DG Enterprise
SME-Commerce
Project Output Report

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SME-Commerce
Project Output Report

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Annex 1: Project Design

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Introduction

Press stories about Information and Communication Technology (ICT) business phenomena such as e-commerce often focus on the major placers, exhibiting full-scale implementation of the latest available technologies. While such stories provide valuable inspiration to all industry players, they may well present a distorted image of the sector in question, as smaller enterprises largely form the playing field, but play by different rules in terms of challenges and possibilities.

The DG Enterprise Study, *SME-Commerce*, aims to explore how SMEs adopt ICTs that carry potentials of creating ICT business networks, allowing small players to act as big. Three such technologies have been chosen for their general use across sectors, and their potentialities in creating business networks linking SMEs to suppliers, partners and customers:

- Technologies for commerce, i.e. e-commerce
- Technologies for customer relationship management, i.e. e-CRM
- Technologies for Supply Chain Management, i.e. (e-SCM)

The study covers five service sectors which are all very relevant regarding new potentials for ICT supported business networks involving SMEs: Biotechnology, New media, Retail, Transport and Tourism.

The study explores the challenges to SMEs through case studies chosen for their experience in using ICTs. In this sense, the case companies in focus are SME frontrunners, however, far they may be from the state of the art implementations featured by larger players. Thus, the study does not provide a statistical overview of ICT uptake in SMEs, but qualitatively analyses trends in the connections between strategic, organisational and technological issues involved in forming business networks.

As e-business front-runners the companies in this survey is often in close cooperation with technology providers, and the ICTs implemented here will often become wide spread, or even industry standard, throughout the sector. Similarly, the implementation processes,

and the benefits and barriers experienced, could be expected to be similar in other SMEs. Thus the report aims to give insight to the current state of ICT adoption in SMEs and the impact expected by new ICTs.

The project output report

The present report is the draft project output report, and the final report of the study SME Commerce. The report presents the analyses of the impact of ICTs in five sectors through 70 case studies and a cross sector analysis of the current up-take and impact of ICT in the five sectors.

The present report is structured in 8 sections:

Section 1 provides an executive summary of the report, including summary of the cross sector analysis and the five sector analyses.

Section 2 presents the applied methodology of the study

Section 3 provides the cross sector analysis of impact of ICTs and policy recommendations.

Section 4-8 presents the analysis of the five sectors: Biotechnology, New Media, Retail, Transport and Tourism.

In addition to the project output report, **Annex 1 & 2** respectively consists of the project design of the study and the 70 case company profiles.

1. Executive summary

This section presents a summary of the main findings of the study, and includes a summary and the recommendations regarding further actions to be taken. The summary includes main findings of the cross sector analysis, as well as of each of the five sector analyses: Bio-technology, New Media, Retail, Tourism and Transport.

1.1 Cross sector analysis

The five sector studies on ICT reveals the following main conclusions regarding SMEs and ICT:

Conclusion regarding ERP systems
SMEs have increased efforts towards establishing more up-to-date ERP systems, but most systems are not sufficiently advanced and integrated.

Conclusion regarding e-commerce systems
SME front-runners throughout EU are currently adopting e-commerce systems, and many companies appear to prioritise the establishment of simple solutions rather than none at all. The creation of more advanced solutions, providing on-line interaction with customers, is moving very slowly.

Conclusion regarding collaboration software
Collaborative software is gaining increased attention in SMEs, and front-runners have successfully implemented advanced solutions within this area. Most SMEs seem to lack the necessary ICT infrastructure, and impetus from business partners to take the next step into more advanced systems.

Conclusion regarding Internet web pages
A company Internet page are becoming a must for SMEs, and while many SMEs are currently improving and updating their pages, most SMEs are still only utilising a very limited part of the potential in an Internet web page.

Conclusion regarding e-marketplaces
E-marketplaces and portals have been established in most sectors, but the impact on SMEs in the sectors has so far been limited. Companies running e-marketplaces expect this to be changing in the near future.

Conclusion regarding collaborative commerce
The large potential in 3rd generation networks, with more integrated and automated communication throughout the value chain, remains largely unused towards suppliers, partners and customers. SMEs in all five sectors have a large potential of more automation and integration of the value chain and partner network.

The cross sector analysis, and suggestions from the case companies in all five sectors, leads to the policy recommendations below:

1. Support access to high quality IT consultancy

Recommendation
Investigate initiatives to increase the general quality of IT-providers, and increase SMEs access to IT-consultancy.

2. Promote information about potentials of ICT

Most SMEs lack knowledge of the new potential provided by ICTs, including both internal and especially external optimisation of business processes. The potential employed in up-to date ICT infrastructure; integrated ICT systems and external virtual networks are far from well known in SMEs. It is suggested to promote more objective and action oriented information about possible benefits, system functionality and integration issues.

Recommendation
Promote information about potentials of ICT for SMEs

3. More active role of business associations

Several ICT front-runner SMEs have pointed out, that business associations are weak in seeing potentials in the use of ICT and e-commerce. Some national business associations have acted very sceptical towards new ICTs, and have very few competences within ICT counselling. Business associations can play a central role in raising awareness of ICT and promote investments in ICTs.

Recommendation
Encourage the business associations at national and EU-level to understand and promote investments in ICT in the sector.

4. Raise level of ICT skills among employees

The case companies have indicated that 'normal' employees still lack basic IT-competences, which means that investments in new ICTs are not utilized optimally. Some companies also need resources required for a general lift of basic ICT skills, and support for IT-education is considered relevant.

Recommendation
Promote ICT training and education at relevant levels.

5. Develop standards for e-commerce / e-procurement

Current (UN/ECE) standards are considered to very broad, and not very helpful as a means of securing that compatible e-commerce and e-SCM systems. Most standards are primarily for transactions, quantities and price, and there is a demand for more detailed standards on product information. Similarly, a standardisation of data formats and catalogues are important.

SMEs reveal that the lack of standards represents a problem in regard to diffusion of ICTs, because establishment of electronic systems becomes much more complicated, time-consuming and expensive.

Recommendation
Investigate the possibilities of national and European standards within e-commerce in SMEs, and support pilot projects for establishing standards.

Recommendation
Promote increased development and use of open standards for ICT systems integration, and ensure interoperability between systems.

6. Increase access to fast and cheap Internet connections

SMEs in all sectors have complained that access to cheap Internet and broadband (above 2Mb) is limited. More advanced products, services and collaboration applications all require fast Internet connections, and SMEs as well as consumers need access to cheap broadband connections. It is recommended that the existing initiatives to promote fast and cheap Internet be stepped up.

Recommendation
Increase initiatives to speed up the establishment of broadband Internet in Europe, and continuation of policy of liberalisation of telecommunications law.

1.2 The Biotechnology sector

ICT is an increasingly important factor in the competitiveness of EU biotechnology companies. The sector is characterised by large and increasing growing data flows and data analysis, and a high degree of external collaboration. Thus ICT provides the potential of fundamentally restructuring internal and external business processes, and makes possible completely new products and services.

Most investments in the biotechnology sector in EU are in basic IT-infrastructure, simple web-based product catalogues and bio informatics. Compared to other sectors, ICT usage, especially in external relations, is relatively low. The case studies identifies a number of challenges for the EU biotechnology sector in regard to ICT development, including:

- Managing new bio informatics tools
- Establishing a modern (internal) IT infrastructure
- Establishing IT based collaboration

The following table of strengths, weaknesses, opportunities and threats (SWOT) summarises the challenges.

Strengths, weaknesses, opportunities and threats of ICT use in the biotechnology sector

Strengths:		Weaknesses:
Young sector and most employees are positive towards introduction of new ICTs	But…	Employees lack sufficient IT skills to gain full advantage of IT.
Large focus on introduction of new analytical and statistical tools	But…	Little attention to integrating IT systems and bio informatics tools.
Some companies are upgrading IT infrastructure, and future plans indicate that a more companies will make improvements during the next two years	But…	IT infrastructure lags behind other sectors and international front-runners, e.g. in U.S. Barrier to more use of advanced IT applications.
Extensive use of Internet and databases for research	But…	Very limited use of collaborative software and extranets in relation to partners
High investment level within R&D, and long-term investment horizon, means that ICT investments are considered relatively moderate. Investments in ICT are carried out when necessary	But…	Low investment level in ICT and e-commerce in particular. Very limited pressure from using ICT by suppliers and customers.
Opportunities		**Threats:**
SMEs makes use of the big potential in ICT facilitated drug development, e.g. much better use of Internet and IT tools in the process	But…	Lack of competences within in the cross field between IT and biotechnology means problems of choosing and implementing new tools.
General improvement of the basic IT infrastructure, makes usage of more advanced IT applications possible	But…	Too late introduction of a modern infrastructure compared to international front-runners
The introduction of new bio informatics and analytical software boosts the general use of ICT in the sector	But…	Lack of competences means application are only utilised to a limited degree
SMEs makes much more use of e-business and business processes become more efficient and cost effective	But…	High expenses and low quality of IT-consultancy slows down introduction of modern e-business systems. Customers can't see benefits in e-business.
Increased use of collaborative software to improve partnerships	But…	Sector don't realise potentials of collaborative webs
Highly skilled work force		

This SWOT of the biotechnology sector leads to the following policy recommendations:

	Policy recommendations
1.	Promote information about potentials of ICT for biotechnology SMEs.
2.	Investigate the possibilities of national, regional and European standards within e-commerce in the biotechnology sector and support pilot projects for establishing standards in the sector.
3.	Investigate initiatives to increase the general quality of IT providers, and increase SMEs access to affordable IT consultancy.
4.	Promote ICT training and education at relevant levels.
5.	Promote ICT training and education within bio informatics. Promote SMEs access to products and services within choosing, implementing and integrating bio informatics tools.
6.	Increase initiatives to speed up the establishment of broadband Internet in Europe, and continuation of policy of liberalisation of telecommunication law.
7.	Establish EU biotechnology portal with access to all relevant information on EU-legislation, financial support, standards, etc.
8.	Promote initiatives to improve the existing IT-infrastructure in biotechnology SMEs. Promote initiatives to increase the use of electronic documentation in the drug approval process.
9.	Promote initiatives to increase use of e-commerce among biotechnology customers and suppliers. Setting up (affordable) education and seminars to promote e-commerce, e.g. e-marketplaces among suppliers of laboratory and equipment to the biotechnology sector.

1.3 The New Media sector

What a difference a year makes! The dotcom hype came and went, and the new media sector has suffered from lack of interest from investors and to some extent even customers ever since. But this young business sector is still vibrant and ready for change and growth.

The new media sector dates back no longer than the mid-1990s, but the sector (and its related producer networks) is a rapidly growing economic segment in many countries. The sector's potential for job creation and economic development have attracted significant political interest, and promotion of new media clusters has become a significant focus for regional development strategies.

New media companies are faced with a number of challenges both in terms of forming ICT-facilitated business networks and in finding feasible revenue models.

Key challenges include:

- Finding feasible business models
- Finding profitable niches
- Building partnerships or brands to gain attention
- Maturing with the market and adapting to changes
- Securing finance for growth and development.

A SWOT analysis of the new media sector is presented overleaf.

Strengths:		Weaknesses:
Business clusters provide an environment for growth in SMEs	But…	Clusters make it more difficult to implement national or EU level enterprise policies, as different clusters should be treated differently. And no single and uniform approach can be adopted towards creating clusters, as these must develop according to specific preconditions and potentials in a given area.
Strong specialisation at focal points along the value chain	But…	This makes the sector fragmentised from a policymaker's point of view. Different companies have different needs…
Options for creating networks along the value chain	But…	A sense of competition and a wish to be self-reliant makes network and spill over benefits harder to realise. Many customers want to deal with one contractor only (creating a demand for a one-stop shop concept).
Creative and professional product and service offers	But…	Lack of qualifications on the demand side makes the abundance of technologies, platforms, standards, products and services confusing and may even provide demand for lesser quality or contra productive work. Furthermore, the market for new media offers may saturate as B2B clients settle for the solutions already implemented.
The internet provides a low cost possibility for SMEs to reach a large audience	But…	Lack of clear regulations and standards (e.g. in copyrights) can make it difficult to protect and make money on offers developed.
Innovative ideas and business models		Lack of venture capital or lack of knowledge of how to find and attract investors
Opportunities		**Threats:**
Providing specialised offers to definite customers segments	But…	Big players merge and integrate services and kill the small players in the process. Furthermore, internet technology and concepts are easy to copy.
Finding new sources of revenue – particularly micro-payments	But…	Big players such as telecoms refuse to cooperate or end up reaping the benefits on behalf of content providers. No usable infrastructure for micro payment is found.
Most companies in new media are SMEs	But…	The big are better equipped for building brands, reaching large audiences, attracting investments, defining standards and going global.
As the western market saturates, new markets open in less developed parts of the world	But…	This calls for internationalisation – not an easy task for SMEs. The big players are better equipped for taking on new markets.
Europe leads in wireless technologies	But…	The lead is relative to USA as Japan is even further ahead due to sharing of revenues among content providers and telecoms. European SMEs risk losing the first mover advantage

This leads to the following policy recommendations:

	Policy recommendations
1.	Facilitate sufficient supply of fast and cheap Internet connections
2.	Facilitate developments of institutional, technological and commercial frameworks for micro-payments enabling feasible business models in content provision. Study the experiences gained in Japan and Finland.
3.	Create awareness of different types of clusters/networks and governance in different regions to prevent formulation of one-sided new media policies. Study *preconditions for*, *dynamics in* and appropriate *means of facilitating* the formation of new media business clusters.
4.	Support resolving of standardisation and regulation issues.

1.4 The Retail sector

Through the retail study, the following major points have been made on how retail SMEs use ICTs in relation to business networks:

- E-commerce is the major trend in SME retailer's use of ICTs. The e-commerce applications generally feature catalogues, product information and possibilities of requesting additional information, and facilities for ordering online. Developments in use of ERP and CRM systems are promising.
- Systems for online payment are not yet a standard element of e-commerce solutions and still pose a challenge in some countries as the financial service infrastructure is under development. While order management is a service well underway in SME e-tail, product configuration and m-commerce are still trends for the future.
- SMEs are increasingly turning to multi-channel and clicks-and-bricks strategies. Retail SMEs seek competitive advantages in niches, brands, service and operational excellence.
- While the SMEs are innovators by being early adopters of e-commerce, the case studies suggest only limited evidence that ICTs lead to increased innovation.
- The SMEs studied, generally take a precocious rollout rather than a born-global approach to internationalisation.
- SMEs lack behind big players in use of virtual market places and e-SCM but do show an increased interest. Some SMEs feel that manufacturers and wholesalers are less ready and thereby slow down the automation process.
- SMEs are using new forms of marketing (affiliate marketing as with non-exclusive partnerships, referrals, hyperlinks) to a low degree only.
- Current investment focus is on further development of e-commerce, CRM and ERP applications and business practices.
- Future investment focus (2-3 years) includes further automation of downstream business processes and integration of front end and back end systems. Plans for investment in M-commerce is also been considered by some SME e-tailers.

- Cost-benefits of ICTs investment are unclear for SME e-tailers, as many still have not turned profitable. Investments are made with a view to growing sales more than cutting costs.
- Thus, the main benefits incurred by using ICTs are extension of distribution and marketing channels, improved customer satisfaction and partly also reduction of product-to-market lead time and better information collection. The case companies show an increasing focus in return on investment (moving away from burn rate strategies).
- The main barriers to ICTs investments are high costs of ICTs, shortage of personnel and track dependency, as SMEs feel bound by present systems.

Following the analysis presented in the report, SWOT-analysis takes the form of the table presented below:

Strengths:		**Weaknesses:**
The Internet is a low cost marketing opportunity.	But …	Though the Internet provides relatively low cost opportunities, ICT investments can be too expensive to some SMEs.
The specialised focus and niche approach of many SMEs is suitable for building brands – both online and off line.	But …	On the internet, the winner often takes it all, and it is difficult and expensive for SMEs to build brands online
With e-SCM fewer people are needed to provide better service and control, i.e. small can act as big	But …	Big players have the capital enabling and economy of scale justifying investments in e-SCM. And SMEs have been slow at implementing e-SCM.
With CRM, fewer people are needed to provide better service, i.e. small can act as big	But …	Many SMEs lack ICT skills and experience difficulties hiring qualified ICT-skilled staff.
SMEs with local presence often have close customer contact and customer loyalty. This can be transferred to the web in clicks-and-bricks strategies. Conversely, SME pure play front-runners can open physical stores to leverage the online brand.	But …	Once consumers get used to shopping online, local presence is no longer as big a competitive advantage. Big retail portals like Amazon.com or Buy.com can offer discount prices and have more funds for marketing. SMEs without a clear brand are threatened.
SMEs are less restricted by “old economy dead weight” such as physical outlets or large sales forces.	But …	Fixed cost of implementing e-commerce applications (e.g. software and hardware purchase) is a heavier burden to SMEs than to large enterprises.
Opportunities		**Threats:**
Sourcing from virtual marketplaces allows SMEs to find suppliers at low cost	But …	B2B retail market places and exchanges like World Wide Retail Exchange are open only to large players or at least players big enough to support necessary investments solving ICT-integration issues.
Virtual shopping centres/ electronic malls allow SME retailers to operate a store at low cost, while benefiting from the brand of the centre (e.g. Yahoo!).	But …	The centre is branded, not the small e-tailer. Thus, the centre can choose to launch a fully integrated supply chain of its own taking over the role of the SMEs.
E-commerce can be a driver of internationalisation	But …	Again the big players often have bigger brands
Tag on to e-SCM systems of large manufacturers and wholesalers	But …	Manufacturers and wholesalers can become e-tailers themselves.

These points lead to the following policy recommendations:

Policy Recommendations:
Recommendation 1: Continue benchmarking the ICT infrastructure available to and used by consumers and businesses in European countries as compared to other front running countries. Adopt policy measures to secure a world class ICT infrastructure. **Recommendation 2:** Benchmark the up take of e-commerce, e-CRM, virtual market places and e-SCM by retail SMEs in European countries as compared to other front running countries. **Recommendation 3:** Asses conditions available to retail SMEs in EU countries in terms of ICT infrastructure, service provision and work force. **Recommendation 4:** Further the process of harmonising EU rules and regulation for e-business considering marketing, consumer rights, product safety, taxation and on-line payment. **Recommendation 5:** Promote enterprise clusters, partnerships between large firms and SMEs at a local level, virtual value networks and international alliances. **Recommendation 6:** Explore the need for Technology Information Centres and test the possibilities of facilitating them. Such centres could provide information and training in relevant ICT, marketing and business strategy skills. **Recommendation 7:** Explore the need for a pan European B2C retail portal on which SMEs can market their products at low cost. **Recommendation 8:** Explore the possibilities of facilitating virtual value integration of SMEs. **Recommendation 9:** Explore the need for virtual market places specifically aimed at SMEs and test the possibilities of facilitating them.

1.5 The Tourism sector

The tourist sector adopted ICT at a very early stage in technology maturity. This adoption supported the sector to become what it is today but certainly also has constrained the possibilities for generating business networks through the years.

The tourist sector faces two main challenges in the future:

1. Further investments in ICT supporting new business networks

2. Increase product innovation and cost efficiency

Below is presented a SWOT table highlighting the most significant findings in how the sector is dealing with these issues.

Following the analysis of the tourism sector, a SWOT-analysis takes the form of the table presented below:

SWOT of ICT business networks in SMEs

Strengths:		Weaknesses:
Well-organized way of managing supply chain and financial transactions.	But…	Very transparent and comparative product portfolio.
Many travel agents have a large-scale customer database including historic events, generating a great platform for implementing CRM systems.	But…	Requires high ICT skills/education to take full advantage of CRM and related ICT products.
Great investments in ICT solutions are being made.	But…	Working with the CRS as the current anchor-point in business networks is reducing the full potentials of ICT investments
Opportunities		**Threats:**
The creation of more innovative products, adding more value.	But…	Greater focus from especially the airlines on selling travel products directly to consumers.
The presence of new and open standards for data interchange such as XML completely fits into the sectors general proprietary systems.	But…	Requires high ICT skills/education in the sector to take fully advantage of new data interchange technologies.
The CRS are providing facilities for Internet-enabling important reservation and sales processes.	But…	The content and facilities are regulated by the CRS and not the SMEs and suppliers.

These points lead to the following policy recommendations:

Policy recommendations:

Recommendation 1: Better possibilities for staff and general public ICT education. Support of the 'Home-PC' concept in Europe would probably make staff and customers better educated. Higher IT education in general.

Raise trust in e-commerce by European consumers. Europe has great potential here; they have an industry of very skilled travel agents, and some very strict rules for e-commerce. As a consequence of the European data protection act, EU companies are much more trustworthy than U.S and other companies regarding e-commerce and payments on the Internet. A marketing campaign to increase the awareness of the European data protection act could have a significant impact on SMEs opportunities in e-commerce. The U.S. has a more deregulated approach. EU should set standards promoting e-commerce security and reliability, and promote this common set of laws and rules.

Recommendation 2: Ensure the availability of European standardised data communications lines, which must be low-cost, fast, reliable and quickly installed.

Promote increased development and use of open standards for ICT systems integrations. To promote and ensure interoperability between systems in the EU could become an important task for the Commission.

Recommendation 3: Encourage the business associations in the sector to understand and promote investments in ICT in the sector.

1.6 The Transport sector

Transport SMEs faces two major challenges with regards to ICT development:

Establishing 3rd generation ICT business network: Transport SMEs are increasingly competing as business networks rather than individual and independent companies. Third generation business network are linked by XML or EDI technologies, and the networks are fully integrated in back-end systems of the partners, thus providing dynamic access to information on price and capacity.

Creating new innovative business models: ICT are often used by SMEs to improve operational and service excellence, but there is a lack of focus on innovative excellence, i.e. the creation of new, more innovative business models and strategies. The possibilities of developing new, more innovative products are many, and are often found in the cross field between IT-services and Transport & Logistic Management.

So how is transport SMEs handling these two challenges? The SWOT table below summarises the key findings in relation to this question.

Following the analysis presented in the report, a SWOT-analysis takes the form of the table presented below:

SWOT of ICT business networks in SMEs

Strengths:		Weaknesses:
Strong tradition of using EDI and other B2B network technologies.	But…	Slow transformation of existing EDI platforms to open source Internet / XML platforms.
Innovative transport SMEs are investing in implementing new e-commerce solutions.	But…	No Internet / XML sector standards have emerged to provide an alternative to EDI.
The emergence of simple and sector specific standard e-commerce solutions make the technology affordable for even small companies.	But…	Most e-commerce solutions are very simple solutions, with low back-end integration. The result is a lack of functionalities and few cost reductions.
	But…	Lack of IT-skills among employees and management. Psychological barriers towards the use of Internet.
	But…	Limited use of future technologies: supply chain management and customer relationship management.
Opportunities		**Threats:**
New innovative business models and products are emerging and can be adopted by other companies in the sector.	But…	Lacking strategic qualifications to realize business opportunities in ICT.
Development of 2nd generation e-commerce solutions with high level of back-end integration.	But…	Lack of e-commerce standards and thus high IT-development costs prevents many SMEs from developing advanced e-commerce solutions.
Much more advanced usage of collaborative ICTs, and movement towards 3rd generation business technologies.	But…	Lack of collaboration perspective and trust in partners. Result is slow adoption of close, ICT based networks.
Much more integration of new technologies in working processes to increase efficiency, i.e. freight matching and minimization of transaction costs.	But…	Lack of IT-skills and resistance towards ICT slow down adoption of IT as a working tool.
Supply chain management and customer relationship management becomes largely used technologies.	But…	Integration of e-marketplaces in daily working routines remains low.

These points lead to the following policy recommendations:

Policy Recommendations:
Recommendation 1: Investigate the possibilities of national, regional and European standards within e- & m-commerce in the transport sector. Support pilot projects for establishing standards in the sector. **Recommendation 2:** Support for initiatives in EU aimed at increasing IT-skills among employees and management in the sector. Important to increase the supply of sector specific ICT curses and improve the quality. Important that the EU Commission and national authorities team up with transport associations to support ICT-transport education. **Recommendation 3:** Promote more objective, independent and facts oriented information about ICT, especially in relation to possible benefits, system functionalities and integration issues. Initiatives to be taken goes through public-private cooperation and support to networking activities. **Recommendation 4:** Initiate studies of the effect of marketplaces and electronic partner networks on competition in electronic networks. **Recommendation 5:** Support activities to promote the development and use of digital e-government services for freight companies. **Recommendation 6:** Increase support initiatives to speed up the establishment of broadband Internet in Europe, and continuation of policy of liberalization of telecommunication law.

2. Methodology

This section presents the methods applied in the study. It reports on the research activities conducted and the case selection criteria.

2.1 Research activities

The research activities conducted in the study are:

Desk research

Desk research covered review of recent studies and analysis on business networks and use of ICTs in the new media sector. The review included ICT business literature, ICT analysis and reports as well as Internet research. The focus of the review was:

- Business networks, including recent typologies on electronically networked organisations.
- Major groups of ICT applications, including e-commerce, CRM and SCM.

Two papers were produced on the basis of the aggregate findings of the desk research:

- A paper on network typologies comprising a literature review of classic and recent approaches.
- A paper on major ICT applications of relevance for business organisation network.

