the business partners.

Business Benefits

Qualitative Business Benefits for i@connect customers

The i@connect service provides a set of business benefits to the participating companies: Improve and automate the exchange of business documents used for:

- trading and commerce (orders, invoices, dispatch notices)
- key inter-organizational retail to supplier process (CRP, VMI, etc) like inventory report (central warehouse and store level), point of sales data, etc
- Minimize or even eliminate administration costs (like data entry, order checking, etc)
- Eliminate error-prone processes (like data entry)
- On-time exchange and update of orders, invoices (consequently inventory levels), etc
- With one connection (i.e. one business document mapping) a company has access to the entire market
- Improve trading processes

In more detail, some other business benefits are:

1. **Telecommunication Costs Reduction**: less phone calls (sometimes long distance) for voice and fax communications
2. **Paperwork and Employee Workload Reduction**: through the automation of the order taking procedures, less administration workload will be needed at the sales departments
3. **Customers reach**: the services that will be provided by the pilot users to their partners will be enhanced (e.g. reduced overall order taking time, almost zero data inconsistencies, faster response to customers, better overall control of the business operations), affecting the reach of the users and the corporations that want to do business with them
4. **Opportunity cost gains**: more user's business partners could be serviced at the same time i.e. faster service for the same (or even less) cost
5. **Return on investment**: due to a subscription-based licensing model (review Table 1 below), the users will have rapid returns on their investments, since their total spending for communicating and administering document exchange will be reduced at least by 86% from the first month of the service participation.
6. **Additional cost savings**, like balanced (reduced) inventory levels, less out-of-stock situations, etc.
7. **Once-and-for-all integration**: as long as an organization participates in the service, there is no additional work and cost involved for exchanging documents with any other organization that is already connected to the service or will connect in the future. This is guaranteed since by using the service we remodel the communication from an 1-to-many

(one entity communicating with multiple entities) model to a 1-to-1 (one entity communicating only with the service provider, who takes care of all the communication with any number of entities, on behalf of the first entity) model.

8. **Security and trustworthiness,** since the proposed service will make use of the latest security mechanisms so that business can securely do business online

Regarding the **daily operations** of their business, users through the adoption of the proposed service can:

- Extend their enterprise and business operations, in an secure and automated way, to their business partners, current and future
- Tightly connect and interoperate with their best partners
- Gain advantages over stagnant industry competitors, through the significant cost reductions gained, the faster responsiveness to business actions and the higher quality of corporate information (e.g. sales information)
- Automate their business processes towards the outside, which is enabling the specification of document processing flows not only within the borders of an organization, but also throughout the "supply chain" with the organization's business partners.
- Gain better control over their business processes in a managed, automated way (like ability to know when an order has been received, dispatched, etc.)
- Find inefficiencies in the existing processes and eliminate them
- Gain cost reductions through an inexpensive channel (in most cases they already use the Internet but as consumers, not in the business sense of the term)
- Be prepared to rapidly react to business changes
- Leverage opportunities for expansion and growth, through the openness of their internal system applications
- Increase personnel productivity and overall business productivity
- Preserve high quality of information stored in the internal systems
- better and immediate forecasting of demand due to faster and more reliable automated order taking procedures

Measurable (Quantitative) Business Benefits for i@connect customers

We separate the measurable (quantitative) business benefits in two main categories:

- Benefits for the suppliers
- Benefits for the buyers

Supplier-Specific Quantifiable Benefits

Looking only at the administration costs, significant savings for each user can be achieved depending on the connected partners and documents exchanged (orders, invoices, etc) as shown in the following table (Table 1). We assume that data entry for each document like order, invoice, etc. has an average cost of 2-3€ in Greece.

Process Step	Manual/EDI (Minutes)	eProcurement (Minutes)
Product Selection	20	3
Availability/Price Check	10	1
Requisition Creation	11	2
Requisition Approval	21	3
PO Generation	11	0
PO Approval	3	0
Send PO to Vendor	14	0
PO Confirmation	4	0
Status Check	11	1
Receive Shipment	12	2
Match Invoice, Receipt, etc.	8	5
Process Exceptions	8	3
Payment Approval	4	3
Payment Generation	8	5
Process Returns	5	3
Total Minutes/Purchasing Cycle	**150**	**31**
Cost/Cycle Time (Avg. $0.50/minute)	**$75**	**$15.50**
Per Purchase Savings	**NEARLY $60!**	

Source: NAPM

Fig. 6. Savings achieved through improved purchasing cycles

If we only take into account the business document exchange processes of "Send PO to Vendor", "PO Confirmation" and "Match Invoice, Receipt, etc." we will find out that still we have a significant cost which can be vertically diminished by automating the exchange.

According to research, the cost of electronic business documents handling provides significant cost reductions, ranging from over 75% to almost 95%, as presented in Table 1.