The papers built the foundation for the *preparation of the questionnaire* and were a tool for the *selection of cases*.

Screening

The aim of the screening phase was to identify relevant case companies.

The identification of companies was carried out in close corporation with national business associations and technology companies in each of the six countries involved. Business associations and technology providers provided names of relevant case companies, and

these names were supplemented by extensive desk research, including Internet research, on relevant cases.

Based on the aggregate findings of the screening activities, a gross list of potential cases was produced.

Research design

The objective of the research design phase was to prepare an interview guide for the case studies and the selection of relevant and representative cases.

The interview guide consists of two parts:

- Part 1: A fact sheet, which was forwarded the case company before the interview.
- Part 2: An interview guide that was used as a basis for a personal interview or a telephone interview.

Personal interviews

Personal interviews were conducted with the 70 selected case companies in the sectors: Biotechnology, New Media, Retail, Tourism and Transport. Half of these interviews were conducted face to face and the rest by telephone. The duration of each interview, including telephone interviews, was between one and three hours.

Analysis of data

The analysis of data has included:

- ICT trends in the sector
- Case examples and case focus analysis
- Strategy analysis
- ICT infrastructure analysis
- Three generations of ICT use in business network
- SWOT
- Cost / benefit analysis
- Barrier analysis
- Policy recommendations.

2.2 Case selection

In each sector 14 cases was selected, and the following case selection criteria were considered:

- Distribution in six countries: Germany, Italy, France, UK, Sweden and Denmark.
- Usage of ICTs facilitating external networks, e.g. e-commerce, Supply Chain Management, Customer Relationship Management and Collaboration software.
- Size: SME / large.

The combination of all three parameters cannot, however, be covered by 14 case studies. Therefore, the first priority was to ensure that *each sector was covered in each country*.

In addition to these criteria, the selection of cases was based on the following characteristics of the companies.

Characteristics of selected case companies
• The company is a frontrunner or best practise example of the use of ICT applications. • The use of ICT in the company represents an interesting trend in the sector. • The company represents a typical way of using ICT in the sector.

3. *Cross-sector analysis*

This section presents an aggregate analysis of the five sectors (Biotechnology, New Media, Tourism, Transport, and Retail) in regard to ICT trends in SMEs (3.1), ICT maturity in SMEs (3.2), collaborative commerce (3.3) and policy recommendations (3.4).

As e-business front-runners, the companies in this survey are often in close cooperation with technology providers, and thus the ICTs implemented here will often become widespread throughout the sector. Similarly, the implementation processes as well as the benefits and barriers experienced in these e-businesses could be expected to be similar to the issues faced in other SMEs.

3.1 ICT trends in SMEs

An analysis of past and future ICT investments in the 70 case companies reveals a number of general trends, which apply to SMEs in all five sectors. The cross sector comparison shows that the most important past and current ICT investment areas are:

- Updated Enterprise Resource Planning systems
- Simple e-commerce solutions
- Basic collaborative software
- Internet pages
- Internet marketplaces and portals.

Each of the five areas will be discussed in greater detail below.

Updated Enterprise Resource Planning systems

Modern ERP systems, with integrated features within production, finance and CRM, are implemented in a number of the SMEs in the study. However it is also evident from the study that many SMEs have a fragmented ICT infrastructure with non-compatible business systems, which are neither advanced nor integrated.

Conclusion
SMEs have increased efforts towards establishing more up-to-date ERP systems, but most systems are not sufficiently advanced and integrated.

Simple e-commerce solutions

As e-business front-runners, a large part of the companies have established e-commerce solutions during the last couple of years. E-commerce is prevalent in the tourism, transport and retail sectors, and to some extent in the biotechnology and new media sectors. Most of these systems are basically e-catalogues or standardised e-mail requests forms, which aim at improving customer service and increasing efficiency of working procedures. The percentage of turnover generated on the Internet web page is often limited to 0-5% of the total turnover. It is evident from the analysis that most e-commerce solutions are not integrated into production and administrative systems (e.g. ERP systems), thus limiting the functionality and rationalisation effects considerably. Moreover, the introduction of e-commerce is often not followed by a reorganisation of existing procedures (BPR process), which also inhibits the utilisation of e-commerce.

Conclusion
SME front-runners throughout EU are currently adopting e-commerce systems, and many companies appear to prioritise the establishment of simple solutions rather than none at all. The creation of more advanced solutions, providing on-line interaction with customers, is moving very slowly.

Basic collaborative software

Collaborative software like e-supply Chain Management and project webs is a hot issue in regard to SMEs; as ICT facilitated networks allow an attractive balance between flexibility and economies of scale. The survey shows that in reality, most communication with suppliers, partner and customers is still handled by traditional means of ICT (telephone, e-mail and fax). However, the introduction of more advanced collaborative structures are slowly gaining speed in some of

the sectors studied, especially transport, retail and tourism. The most advanced collaborative software solutions demand a high degree of integration with back-end ERP systems, allowing a dynamic on-line interaction throughout the value chain, e.g. access to online prices, product availability and order status.

Conclusion
Collaborative software is gaining increased attention in SMEs, and front-runners have successfully implemented advanced solutions within this area. Most SMEs seem to lack the necessary ICT infrastructure, and impetus from business partners to take the next step into more advanced systems.

Internet pages

Nearly all SMEs in the survey have created Internet pages, showing that a presence on the worldwide web has become a 'must' in most countries and sectors, even for SMEs. Some of the companies have recently developed second generation Internet pages containing a number of features besides of company information, e.g. online ordering, news services and member areas. However, only a few of the companies have managed to make the large effort required to create a good and professional web page, where content and functionality are carefully considered, and where there is a clear consistency with the company strategy and image.

Conclusion
A company Internet page is becoming a must for SMEs, and while many SMEs are currently improving and updating their pages, most SMEs are still only utilising a very limited part of the potential in an Internet web page.

Internet marketplaces and portals

A common trend in the sectors is the emergence of new Internet based intermediaries, offering sector specific services and business-to-business (B2B) e-marketplaces. Especially in Transport, Tourism and Retail, large investments have been made in Internet marketplaces aiming at lower transaction costs and new services. Very few

marketplaces and portals in the sectors have managed to generate positive revenues so far, and the use of B2B marketplaces seems to be limited in most sectors.

Conclusion
E-marketplaces and portals have been established in most sectors, but the impact on SMEs in the sectors has so far been limited. Companies running e-marketplaces expect this to be changing in the near future.

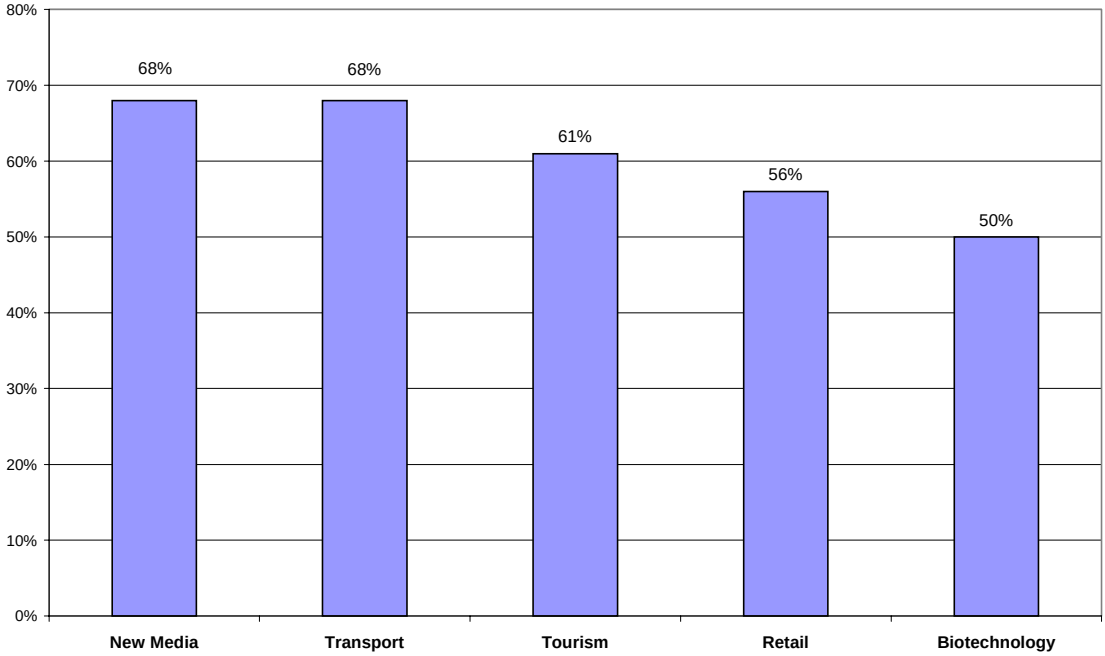
3.2 ICT maturity in SMEs

ICT maturity covers four dimensions of ICT: IT infrastructure, e-commerce, e-CRM and e-SCM. This section presents a comparison of the ICT scores in the five sectors (biotechnology, new media, retail, tourism and Transport) at these four dimensions.

3.2.1 ICT-infrastructure

The first dimension, ICT infrastructure, is an aggregated indicator of the uptake of: Internet web pages, intranet, extranet and ERP-systems. The scoreboard on ICT infrastructure is presented in the figure below.

Figure 3.1: ICT infrastructure - five sectors



The figure indicates that SMEs within new media and transport have a reasonably well-developed ICT infrastructure, but retail and biotechnology lag behind. A high level of intranet and extranet installations gives new media a high position, whereas transport benefits from a large uptake of ERP systems. Biotechnology lags behind because of a low uptake of ERP systems and a very low number of extranets.

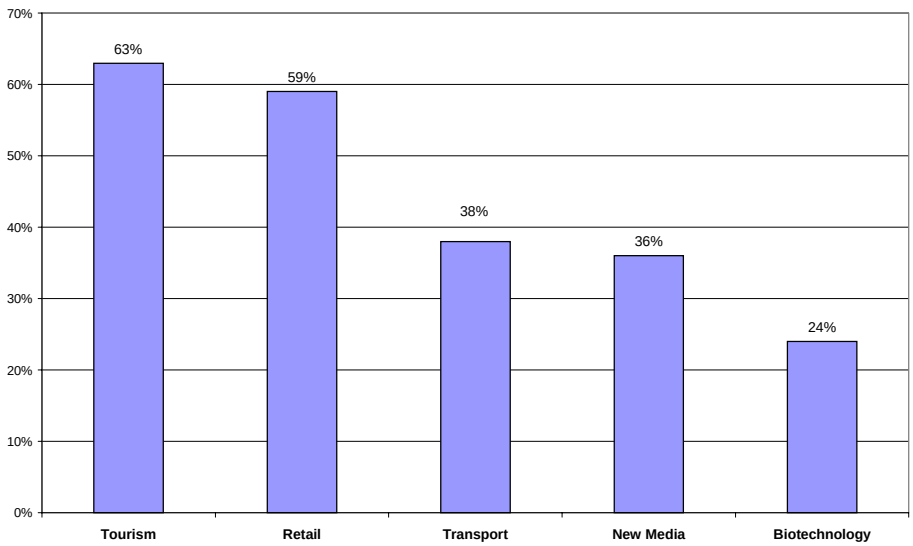
Full-blown ERP systems are rare in all sectors, but just over half of the studied companies have administrative systems approaching ERP level. The transport and retail sector possess a relatively high frequency of such systems, while biotechnology, as mentioned above, scores low. This difference reflects some fundamental differences between the sectors. Most biotechnology companies are newcomers – often having only a few developed products, no production, few business partners, and limited sales – and thus they often do not feel they have a need for an advanced administrative system.

3.2.2 E-commerce

The dimension e-commerce is an aggregated indicator of the frequency following functionalities: e-catalogues, request for information, product configuration, order online, order management, payment, use of marketplaces and mobile services.

The scoreboard on e-commerce is presented in the figure below.

Figure 3.2: E-commerce - five sectors



Virtually all tourism and retail SMEs in the study have implemented a facility for conducting sales on the Internet. These e-commerce solutions usually provide a catalogue of product and an online ordering facility, but surprisingly, only just over half of the SMEs in retail allow for online payment.

The use of e-commerce is relatively high in transport in terms of just having an online ordering facility, thanks to early adoption of EDI, e-marketplaces, and, lately, seller-side Internet booking systems. However, e-catalogues and online payment are rare in transport, which also explains the relatively low score.

E-commerce is only adapted to a limited degree in new media and biotechnology companies, which is due to the nature of the products in the sectors rather than technology scepticism.

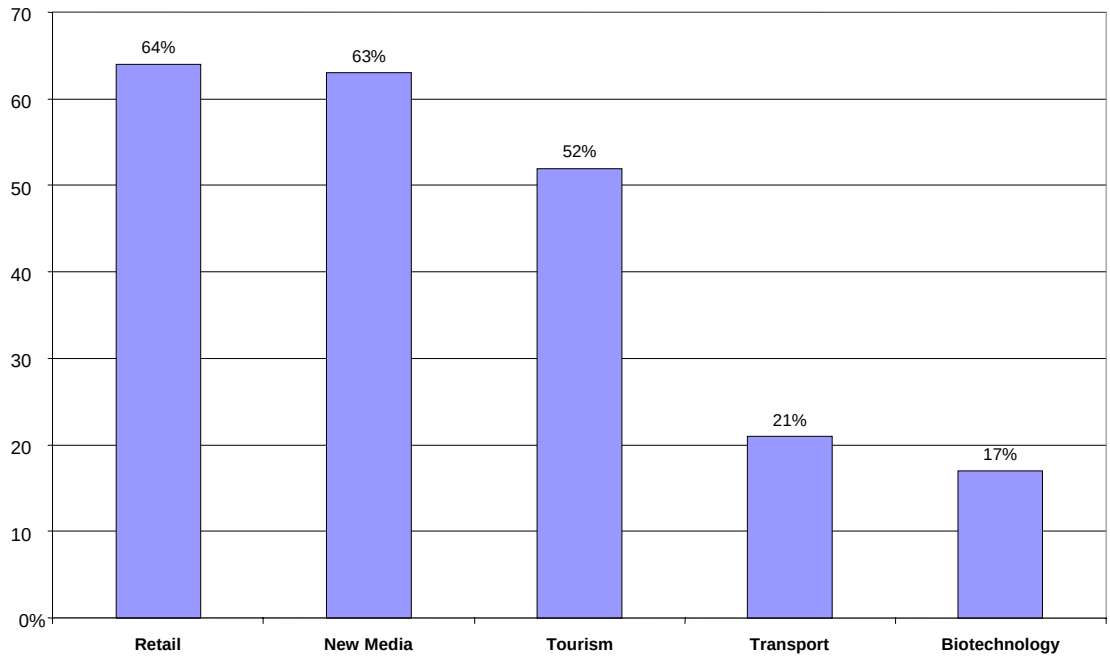
Most companies in the survey are front-runners in the implementation of e-commerce, and experience a lack of interest from partners and especially customers on e-commerce. Most customers, both business-to-business (B2B) and business-to-consumer (B2C), prefer other sales and payment methods. A much higher use of e-commerce requires a combination of:

- Improved e-commerce systems (functionality, online price and product information)
- Much greater acceptance of and demand for e-commerce among customers.

3.2.3 E-CRM

Electronic customer relationship management (e-CRM) tools for data gathering carry a great potential for better customer service and more efficient marketing campaigns. The e-CRM indicator is aggregated by the presence of the following functionalities and usages in the companies: electronic customer database, data analysis, personalisation and online customer service. The scoreboard on e-CRM is presented in the figure below.

Figure 3.3: E-CRM - five sectors



Retail and new media are leading the implementation of e-CRM systems, while the use of e-CRM has clearly not caught on in transport and biotechnology.

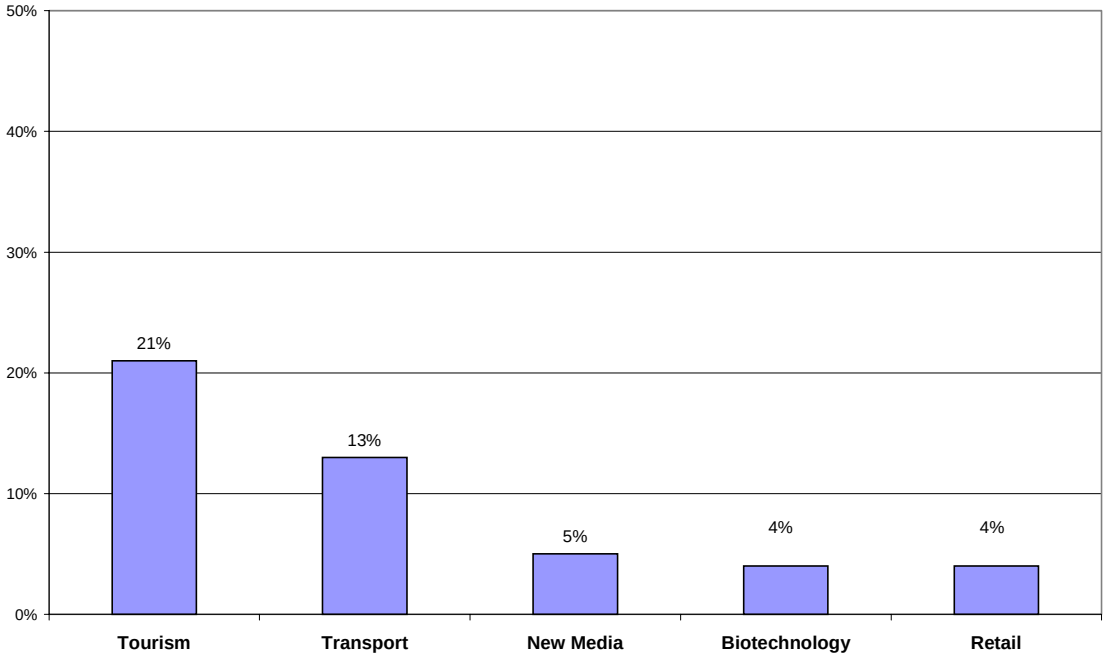
The case studies show that e-CRM is mostly just a tool for registration of customers, marketing campaigns and on-line services, but seldom for more advanced data analysis and segmentation of customers. This means unused possibilities of learning from past customer behaviour and optimising products.

Many SMEs are relying heavily on the philosophy of close personal relations to customers. This is probably necessary also in the future, but in a future of increased internationalisation and increased number of network partners, more advanced tools within customer registration and analysis is becoming still more important.

3.2.4 E-SCM

E-SCM carries promising potentials for retailers: reduced costs following automation of business processes, minimised inventory by just-in-time delivery and customer service following integration of execution functions.

Figure 3.4: E-SCM - five sectors



The figure shows that generally SMEs do not yet use the ICTs available for integrating the supply chains. Tourism and transport have a relatively higher degree of implemented e-SCM, which might be due to the fact that both sectors, throughout a number of years, have established electronic networks, i.e. the CRS system in tourism and EDI networks in transport.

In new media, biotechnology and retail, SMEs with IT systems approaching e-SCM level are very rare. The figure indicates that SMEs focus on automating internal processes – which are also a prerequisite for e-SCM.

3.3 Collaborative commerce: ICTs in the value chain

As noted in the introduction, phenomena described as virtual value networks, business webs or collaborative commerce, are central to the present study, because such networks present the opportunity for SMEs to act big while staying small. While building close relations to the consumers through CRM can be considered part of such networks, virtual value networks should also integrate other parties 'behind the customer scene' provided by the front office system. By selecting case companies who have implemented e-commerce, we have chosen technology frontrunners and we therefore expect to find business networks in operation in the back office. But as already shown, the SME case companies still can not be considered part of full-blown virtual value networks due to limited ICT sophistication in relation to suppliers and business partners.

The ICT sophistication is determined by the use of network technologies in three levels of advancement: B2B or B2C network technologies offer to electronically link companies to suppliers, customers and partners. The typology of network technologies below constitutes a basic understanding of the nature of ICT use in external relations. Based on three generations of networks covered by the cases, the model describes the characteristics of the relations.

Figure 3.5: Three generations of ICT use in networks

Generation	IT-solution	Automation level	Integration
First generation: Unstructured e-mails / Internet communication	E-mails: Person-to-person	No automation	No integration with back-end systems
Second generation: Structured e-mail and Internet communication	E-mail and e-commerce Internet commerce, request forms at web page, e-mails Person-to-machine or machine-to-person	Internal automation	Low integration in back-end systems
Third generation: Standardised communication (e.g. EDI and XML)	Internet & EDI communication Machine-to-machine	External and collaborative automation	Full integration of back-end systems (prices, products, etc.)

The table shows that reaping the benefits of increased automation requires closer integration made possible by more advanced ICT systems. The labelling of three generations reflects a tendency towards joint development in sophistication of automation, ICTs and integration. The three generations are ideal types, as combinations diverging from this general trend do appear in practice.

The first generation of virtual value networks is characterised by no automation, as e-mails are used as communication platform and are written manually. Thus, systems are not integrated.

In second generation virtual value networks, communication is somewhat structured as specified fields or forms for entering data on web pages or automatically generated e-mails are used. Systems are typically integrated internally as with e-commerce applications integrated to production, warehouse management and financial systems.

In third generation virtual value networks, collaborative integration is achieved by automated external communication downstream in the supply chain using specified data formats such as EDI or XML.

The use of these three levels of ICT technologies can be measured in relation to suppliers and partners in one end and customers in the other. The frequency of the use of second and third generation networks in each of the five sectors is illustrated in the two figures below.

Figure 3.6: Frequency of use of 2nd generation ICT in business network

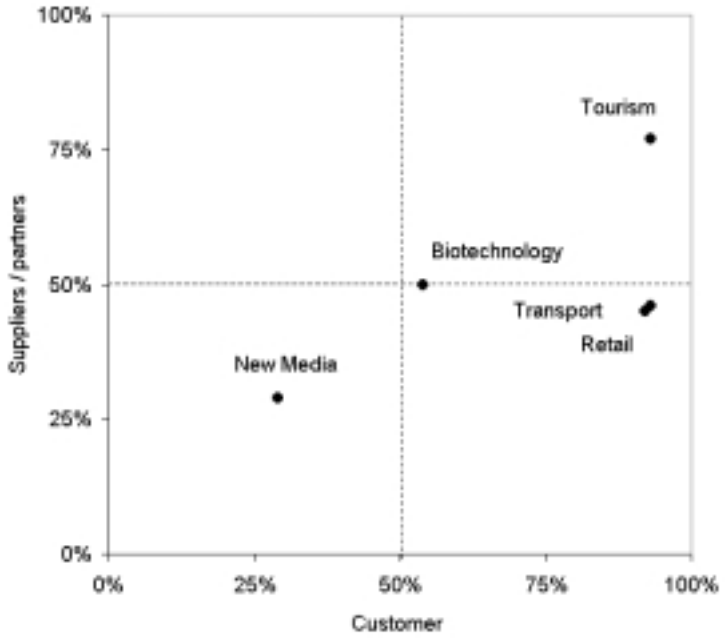
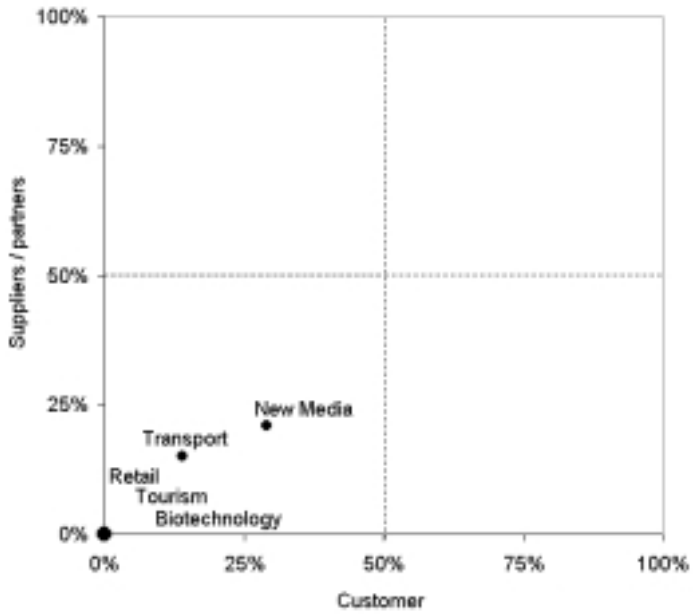


Figure 3.7: Frequency of use of 3rd generation ICT in business network



The tourism sector is clearly ahead in the use of 2nd generation network, both in relation to customers and suppliers / partners, but no tourism SMEs have implemented full integration (3rd generation) of ICT systems with suppliers / partners and customers. The sector has a high level of automation in sales and procurement processes, but the integration is mainly based on batch processes and proprietary ways of systems update.

A large share of transport and retail companies, 93% and 92%, is using 2nd generation networks towards customers, while the use towards suppliers / partners is below 50%. The case studies reveal a strong focus in both sectors upon the customer, and make buying as easy as possible. No SMEs in retail have implemented 3rd generation ICT network, while a minor share of transport SMEs have such virtual networks towards suppliers / partners (15%) and customers (14%).

In Biotechnology 2nd generation ICTs are implemented in 50% of the cases towards suppliers and in 54% towards customers, although in most cases these are only used to a limited degree, and cover a minor part of the total turnover. Many customers in biotechnology are not ready for 2nd generation network, with more integrated and automated communication throughout the value chain. 3rd generation network, with more integrated and automated communication remain unused in biotechnology SMEs both towards suppliers / partners (0%) and customers (0%).

In new media, 2nd and 3rd generation collaborative networks are rarely seen as of yet. Interestingly, third generation integration to customers is more common than second generation. This is due to automation of external relations being preferred to automation of internal handling of relations.

Conclusion regarding collaborative commerce
The large potential in 3rd generation networks, with more integrated and automated communication throughout the value chain, remains largely unused towards suppliers, partners and customers. SMEs in all five sectors have a large potential of more automation and integration of the value chain and partner network.

3.4 Policy recommendations

The best possible use of ICTs becomes an increasingly important competitiveness parameter for SMEs in EU. The policy recommendations below deals with the establishment of the best possible conditions to promote the use of new ICTs in general, and the establishment of ICT business network in particular.

The recommendations below are based on suggestions from SMEs in all five sectors (and are not presented in a prioritised order).

1. Support access to high quality IT consultancy

SMEs in all sectors complain that the quality of IT providers and consultants are low, and that high prices prevent them from investing in e-business software and implementation. It is recommended to investigate initiatives to increase the general quality of IT providers, and increase SMEs access to affordable IT consultancy.

Recommendation
Investigate initiatives to increase the general quality of IT-providers, and increase SMEs access to IT-consultancy.

2. Promote information about potentials of ICT

Most SMEs lack knowledge of the new potentials provided by ICTs, including both internal and especially external optimisation of business processes. The potential employed in up-to date ICT infrastructure; integrated ICT systems and external virtual networks are far from well known in SMEs. It is suggested to promote more objective

and action oriented information about possible benefits, system functionality and integration issues.

Recommendation
Promote information about potentials of ICT for SMEs

3. More active role of business associations

Several ICT front-runner SMEs has pointed out, that business associations are weak in seeing potentials in the use of ICT and e-commerce. Some national business associations have acted very sceptical towards new ICTs, and have very few competences within ICT counselling. Business associations can play a central role in raising awareness of ICT and promote investments in ICTs.

Recommendation
Encourage the business associations at national and EU-level to understand and promote investments in ICT in the sector.

4. Raise level of ICT skills among employees

The case companies have indicated that 'normal' employees still lack basic IT-competences, which means that investments in new ICTs are not utilized optimally. Some companies also need resources required for a general lift of basic ICT skills, and support for IT-education is considered relevant.

Recommendation 4
Promote ICT training and education at relevant levels.

5. Develop standards for e-commerce / e-procurement

Current (UN/ECE) standards are considered to very broad, and not very helpful as a means of securing that compatible e-commerce and e-SCM systems. Most standards are primarily for transactions, quantities and price, and there is a demand for more detailed standards on product information. Similarly, a standardisation of data formats and catalogues are important.

SMEs reveal that the lack of standards represents a problem in regard to diffusion of ICTs, because establishment of electronic systems becomes much more complicated, time-consuming and expensive.

Recommendation
Investigate the possibilities of national and European standards within e-commerce in SMEs, and support pilot projects for establishing standards.

Recommendation
Promote increased development and use of open standards for ICT systems integration, and ensure interoperability between systems.

6. Increase access to fast and cheap Internet connections

SMEs in all sectors have complained that access to cheap Internet and broadband (above 2Mb) is limited. More advanced products, services and collaboration applications all require fast Internet connections, and SMEs as well as consumers need access to cheap broadband connections. It is recommended that the existing initiatives to promote fast and cheap Internet be stepped up.

Recommendation
Increase initiatives to speed up the establishment of broadband Internet in Europe, and continuation of policy of liberalisation of telecommunications law.

4. *The Biotechnology Sector*

In this section the analysis of the Biotechnology sector is presented. The section includes the following 4 parts:

Subsection 4.1 Provides a sector outline featuring general trends and the role of SMEs in the biotechnology sector.
Subsection 4.2 analyses the use of business network ICTs in the SME case studies.
Subsection 4.3 analyses ICT facilitated business networks.
Subsection 4.4 concludes the chapter by a SWOT analysis and policy recommendations.

4.1 Sector Outline

Biotechnology is a new sector, and there exist quite a few different connotations and definitions of the sector. A broadly accepted definition of biotechnology is that biotechnology is any technique that uses living organisms to make or modify products, to improve plants or animals or to develop micro organisms for specific use.

The most recognised definitions of the sector (OECD and European Federation of Biotechnology) emphasise that biotechnology companies make use of scientific principles and deal with biological material[1]. Some broad definitions include suppliers in the chemical industry[2], including pharmaceuticals, whereas others emphasise that biotechnological companies are differentiated from pharmaceutical companies by their use of biological and organic material. In real life, many pharmaceutical companies use biological material and biotech-

OECD sector definition
The application of scientific and engineering principles to the processing of materials by biological agents to provide goods and services. The biotechnology sector includes activities of mainly two NACE sub sectors: 73.1 Research & experimental development on natural sciences 24.4 Manufacture of pharmaceuticals, medicinal chemicals and botanic products

[1] OECD: STI Working paper 2000/6, Biotechnology statistics in OECD member countries: An inventory

[2] Ibid.

nology companies use chemistry in the drug discovery process.

The companies included in this analysis are primarily:

- Providers of technologies, equipment and analytical tools based on biotechnology research
- Healthcare therapeutics and diagnostics, including both 'pure' biotechnology companies and biopharmaceutical companies
- Genetic identification and information
- Biotechnology portals and other intermediaries and distributors taking advantage of Internet technology.

As the list indicates, the case companies have been chosen from different parts of the value chain, including equipment suppliers, research and development, manufacturing and trade (intermediaries).

4.1.1 Characteristics of the sector

In 2000 the European life science industry (the biotechnology and pharmaceutical sector) had revenues of 13.8 billion euro and employed 61 thousand employees[3]. The revenues and number of employees in the U.S. life science industry were more than 2.5 times greater, and totalled 38 billion euro and 162,000 employees[4].

Looking specifically at the biotechnology sector, this is estimated to account for revenues of 8.7 billion euro in Europe. Four countries dominate the sector, and generate more than 55% of the total revenues in Europe. The U.K. dominates with 24% of revenues, followed by Switzerland (15%), Germany (9%) and France (9%).

2000 was the best year ever for the European life science industry with an increase in revenues of 38% and an increase in number of employees of 6%. According to most projections, the sector will face future strong growth during the next ten years.

[3] Ernst & Young 2001: European Life Sciences

[4] Ibid.

Biotechnology is a young sector, which is illustrated by the fact that all of the 14 case companies in this survey have been established during the last 17 years. This has a number of consequences on business models and IT infrastructure.

Another characteristic of the sector is that many companies have not yet created positive financial results, and last year the European life science sector had a net loss of 2.5 billion euro[5]. Similarly, more than half of the companies in the survey report that they have never generated a profit. They are also characterised by a very high level of R&D expenses, which account for nearly 60% of the total revenues. This means that biotechnology companies are accustomed to making long-term investments in general, which can thus also benefit long-term IT-investments. The high level of R&D investments also means that IT-investments become moderate in comparison.

The complexity of the products, and the need for continual innovation and adoption of new scientific results, means that establishment of partnerships with universities, suppliers and pharmaceutical companies is crucial. Often, biotechnology companies have a number of long-term collaboration projects with partners, which make optimisation of communication with these partners very important.

4.1.2 The role of SMEs in the sector

SMEs account for a relatively low share of employment in the two biotechnology-related sectors, Research and Development (31% of the employment in SMEs) and Manufacture of chemicals, rubber and plastics (40% of employment in SMEs).

The biotechnology sector seems to have a higher share of SMEs than the two sectors mentioned above, as estimates of number of employees (61,000) and number of companies (1,570) makes an average

[5] Ibid

size of 39 employees per company[6]. Estimates of the size of European companies give the following distribution[7]:

Figure 4.1: Size distribution of European biotechnology enterprises

	% of total employment
Micro enterprises (up to 10 employees)	32%
Medium and large enterprises (10-500 employees)	40%
Large enterprises (over 500 employees)	28%

The average employment in SMEs (below 250 employees) for all sectors in the European Union is 66%.[8] The biotechnology sector faces a number of changes in regard to the structure of the sector and the driving forces. Some of the most important are:

Recent changes in biotechnology	
Increase of data	New ICT and the Human Genome project results in a intensive increase of accessible data on genomes, protein, organism, etc.
Globalisation	Globalisation is currently increased both in terms of increase of international partnerships, production and sales and R&D investments
Demand for new products	Long development periods of new drugs after patenting, and an average IPR-period of 20 years, means that most product have a short lifetime. The result is increased pressure to develop new products.
Higher R&D expenses and demands	Last year development expenses increased by 56%[9] in European biotechnology companies, and demands are for documentation and clinical tests are also increasing.
More critical investors	Biotechnology companies have gone through a period of volatility in regard to venture capital and stocks following the decrease of technology indexes around the world. During the last year, investors have looked for more secure investments during the fall of the dotcoms.

[6] Calculation based on figures from Ernst & Young 2001: European Life Sciences

[7] European Commission DG XII, B.Zechendorf: European Biotechnology: Development and outlook.

[8] Eurostat 2001: Enterprises in Europe

[9] Ernst & Young 2001: European Life Sciences

These overall changes all affects SMEs in the biotechnology sector, and during the case studies a number of strategies to cope with these changes have been identified:

Increased cost focus

Especially technology intensive companies within genomics, biotech tool and Internet marketplaces and portals are faced with more investor scepticism than earlier. SMEs within these areas have reacted by trying to keep costs down and bring down burn-rates of investor capital.

New business models

Several companies in the study are trying to change the traditional business model in biotechnology. These companies have realised that the traditional model where companies solely rely on developing new drugs through 10-year clinical drug trials is very risky. Instead, they try to develop business areas which can supplement or even replace the traditional drug development model, and develop products within research and development, information-providing, performance of clinical tests and analysis, etc.

The new technologies of genetic analysis enables a number of new companies in the cross field between the IT sector and the biotechnology sector. These companies are much more focused on integrating research and development results in new analytical IT tools, databases and biochips.

Another business model has been developed by a successful company in the study which focus on key competencies of commercialising promising drugs and outsourcing all activities, which are not key strategic areas, including all IT support and maintenance.

Case example: Outsourcing
Shire: Has taken the outsourcing philosophy to the extreme. Shire does not undertake in-house research, but in-licence projects at the earlier stage of clinical development. The core activities is search, development and marketing, and all other areas, including IT, is outsourced.

Networking

A large part of the companies in the study have strong network building activity and even merging activity, typically with former partners. Partnerships are established both with other biotechnology companies with supplementary competences, and with pharmaceutical companies being able to bring the drugs through clinical trials. The increased networking activity also seems to be a result of the increased complexity and strong increase of information to be handled as a result of Internet, genomic databases, etc.

Increased focus on new technologies

A number of new technologies are emerging within the biotechnology sector, most notably genomics and bio informatics. Genomics deals with the identification and sequencing of genomic, genomic analysis and tests. Bio informatics includes development of new database methods to store genomic information, virtual clinical test and biochips to perform complex IT based analysis. The emergence of these new technologies is very visible at the product portfolios of the case companies.

The Human Genome Project (HGP)

The mapping of the human genome creates the foundation for a future industry in the biotechnology sector. The project began in 1990 when research agencies began research to map and sequence the human genome (the total DNA), to localize 50,000-100,000 genes, and analyse genomes of several other organisms. In February 2001, the initial analysis of the genome sequence was published in scientific literature.

The new knowledge will make it possible to develop new, more individual diagnostics and treatments. To navigate in the large amount of data, advanced analysis methods and new IT tools are necessary.

Genomics

Genomics is the term for mapping and sequencing of genomes, and for analysing the genome function. An entire IT and software industry is emerging in order to provide the tools necessary for these advanced analysis.

4.2 Impact of ICT in the Sector

Large enterprises are front-runners in the use and development of new ICTs in the biotechnology sector, but SMEs are also discovering the potential of ICT to achieve more efficient business process internally and externally. They increasingly discover how e-business and Internet can transform business processes, and how new analytical tools can increase efficiency of the demanding drug development phases.

This section of the report presents ICT trends in biotechnology, emerging ICT facilitated business models and ICT infrastructures adopted by the case companies including e-commerce, e-CRM and e-SCM.

4.2.1 Technology overview

The sector reports include a 'scoreboard' of ICT maturity and a benchmarking of ICT use in network relations. The content of the each of these are explained below.

The analysis of ICT maturity in the sector case companies includes four dimensions: IT infrastructure, e-commerce, Customer Relationship Management and Supply Chain Management. Maturity in each of the four dimensions is determined by the frequency of a number of functionalities as described below. The evaluation criteria provide implicit definitions of the technologies in question:

IT infrastructure is evaluated in four dimensions:
1) Internet homepage: Can be for information and marketing purposes only as e-commerce is dealt with elsewhere. 2) Intranet: A private network within the company using an Internet protocol (e.g. TCP/IP). Intranets enable file sharing and message posting within an organisation but may well bind together geographically dispersed entities. 3) Extranet: A closed external network connecting a company to suppliers, partners or customers using an Internet protocol. An extranet requires security, often provided by firewalls. 4) ERP-system: An internal IT system for handling of production planning, logistics, sales, accounting and human resources. To put it simply, ERP is the back-office and e-commerce is the front office.

E-commerce is evaluated in eight dimensions:
1) Catalogues with price information, product data and pictures available on the web page. 2) A feature for customers to make requests through the web page in more or less interactive ways. 3) Product configuration – products are made to order and customers are given the option to specify product options at website, thus participating in the design of their individual products. 4) A feature for ordering online. 5) Order management including shopping cart, order notification, and order status (track and tracing). 6) Payment online. 7) Use of marketplaces for procurement. 8) Mobile services (e.g. M-commerce, SMS messages, WAP features).

E-customer Relationship Management (CRM) is evaluated in four dimensions:
1) Electronic customer database (storing historical data on customers). 2) Data analysis / data mining (analysing and grouping customer behaviour, profitability etc.). 3) Personalisation (using password, cookies, etc.). 4) Online customer service.

E-Supply Chain Management (e-SCM) is evaluated in four dimensions:
1) Use of EDIFACT / light EDI connection with partners. Using DEI (electronic data interchange) is a way of automating communication between network parties (trading partners). EDIFACT is a standard for this data exchange. An EDI message contains a string of *data elements*, each of which represents a singular fact, such as a price, product model number, etc. Thus, EDI is the exchange of business data using an understood data format and is a predecessor of today's Internet. EDI involves data exchange among parties who know each other well and make arrangements for one-to-one (or point-to-point) connection, usually dial-up. EDI is expected replaced by one or more standard XML formats, such as ebXML. **2) Integration of planning functions** These processes include shared access to information across companies by integration of information on demand forecasting, distribution, transportation and manufacturing planning and scheduling **3) Integration of execution functions** Here, not only planning information is shared, actual production and fulfilment is automated by integrating companies by automating procurement, manufacturing and distribution. For instance, when stocks are low automatic orders of supplies are generates. **4) Shared databases with market data** Here, full integration in supply chain is achieved by joint access to databases.

4.2.2 Use of ICT in the biotechnology sector

In order to understand the impact of ICT in the sector, it is very important to recognise that biotechnology is a young sector, and as such it has not yet adopted large-scale information systems and IT based collaborative networks. So far business processes have only to a limited degree been executed by large-scale information technology systems. This also means that evolution of modern ICT has the potential to significantly change the business networks in the industry.

Generally, there is awareness in the sector that ICTs have an increasing impact on a large number of areas and processes. Basically, the impact of ICT is within to areas:

- **Product impact:** ICT creates new opportunities for developing revolutionary products within drugs, medicines, therapy and transplantation. New ICTs have resulted in an explosion of data, e.g. from the mapping of the human genome. Examples of new technologies are bio informatics and genomics.
- **Business process impact:** ICTs have the potential of facilitate integration of companies, streamline production, improve drug discovery and development and make sales and marketing more efficient.

A huge challenge is to handle the increase of data, an issue that all companies are facing at the moment. Using modern statistical and analytical tools, which are often referred to as bio informatics tools, can help to solve this problem.

Bio informatics
Bio informatics is a scientific field and business area developed in the cross field between ICT and biotechnology. Bio informatics deals with the analysis of biological information, including biological sequence data (genes and proteins) or whole organisms. One important task in bio informatics is to design and establish databases of biological information and develop interfaces whereby researchers can access information. Another main task is to analyse this information, making use of advanced computer software called sequence analysis tools. This software can be used to a number of purposes, including prediction of the function of newly discovered proteins and RNA sequences.

4.2.3 Current ICT trends in SMEs

The current development in SMEs in regard to adopting new ICT is very much characterised by being in an initial search phase, where the main focus is to adopt standard information technology systems from other sectors in areas where this is possible, e.g. ERP and e-commerce systems. At the same time the companies try to develop ICTs directed to their special needs within bio informatics and analytical tools, research and development, databases, etc. There is a growing understanding of the importance of exploiting new ICTs, and that Internet can actually transform business processes, but at the same time many SMEs think the current ways of conducting business are the most efficient.

Although the sector is characterised by business network and collaborative projects with partners, the history of exploiting ICT for external communication and business transactions is limited. One important reason for this, in addition to the short history of the sector, is that transactions are few and complex in many R&D intensive companies, and large investments in collaborative systems and sharing of databases have not yet taken place.

Moving from the ICT use at an overall sector level to the companies involved in the study, the analysis has included the issue of what applications the companies actually have implemented during the last three years. Table 4.1 on the following page contains a list of the most frequently implemented ICT-applications during the last three years in the companies.

Table 4.1: Main applications implemented in biotechnology SMEs during the last three years

APPLICATION	TYPE
Bio informatics and statistical software	Statistic tools like SAS, SPSS, and Statistical. Sequence analysis software for genes, proteins, enzymes, etc.
Enterprise Resource Planning	ERP including modules for administration, finance, production and customers.
E-commerce	E-catalogues Simple order systems on web page.
Web page	WebPages containing information sites for stakeholders, including investors and customers.
Intranet	Intranet containing company news, project information Intranet with access from different geographical locations
E-portals	Biotechnology specific portals with news and e-marketplaces

The most frequently implemented tools are analytical and statistical software tools for research and drug development. These tools are used more

Two of the companies have recently implemented modern ERP systems, enabling integration of the different parts of the business processes, and making the company ready for integrated e-commerce. Others have implemented more simple administrative systems.

E-commerce is implemented in a great many biotechnology companies, which actually sell products – like suppliers of analytical equipment and biochips. The e-commerce solutions in the case companies are all web-catalogues with online ordering functionality, and very seldom dealing with payment.

Web pages are currently updated and made more informative and functional, and Intranet is also established by many of the companies. Finally a large number of start-ups have tried to establish vertical e-portals, with e-commerce and a number of value adding services.

4.2.4 Future ICT trends in SMEs

There is a growing recognition in the biotechnology sector that Internet can actually transform the sector and network structures fundamentally. E-business can mean a total restructuring of the value chain, online interaction with suppliers and partners, and web as platform for internal project and customised intranet where employees can follow topics of interest.

In the long-term, it is possible to imagine that biotechnology firms will switch from the time-consuming paper-based approach to collecting data in clinical trials, to a fully Internet based drug development process, which would make communication and process management much more efficient. Combined with use of more advanced IT-analytical tools, the cost of the extremely expensive drug development process could be minimised considerably.

These future perspectives, however, do not play a significant part of the future perspectives of the SMEs. The companies have revealed the main ICT-investments for the next 3 years, as summarised in the table below.

Table 4.2: Main ICTs to be implemented in biotechnology SMEs during the next three years

Advanced sequencing tools	Advanced statistical and analysis tools DNA and protein sequence analysis Clinical trials
On-line databases	Using large databases for gene sequencing Online services within gene, DNA and LNA analysis
Enterprise Resource Planning	Implementation of more modern ERP systems, with integrated features within production, finance, CRM and e-business
Customer Relationship Management	CRM systems to be adopted in sales departments More advanced functionalities within data analysis CRM as module in ERP or separate systems like Super Office
E-commerce	Establishment of simple online ordering solutions Further development of existing solutions, e.g. product introduction, payment, order status, track and tracing
Collaboration software	Online collaboration with external partners Shared extranet with access to data, project news, project progress, etc.
Security systems	Improving security in all parts of data storage

The future investments are aimed at making ICT a more integrated tool in internal and external business processes. They can be seen as a continuation of the types of investments made previously and no fundamental changes in the use of ICT can be observed. It will be an improvement of the current IT systems, and the adoption of additional features within finance, project management, intranet, customer analysis, e-commerce and analytical tools.

It is striking that the issue of e-procurement, meaning not just e-commerce but using electronic means to support the whole procurement process, was not mentioned as important in future use of ICT. Most companies felt that customers are very conservative, and very reluctant even just to order online.

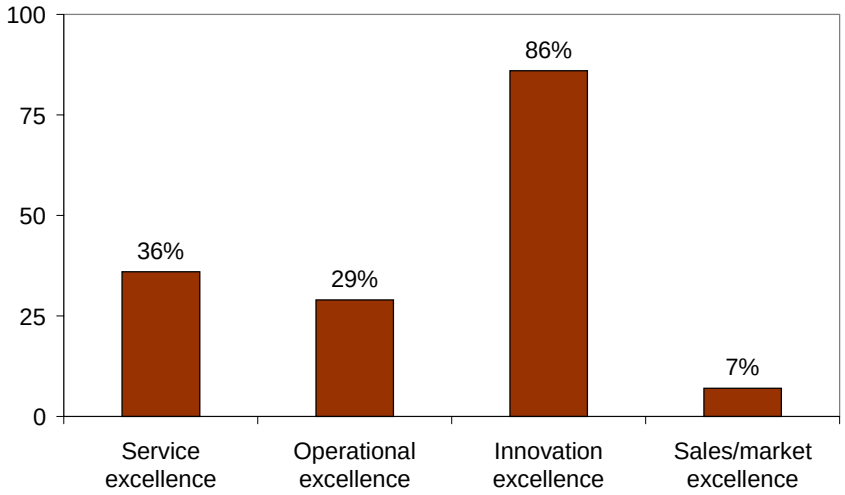
Another important issue, which seemed to have received remarkably little attention among the companies, was integration of IT systems. Most of the companies did have different and non-integrated systems for finance, production, e-commerce and CRM, resulting in many manual internal processes in order to utilise the information (e.g. order registration and invoicing).

4.2.5 Emerging ICT facilitated business models

The companies in the study have been asked about the most important differentiation strategy. The respondents have indicated the importance of:

- Service excellence: the delivery of superior value services
- Operational excellence: high quality products at a reasonable price
- Innovation excellence: continuous delivery of innovative products
- Sales excellence: market-driven products and company.

Figure 4.2: Strategic differentiation adopted by the case companies



Innovation excellence (86%) is clearly the most important way to differentiate from competitors. Service excellence (36%) and operational excellence (29%) are less important ways of strategic differentiation, and sales/marketing excellence have only little attention among the companies.

The fact that the case companies consider themselves relative experts in innovation means that they should be ready for continuous development of products, and also continuous evaluate how new products are developed through convergence between information- and biotechnologies. The low focus on sales and marketing excellence is a result of the outsourcing of commercial activities to distributors or pharmaceutical companies, and also a result of exclusive market position with unique products for many of the involved cases. The low focus on sales and service excellence means that this will seldom be a major argument for implementing e-commerce.

The integration of ICT at the highest strategic level is an important indicator of the use of ICT in a sector. The high data intensity in biotechnology means that ICTs can actually become integrated in business processes, products and services to a very high degree. During the study, several examples of interesting adoption of ICT in products and business models are observed.

One of these could be labelled *provider of bio informatics products and services*. Bio informatics products can include both the development of software, data collection and analysis of sequences. These companies typically need competences in the cross field between IT and biotechnology, and especially be specialists in developing and handling of databases and analysis.

Another example of the convergence between ICT and biotechnology is the usage of biochips and ICT, which can be used for identifying detailed structure of DNA and LNA. When biochips are connected to hardware, bio informatics software can be used to analyse samples for medical purposes.

A further development area, and model of IT/biotechnology convergence, could be called *software developer and database provider*. Besides developing analytical tools, some companies develops own databases of genome and protein analysis they conduct, and may use these two processes to develop a new and competitive product.

Case examples: ICT facilitated products and services

French SME:
A biotechnology company with focus on technology. It provides services within genomic data collection.

Genome Express:
SME developing tools for research and analysis within bio informatics, signal analysis techniques, gene profiling and proteomics. It is involved in the Geno*TM bio informatics consortium to design and develop modular software platforms for genomics.

Exiqon:
Produces biochips, which can be used for identifying detailed DNA and LNA structures.

ExonHit Therapeutics:
Develops gene profiling technologies, and considers provide access to database on genome and protein analysis to support the analytical tools.

Finally the establishment of biotechnology portals and e-marketplaces can be considered an example of the adoption of ICT in strategy and products. Table 4.3 on the next page is a list of a selection of the most significant biotechnology portals and e-marketplaces in Europe.