Number of Business Documents	Cost Reduction with i@connect %
100	78%
300	86%
800	90%
1500	91%
3000	93%
5000	95%

Table 2. Cost reductions achieved through the use of the i@connect service (suppliers, buyers)

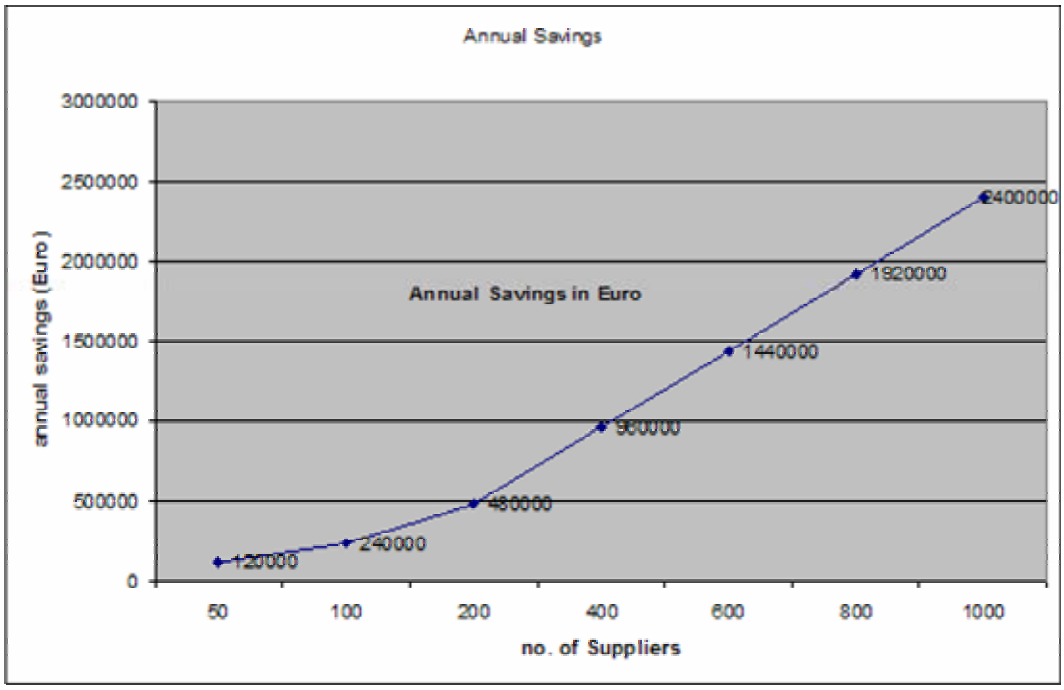

Fig. 7. Total Market Savings

Buyer-Specific Quantifiable Benefits

Additionally to the above-mentioned benefits, buyers can gain huge cost reductions by adopting the i@connect set of services. Traditionally, buyers (and especially large ones) have got a lot of personnel in order to do the data-entry for the piles of paper-based business documents (e.g. invoices) they receive.

Example: One example is a large supermarket chain in Greece, which employs about sixty (60) people to do invoice data-entry and control. Using an average of 18.000 € (per person per year, including public insurance, consumables, employee benefits, etc.) means that the chain has to spend **around 1.100.000 € for manual data-entry** on a yearly basis. Using the i@connect approach means that the bulk of these operations can be performed automatically. If only 80% of the process is automated (i.e the chain could now only use about 10 persons) by doing simple calculations, it is obvious that **the chain could gain about 900.000 € yearly – a cost reduction of 83.3%** just by using the service!

Additionally, huge indirect savings can be achieved when automating invoice entry by:

- **reducing physical inventory procedures**, due to the fact that through the automatic processing and control of buy & sales information they can have instant knowledge of their stock
- **accurate stock** and delivery information
- **real-time control** of spending
- control of supplier **service levels**

Technologies

The development of a solution (such as i@connect) should be based on the following tenets:

- End-to-End Security and Trust
- Service-oriented approach (no local resources required, clients just consume a service)
- Support for heterogeneity
- Use of public networks (the Internet)
- Flexibility
- Use of the latest IT technologies

Enterprise Application Integration

Enterprise Application Integration (EAI) software provides the infrastructure to connect an organization's internal applications. The ultimate goal is to have an organization's disparate internal applications appear and act as one single unified application.

XML / XML Web Services

Extensible Markup Language (XML) is the universal format for data on the Web. XML allows easily developing, describing and delivering rich, structured data from any application in a standard, consistent way.

XML Web services are the fundamental building blocks in the move to distributed computing on the Internet, becoming the platform for application integration. XML Web services are built on XML, SOAP, WSDL and UDDI specifications.

Security and Encryption

Security is obviously a primary concern, especially in business / trade scenarios. Messages need to be protected against data theft and tampering; people and systems need to be reliably authenticated; services must be hardened against intrusion and denial of service attacks.

Hub – Spoke Architecture

In a Hub-and-Spoke Architecture the Hub is the central building block that handles all communication among the connected business applications, known as spokes (application clients). Each spoke can be a message sender, or a receiver, or both.

In a business exchange network, each spoke possesses additional functionality such as:

- message persistence
- transaction support
- security

The Future: Expand and Extend

Easy and flexible connectivity will remain one of the most important factors to implement supply chain integration and thus provide the backbone for advanced supply chain management implementations.

We believe that the next future steps on supplier connectivity are:

1. *Connectivity becomes a commodity*: as more and more enterprises realize the need to do business online (including exchange of business documents) and more solution offerings appear in the marketplace, connectivity services are going to be a must in modern business taking.
2. *Trading exchange services evolve to intelligent, inter-organizational process-execution hubs*: these services include VMI (Vendor Managed Inventory), CRP (Continuous Replenishment Prorgamme), CPFR (Collaborate Planning Forecasting and Replenishment) and others.
3. *Network of Networks*: similar to the evolution of the Internet, we believe that gradually the business networks are going to be standardized into a distributed inter-network, so that communication and exchange will be easier among trading partners. Local Providers are going to play significant role into this.

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