Table 4.3: Biotechnology portals and e-marketplaces

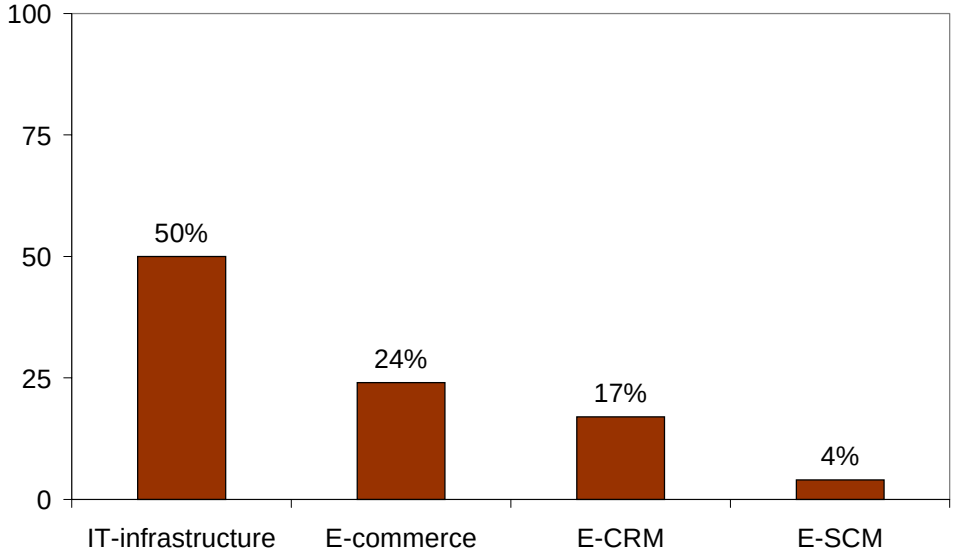
MARKETPLACE	TYPE
UK	
Abcam.com	Marketplace for antibodies. Website for finding, buying and selling antibodies.
BioMedNet / bmn.com	Website for biological medical researchers providing access to biomedical databases, journal collection, news, etc.
Biotech Analytics	Internet portal offering e-commerce, collaboration, investment information, news, job search and more.
Pharmiweb.com	Portal with trading platform, news, job search and more.
GERMANY	
Bioropa.com	Marketplace of science and laboratory equipment. Offers e-commerce solutions to buyers and suppliers.
Elabseurope.com	Marketplace, catalogue one-stop shop for laboratory supplies. News and information forum.
Labexchange.com	Second-hand market of laboratory and analysis equipment for laboratories, institutes and equipment manufacturers.

E-marketplaces have especially emerged within the field of biotechnology equipment and analytical tools. The current strategies of e-marketplaces is both a threat to SME distributors, that do not realise the potential of e-commerce, but if they choose to enter a collaboration with one of the marketplaces, e-marketplaces also provide an opportunity to extend distribution channels and increase efficiency of procurement without large start up investments.

4.2.6 ICT infrastructure in SMEs

ICT-maturity is a term covering four overall aspects of ICT use: IT infrastructure, e-commerce, e-CRM and e-SCM. The ICT maturity in biotechnology is presented in figure 4.3 as the figure shows the frequency of major ICT applications.

Figure 4.3: ICT maturity of SMEs in biotechnology sector (%)



The figure does not show the frequency of uptake of the four system types in focus. Rather, it presents scores on maturity of the systems calculated as average sophistication of the systems implemented by the case companies.

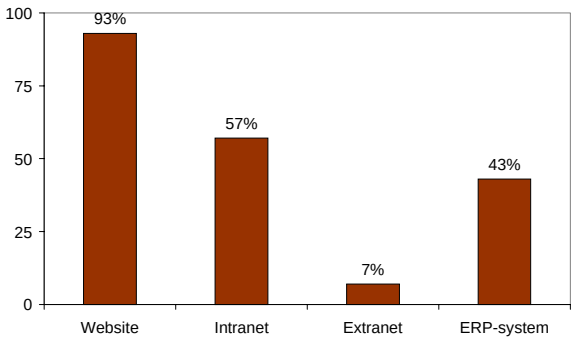
The figure reveals that even SMEs chosen as front-runners in use of ICT do not use recent e-business technologies to an advanced extent. The basic IT-infrastructure is being implemented, but the figure shows clearly that this has not been implemented to a great level of sophistication. E-commerce and e-CRM are used to a limited extent, and e-SCM is hardly used.

A part of the explanation is that the production and services of some of the biotechnology companies are quite complex, and transactions with customers are few. Thus the figure indicates that the sector has not yet found the solutions for a more efficient use of ICT.

To gain a more detailed understanding of the IT-use of the solutions underlying the maturity scores, each of the four applications are analysed in greater detail below.

IT infrastructure includes the use of website, intranet, extranet and ERP. Generally the basic IT infrastructure is very important in biotechnology companies, as they form the basis for efficient management of projects, R&D processes, economy and knowledge. Even more important are the demands from shareholders like investors and authorities for documentation of economy, quality and business processes. The table below shows that the current IT infrastructure is not very mature, but it should be added that most of the companies are concentrating on upgrading their IT infrastructure. Internet pages are implemented in most of the companies, 93%, but the sophistication of the pages are generally low. More advanced features at the pages are online ordering and access to member areas. Intranet is used to a fairly high degree, 57%, and is usually designed for message posting, and in some companies also for communication between geographically dispersed offices. Extranet is nearly not used even though it is extremely relevant in the sector, e.g. for project collaboration and access to research results. Up-to-date ERP is very important for the companies to management resources and development processes, but most companies have so far only implemented simple administrative systems.

IT-infrastructure – biotechnology (%)



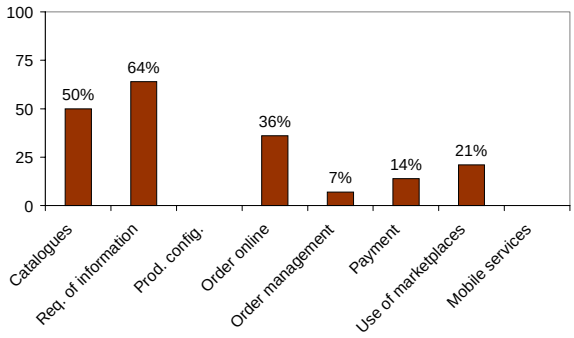
Case examples: ERP systems

Biora
Last year Biora started implementing an ERP and e-business solution. The implementation will provide a much more integrated IT-infrastructure, and faster and better management information.

Bioropa
E-marketplace which has implemented a ERP systems, which is the foundation for offering integrated procurement systems and services to customers such as tracking and online order status

It comes as no surprise that **e-commerce** is only adopted to a limited degree in biotechnology companies, as many of them do not sell products which are well suited for e-commerce. However, a number of the cases are equipment providers or perform analysis, and 50% have an e-catalogue. 36% offer online ordering and only 14% payment. Usually this is explained by lack of interest from customers.

E-commerce- biotechnology (%)



E-commerce for buying and selling is used by 21% of the companies, and mostly for non-strategic articles like office equipment. Mobile services are not used by any of the companies, and there are no plans to do so in the future.

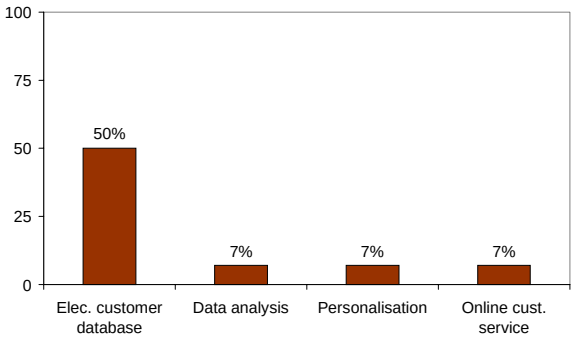
Case examples: E-commerce

Osteometer
Implemented e-catalogue in 2001, with possibility of online ordering and payment. The system is not (yet) integrated with administrative- and CRM systems.

Genome Express
Offers an online catalogue with price lists for gene analysis. Downloadable order forms but do not yet have online ordering and payment.

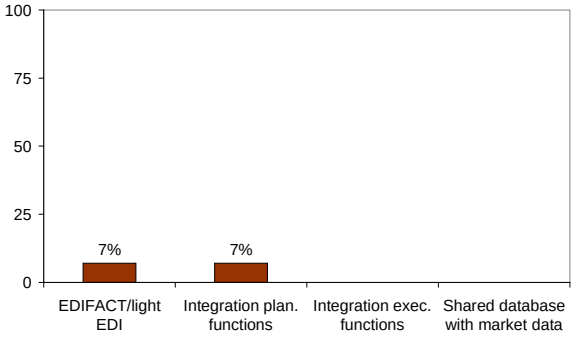
E-CRM carries a large potential for most biotechnology companies as it enables much better information on end-customers and much more efficient marketing campaigns. Biotechnology companies use customer databases to some degree, 50%, but only very seldom more advanced CRM tools like analysis and personalisation. Online customer service is only offered by 7% of the cases.

E-CRM – biotechnology (%)



E-SCM carries some potential for health care service. Looking at the entire value chain from biotechnology equipment supplier to patients, benefits could be reach by a closer linking of each participant in the supply chain: reduced costs following automating of business processes entailed in integration of planning functions and execution of orders. SCM is an area with relatively low focus in biotechnology companies. In the case of drug development companies, the costs of supply are very minimal compared to the costs of R&D.

E-SCM – biotechnology (%)



Generally, the uptake of new ICTs within the four areas IT-infrastructure, e-commerce, e-CRM and e-SCM are limited. Even the basic ICT-infrastructure like a modern ERP system, intranet, extranet and web page is only developed to an up-to-date level by half of the case companies.

4.3 Collaborative commerce: ICTs in the value chain

As noted in the introduction, phenomena described as virtual value networks, business webs or collaborative commerce, are central to the present study, because such networks present the opportunity for SMEs to act as large companies while staying small.

While building close relations to the customers through CRM can be considered part of such networks, virtual value networks should also integrate other parties 'behind the customer scene' provided by the front office system. By selecting case companies who are front-runners in the use of ICT, we expected to find electronically business networks in operation at the back office. But as shown, the SME case companies still cannot be considered part of virtual value networks due to limited ICT sophistication in relation to suppliers and business partners. A general profile of typical business networks in the bio-technology sector is presented in table 4.4 below.

Table 4.4: General network profile for the biotechnology sector

	Number	Proximity	ICT sophistication
Suppliers	Medium	High	Low
Partners	Low	High	Low
Customers	Medium	High	Medium

The number of relations of biotechnology SMEs to suppliers and customers are medium, and low in regard to partners. For most biotechnology companies, bulk chemical producers and laboratory equipment providers are the most important suppliers. The most important partners are usually universities, research institutions and other biotechnology companies. Other biotechnology companies, pharmaceutical companies, universities and hospitals dominate the customer side.

Most of the biotechnology companies do have close relations to at least some of their suppliers, partners and customers. The use of ICT in network relations is typically very little, except from the relation to customers, which is at a medium level.

The network profile, and the case studies, forms a picture of a sector with a low number of external relations but characterised by close contact to suppliers, partners and customers. This is the ideal basis for developing advanced IT solutions for collaboration, but so far the ICT sophistication in this relation is low.

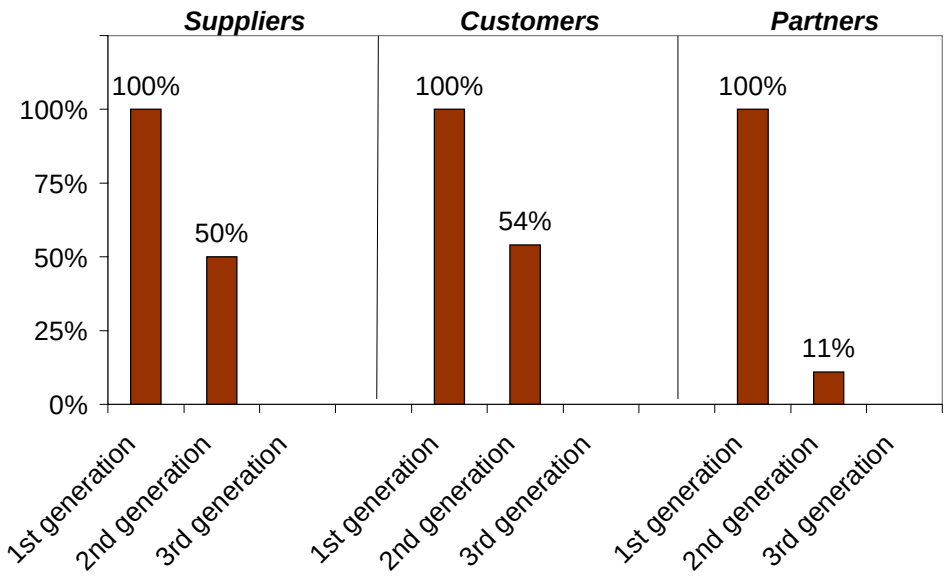
The ICT sophistication is determined by the use of network technologies in three levels of advancement. The typology of network technologies below constitutes a basic understanding of the nature of ICT use in external relations. Based on three generations of networks covered by the cases, the model describes the characteristics of the relations.

Table 4.5:Three generations of ICT use in networks

Generation	IT-solution	Automation level	Integration
First generation: Unstructured e-mails / Internet communication	E-mails: Person-to-person	No automation	No integration with back-end systems
Second generation: Structured e-mail and Internet communication	E-mail and e-commerce Internet commerce, request forms at web page, e-mails Person-to-machine or machine-to-person	Internal automation	Low integration in back-end systems
Third generation: Standardised communication (e.g. EDI and XML)	Internet & EDI communication Machine-to-machine	External and collaborative automation	Full integration of back-end systems (prices, products, etc)

The table shows that reaping the benefits of increased automation requires closer integration made possible by more advanced ICT systems. The labelling of three generations reflects a tendency towards joint development in sophistication of automation, ICTs and integration. The three generations are ideal types, as combinations diverging from this general trend do appear in practice (for a more elaborated description of the three generations of network, see section 3.3).

Figure 4.4: ICTs in networks



All biotechnology companies have implemented the 1st generation ICT-network structure, and use unstructured means of communication. 2nd generation ICTs are implemented in 50% of the cases towards suppliers and in 54% towards customers, although in most cases these are only used to a limited degree, and cover a minor part of the total turnover.

The 2nd generation solutions are especially web-based catalogues, online booking, and even online booking of genomic analysis. Generally these systems have a very limited degree of integration with back end systems. Many customers are not ready for 2nd generation collaboration, because they do not have a modern IT-infrastructure. Many respondents expect that this situation will be very different within two years, when a larger share of partners have implemented better IT-systems.

The figure shows that the large potential in 3rd generation network, with more integrated and automated communication throughout the value chain, remains unused towards suppliers (0%), partners (0%) and customers (0%). The conclusion is that biotechnology companies have a large potential of more automation and integration of the value chain and partner network.

Case examples:
Collaborative webs in biotechnology

Example of use
The biotechnology cluster Genopole (France) has a complete national network of industrial and academic partners that provide easy and permanent access to up-to-date shared technological platforms (sequencing, screening, combinatorial chemistry, biochips platform, NMR, mass spectroscopy) needed to carry out research activities.

Plans to use
Newron: Plans to implement an extranet as collaboration platform with a project partner (a university). The extranet should include information on project progress, project news and enable fast and secure access to data.

Exonhit: Considers entering e-commerce by offering Internet access to a database of genome and protein analysis.

Osteometer: Considers establishing an ICT-platform (extranet) for external collaboration, which will also make them a more attractive partner for large biotechnological companies.

4.3.1 Benefits of using ICT in networks

The cost/benefit ratio and payback time is important indicators in relation to investments in ICT, and all the cases have been asked to indicate the total cost/benefits of network focused ICT applications implemented during the last 3 years. The cost-side includes both direct cost of software, external consultancy and the internal work hours invested in implementation. The benefits are measured in terms of yearly cost reduction and increased revenue. The results are shown in the table below.

To get a complete picture of cost and benefits, it is important to consider the additional cost and benefits, which are not included in the table below:

Additional benefits: The benefits are primarily direct benefits related to reduction of personnel in sales and order departments, savings of marketing expenditures and savings of investments in other IT systems. Some of the companies had difficulties estimating the indirect benefits, e.g. faster and better information about processes and economy.

Additional costs: The cost in the table below includes the initial investments in software, hardware, consultancy and internal working hours. In addition to these costs it is important to consider the operational costs of maintenance and support of the IT systems. These costs differ significantly from company to company. For instance, the e-catalogue at Glycorex requires only a few man-hours support & maintenance a month, whereas the larger ERP and e-business solutions require much more support & maintenance.

Table 4.6 below indicates the cost and benefits of the ICT investments conducted by the 14 case companies.

Table 4.6: Costs and benefits of ICT investments

Case company nr.	E-application	Cost of application (incl. software & man-hours)	Benefits per year (cost reduction / increased revenue)
1	-	N.A.	N.A.
2	E-catalogue ERP & E-business	11,300 euro 227,000 euro	0 euro 90,700 euro
3	E-portal, incl. e-commerce	4,600,000 euro	1,530,000 euro
4	-	N.A.	N.A.
5	E-portal, incl. e-commerce	< 800,000 euro	< 400,000 euro *(payback: 2 years)*
6	E-catalogue	11,300 euro	4,500 euro
7	ERP & e-business solution (integrated)	71,300 euro	N.A.
8	-	N.A.	N.A.
9	CRM Bio informatics	N.A.	2 years payback time ½ year payback time
10	Web page incl. e-catalogue	13,300 euro	5,700 euro
11	Network facilitating application	15,000 euro	N.A.
12	Software (analytical software, etc.) Hardware (PCs, servers)	59,400 euro 103,300 euro	N.A. N.A.
13	E-commerce	13,700 euro*	10,000 euro
14	Medical information system	3,200 euro	N.A.
Total, 6 cases **Total, 10 cases**		**5,676,600 euro** **5,928,800 euro**	**2,040,900 euro**
Average payback time			**2.8 Years**

*Excl. operation costs: includes software and internal working hours, but excl. monthly fee on ASP and transactions.

It is clear from the table that the investment level varies significantly between the different companies dependent on size and type of company. The following main findings emerge from the indicated cost/benefits:

Payback time: The average payback time of the IT investments is nearly three years. It is important to add that most of the companies in the study considers this a very long investment horizon. The most favourable investment among the 14 cases is an e-catalogue for standard biotechnology equipment.

Moderate investments in new ICTs: Investments in e-business and collaborative commerce technologies in the biotechnology sector are low. Even though the sector is characterised by a large number of networks and collaborative project, only a few companies actually consider how to exploit IT in relation to partners. So far the main area of e-commerce solutions is a standardised biotechnology product like equipment, analytical tools, etc.

Large investments in Internet portals: Companies establishing biotechnology portals are conducting large IT investments. The most well known portals are investing at least 500,000 euro plus internal working hours to develop solutions. The investment level makes them a significant driver of ICT in the sector, paving the way for solutions within e-procurement and e-commerce for biotechnology companies.

The cost/benefits of e-commerce solutions show that these investments are usually not favourable within a short period of time. The interviews indicate that this is partly due to the fact that most customers, e.g. scientists, are reluctant towards using e-commerce.

Case examples:
Quantitative costs of e-commerce

Scibion is a e-commerce provider for the biotechnology and pharmaceutical industry. They offer a e-commerce ASP solution aimed at SMEs. The costs of an average e-catalogue solution are estimated below:

Standard package: 10.000-15.000 Euro
Consultancy, implementation: Current account
ASP, operation: 10.000 Euro
Click-fee: 3 Euro

The total costs depends on initial analysis, need for conversion of data i.e.

The realised benefits of using ICT in networks are presented below.

Table 4.7: Benefits from using ICTs

	Not at all	Low	Some	High	Very high	Cases
Improved customer satisfaction	-	33%	33%	25%	8%	12
Reduction of product-to-market lead time	-	46%	31%	23%	-	13
Reduction in labour costs	-	8%	69%	23%	-	13
Reduction of procurement costs	8%	8%	54%	31%	-	13
Better information collection	-	15%	46%	31%	8%	13
Better match of production level to demand	-	62%	31%	8%	-	13
Extension of distribution and marketing channels	-	8%	54%	39%	-	13

To the greatest extent (38% very high or high), the benefits obtained by using ICT are better information collection and extension of distribution and marketing channels. Very few companies have experienced benefits in areas which typically require implementation of more advanced e-procurement or supply chain management systems: better match of production level to demand, reduction of product to market lead time and improved customer satisfaction.

The table below contains an overview of the main benefits indicated by the case companies.

Table 4.8: Main benefits of implementing ICT

Case overview
Better management information Biora: ERP provides information about business processes, which makes better and faster decisions possible. Exiqon: ERP systems enable better overview of business processes. **More efficient procurement process** Bioropa: E-procurement makes sourcing and purchasing processes more transparent, faster, more efficient and more cost-effective. Biotech Analytics: Purchaser benefits are cost savings in terms of time saving in the procurement process. Genome Express: Automated procurement process. **Improved communication** Biosearch Italia: More efficiency in communication with external partners Exonhit Therapeutics: Improved communication with the American subsidiary (intranet / analysis database, e-mail). Genome Express: More efficient communication between the different offices (intranet, e-mail). German biotechnology company: Collaborative ICT helps creating a scientific environment, which is difficult to achieve in a small company. Osteometer: IT improves internal sharing of information and access to the results of the research. **Improved data management** Biosearch Italia: IT makes it possible to store and record research and trials in a more structured way to increase 'reuse' of information. Genome Express: Bioinformatics tools improves data management and analysis in the research process German biotechnology company: Storing and analysing large amount of data. Newron: Easy search for information and the possibility to store large amounts of information rapidly. **Extension of marketing channels** Biotech Analytics: E-marketplaces benefit suppliers by increasing the customer base. Glycorex: Establishment of a new marketing channel, which makes potential customers more aware of the presence of the company. Another main advantage is savings of sending paper-based sales catalogues, especially to customers outside Europe. **Improved customer service** Osteometer: One of the main advantages, and reasons for establishing e-commerce, is that it enables customers online ordering 24-hours a day, which is especially an advantage for customers in other parts of the world.

4.3.2 Barriers towards using ICT in networks

The companies have been asked to assess the barriers towards implementation and gaining the most of ICT in networks relations. To high costs is clearly the single most important barrier (8% very high and 69% high). Other important barriers are lack of resources (33%) and lack of knowledge of which system is best (27%).

Table 4.9: Barriers of using ICT

	Not at all	Low	Some	High	Very high	Cases
Cost is too high	-	8%	15%	69%	8%	13
Too few people/too little time	-	17%	50%	33%	-	13
Management is against it	-	67%	33%	-	-	13
Employees are against it	8%	58%	33%	-	-	13
We are bound by present systems	-	50%	42%	8%	-	13
We don't know which system is best	9%	27%	36%	27%	-	13
Any system will too quickly be outdated	-	60%	40%	-	-	13

Resistance among management and employees seems to be a low barrier. The case studies confirm this picture, and many respondents mention that young and highly skilled people, who are positive towards implementation of new ICT, dominate the sector. However, it is also mentioned by one respondent that a large part of the employees could benefit from IT-training or courses in order to utilise new ICT to the full.

The table below contains an overview of the main barriers indicated by the case companies.

Table 4.10: Main barriers of increased use of ICT

Case examples
Low quality of IT-providers Biora: Low quality and high costs of IT-consultancy Biosearch Italia: Lack of specific biotechnology knowledge among IT providers Shire: High prices and low quality of IT-suppliers and consultants. **Lack of IT-knowledge** French biotechnology company: lack of knowledge and resources on choosing, implementing and integration analytical tools. **Technical barriers in biotechnology companies** Bioropa: Poor IT-infrastructure in many biotechnology companies – many do not have efficient and modern internal accounting and ERP systems. ExonHit: Lack of broadband connections, lack of security at Internet and lack of standards and integration within analytical tools. Genome Express: lack of standards within e-procurement and DNA sequencing. Osteometer: Biggest barrier is the lack of standardised communications systems for e-procurement between different companies. **Complicated maintenance** German biotechnology company: Difficult to establishment efficient and automated support and maintenance function. The software in the biotechnology sector is often complex installations running UNIX servers, and expensive to set up and maintain. Osteometer: Many IT-systems require too much maintenance Shire: Many IT-systems are developed in a way, requires a great deal of support and maintenance. **Resistance and lack of IT skills among employees** Biora: Employees lack sufficient IT skills to gain full advantage of IT Bioropa: Employees in central procurement functions are afraid of e-commerce Exiqon: Older employees can be more reluctant to new working methods **Suppliers or customers not ready** Biotech Analytics: Suppliers need better knowledge of e-commerce Biotech Analytics: Suppliers maintain product data in many different formats Genome Express: Customers are not able to pay by credit cards Glycorex: Reluctance of scientists, private companies and hospitals of using advanced procurement solutions

4.4 Conclusion and policy recommendations

ICT is an increasingly important factor in the competitiveness of EU biotechnology companies. The sector is characterised by large and increasing growing data flows and data analysis, and a high degree of external collaboration. Thus ICT provides the potential of fundamentally restructuring internal and external business processes, and makes completely new products and services possible.

Most investments in the biotechnology sector in EU are in basic IT-infrastructure, simple web-based product catalogues and bio informatics. Compared to other sectors, ICT usage, especially in external relations, is relatively low. The case studies identifies a number of challenges for the EU biotechnology sector in regard to ICT development:

Managing new bio informatics tools

Bio informatics IT tools deal with the advanced analysis of biological information, including biological sequence data (genes and proteins). These tools are very important for the future competitiveness of the sector. SMEs lack the needed resources to choose, implement and integrate the new analytical tools entering the market.

Establishing a modern (internal) IT infrastructure

Many biotechnology SMEs have not yet established a modern and integrated ICT infrastructure. Data is stored in many different systems, and the integration of the systems is low. The establishment of an up-to-date infrastructure is a prerequisite for establishing the entire drug development process on an Internet platform, with the perspective of a much faster and more cost effective development process.

Establishing IT based collaboration

Biotechnology companies are slowly realising the benefits of IT-facilitated collaborative structures – both in regard to e-commerce and collaborative project webs. SMEs are very slow in the adoption of more advanced networks linked by XML technologies and fully integrated in back-end systems of partners.

The following table of strengths, weaknesses, opportunities and threats (SWOT) summarises the challenges.

Table 4.11: SWOT of ICT business networks in SMEs

Strengths:		Weaknesses:
Young sector and most employees are positive towards introduction of new ICTs	But…	Employees lack sufficient IT skills to gain full advantage of IT.
Large focus on introduction of new analytical and statistical tools	But…	Little attention to integrating IT systems and bio informatics tools.
Some companies are upgrading IT infrastructure, and future plans indicate that a more companies will make improvements during the next two years	But…	IT infrastructure lags behind other sectors and international front-runners, e.g. in U.S. Barrier to more use of advanced IT applications.
Extensive use of Internet and databases for research	But…	Very limited use of collaborative software and extranets in relation to partners
High investment level within R&D, and long-term investment horizon, means that ICT investments are considered relatively moderate. Investments in ICT are carried out when necessary	But…	Low investment level in ICT and e-commerce in particular. Very limited pressure from using ICT by suppliers and customers.
Opportunities		**Threats:**
SMEs makes use of the big potential in ICT facilitated drug development, e.g. much better use of Internet and IT tools in the process	But…	Lack of competences within in the cross field between IT and biotechnology means problems of choosing and implementing new tools.
General improvement of the basic IT infrastructure, makes usage of more advanced IT applications possible	But…	Too late introduction of a modern infrastructure compared to international front-runners
The introduction of new bio informatics and analytical software boosts the general use of ICT in the sector	But…	Lack of competences means application are only utilised to a limited degree
SMEs makes much more use of e-business and business processes become more efficient and cost effective	But…	High expenses and low quality of IT-consultancy slows down introduction of modern e-business systems. Customers can't see benefits in e-business.
Increased use of collaborative software to improve partnerships	But…	Sector don't realise potentials of collaborative webs
Highly skilled work force		

4.4.1 Policy recommendations

The best possible usage of ICTs becomes an increasingly important competitiveness parameter for biotechnology SMEs. A number of challenges are identified, and the policy recommendation below deals with the establishment of the best possible conditions to promote the use of new information technologies. The recommendations are based on suggestions from the companies of the study.

Table 4.12: Policy issues in regard to ICT

	Challenges	Policy oriented actions
1.	Increase knowledge of potentials of ICT.	Promote information about potentials of ICT for biotechnology SMEs.
2.	Develop standards for e-commerce/e-procurement.	Investigate the possibilities of national, regional and European standards within e-commerce in the biotechnology sector and support pilot projects for establishing standards in the sector.
3.	Access to high quality IT consultancy at affordable prices.	Investigate initiatives to increase the general quality of IT providers, and increase SMEs access to affordable IT consultancy.
4.	Raise level of IT knowledge among employees.	Promote ICT training and education at relevant levels.
5.	Secure access to labour in the cross field between IT and biotechnology.	Promote ICT training and education within bio informatics. Promote SMEs access to products and services within choosing, implementing and integrating bio informatics tools.
6.	Sufficient supply of fast and cheap Internet connections.	Increase initiatives to speed up the establishment of broadband Internet in Europe, and continuation of policy of liberalisation of telecommunication law.
7.	Easy access to sector specific information.	Establish EU biotechnology portal with access to all relevant information on EU-legislation, financial support, standards, etc.
8.	Support implementation of modern IT-infrastructure.	Promote initiatives to improve the existing IT-infrastructure in biotechnology SMEs. Promote initiatives to increase the use of electronic documentation in the drug approval process.
9.	E-enable suppliers.	Promote initiatives to increase use of e-commerce among biotechnology customers and suppliers. Setting up (affordable) education and seminars to promote e-commerce, e.g. e-marketplaces among suppliers of laboratory and equipment to the biotechnology sector.

Each of these issues is dealt with below.

1. Increase knowledge of potentials of ICT

Internet and E-business technologies can mean a total restructuring of the drug development process as well as the whole health care value chain. The sector is currently confronted with the challenge of handling an explosion of data, which also demands implementation of new statistical and analytical tools.

Biotechnology companies lack knowledge of the new potentials provided by ICTs, including bio informatics, e-commerce, and external collaboration and Internet platforms for the drug development process. The investment structure and financial resources of the sector means that biotechnology companies actually have financial resources to ICT-investments, if these are considered important.

Recommendation 1
Promote information about potentials of ICT for biotechnology SMEs.

2. Develop standards for e-commerce/e-procurement

Current (UN/ECE) standards are considered to be to broad, and are primarily standards for transactions, quantities and price. There is a demand for more detailed standards on product information in biotechnology. Similarly, a standardisation of data formats and catalogues are important.

SMEs reveal that the lack of standards represents a problem in regard to diffusion of ICTs, because establishment of electronic systems becomes much more complicated, time-consuming and expensive.

Recommendation 2
Investigate the possibilities of national, regional and European standards within e-commerce in the biotechnology sector. Support pilot projects for establishing standards in the sector.

3. Access to high quality IT consultancy at affordable prices

Several companies complain that the quality of IT providers and consultants are low, and that high prices prevent them from investing in e-business software and implementation. Another problem identified is lack of biotechnology specific competences among IT providers, and that there is a lack of applications for biotechnology companies. It is recommended to investigate initiatives to increase the general quality of IT providers, and increase SMEs access to affordable IT consultancy.

Recommendation 3
Investigate initiatives to increase the general quality of IT-providers, and increase SMEs access to affordable IT-consultancy.

4. Raise level of IT-knowledge among employees

The case companies have indicated that 'normal' employees still lack basic IT-competences, which means that investments in new ICTs are not utilized optimally. Some companies also need resources required for a general lift of basic ICT skills, and support for IT-education is considered relevant.

Recommendation 4
Promote ICT training and education at relevant levels.

5. Secure access to labour in the cross field between IT and biotechnology

Biotechnology SMEs lack the needed resources to choose, implement and integrate the new analytical tools entering the market, even though these are central to the further development of the sector. Competences needed to fully exploit these tools in the cross field between IT and biological sciences. There is a large task of securing the future access to skilled employees in these fields, and it is recommended that initiatives be taken to secure the right access.

Recommendation 5
Promote ICT training and education within bio informatics. Promote SMEs access to products and services within choosing, implementing and integrating bio informatics tools.

6. Sufficient supply of fast and cheap Internet connections

Several companies have complained that access to cheap Internet and broadband (above 2Mb) is limited. The sector is data intensive, and companies needs to transfer large amounts of data between own offices and to partners. More advanced collaboration applications require fast Internet connections, and SMEs need access to cheap broadband connections. It is recommended that the existing initiatives to promote fast and cheap Internet be stepped up.

Recommendation 6
Increase initiatives to speed up the establishment of broadband Internet in Europe, and continuation of policy of liberalisation of telecommunications law.

7. Easy access to sector specific information

Different portals within biotechnology companies have been established to provide sector specific information for investors and biotechnology companies. However, relevant information is spread across several web pages and portals, and it is very difficult to get an easy overview. One company suggests that a portal collecting all relevant information for EU biotechnology is established, and the portal could contain following issues:

- Legal matters (directives, etc.)
- Support possibilities (Framework programmes towards biotechnology)
- Standards (e-commerce, documentation, etc.)
- Database of Intellectual Property Rights
- Online journals.

Recommendation 7
Establish EU biotechnology portal with access to all relevant information on EU-legislation, financial support, standards, etc.

8. Support implementation of modern IT infrastructure

Biotechnology companies still need support to implementation of a basic ICT infrastructure, including modern Internet, intranet, extranet, ERP and knowledge management. Several case companies find that financial resources to support the implementation of an improved IT infrastructure are necessary.

The use of e-governance among administrative authorities is another way to increase the implementation of an improved IT infrastructure. One company has complained that possibilities of electronic submission are still not good enough, and not supported strongly enough by relevant authorities. It is suggested that electronic submission of drug approval documentation is facilitated, and even made more advantageous by faster processing of electronic submissions.

Recommendation 8
Promote initiatives to improve the existing IT infrastructure in biotechnology SMEs. Promote initiatives to increase the use of electronic documentation in the drug approval process

9. E-enable suppliers

Biotechnology companies complain that suppliers and customers are reluctant to the use of new ICTs. This ‘drive’ from external partners is very important in order to increase the use of ICT in the sector.

Equipment and laboratory suppliers are considered to be reluctant of using e-marketplaces and e-commerce. Many are critical of the possibilities of gaining positive effects by joining e-marketplaces, and thus keep product data in many different formats and old systems, making e-commerce very difficult. It is suggested that efforts be made to raise knowledge of e-commerce among suppliers.

Customers of biotechnology companies are hospitals and universities, and these are slow in the adoption of new e-procurement technologies. The customers are of course central to improving the use of e-commerce in the sector, and it is recommended that initiatives be made to improve the use of e-commerce in hospitalities and universities.

Recommendation 9
Promote initiatives to increase use of e-commerce among biotechnology customers and suppliers. Setting up (affordable) education and seminars to promote e-commerce, e.g. e-marketplaces among suppliers of laboratory and equipment to the biotechnology sector.

5. *The New Media Sector*

This section includes the following 4 subsections:

Section 5.1 Provides a sector outline featuring general trends and the role of SMEs in the new media sector.
Section 5.2 analyses the use of business network ICTs in the SME case studies.
Section 5.3 analyses ICT facilitated business networks.
Section 5.4 concludes the chapter by a SWOT analysis and policy recommendations.

5.1 Sector outline

"New media" is a broad term for all forms of electronic communication that have appeared in recent years, in competition with more traditional, mainly text and static visual forms of online communication. Thus, the new media sector is rather new, making agreed definitions and sector statistics hard to come by. No NACE codes for the sector exist, as the sector is comprised of a number of strategic orientations within manufacturing, business services and publishing.

The new media sector dates back no longer than the mid-1990s, but the sector (and its related producer networks) is a rapidly growing economic segment in many countries. It's potential for job creation and economic development have attracted significant political interest, and promotion of new media clusters has become a significant focus for regional development strategies.

The term new media is used to include a number of products and services: special audio effects of any kind, streaming video and audio, 3D and virtual reality environments and effects, interactive user interfaces, broadband communication in general, CD and DVD media, digital data integration, online communities, micro devices with embedded systems programming, live internet broadcasting, person-to-person visual communication, etc.

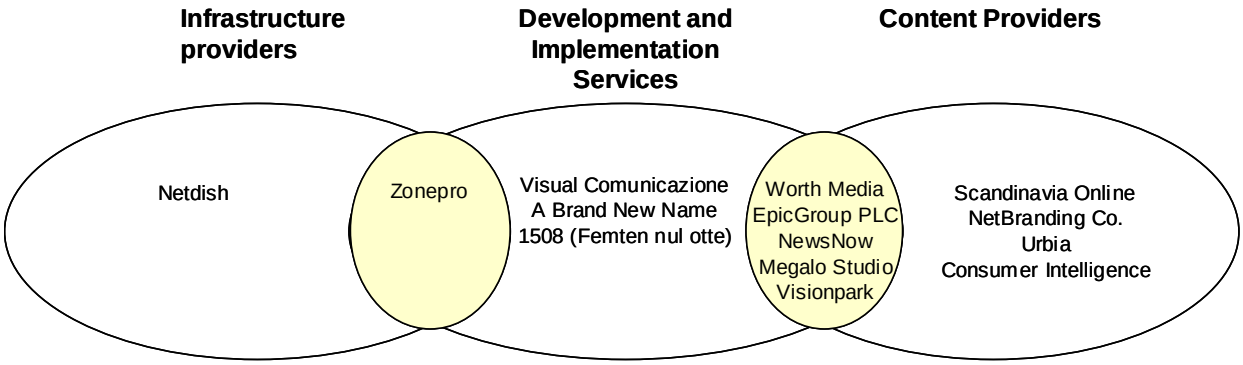
A concise definition of the term new media is difficult to establish, as can be seen. Often, however, what triggers the use of the term is the visual aspect of a new digital technology experience. New media encompasses somewhat more specific terms such as “multimedia”, which is used mainly for standalone (not online) presentations as well as “hypermedia”, which emphasises interactivity and the possibility of linking directly from one content form to another.

The companies included in this analysis are placed within three main categories along the value chain of the new media sector:

1. Developers of infrastructure (ISP) - e.g. producers of broadband, data storage and software
2. Development and implementation service providers - e.g. web-bureaus and e-learning agencies
3. Content providers e.g. portals and info sites.

The 14 case companies have been selected as representatives of not only different countries, but also different positions in the new media value chain. As shown in the figure below, some companies combine two of the three major value chain positions:

Figure 5.1: Case company positions in the new media value chain



5.1.1 Characteristics of the sector

New media is inherently international as consumers globally can access web pages, with the global Internet community growing at 50% to 100% annually.

Initially, the market concentrated on creating website interfaces with content to attract surfers. As the number of websites has grown, new media companies and clients have sought to improve their content and interactivity in order to better attract and retain consumers. On the one hand this has led to ever more creative graphics and content, and on the other, incorporating methods of interactivity between consumer and client, and data gathering methods to improve corporate databases.

The growth of advertising on websites with banner advertising has led to the development of media buying in cyberspace, as well as additional creative work for new media agencies. New media agencies and the industry in general are growing at a fast pace. Brand strategists now view a web presence as a vital part of the brand's development, and new media designers must be aware of the importance of branding. Industry analysts Hambrecht & Quist estimate that by 2005, the market for global web-based consultancy work will be in the region of USD 50 billion, or over GBP 30 billion. However, such estimates are not without problems as recent developments have shown a hitherto unexpected but sharp decline in online advertising revenues explained by falling demand and prices spurred by the dotcom shakeout beginning in March 2000.

Nevertheless, the growing realisation that new media is a crucial component of the wider advertising and marketing industry will drive growth in the industry into the next decade. Also contributing to this will be the growth of e-commerce and online advertising.

Sector size and growth

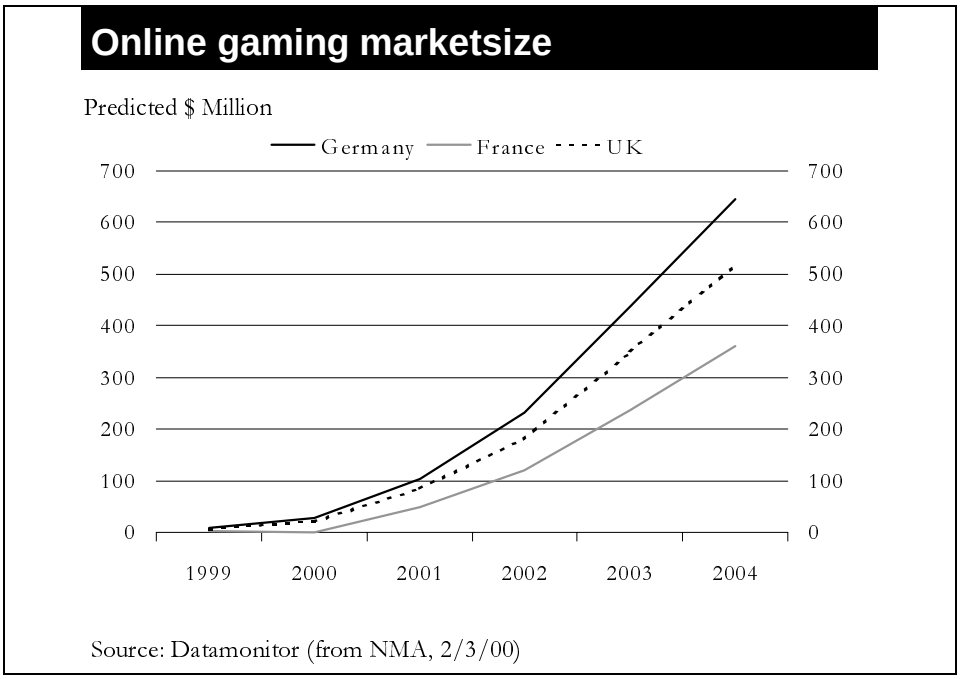
Precise statistics for the new media industry do not exist which follows logically from the rather vague definition of the term and the short history of the sector. Instead a variety of proxy statistics can

serve as broad indicators of the overall spreading of and growth perspectives for the new media sector in Europe.

In 1999, the total online ad spending in Western Europe was USD 434 million – or roughly 10% of global online ad spending. This figure, however, is predicted to surge to approximately USD 5,300 million by 2005 – or roughly 25% of predicted global online ad spending[10].

Total online gaming market size in Europe is also expected to soar as illustrated in figure 5.2 with triple digit growth rates in the coming years.

Figure 5.2 Online gaming market size



When looking at DVD-software often used as a proxy for the spread of new media, the trend is also straight upward. Total DVD-software revenue in Europe amounted to USD 0.1 million in 1999, but is expected to skyrocket to some USD 28.3 million by 2005[11].

[10] Jupiter Communications (June 2000)

[11] Strategy Analytics, September 1999

The exact size of the composite new media sector is difficult to pin down, but that it is an industry with strong growth perspectives is clearly indicated in the statistics above. It should be noted that the industry along with the rest of the TMT-sector is experiencing a powerful short-term decline as a result of a global recession in capital spending. This could alter the optimistic predictions mentioned above. It does not, however, change the promising long-term growth prospects of the new media sector.

The role of SMEs in the sector

Although exact figures or even estimates are not available, there is no doubt that the new media is largely comprised of SMEs and micro enterprises. For example, one of the case companies, Epic Group PLC has only 200 employees, but claims to be the biggest company in Europe within e learning. Another example is Scandinavia Online, who employs 180 across four countries and claims to the regional leader in Internet media (consumer directed content provision). In the consulting business, major web bureaus such as Razorfish, Framfab or Icon Media lab used to employ thousands of employees across a number of countries, but recent developments have seen them cutting back dramatically in many countries, and today they often number less than 250 employees in individual countries,

Clusters

Business clusters may create a local/regional labour pool of workers with special sets of skills and inter-firm information flows may be enhanced, allowing firms to benefit from technological spillovers. Factors that seem important for the development of new media clusters include:

- The presence of the "traditional" media industries (particularly television and print publishing)
- The presence of other information-based industries (e.g. advertising and computing);
- The existence of a "dynamic" local cultural climate; a large and well qualified labour pool (often linked to the presence of universities and R&D institutions)
- The availability of cheap and suitable real estate (sometimes in disused industrial premises/locations).

Examples of new media clusters are listed below (if known, percentages indicate the proportion of that country's new media companies which are based within the cluster)[12].

- The US: New York, Los Angeles, San Francisco and Washington DC
- The Netherlands: Amsterdam region (40%), Eindhoven/South East Brabant, Rotterdam/The Hague/Delft/Leiden, and Utrecht (12-17% each region)
- The UK: London, the M4 corridor, Cambridge and Brighton.
- Sweden: Stockholm (47%), Gothenburg (9%), Malmo/Lund (8%) and the university towns of Linkoping, Umea, Uppsala and Lulea (11%).

Case focus: Business cluster – Wired Sussex

Located in Brighton, ***Worth Media*** is based in the new media cluster in Sussex, which is facilitated by the organisation ***Wired Sussex***. John Worth comments on the cluster:

"Wired Sussex is very influential and supportive. But not a lot of companies use the cluster because of lack of decent property. The cluster in Sussex attracts and retains a lot of talent – largely because of the university, but also because of the quality of life in Brighton – the celebrity scene and the action. This was important during the boom last year that spurred a war for talent. This year with the recession, that war is over. We have very limited relationships with other companies in the cluster. We are working in a competitive environment after all. And we don't use the cluster concept for marketing purposes, but clients do enjoy visiting Brighton because it is young, vibrant and diverse".

This case examples shows, that while clusters have proven to be drivers of growth in the new media sector, it may still be a challenge to the individual companies in a cluster to harness the potential benefits of being in a cluster. Here ICT-facilitated networks can prove to be a driver in the future as collaborative ICT solutions are developed and proliferated.

[12] Source: Report from a workshop held in Stockholm in 1999: "New Media industry development: regions, networks and hierarchies", see http://www.niwl.se/wl2000/workshops/workshop63/report_en.asp

5.2 Impact of ICT in the sector

This section of the report presents ICT trends in the new media sector, emerging ICT-facilitated business models and ICT infrastructures adopted by the case companies including e-commerce, e-CRM and e-SCM.

5.2.1 Technology overview

The sector reports include a 'scoreboard' of ICT maturity and a benchmarking of ICT use in network relations. The content of the each of these are explained below.

The analysis of ICT maturity in the sector case companies includes four dimensions: IT infrastructure, e-commerce, Customer Relationship Management and Supply Chain Management. Maturity in each of the four dimensions is determined by the frequency of a number of functionalities as described below. The evaluation criteria provide implicit definitions of the technologies in question:

IT infrastructure is evaluated in four dimensions:
1) Internet homepage: Can be for information and marketing purposes only as e-commerce is dealt with elsewhere. 2) Intranet: A private network within the company using an internet protocol (e.g. TCP/IP). Intranets enable file sharing and message posting within an organisation but may well bind together geographically dispersed entities. 3) Extranet: A closed external network connecting a company to suppliers, partners or customers using an Internet protocol. An extranet requires security, often provided by firewalls. 4) ERP-system (enterprise resource planning): An internal integrated IT system for handling of production planning, logistics, sales, accounting and human resources. To put it simply, ERP is the back-office and e-commerce is the front office.

E-commerce is evaluated in eight dimensions:
1) Catalogues with price information, product data and pictures available on the web page. 2) A feature for customers to make requests through the web page in more or less interactive ways. 3) Product configuration – products are made to order and customers are given the option to specify product options at website, thus participating in the design of their individual products. 4) A feature for ordering online. 5) Order management including shopping cart, order notification, and order status (track and tracing). 6) Payment online. 7) Use of marketplaces for procurement. 8) Mobile services (e.g. M-commerce, SMS messages, WAP features).

E-customer Relationship Management (CRM) is evaluated in four dimensions:
1) Electronic customer database (storing historical data on customers). 2) Data analysis / data mining (analysing and grouping customer behaviour, profitability etc.). 3) Personalisation (using password, cookies, etc.). 4) Online customer service.

E-Supply Chain Management (e-SCM) is evaluated in four dimensions:
1) Use of EDIFACT / light EDI connection with partners. Using DEI (electronic data interchange) is a way of automating communication between network parties (trading partners). EDIFACT is a standard for this data exchange. An EDI message contains a string of *data elements*, each of which represents a singular fact, such as a price, product model number, etc. Thus, EDI is the exchange of business data using an understood data format and is a predecessor of today's Internet. EDI involves data exchange among parties who know each other well and make arrangements for one-to-one (or point-to-point) connection, usually dial-up. EDI is expected to be replaced by one or more standard XML formats, such as ebXML. **2) Integration of planning functions** These processes include shared access to information across companies by integration of information on demand forecasting, distribution, transportation and manufacturing planning and scheduling **3) Integration of execution functions** Here, not only planning information is shared, actual production and fulfilment is automated by integrating companies by automating procurement, manufacturing and distribution. For instance, when stocks are low automatic orders of supplies are generates. **4) Shared databases with market data** Here, full integration in supply chain is achieved by joint access to databases.

5.2.2 Use of ICT in the new media sector

New media companies are, by definition, technology-oriented. However, the use of ICTs in new media companies are somewhat different from the other sectors under study in the SME-Commerce project, as the intangible, often project-based and informational nature of the new media products make e-commerce and e-SCM less relevant. Some companies in the sector have very few customers (B2B clients to consultancies) and consequently find e-CRM irrelevant. Nonetheless, the question of ICTs facilitating business networks and providing for competitive advantages is still relevant to the new media sector.

The ICTs relevant to new media companies depend on positions in the value chain as shown below:

Position in value chain	Relevant ICTs for business network facilitation
Technology infrastructure: ISPs, ASPs	• Automation and integration of processes • e-CRM
Development and implementation: Web bureaus	• e-CRM • Project management • Collaboration extranets
Content provision: info-sites	• e-CRM • Automation of content management • Automated management of banner ads, etc. • Extranets for payable services • Chat forums and other real time ICT solutions

Generally, communication with suppliers, business partners and customers takes place using traditional means such as meetings, phone, fax and e-mail. But collaborative forms of communication such as extranets are on the rise. And within content management, integration and automation are widespread.

5.2.3 Current ICT trends in SMEs

Thus, the current trend is towards increased ICT support of communications and workflow in the sector. With many companies in the new media sector being small, one trend is towards implementing general administrative systems (ERP or equivalent) as the companies grow to justify such investments.

Most ICT investments in the sector are aimed at improving or extending the product or service offers of the new media company. Thus, a major trend is extension of offers to include more technological platforms. Most noticeably, the new media sector has moved from CD-ROM to internet/intranet solutions navigated by browser technology. This step is largely completed, although the problems of Internet speed and congestions (lack of bandwidth in connections) lead to hy-

brid forms combining Internet connectivity with physical formats such as CD-ROM or DVD.

These and more current trends are witnessed in the assessments made by the case companies of trends in ICT usage in their particular corner of the new media sector.

Assessments by case companies: Major trends in the use of ICT
Visual Comunicazione: A move to continued services, e.g. subscription- based revenue models. Web bureaus are also moving to more advanced service offers.
Netdish: Within data transmission (core business of Netdish) many companies are creating systems for replicating data, so there is a lot of investment in the field.
Worth media: In e learning, a major trend is public investments within education and health – an imperative for governments around the world. ICT supports these tasks tremendously, thereby creating a market for e-learning. "There is a lot of invention and innovation. Some companies try to sell pieces of software for e learning without a real understanding of the needs of individuals. Young people want to see fast paced dynamic productions".
Magalostudio: 1) CRM; 2) adopting software to project management.
Zonepro: 1) Using communication online; 2) collaboration in networks.
NetBranding Company: Multiple support across ICT platforms: technological convergence of web, SMS, interactive TV, PDA.
Consumer Intelligence: 1) Mobile solutions – GBRS technology (the company does joint ventures with *Gule Sider* (Yellow Pages on web) and *Alt om Stockholm* (website called All About Stockholm). 2) .net – a new technology from Microsoft.
A Brand New World: The internet is going mobile and the public demand will be that everybody should have access to the Internet.
1508: More and more services online are gathered in communities.

A more detailed analysis of the current trends is presented in later sections of the present chapter, studying findings on the actual ICT-infrastructures of the case companies.

5.2.4 Future ICT trends in SMEs

Internally within companies in the new media sector, more specialised systems such as e-CRM are the next step in the process of supporting business processes and workflow with ICTs. While solutions implemented and practices adopted still appear to be rather simple,

many of the case companies expressed plans for further development.

In terms of the trend towards cross platform solutions and support, the next step is moving to a wider range of platforms such as mobile Internet (WAP or more noticeably SMS, the short messaging system allowing for overcharge by telecoms, i.e. a system for micro-payments). Other platforms adopted include PDA, interactive TV and even print media as Internet media dotcoms seek new revenue models. This trend is already seen today but will grow in the future as more formats and new technologies proliferate (such as UMTS within mobile Internet).

Future trends can be illustrated by the concrete plans of the case companies in a two-year time frame:

Case Overview: Planned IT-projects within the next two years

Visual comunicazione: "We plan to keep up with market technology development and to offer better and cheaper services."

Netdish: Plans to develop further all of its ICT structure including its proprietary solution for file transfer. Other plans include development of new products/applications, 2-4 projects, which are all related to core business, are expected. No major internal systems are planned, but perhaps a project management tool will be implemented (such as Lotus Notes).

EpicGroup PLC: No big spending expected outside development on client projects. " We are cutting edge".

Scandinavia Online: An administrative system will be implemented. The company has just implemented a shared server park across national entities in the Nordic region.

NewsNow: "We have loads of plans for IT-projects. Mainly we are setting up our software and development organisation to provide evolvable software systems allowing us to follow the market".

Magalostudio: Plans to implement e-commerce and to adopt a software solution for planning the production process.

Zonepro: Plans to develop support for information exchange.

NetBranding Company: Plans to develop multiple support across different ICT platforms – to deliver content on offline publications, SMS (short message system – used on mobile phones), Internet, PDA (personal digital assistant, e.g. palm pilot) and interactive TV.

Case Overview: Planned IT-projects within the next two years
Urbia: More tools on their website will provide further integration with partners through XML-pages. ***Visionpark:*** Plans for a new ERP-system and to build a new investor relations website. ***Consumer Intelligence:*** Integrate back-end system with front-end system. Have an ERP system that can handle these processes. ***A Brand New World:*** An ERP-system that can be used as an economic management tool within the business. ***1508:*** A new ERP-system.

Future scenario: Independent content management
1508 sees a need for independent content management as a way of creating collaboration and here points to the process leading to a solution: 1) A real knowledge management system that could be shared with partners for collaboration should be implemented. The system should be integrated with a Resource Planning System. 2) A service-minded content management system to be part of a homepage – it would be a "dream come true" for the sector, if there were a standardisation of the software programs behind content management systems. 3) Develop the Content Management System. 4) Let the Content Management System and the website be placed independent from the web-bureau. Let it be hosted externally and not internally, at the web bureau.

As witnessed by the case overview, the present trends seem likely to continue the next two years: Companies will continue to develop new product or service offers based on cutting edge methods, approaches and technologies following any market development. Internally, the new media company will implement more advanced solutions for integration, automation, product management and developments. Externally a move towards increased integration and collaboration in project management can be expected.

5.2.5 Emerging ICT-facilitated business models

The new media sector has taken a blow as the bubble burst and the 'glory days of dotcom heaven' came to a sudden end in March 2000 initiated by plunging Internet, new media and technology stocks at the NASDAQ exchange. Symptoms of crises have abounded: abandoned

plans for IPOs, firing in large numbers and bankruptcies tell their sordid tales.

But following the first wave of internet-based new media companies and the subsequent crisis, many companies are fine-tuning or changing their business models, opting for new or improved sources of revenue. The first wave, the crisis and the second wave are shown in the table above for each of the three major steps of the new media value chain, infrastructure, implementation service and content provision:

First wave: Hype – companies form in:	Crisis caused by:	Second wave: Concentration and innovation:
Content provision	Bad revenue models, trouble caused by failing market for online advertising	New revenue models: (micro)payments Syndication New revenue models for banner ads Web services
Implementation services	Increased competition, uncontrolled growth, lack of control and management, market maturity	Mergers and acquisitions Downsizing and sale of business units Focus on project management Advanced solutions (such as integration)
Infrastructure	Increased competition Falling prices	Mergers and acquisitions Innovation (e.g. UMTS and satellite transmission) New business models (e.g. ASP)

As indicated in the table, the answer to the crisis entails both restructuring of individual companies and the sector at large. The new revenue models take on different forms:

- A new economy slogan used to be “give it away”. This no longer applies as micro-payments such as overcharged SMS or use-charged to client accounts allow content providers to receive direct returns for the services offered instead of indirectly from advertisers.
- Another revenue model is to syndicate content or web services (such as search engines or currency converters) to other websites willing to pay for content or service because it attracts valued users to the client site.
- Banner ads still bring revenue to content providers, but the simple form of paying for impressions with the prices measured in CPM – cost per mil indicating a thousand impressions – gives way to mo-

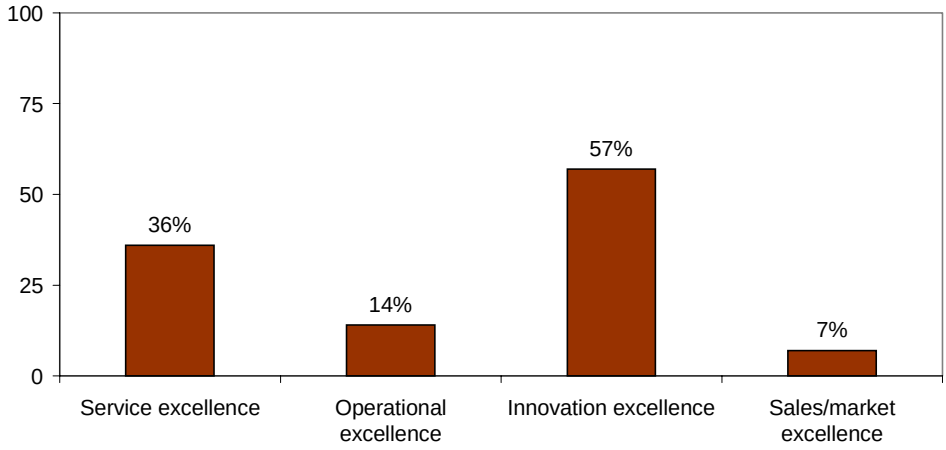
more effect-oriented revenue models such as CPC (cost per click), CPA (cost per action such as purchase action) or CPL (cost per lead, i.e. payment for number of new registrant users of a website).

The innovative approach to business models is also characteristic of the implementation-oriented companies (such as web bureaus) and infrastructure providers:

- For implementation companies (e.g. web bureaus), specialisation has been one answer of SMEs in the battle for a market floated by a growing number of companies. Examples of specialisation include a focus on e learning, on new media marketing (animated banner ads), on streaming media or on technologically complex integration issues. Other companies focus on business sectors such as health care, retail, financials, education or health.
- For infrastructure providers, new business models include new technologies (mobile and satellite) and new forms of service provision as companies look into becoming application service providers.
- For implementation companies and infrastructure providers, new business models also include diversification as some companies move into content provision thereby integrating several steps in the new media value chain.

With these developments in mind, it comes as little surprise, that the primary form of competitive excellence in the new media sector is innovation excellence, cf. figure 5.3.

Figure 5.3: Strategic differentiation adopted by the case companies



The focus on innovation leads to a smaller focus on cost (operational excellence) although the sector 'crisis' certainly has brought a cost focus to many companies. Only few feel this new focus to be a competitive advantage as of yet. Sales/marketing excellence is not in focus, as sales are driven by innovation (technological sales) or innovative services - service excellence is indeed another important means of differentiation as shown in figure 5.3.

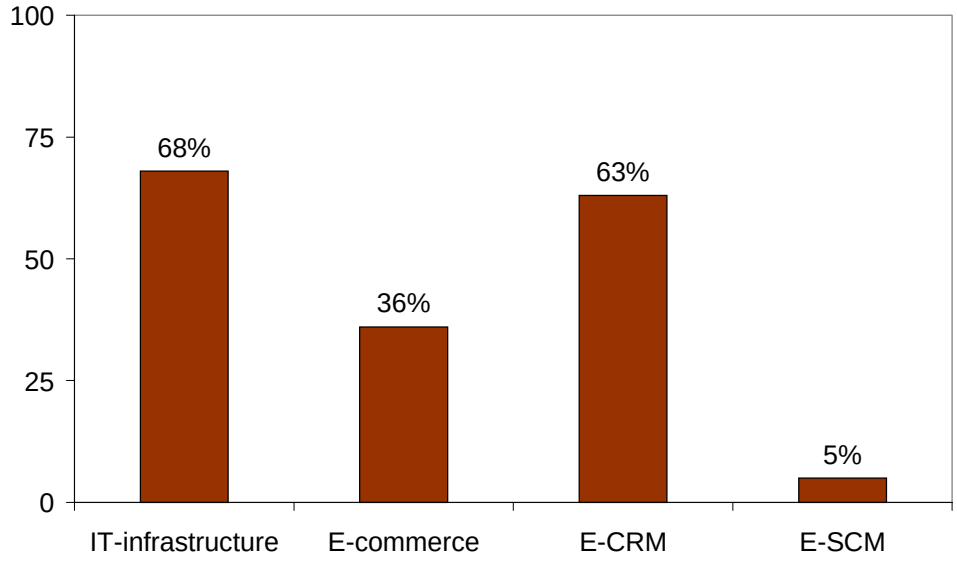
Competitive advantages are sought and found both with and without ICTs as drivers. Case examples are provided in the table below.

Company name:	With ICT (online)	Without ICT (offline)
Visual Comunicazione:	Technologically advanced offers: Usability engineering, measurements of target audience, knowledge of search engine optimisation.	Uses an innovative revenue model, where clients are offered services on subscription basis. Furthermore, clients are offered measurable results within a given timeframe with a money back guarantee. Other competitive strengths: Linguistic capabilities, teamwork and extensive experience.
Netdish:	The company feels it has no real competitors as it develops a new market through new technology. Thus, ICTs are essential to competitive advantage.	-
Worth media	Tracking users, adding functionalities for e-evaluation of the applications and websites. Innovation is the primary means of differentiation, but also service and operational excellence apply. The company, however, is not said to be marked by an entrepreneurial spirit in a significant way. Entrepreneur-ship is not seen as an effect of technology focus.	Addressing markets from a different perspective. Worth Media focus on fulfilling audience needs. E.g. it sees young people, not teachers as the market for e learning in education. This is said to be a rare approach.
EpicGroup PLC	"ICTs are very important to competition". Using ICT tools for creating interesting content and using ICTs such as content management systems for efficient production.	By being flexible and responsive to needs. Tailoring projects to clients' needs.
Scandinavia Online	Aggregating content. Vision: To be 80% for 80% of internet users. Using web-based user polls. Keeping ahead is important but difficult because of need for low costs	Visionary thinking, staying at the cutting edge of user demand. Using market intelligence.
NewsNow	Providing the fastest updates. Developing superior techno-logy	"We are not the cheapest, but we try to be the best by constantly improving our services, both in terms of delivering the most relevant information and content to clients but also in terms of human to human customer service.
Magalostudio	"From the research to the final product we spend an average of 1 month, when large web agency spend 2 years".	"We are more pragmatic than large web agency, as we offer implementations, not just strategy.
NetBranding Company	Using intelligent publicity integrating marketing services and ICTs (i.e. public relational content and intelligent banners)	-
Urbia	Develop the technological integration with our partners	Increasing number of partners is a means to competitive advantage.
Visionpark	A new ERP-system – web-based database (would like to invest in a Navision system)	Works to have a better-structured organisation as the organisation is new following a merger between to companies.
Consumer Intelligence	1) Get a higher electronic capacity that can handle more traffic 2) .net from Microsoft (a more integrated system totally based on the internet) 3) Mobil services.	1) Get partners that can legitimise the concept - for example the public consumer information agency. 2) Getting a stronger brand through partnerships and advertising, as the brand is very important for getting traffic and consumer confidence.
A Brand New World	Online Project Management Systems.	1) Better project management. 2) More useful and effective partnerships and collaboration with other companies.
1508	Focus on streaming media content and solutions.	1) Improve service and education so that customers are capable of controlling their own system 2) Control simple project management processes – "the sector is so bad in project management".

5.2.6 ICT infrastructure in SMEs

Scoring the sophistication of the average solution in the 14 case companies provides an overall indication of the ICT maturity in the new media sector as indicated in figure 5.4.

Figure 5.4: ICT maturity of SMEs in new media

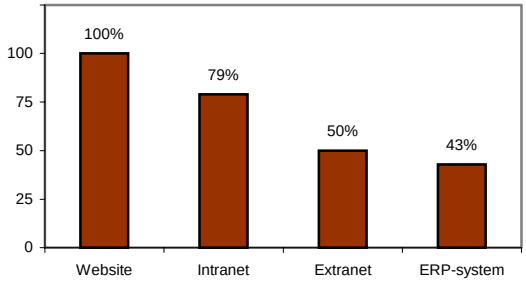


As earlier noted, e-commerce and e-SCM strictly defined are less relevant to many new media companies. This accounts for the low score on these parameters. IT-infrastructure and e-CRM are more relevant, and consequently the case companies show higher maturity scores here.

The four parameters are discussed in greater detail in the sections below.

5.2.7 IT infrastructure

IT-infrastructure – new media (%)



Not surprisingly, all the case companies have a website – a definitive must in the new media sector. The study shows that intranets are also quite common, even though many new media companies are relatively small – the smallest account for the companies not having intranets, as they see no acute need. Extranets are less common, but half the case companies have extranets of some sort – mostly for collaboration with clients in project work or for delivering personalised content.

Case examples: Intranet

Netdish: LAN (local area network) with dedicated links to servers etc.

Worth Media: Not fully integrated

Consumer Intelligence: Small network on a shared server and not a real intranet.

Full-blown ERP-systems are very rare, but quite a few companies (43%) have administrative systems approaching ERP level, and more are considering implementation and integration of administrative IT-systems.

Case examples: Extranet

EpicGroup PLC: Project collaboration websites.

Scandinavia Online: Limited access. Need for registration to access parts of content such as ring tones for mobile phones or publishing in the form of a personal web page.

NewsNow: The B2B clients receive the digital media intelligence service in a closed web format, i.e. an Extranet.

Consumer Intelligence: Right now project sites are used where customers can get access to own surveys – do questions and undertake their own analysing. In future it will be possible to work with external partners.

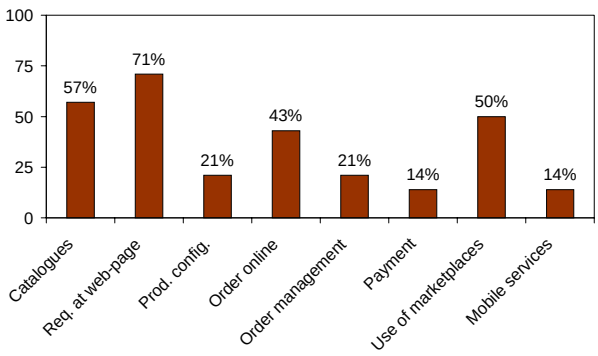
1508: Collaboration project website so that customers can be a part of the developing process.

Case examples: ERP-System
Visual Comunicazione: The company is with 10 employees to small to reap the benefits of an ERP-system.
Netdish: Does not have an ERP-system because the company is still very young and relatively small. However, the company wishes to implement one soon.
EpicGroup PLC: Proprietary system including accountancy and time sheets for project management.
Scandinavian Online: But a production management system for page views and banner ad views. However, the system is not integrated with the accountancy system.
NewsNow: The company has an internal database system with corporate information such as specifications on clients' set-up of services and other customer data, i.e. CRM. But this system is not integrated with accounting.
Magalostudio: The CEO claims they have ERP / kind of ERP due to the process of managing the Active Service Provider production.
Zonepro: Runs the system called PHP.
Visionpark: Runs an old system called Scala.
Consumer Intelligence: Not really – information about customers are gathered in a database but it is not working as an ERP-system. Invoices are handled individually.

The cases show that the new media sector has the technological infrastructure in place for project oriented and content management oriented collaboration. But integration and automation based on ERP systems is unlikely to take place within the next few years.

5.2.8 E-commerce

Figure 5.5: E-commerce



With the high uptake of homepages comes the easy to implement feature of possibilities of requesting information at webpage. A link to an e-mail is often enough. More than half of the companies also provide catalogues, but only 14% offers regular e-commerce with payment online. This is do to the nature of the products in the new media sector. The low uptake of e-commerce is not due to technology

scare as witnessed by the fact that half the companies use e-commerce for purchasing – mostly by ordering from suppliers' websites. Genuine market places with auction type selling are rarely used.

Case examples: Use of market places for procurement

The case companies rarely uses auction type market places for purchasing purposes, but many are avid users of B2B e-commerce in purchasing of hardware, software or stationary:

NewsNow: Uses B2B e-commerce, not dynamic markets or auctions. 'I have not seen much of market places'.

Netdish: Uses extensively for routers, etc.

EpicGroup PLS: Ordering e.g. stationary online as B2B e-commerce.

Scandinavia Online: B2B E-commerce for hardware, office supplies, etc.

Consumer Intelligence: Does not use any more, but the company has experiences with marketplaces. Bought software and material online. Quotes no particular reason for not doing it any more.

A Brand New World: Uses for B2B e-commerce for buying software and programs.

In the new media sector, the companies show relatively high uptake of personalisation, as this is easily achieved with informational products and services. Alså mobile service features are relatively common, and case examples of this notable content feature are presented below.

Case examples: Mobile services

SOL (Scandinavia Online): A great deal – they are the biggest single cost at present (as SOL is charged by telecoms for SMS-services provided free of charge to users).

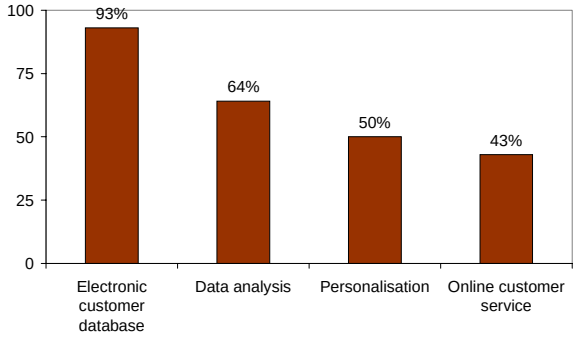
NewsNow: The content and technology (phones, etc.) are not suitable for such services yet.

Urbia: Has some SMS-services – mainly sponsored information services.

Consumer Intelligence: Have plans for implementing mobile services in the future. It will be the next generation of services. It will not be based on WAP-technology, as WAP is thought to be outdated.

5.2.9 E-CRM

Figure 5.6: E-CRM



The new media sector shows great variance in terms of E-CRM relevance. To consultants, web bureaus, and development houses, the concept seems less relevant since customers are few. Still some companies work with databases and analysis as a way to improve customer's relations, service and profitability none the less. Providers of infrastructure and content (info-sites) have higher numbers of customers and consequently see greater potential for e-CRM. The trend in figure 3.4 is clear – almost all the case companies have the technological infrastructure needed for registration (i.e. databases), but fewer do actual analysis and fewer yet implement features such as personalisation and online customer service. With rising complexity comes falling uptake.

Case examples of personalisation are given below:

Case examples: Personalisation (passwords, cookies, etc.)
Visual Comunicazione: The website is obsolete, e.g. the company has now stopped any further developments using the Flash technology for clients, but the company's website still runs Flash.
NewsNow: Content is filtered and delivered to client specifications, but the portal does not feature personalisation as of yet.
NetBranding Company: Passwords are used, but not cookies.
Urbia: In certain areas of the site there are cookies – also personal request forms if people want to join as subscribers of the newsletter.
Visionpark: They have areas, a kind of chat forums, dedicated to games developed by the company.
Consumer Intelligence: Visitors can sign up to become members of the consumer database and then receive exclusive information.

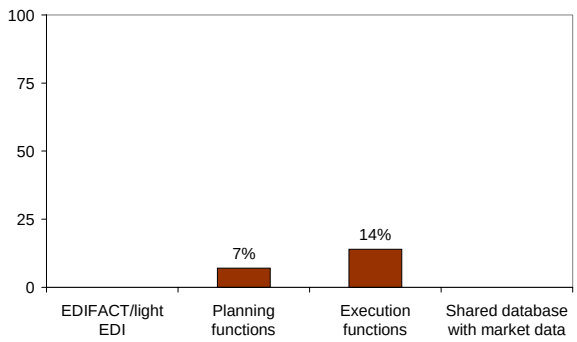
Examples of online customer service include traditional content oriented forms such as newsletters, debate fora and FAQs, but

interestingly in relation to the collaborative commerce perspective in the study at hand, examples also include collaboration extranets as witnessed by Epic Group PLC in the case examples below:

Case examples: Online customer service
Scandinavia Online: Newsletters, debate forum with chat functions, possibility to ask questions on email or phone.
NewsNow: Feedback form, e-mail button and e-mail newsletters. But B2B client relations are primarily managed over the phone in order to establish closer relations.
EpicGroup PLC: A bug database with forums, project plans and clients for collaborative project management purposes can access weekly progress reports online. This collaborative extranets includes details of all people working in the team in focus. The extranet covers all deliverables: Technology, design, art directions, prototypes, links, documents and bug database (a system for company and client testing of project contents and functionality). People have to be encouraged to collaborate online. We will send clients an e-mail with a link to news published. People's habits have not changed yet, but it depends on the type of client – whether they are traditional or new organisations. The extranet does reduce the amount of offline contact – providing efficiency and customer service.

5.2.10 E-SCM

Figure 5.7:E-SCM



As already noted, supply chain management is less relevant to new media companies because of the intangible, often project based and informational nature of the new media products and services. This is clearly reflected in the integration of supply chains. EDI is not used by any of the case companies. However, other forms of value chain integration and automation do occur.

Within content management, exchange of information between companies are often integrated and automated (accounting for 14% uptake of e-SCM in the execution function), and collaborative planning is facilitated by joint project management systems e.g. based on col-

laborative extranets (in 7% of the case companies). Examples of these trends are provided below:

Integration of planning functions
Worth media: But the company has a project management system.
1508: Use a very simple project management system that helps the project manager to control resources, time, etc. in a project.
Integration of execution functions
Scandinavia Online: Automated content delivery by content providers – or automated pull from their servers.
NewsNow: Automated delivery of content from suppliers and on to customers.
Consumer Intelligence: Integration of CINTs information on other websites through XML-pages or frames. Furthermore, business clients can access to their own surveys online.
Urbia: XML-pages and frames with partners.

5.3 Collaborative commerce: ICTs in the value chain

As noted in the introduction, phenomena described as virtual value networks, business webs or collaborative commerce, are central to the present study, because such networks present the opportunity for SMEs to act big while staying small. While building close relations to the consumers through CRM can be considered part of such networks, virtual value networks should also integrate other parties 'behind the customer scene' provided by the front office system. By selecting case companies who have implemented e-commerce, we have chosen technology frontrunners and we therefore expect to find business networks in operation in the back office. But as already shown, the SME case companies still can not be considered part of full-blown virtual value networks due to limited ICT sophistication in relation to suppliers and business partners. A general profile of typical business networks in the new media sector is presented in table 5.1 below.

Table 5.1: General network profile for the biotechnology sector

	Number	Proximity	ICT sophistication
Suppliers	Medium	Medium	Low
Partners	Low	Low	Low
Customers	Medium	Medium	Low

It might seem odd that companies who build their competitive edge on new technologies here are classified as “low” in terms of ICT sophistication towards suppliers, partners and customers. This, however, is due to the focus in the present study on ICT-facilitated business networks and collaboration.

The ICT sophistication is determined by the use of network technologies in three levels of advancement. The typology of network technologies below constitutes a basic understanding of the nature of ICT use in external relations. Based on three generations of networks covered by the cases, the model describes the characteristics of the relations.

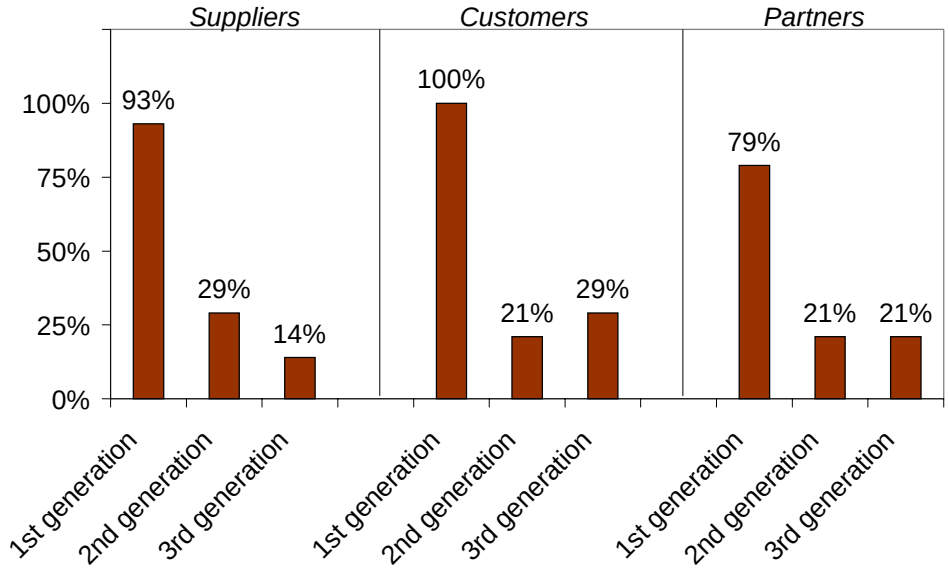
Table 5.2:Three generations of ICT use in networks

Generation	IT-solution	Automation level	Integration
First generation: Unstructured e-mails / Internet communication	E-mails: Person-to-person	No automation	No integration with back-end systems
Second generation: Structured e-mail and Internet communication	E-mail and e-commerce Internet commerce, request forms at web page, e-mails Person-to-machine or machine-to-person	Internal automation	Low integration in back-end systems
Third generation: Standardised communication (e.g. EDI and XML)	Internet & EDI communication Machine-to-machine	External and collaborative automation	Full integration of back-end systems (prices, products, etc)

The table shows that reaping the benefits of increased automation requires closer integration made possible by more advanced ICT systems. The labelling of three generations reflects a tendency towards

joint development in sophistication of automation, ICTs and integration. The three generations are ideal types, as combinations diverging from this general trend do appear in practice (for a more elaborated description of the three generations of network, see section 3.3).

Figure 5.8: ICT in networks



As shown, first generation ICT networks are always used with customers. The fact that first generation communication does not reach 100% for suppliers and partners is simply due to the fact that some companies state that they are self-sufficient having no suppliers or partners worth mentioning. As expected, second and third generation collaborative networks are rarely seen as of yet. Interestingly, third generation integration to customers is more common than second generation. This is due to automation of external relations being preferred to automation of internal handling of relations. Here it should be noted that interpretations of the collaborative formats have been in terms of using the essentially manufacturing oriented generational model in the in the service oriented new media sector. Therefore an overview of actual collaboration formats is presented below for further clarification:

Company	Forms of ICT facilitated collaboration
Visual Comunicazione	Even e-mail communication is limited because receivers may not check their email accounts regularly.
Scandinavia Online	Automation deals with content provision (suppliers) and administration of banner ads (customers).
NewsNow	Automation deals with content provision (getting news content from suppliers, processing it and delivering it to customers).
Urbia	The company partners with e-commerce companies whose offerings are presented within frames in the femme-online.com site. Thus content is automatically fetched at other sites.
CINT (Consumer Intelligence)	Automatically delivers content to other sites - machine-to-machine functionality. Business customers can access database creating content themselves with no intervention from CINT.
Netdish	Clients and partners prefer email communication and face to face meetings to automation.
Worth media	Has a project management system, but no automated collaboration platform.
Magalostudio	Offers automated interface in the ASP part of the business.
Zonepro	Offers automated interface in the ASP part of the business.
NetBranding Company	The company partners with e-commerce companies whose offerings are presented within frames in the femme-online.com site. Thus content is automatically fetched at other sites.
A Brand New World	Consultancy - sees no potential in automated communication at present.
1508	No automated communication, but the web bureau does operate collaboration extranets for project management with clients.
Visionpark	E-commerce sales is not integrated to ERP. Development will in the future include collaborate platforms for working across geographical locations.
EpicGroup PLC	Automation is low, but the company does offer its customers access to an extranet-based collaborative platform.

A richer understanding of the business networks in the new media sector can be achieved through case examples showing types of suppliers, customers and partners:

Name of case company	Suppliers	Customers	Partners
Visual Comunicazione	Publishers/printing companies. Sector boundaries are blurred as some printers offer graphical work and become competitors to advertising agencies like Visual Comunicazione. For advanced programming a close network of freelancers are used. They take on assignments in their spare time.	Not many clients, all are B2B at present, but the company takes over an internet portal for the city of Venice in September. This will bring a new type of customer to the scene, namely a user audience.	None
Netdish	All in all less than 10 key suppliers: 2-3 satellite providers, 2 hardware providers and 1 software provider of middleware licenses used by all Netdish clients.	10 at present, but 20-30 are expected before the end of next year. All customers are B2B: Companies with intranet portals, databases or other streaming needs, content providers and ISPs.	Agreements with ISPs but also direct sales. Very soon relations with other European companies are expected to be formed.
Worth media	The company has only a few suppliers as it follows a strategy of being self-supportive. Freelance experts are used to some degree but only rarely.	A growing number of B2B Clients, but also end users of e-learning products.	Three revenue sharing partners are signed up for different products produced by Worth media but sold by partners in different networks (stores, TV shop, etc.) Affiliate marketing is also a sales channel under consideration.
Epic Group PLC	Often no suppliers are used. "Epic is a one-stop shop".	30-40 projects. Epic sells directly to business customers.	Epic does interactive versions of video arts produced by another company.
Scandinavia Online	Primarily content providers, but also hard ware suppliers.	700,000 internet users. 75-80% of internet population in Denmark on a monthly basis	The other national branches (portals) are main partners as each specialises in different areas but all share developments.
NewsNow	Online media (content providers).	A growing number of B2B Clients, but also end users of the free news service (users of the portal).	"We have one or two resellers, but we generally try to maintain direct relations with our clients".
MagaloStudio	The server (COLT) and a music provider.	Business clients	None
NetBranding Company	Accounting procedures, web agency, CRM consultant, and cleaning company.	Companies that buy Femmeonline web space.	Three different distributors. Svenska post (Swedish Post), DHL, and one more.
Urbia	Marketing and designers.	Users: 250,000	
Visionpark	Mostly external game developers.	Most of them are B2B – sales channels and distributors. It can be everything between a big supermarket chain and a small salesman.	
Consumer Intelligence (CINT)	Designers, data housing, technological suppliers.	70 customers that pay for every product that is recommended and sold through CINT 5-6 customers that use database information from CINT to benchmark their own products – for examples Scandic Hotel that buys information about golf courses.	

Name of case company	Suppliers	Customers	Partners
A Brand New World	Technical suppliers/developers, etc.	Some customers buy whole system. Other use A Brand New World as suppliers – buy small components.	
1508	Designers, usability experts (should always be external) and communication bureaus.		

5.3.1 Benefits of using ICTs in business networks

The fact that ICT collaborative sophistication is still somewhat low in the new media sector does not prevent the companies form reaping the benefit of the technologies employed.

An open question about the main benefits of using ICTs yield a wide range of answers from the different case companies:

Case Overview: Main benefits vs. collaborators
Visual Comunicazione: Fast and easy communications.
Netdish: File exchange, speed and competitive differentiation through collaborative commerce.
Worth media: In the future we can develop frameworks for collaboration, e.g. intranets. This will help to collate ideas and develop collaboration in line with the nature of our project based work processes.
EpicGroup PLC: Increased services by consolidation of products in the browser web platform.
Scandinavia Online: Integration and automation of content delivery.
NewsNow: 1) Low costs, 2) flexibility 3) personalisation 4) economies of scale 5) independent communication.
Magalostudio: Clarification of the relations, using Internet – you have no visual contact – hence all the info needs to be precise.
Visionpark: It is possible to sell to a large area.
Consumer Intelligence: Makes partnership without any physical interaction possible. Standardisation makes it possible to deliver information from one-to-one or one-to-many. The interaction with partners is cheap because it is standardised.
A Brand New World: "The possibility of sharing information and monitoring people's behaviour is incredible. It makes it possible for the market to be proactive. With very few resources customers demand can be delivered without customers having to do anything themselves".
1508: "ICTs can develop and improve your network – but is not very useful without collaborators. But then ICTs also improves market transparency and could help you to find good partners (e.g. a designer for a project)".

When asked specifically about to what degree a list of typical benefits apply, it is also clear, that ICTs has a number of positive effects in each company:

Benefits from using ICTs

	Not at all	Low	Some	High	Very high	Cases
Improved customer satisfaction	-	14%	7%	50%	29%	14
Reduction of product-to-market lead time	7%	-	21%	57%	14%	14
Reduction in labour costs	-	7%	57%	36%	-	14
Reduction of procurement costs	7%	-	43%	36%	14%	14
Better information collection	-	8%	-	62%	31%	14
Better match of production level to demand	21%	-	29%	36%	14%	14
Extension of distribution and marketing channels	7%	7%	43%	36%	7%	14

As shown in the table, the easiest benefit to achieve is better information collection, but also most companies experience improved customer satisfaction and reduction of product-to-market lead times. The other benefits mentioned are also significant showing that ICTs have varied positive effects in the case companies.

In terms of financial cost-benefit analysis, the companies in new media again defer from the other sectors in the SME commerce, as many new media companies mainly develop e-business and ICT solutions for clients and thereby realise immediate or very short-term returns on invested hours. Examples of definite projects are given below with the level of detail that the case companies were able to provide. Some respondents were not able to estimate costs or payback times.

Cost and benefits of ICT investments

Case company nr.	E-application	Cost of application (incl. software & man-hours)	Benefits per year (cost reduction/ increased revenue)
1	Other major network facilitating ICT application (homepage)	30,000 euro	
2	Customer Relations Management	108,032 euro	3-4 years payback time.
3	Customer Relations Management Collaboration software	46,000 euro 7,600 euro	
4	E-commerce applications Customer Relations Management Other major network facilitating ICT application (servers, back office)	23,000 euro 7,500 euro 230,000 euro	
5	Other major network facilitating ICT applications (spent on a portal)	200,000 euro	Break even for the whole company is expected within 1.5 years of start up.
6	E-commerce applications	20-30,000 euro	Expected payback time 1-2 years.
7	Health communications professionals platform	120,000 euro	3 years payback time.

5.3.2 Barriers to using ICT in networks

Just as the new media companies gain a wide range of benefits from ICT usage, a number of different barriers to technology uptake are experienced:

Case Overview: Main barriers for the use of ICT in business network
Visual Comunicazione: Our clients are primarily family-run businesses where ICTs and electronic communication are given a low priority. ICT skills are low and personal relationships essential, thus providing a barrier to the less personal electronic communication format. ***Netdish:*** B2B clients prefer genuine and traditional meetings to electronic communication. E-commerce is fine in relation to low involvement goods, but not for expensive and complex purchases calling for a discussion. ***EpicGroup PLC:*** No large internal spending on tools. Employees mostly develop these on client projects and in their spare time.

Case Overview: Main barriers for the use of ICT in business network
Scandinavia Online: Low sophistication of ICT used by our contacts.
NewsNow: 1) The ICT skills of people doing the communication 2) Having to know how to fix technological problems 2) When the power goes down (that has happened for us –)
Zonepro: We need broadband (in general – all people).
Urbia: The financial differences between the countries used to be a problem – not any longer within the EU.
Consumer Intelligence: Different systems – it is sometimes very difficult to communicate with partners.
A Brand New World: 1) The human factor – the overload of information is drowning creative and innovative ideas. 2) The lack of humanity and ethical responsibility in the technical solutions – for example: The WAP technology toy sold as business tools.
1508: It is sometimes difficult to work together because the companies are not using the same technology, e.g. same knowledge management system. Furthermore, the transparency created by the internet can be seen as a threat to the competitive advantages of having a good network

When asked specifically about a number of common barriers, it is clear that new media companies generally are technically savvy. Management and employee resistance to technology is generally not a problem. Being bound by present systems or lack of knowledge about what systems to implement is not an urgent problem, although it does apply to some degree. The biggest problems are ICT costs being to high and lack of time or personnel for implementation, cf. the table below.

Barriers to using ICT

	Not at all	Low	Some	High	Very high	Cases
Cost is too high	8%	15%	31%	39%	8%	14
Too few people/too little time	8%	15%	46%	23%	8%	14
Management is against it	62%	31%	8%	-	-	14
Employees are against it	46%	31%	15%	7%	-	14
We are bound by present systems	23%	31%	39%	8%	-	14
We don't know which system is best	15%	8%	62%	15%	-	14
Any system will too quickly be outdated	23%	39%	23%	15%	-	14

The analysis of business models, network profiles and benefits and barriers involved in ICT-facilitated networks form the basis for the concluding policy recommendations in the following chapter.

5.4 Conclusions and policy recommendations

What a difference a year makes. The dotcom hype came and went, and the new media sector has suffered from lack of interest from investors and to some extent even customers ever since. But this young business sector is still vibrant and ready for change and growth.

Young technology-intensive growth sectors provide special opportunities for SMEs because innovation and flexibility – typical SME strongholds – often are more important than the economies of scale and scope more accessible to larger enterprises.

Nevertheless, the current situation presents new media SMEs with serious challenges no matter what position they occupy in the value chain. Among these challenges the most immediate are:

Finding feasible business models

As the market for online advertising dwindles, content providers need to look for revenues elsewhere. “Usability Guru” Jakob Nielsen predicts that advertising-based revenue models on the Internet will be a temporary phenomenon only. As discussed such revenue models may relay on micro-payments (selling content to the user audience) or syndication of content (selling to websites, not user audiences).

Finding profitable niches

Facing competition from major portals, technology providers, consultancies (or indeed conglomerates incorporating all three aspects of the new media value chain), SMEs also need to find profitable niches. These will often follow from specialisation in technology, services or content forms (catering to closely defined user audiences, too small to interest the major players).

Building partnerships or brands to gain attention

A problem with specialisation, however, is lack of attention and visibility in the marketplace.

Maturing with the market and adapting to changes

The business history in high tech is abundant with examples of companies betting on the wrong technology. SMEs will need to follow trends closely to move with the market and stay attractive to customers. Particularly, the need to stay abreast of technological developments.

Securing finance for growth and development

With darkening growth and revenue expectations, the venture capital market will be harder to play. Search, persuasion and negotiation are requisites, but sufficient personnel, time and skills for the process are not always available to SMEs.

The current situation entails noteworthy issues within all four fields of the SWOT framework as shown below:

Strengths:		Weaknesses:
Business clusters provide an environment for growth in SMEs	But…	Clusters make it more difficult to implement national or EU level enterprise policies, as different clusters should be treated differently. And no single and uniform approach can be adopted towards creating clusters, as these must develop according to specific preconditions and potentials in a given area.
Strong specialisation at focal points along the value chain	But…	This makes the sector fragmentised from a policymaker's point of view. Different companies have different needs…
Options for creating networks along the value chain	But…	A sense of competition and a wish to be self-reliant makes network and spill over benefits harder to realise. Many customers want to deal with one contractor only (creating a demand for a one-stop shop concept).
Creative and professional product and service offers	But…	Lack of qualifications on the demand side makes the abundance of technologies, platforms, standards, products and services confusing and may even provide demand for lesser quality or contra productive work. Furthermore, the market for new media offers may saturate as B2B clients settle for the solutions already implemented.
The internet provides a low cost possibility for SMEs to reach a large audience	But…	Lack of clear regulations and standards (e.g. in copyrights) can make it difficult to protect and make money on offers developed.
Innovative ideas and business models		Lack of venture capital or lack of knowledge of how to find and attract investors
Opportunities		**Threats:**
Providing specialised offers to definite customers segments	But…	Big players merge and integrate services and kill the small players in the process. Furthermore, internet technology and concepts are easy to copy.
Finding new sources of revenue – particularly micro-payments	But…	Big players such as telecoms refuse to cooperate or end up reaping the benefits on behalf of content providers. No usable infrastructure for micro-payment is found.
Most companies in new media are SMEs	But…	The big are better equipped for building brands, reaching large audiences, attracting investments, defining standards and going global.
As the western market saturates, new markets open in less developed parts of the world	But…	This calls for internationalisation – not an easy task for SMEs. The big players are better equipped for taking on new markets.
Europe leads in wireless technologies	But…	The lead is relative to USA as Japan is even further ahead due to sharing of revenues among content providers and telecoms. European SMEs risk losing the first mover advantage.

5.4.1 Policy recommendations

While new media raises policy issues are relevant to a number of policy domains such as enterprise, culture, media, consumer rights and education, the following discussion deals with enterprise policy only.

Based on the analysis the four following policy recommendations stand out as most urgent.

	Policy recommendations
1.	Facilitate sufficient supply of fast and cheap Internet connections
2.	Facilitate developments of institutional, technological and commercial frameworks for micro-payments enabling feasible business models in content provision. Study the experiences gained in Japan and Finland.
3.	Create awareness of different types of clusters/networks and governance in different regions to prevent formulation of one-sided new media policies. Study *preconditions for*, *dynamics in* and appropriate *means of facilitating* the formation of new media business clusters.
4.	Support resolving of standardisation and regulation issues.

These are discussed in more detail below.

1. Sufficient supply of fast and cheap Internet connections

As in other sectors several companies in the new media sector have complained that access to cheap Internet and broadband (above 2Mb) is limited. The sector is extremely data intensive and data exchange dependent both along B2B and B2C lines. More advanced products, services and collaboration applications all require fast Internet connections, and SMEs as well as consumers need access to cheap broadband connections. It is recommended that the existing initiatives to promote fast and cheap Internet be stepped up.

Recommendation 1
Increase initiatives to speed up the establishment of broadband Internet in Europe, and continuation of policy of liberalisation of telecommunications law.

2. Micro-payments

As noted several times, micro-payments can prove to be an important revenue model for content providers driving growth and development in the entire new media sector. But micro-payments call for *of* institutional, technological and commercial frameworks. Such a framework is provided by telecoms that already have customer accounts in place as well as mechanisms for measuring traffic. Several models of revenue sharing with content providers are possible, but big players such as telecoms refuse to cooperate or end up reaping the benefits on behalf of content providers. This leads to recommendation 2, probably the most important in the present study:

Recommendation 2
Facilitate developments of institutional, technological and commercial frameworks for micro-payments enabling feasible business models in content provision. Study the experiences gained in Japan and Finland.

3. Business clusters

As noted in the SWOT analysis, the prevalence of business clusters in the new media sector makes it more difficult to implement national or EU level enterprise policies, as different clusters should be treated differently. And no single and uniform approach can be adopted towards creating clusters, as these must develop according to specific preconditions and potentials in a given area. This leads to policy recommendation number 3:

Recommendation 3
Create awareness of different types of clusters/networks and governance in different regions to prevent formulation of one-sided new media policies. Study preconditions, dynamics and appropriate policy measures related to the formation of new media business clusters.

4. Standards and regulations

Lack of clear regulations and standards (e.g. in copyrights) can make it difficult to protect offers developed and to capitalise them. Furthermore, Internet technology and concepts are easy to copy. Emerging standards can provide opportunities for SMEs who stands little chance in defining standards, but can leverage and harness standards by developing specialised offers within them. Standards also form a framework for collaborative commerce making integration and even automation easier. In order to stimulate innovation and SME growth, this recommendation calls for actions within standards and regulations, whether the policy actions aim to support discussion only or seek actual intervention.

Recommendation 4
Support resolving of standardisation and regulation issues.

These four recommendations follow the analysis presented in the report. But the case companies also offered a number of recommendations based on their individual perspectives and observations. Given the empirical approach of the present study it seems only relevant to conclude with the bottom-up suggestions made by the case company representatives.

Suggestions made by case companies: How to increase the use of IT in SME business
Worth media: We compete against the big by differentiating ourselves. Everyone was chasing e-commerce. We focused on skills development and build a capability of developing content with substance. We avoided e-commerce purposefully. We changed our name and focus even before the crash. We don't see ourselves as a web bureau. This is important because we try to define product specifications for the future in our two sectors – health and education. We need relationships with doctors, teachers, and kids. We have to be seen as involved in the substantial issues.
Magalostudio: We need some consultant to advice us, for the IT purchases.
Zonepro: Give some grants to foster innovation like ANVAR in France but on EU level.
NetBranding Company: To adopt broadband.
Consumer Intelligence: Infrastructure is important – everybody should have internet access. Implement electronically ID.

Suggestions made by case companies: Increasing the use of IT in SMEs
Visual Comunicazione: Provide incentives and benefits to companies that move to the web – such as tax incentives, also with a view to the possible environmental friendly effects of e-commerce. Another suggested policy initiative is facilitating better ICT infrastructure such as fast Internet connections. Furthermore EU should provide specifications of quality in web design to halt bad service and quality work by some web bureaus. Web bureaus should be forced to offer certain services.
Worth media: We build our business and skills on a lot of public funding. The government can be a driver. So can public service channels (e.g. BBC). But government can also block opportunities as when they award 40 million pounds to the BBC to develop an online curriculum. Broadband internet connections also drive developments. But we have always been working around limitations in internet speed – e.g. using a combination of DVD and Internet.
Zonepro: Give some grants to buy IT equipment and decrease internet costs access.
NetBranding Company: To adopt broadband.

6. *The Retail Sector*

The present analysis of the Retail sector is structured in 4 sub-sections:

Subsection 6.1 Provides a sector outline featuring general trends and the role of SMEs in the retail sector.
Subsection 6.2 analyses the use of business network ICTs in the SME case studies.
Subsection 6.3 analyses ICT facilitated business networks.
Subsection 6.4 concludes the report by a SWOT analysis and policy recommendations.

6.1 Sector outline

Essentially, the retail industry is defined by the selling of products to consumers. This means that retailers sell largely tangible products, as intangible products generally belong to the service industry. However, some retail products are less tangible than others, e.g. software or music (especially in download form, which might be considered a service rather than a retail good). Consumers are thought of as members of private households, as B2B sales generally follow different lines of commerce and distribution, and therefore are rarely included in considerations of the retail industry, even though many retailers also sell to business customers.

Sector definition
As defined by Eurostat, retail trade (NACE 52) includes the retail trade in non-specialised stores and specialised stores, food retailing, pharmaceutical products, the sale of used goods in stores, retail trading not carried out in shops and the repair of personal and domestic appliances.

6.1.1 Characteristics of the sector and general trends

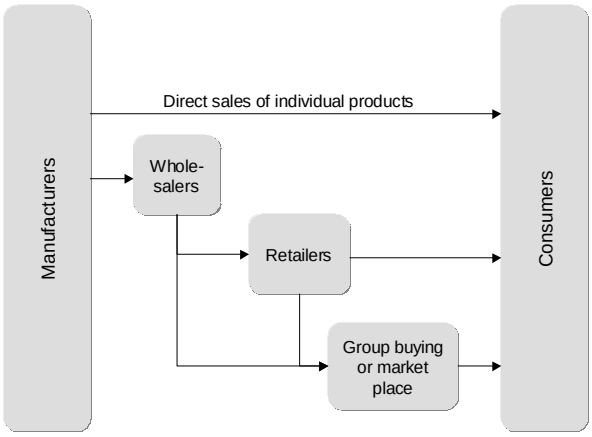
The classic line of retail sales involves a supply chain following four steps: manufacturers, wholesalers, retailers and customers. The role of the retailer in this distribution chain is to present attractive assortments of goods in attractive ways at attractive outlets. This means that running a retail business generally involves four central management processes:

1) Management of procurement of products from manufacturers or wholesalers. In some cases however, manufacturers sell directly to consumers. The objective here is to secure attractive products at optimal prices – often through increased buying power achieved by collaborative sourcing or by building close relations to suppliers.
2) Management of logistics – which can be handled by the manufacturers, wholesalers or by retail organisations themselves. The objective here is to secure just-in-time arrival of products.
3) Management of stores. A retail organisation can involve a single shop only or a host of stores. Either way, store management involves sales order processing, cash management, management of stocks and management of information (reporting systems). As margins are low in some segments of the retail industry (i.e. grocery products), cash flow management and optimising of credits can be an important source of revenue.
4) Management of promotion and marketing – involving both the brand of the retailer itself and the products sold as with special product offers. The objective is to attract consumers to outlets.

The retail industry provides all products imaginable aimed at consumers. A general typology differentiates between fast moving consumer goods (e.g. grocery products) and the slower moving consumer durables (e.g. dishwashers or cars).

Different retail formats are possible involving different supply chain constellations as shown in figure 6.1 below.

Figure 6.1: Retail supply chain formats



As noted, the classic retail set-up places the retailer between the wholesaler and the costumer. But this is changing for some, as old intermediaries disappear and new ones come to life. Driving

these changes are a number of general trends. Seven such trends are identified bellow:

1) Convergence of wholesalers and retailers as boundaries in division of work are blurred (vertical convergence) and convergence between non-specialised stores, specialised stores and food retailing (horizontal convergence);
2) Concentration and/or specialisation;
3) Changes in geographical localisation patterns – opening of shopping centres concur with the revitalisation of city centres;
4) Internationalisation leading to increased competition and innovation, as well as new challenges such as strategic approaches to expansion, logistics, language barriers, and cultural barriers;
5) New business concepts, including discount shops, parallel import, factory outlets, franchising, e-commerce (e-tail), whole branding of the retail organisation (e.g. The Body Shop), and large category stores such as Ikea or Toys-R-Us (referred to as “category-killers”, “big boxes”, “mega centres” or “power centres”).
6) New Internet based intermediaries or “infomediaries”, including intelligent shopping agents (e.g. priceline.com), product recommendation agents (e.g. epion.com), informative websites on intelligent agents (planete-commerce.com), Internet-based shopping communities (letsbuyit.com) and C2C auctions (etrade.com).
7) Consumer trends such as an increased focus on emotions, entertainment, storytelling, health, information, and global brands.

In addition to these trends, “classic” or “old fashioned” retail virtues still apply, such as negotiation and service skills, salesmanship, customer-centrism, and ‘knowing your customers’. These virtues, however, are currently reformulated with a new touch as with customer relationship management.

6.1.2 The role of SMEs in the sector

The retail sector is massive in Europe (EU-15): The number of enterprises is as high as 3,048,126; total employment is more than 13 million people and total turnover comes to 1,473 billion euro[13].

The share of employment and turnover held by SME' in the retail sector largely mirrors the average of all sectors. 68% of all employed in retail enterprises work for SMEs. Furthermore, SMEs account for 59% of the sector turnover. Micro enterprises play an important role in retail, and very small units (1-9 employees) account for 34% of sector employment, while large enterprises (many of which are international chains) account for 31% of sector employment.

The 14 European retail SME case studies reveal five trends in SME retail strategies: e-commerce strategies, niche strategies, brand strategies, service excellence strategies, and operational excellence strategies.

Multi channel e-commerce strategies: A major trend in retail is e-tail, i.e. retail through e-commerce. However, the case studies reveal a tendency to multi-channel approaches where products are sold from a combination of physical outlets; traditional catalogue orders using print catalogues and a call centre for receiving orders; and e-commerce. This trend is not only visible with well-established retailers; some Internet pure players have later

Case focus
– from e-tailor to retailer

While several of the case companies are bricks-and-mortar retailer turning to clicks-and-mortar by extending their business to the Internet (e.g. Globetrotter and ELFA), the opposite is also true. After two years as a pure play e-tailer, Grow in life opened a real physical shop in Stockholm featuring the same collection as the online-shop. This provides Grow in life with a chance for real contact with their customers, as it is difficult to have a dialogue and to learn from the customers on the net, however sophisticated the CRM system may be. The company will therefore in the future concentrate on both businesses in their expansion strategy.

[13] These figures are for 1996 – the most recent available published by Eurostat, 2001: *Enterprises in Europe. Data 1987-97.* The structure of the sector is largely unchanging on a year-to-year basis. However, from 1995-1996 a slight tendency towards large enterprises gaining relative importance is visible as also noted in the seven identified general trends by pointing to concentration.

opened physical stores (e.g. Growinlife.se).

Niche strategies: The case studies show, that SME retailers often adopt a niche or specialist strategy were competition is less intense, as the niches are unattractive to the large enterprises. Some niches are narrower than others. For instance, Globetrotter.de carries 12,000 items relevant to outdoor travel, while Growinlife.se focuses more narrowly on maternity clothes, and Blume2000.de features only 200 products in its online catalogue, which may seem limited but in fact is more than its online competitors and interestingly also more than the biggest player in this category, Interflora (in Germany operating under the name Fleurop). Obviously, the number of different products to offer depends on the strategic focus of the retailer.

Brand strategies: A natural extension of the niche strategy is to develop a brand that is connected to quality, special product features or service in the mind of the customer or prospect. SMEs do not have the heavy marketing funds spent by large retailers, so their brands are instead often closely related to their focused niche approach benefiting from the general assumption that specialists provide better product or service quality. Catalogues and newsletters, in print or electronic formats, are a cost effective marketing strategy adopted by the SMEs. This approach, however, is cost effective by being aimed at existing customers and thereby has a limited scope.

Service excellence strategies: The retailers under study all have adopted e-commerce channels, and the study shows that e-commerce is widely used for creating better services in order to gain customer loyalty. Service excellence is achieved online in a number of ways such as providing free information, online tools (e.g. the calculation software for wood construction by Ablewood), and building online communities.

A major point for SMEs is the fact that CRM makes it possible to serve a high number of customers individually without a large staff of service people.

Case examples – added (information) services in e-commerce
Grow in Life: Customers can ask questions and be in dialog with the shop or a connected expert in pregnancy.
Globetrotter.de: Tracking service though postal system. Customers forum featuring guest book, C2C auction in second-hand market, travel partner search, and advertising of travel and outdoor related events.
Blume2000: Quick order, reminder service (e.g. for birthdays), subscription service, plant doctor featuring advice on plant treatment, newsletter
Peck.it: A couple of employees are responsible for answering all customer questions immediately online.
Flashmall: Chat feature between customers and employees as well as e-mail answering and online forum.
Ablewood: Web page features software that allows customers to make calculations and validations on wood. Hence, the clients can make their own calculations online.

Operational excellence strategies: SMEs increasingly benefit from the operational excellence potentiality of ICTs. Falling prices of standard software solutions make it possible for SMEs to adopt advanced information and management systems run by a few people resulting in an effective organisation. However, virtual integration of supply chains is still a trend limited to mainly large players.

6.2 Impact of ICT in the sector

Large enterprises are leading ICT use and developments in the retail sector, but also SMEs are discovering the potential of e-commerce to reach new customers at both national and international levels; the potential of e-CRM in building closer and more profitable relations to customers; and the potential of e-SCM in acting big while staying small by building effective partnerships along the supply chain.

This section of the report presents ICT trends in retail SMEs, emerging ICT facilitated business models and ICT infrastructures adopted by the case companies including E-commerce, e-CRM and e-SCM.

6.2.1 Technology overview

The sector reports include a 'scoreboard' of ICT maturity and a benchmarking of ICT use in network relations. The content of the each of these are explained below.

The analysis of ICT maturity in the sector case companies includes four dimensions: IT infrastructure, E-commerce, Customer Relationship Management and Supply Chain Management. Maturity in each of the four dimensions is determined by the frequency of a number of functionalities as described below. The evaluation criteria provide implicit definitions of the technologies in question:

IT infrastructure is evaluated on four dimensions:
1) Internet homepage – can be for information and marketing purposes only as e-commerce is dealt with elsewhere. 2) Intranet: A private network within the company using an Internet protocol (e.g. TCP/IP). Intranets enable file sharing and message posting within an organisation but may well bind together geographically dispersed entities. 3) Extranet: A closed external network connecting a company to suppliers, partners or customers using an Internet protocol. An extranet requires security, often provided by firewalls. 4) ERP-system: An internal IT-system for handling of production planning, logistics, sales, accounting and human resources. To put it simple, ERP is the back-office and E-commerce is the front office.

E-commerce is evaluated on eight dimensions:
1) Catalogues with price information, product data and pictures available at web page. 2) A feature for costumers to make requests through the web page in more or less interactive ways. 3) Product configuration – products are made to order and costumers are given the option to specify product options at website, thus participating in the design of their individual products. 4) A feature for ordering online 5) Order management including shopping cart, order notification, and order status (track and tracing) 6) Payment online 7) Use of marketplaces for procurement 8) Mobile services (e.g. M-commerce, SMS messages, WAP features)

E-customer Relationship Management (CRM) is evaluated on four dimensions:
1) Electronic customer database (storing historical data on customers) 2) Data analysis / data mining (analysing and grouping customer behaviour, profitability etc.) 3) Personalisation (using password, cookies etc.) 4) Online customer service

E-Supply Chain Management (e-SCM) is evaluated on four dimensions:
1) Use of EDIFACT / light EDI connection with partners. Using DEI (electronic data interchange) is a way of automating communication between network parties (trading partners). EDIFACT is a standard for such data exchange. An EDI message contains a string of *data elements*, each of which represents a singular fact, such as a price, product model number, etc. Thus, EDI is the exchange of business data using an understood data format and is a predecessor of today's Internet. EDI involves data exchange among parties that know each other well and make arrangements for one-to-one (or point-to-point) connection, usually dial-up. EDI is expected to be replaced by one or more standard XML formats, such as ebXML. **2) Integration of planning functions** These processes include shared access to information across companies by integration of information on demand forecasting, distribution, transportation and manufacturing planning and scheduling **3) Integration of execution functions** Here, not only planning information is shared, actual production and fulfilment is automated by integrating companies by automating procurement, manufacturing and distribution. For instance, when stocks are low in a (automatic order planning, production and distribution) **4) Shared databases with market data** Here, full integration in supply chain is achieved by joint access to databases.

6.2.2 ICT trends in SMEs

Central ICT trends in retail are not surprisingly the e-business technologies for c-commerce, customer relationship management (CRM), and supply chain management (SCM). But the ICT trends in retail can also be analysed under the headings of the four central management processes identified in section 1.2: Management of procurement, management of logistics, management of stores and management of promotion and marketing. ICT trends corresponding to theses tasks are identified in table 6.1.

Table 6.1: ICT trends in retail responding to management processes

Management of Procurement	ICTs facilitate collective sourcing, automation of sourcing and the development of virtual exchanges.
Management of Logistics	ICTs facilitated supply chain management systems focusing on just-in-time delivery to shops following integration of information systems for order management, inventory management, transport routing, and sourcing (procurement).
Management of stores	ICT systems for store operations and accounting and in case of mail order and e-commerce also packaging and order management.
Management of promotion and marketing	Includes applications for customer relationship management, e-commerce and affiliate marketing

Virtual market places in retail

GlobalNetXchange (GNX), is a B2B electronic marketplace serving the global retail industry by facilitating communication and collaboration among retailers and suppliers globally. GNX provides products and services to streamline the buying process, improve efficiency, lower costs, and deliver better products to retail customers. Services offered by GNX include a global retail marketplace to buy and sell products, Collaborative Planning Forecasting and Replenishment services to communicate and collaborate with trading partners, and a transaction hub to facilitate communication across multiple platforms and companies.

The Exchange is open to businesses of all sizes, but so far only big players are members. Founded early in 2000 Sears, Carrefour and Oracle, GNX now has eight retailer equity partners, including Kroger, Sainsbury's, Metro, Coles Myer, PPR and Karstadt Quelle. The success of the recently concluded Early Adopter program has added eleven retailers and suppliers as members of the exchange. Total purchase volume of GNX members is over US$400 billion. By February 28, 2001, GNX members had conducted over 500 transactions valued at more than US$600 million using the marketplace tool. A majority of these transactions sourced goods for resale.

The World Wide Retail Exchange (WWRE), founded in March 2000, is headquartered near Washington, D.C. The WWRE will enable Web-based transactions among retailers and suppliers operating in the food, general merchandise, textile/home and drugstore sectors. To date, the WWRE includes 53 members with combined annual revenue of U.S. $790 billion. All retailers have equal status on the WWRE, but $1 billion turnover is required for membership. The WWRE is not tied to a technology provider, and no technology company has an ownership position. The WWRE operates as an independent, not-for-profit organization, and has no intention of seeking an initial public offering (IPO). All retailers participate with the same fee structure, with a sliding scale based on transaction volume. All transactions are confidential and secure.

Management of procurement is central to retail, and ICTs for collective sourcing, automation of sourcing and virtual exchanges carries potential for creating win-win business networks. So far, however, actual development and success of such forms of procurement still lags behind expectations and media coverage as witnessed in the SME cases, and in terms of exchanges by the reference case worldoffruit.com. The big players have taken the lead as witnessed by GlobalNetXchange and The World Wide Retail Exchange (see text box).

Clearly, e-commerce is *the* ICT trend in retail. Still, e-tailers are frontrunners seeking new opportunities, and only a small proportion of retailers sell through e-commerce channels today. Indeed the “site-centric” business model (displaying an assortment of goods at a location easily accessible to the customer) is still a winning strategy, and e-tailers are increasingly opting for a combination of “clicks and bricks”.

CRM is a trend following e-commerce, as SMEs with online boutiques begin to take an interest in the actively using the large amounts of data on customers available through the electronic transactions with customers.
Part of this process is also the implementation of internal systems for handling data. Several of the case companies plan to implement new ERP-systems.

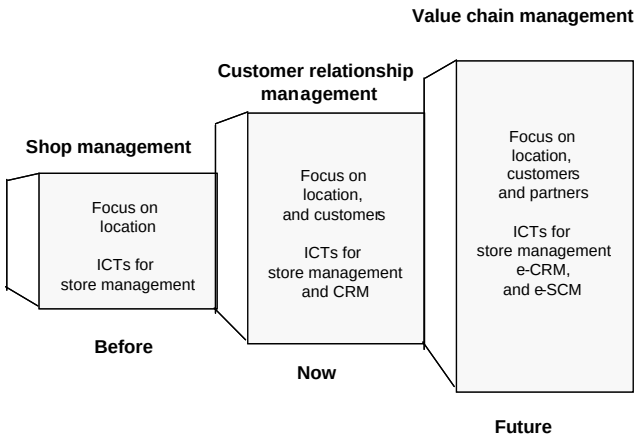
The case studies show that SMEs mainly have adopted ICTs for store management, e-commerce, and e-CRM, while e-SCM lags behind and remains a trend for the future.

Thus, analysis of the ICT infrastructure of the case companies shows an evolution trend from shop management to costumer relationship management and to value chain management. This is not to say, that the management focus of retailers are or will be shifting from one to

the other. Rather, it shows that ICTs are gaining increased importance in all business processes.

This development trend is illustrated in figure 6.2 below.

Figure 6.2: ICT development trend in retail SMEs



Again it should be noted, that the concepts of e-CRM and e-SCM do not entail radical shifts in retail strategies, but simply present more efficient ways of conducting central retail business processes.

The case companies also point to the following trends in the retail sector:

- XML is adopted as standard for electronic communication and web pages.
- Affiliate marketing is not widely used as of yet, but carries potential also for SMEs.
- Several case companies point to an increased interest in using ICTs for procurement.
- Increased focus on return on investments (moving away from 'burn rate' strategies.

Examples of concrete future projects considered or planned by the case companies are presented below

Case examples – ICT projects planned for the next two years
All the retail cases plan further development of their e-commerce solutions. Below are other examples of planned projects: New ERP Systems are planned by Growinlife.se, Aarstiderne.dk, Bluemarx.se A Content Management System will be adopted by Peck.it for faster updates of catalogues. The Danish Association of Bookstores is developing a collective database of all Danish books – gad.dk will be among the users. Conversion of accounting and economic transactions to the euro is planned by Peck.it Move to APS (application service provider) is planned by Peck.it Security control on data access in internal organisation at Flashmall.it Evaluation of open source solutions is planned by Flashmall.it Automation of logistics is also planned by Flashmall.it m-commerce/WAP is being considered by ELFA, globetrotter (and Flashmall for information, not commerce) while Growinlife and BlueMarx have evaluated the business model and decided not to implement it. Implementation of online and other forms of payment is planned by Deus' Cheveau.com, Growlinlife.se, Elfa.se, and Bluemarx.se. Sweden has been lacking behind in financial infrastructure but is now catching up in different ways. The new trend in e-commerce is to complement online credit card options with other forms of payment: invoices, payment on delivery (the Swedish postal service, Svenska Posten, is currently developing this service) and account-to-account transferral (Danske Bank and Nordea, the two leading banks in Denmark, already provide this service to web merchants). One incentive to implement alternative forms of payments is to meet consumer concerns about security of online credit card use.

The focus on e-commerce is carried on into the future, as the case companies plan to further develop their solutions both in terms of CRM implementation and ERP integration.

6.2.3 Emerging ICT facilitated business models

Obviously, e-commerce is a major emerging ICT-facilitated business model – both in its pure play form and in combination with physical outlets and traditional mail and telephone order shopping. Indeed, all the cases under study have implemented e-commerce business mo-

models. But more closely analysed, ICTs facilitate five new types of business models as shown in table 6.2 below.

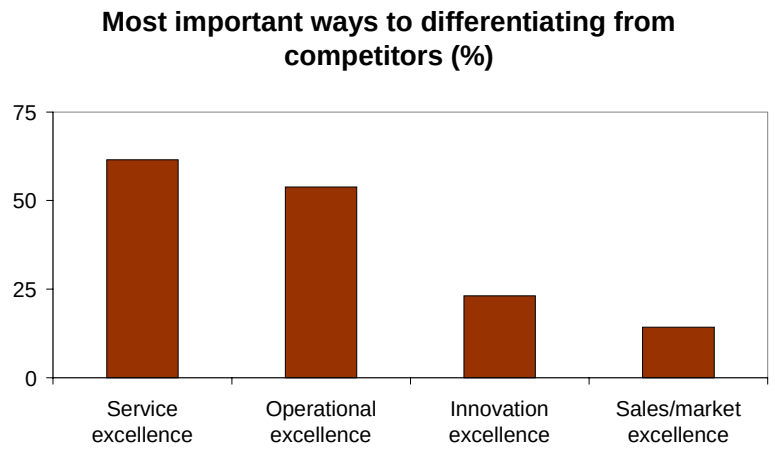
Table 6.2: ICT facilitated business models in retail

Model Type	Model forms	Case examples
Marketing models	• Auctions • Virtual marketplaces • Group buying (collective buying power)	**Group buying:** BlueMarx **Auction:** Ask-Smith.dk, Globetrotter.de (supplementary, no charge), Peck.it (small, supplementary) **Market place:** Ask-Smith, Worldoffruit
Supply chain models	Virtually integrated supply chains focusing on • innovation • cost reduction • service	The case companies have still not implemented this, but e.g. Globetrotter.de has begun by creating a system generating automated e-mails and faxes from its ERP system to suppliers.
Channel innovation models	• clicks and bricks • e-commerce pure plays • manufacturer to consumer retail • m-commerce (mobile Internet) • Affiliate marketing • Advertising revenues	**Clicks and bricks:** Globetrotter.de, Blume2000.de, Gad.dk, Peck.it, ELFA, (GrowinLife started on the net but now operates a physical store) **E-commerce pure-plays:** Deus' Cheveau, Ask-smith, Bluemarx, Aarstiderne **Advertising:** GrowinLife and more
Brand excellence models	• Internationally orientated niche strategies • Mega-assortments (e-category killer) • Discount strategies	**International:** Peck.it (focus on USA and Japan) planned by Globetrotter.de, GrowinLife (Scandinavia) and Aarstiderne (Scandinavia and Germany) **Mega assortments:** Elfa.se, Globetrotter.de, ELFA **Discount strategy:** Flashmall, Bluemarx, Ask-smith
Service excellence models	• CRM • Personalisation • Customisation • Information add-ons • Subscription services	**CRM:** Most cases… **Information add-ons:** Pays de France, Deus' Cheveau, Aarstiderne, Globetrotter.de, Blume2000.de **Subscription services:** Aarstiderne and Blume2000.de

These business models are not mutually exclusive, indeed they can all be considered different aspect of the general e-commerce model, as doing business online often affects both marketing, supply chains, channels, brands and services.

While the above table provides an overview of general trends in Internet facilitated business models in retail, the sector studies show that SMEs primarily focus on service and operational excellence as witnessed in table 6.3.

Figure 6.3: Strategic differentiation adopted by the case companies



The fact that the case companies consider themselves relative experts in providing service can be understood as a consequence of their uptake of e-commerce and CRM. It is interesting to note, that e-commerce generally is thought of more as a way of improving service than as a way of improving sales/and marketing. Perhaps this reflects the limited marketing budgets available to SMEs.

In situations where demand is geographically dispersed (e.g. demand for niche products), the e-commerce business model is suitable for gathering demand centrally through a website and then distributing products directly to customers from a central warehouse, thus eliminating the need for locally distributed outlets. The business models of Aarstiderne, BlueMarx and Ask-Smith are examples of this.

Examples of actual implementations of each of the four types of excellence are presented in the table below.

Case examples – service excellence:	
- without ICTs	- through ICTs
Globetrotter.de: Customer friendly service, e.g. customers get a replacement product if anything is wrong with the initial delivery. Flexible and service-minded in-house repair shop. **Blume2000.de:** Larger variety and more accessories than competitors.	**GAD.dk:** Minimising the supply chain and to give a better service (more choices). **ELFA** will develop a B2B system to offer a better service for professional customers. It has to be faster, simpler and more transparent. **Blume2000.de**: Large variety and accessories online, 'what you see is what you get' - because of e-commerce. Selling points: Fresh products, 24-hour service all over Germany, greeting cards. **Flashmall**: The company does not try to invent customers' preferences, it prefers follow customers suggestions and carefully meet customers wishes and provide great service. To keep delivery time down, the company keeps a stock of the products in its own warehouse.
Case examples – operational excellence:	
- without ICTs	- through ICTs
Aarstiderne and **ELFA** seek to find better and more rational purchasing. **Blume2000.de:** Cheaper products. Favourable price agreement with Deutshe Post because of large parent company. **Pay de France**: Close and long term relations to suppliers.	**Aarstiderne** Plans integration of the supply chain through a new ERP system. **ELFA**: Stock management. A more rational management of all the 40,000 articles. **BlueMarx** Affiliate content provision through XML-web pages; technological integration between warehouse and administration, and better communication with the supplier through databases.
Case examples – Innovation excellence:	
- without ICTs	- through ICTs
Globetrotter.de: Close relations to manufacturers allow Globetrotter.de to market innovative products earlier than its competitors.	**Globetrotter.de**: Technological innovation (e.g. e-commerce).
Case examples – sales/marketing excellence:	
- without ICTs	- through ICTs
Deus' Cheveau aims at selling products with high value added in a market with little competition. Grow in Life will open a physical store to engage in face-to-face dialogue with the customers – the experience is useful on the net. The company will also grow sales through marketing and PR.	**Peck.it** seeks to take advantage of the brand since the offline brand Peck is famous for its quality products. The company has run a lot of banner adds on the most visited websites in Japan and the United States. **Flashmall** aims for a very interactive and dynamic website. To make calculations easy, all taxes are included in the displayed at the website.

The individual cases cannot be closely associated with one of the forms of excellence. Thus, their strategies are not to excel in just one category. Rather the strategies of the retailers lie more in their choice of product specialisation. Following this strategic decision, the case companies focus on building relationships to suppliers and customers and running their companies efficiently. While relationships to suppli-

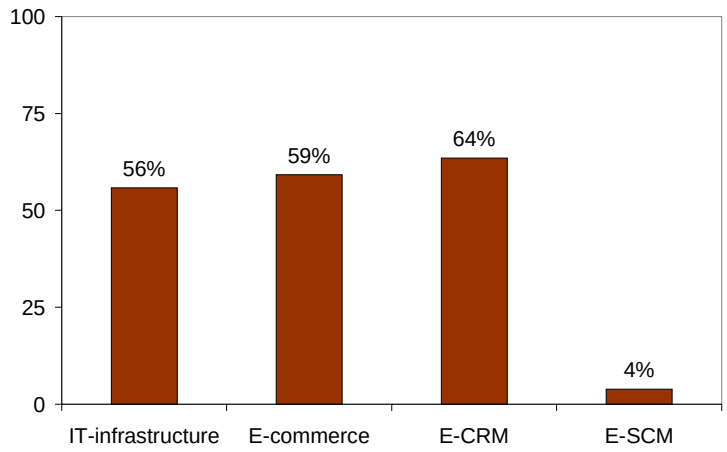
ers largely are managed offline, relationships to customers and efficient management processes involve ICTs.

Compared to other SMEs, the case company generally can be considered innovators, as they have been early adopters of e-commerce. The adoption of e-commerce seems also to come with a general focus on improving business processes though adopting and inventing new practices and ICTs. However, the cases do not clearly suggest whether ICTs generate new room for innovation or an innovative organisation seeks to adopt ICTs. Otherwise put, it is unclear weather ICTs stimulate innovation or innovation stimulates the up take of ICTs.

6.2.4 ICT infrastructure in SMEs

An overall picture of the ICT maturity in SME retail is presented in figure 6.4 as the figure shows the frequency of major ICT applications.

Figure 6.4: ICT maturity overview of SMEs in retail sector



The histogram does not show the frequency of up take of the four system types in focus. Rather, it presents scores on maturity of the systems calculated as average sophistication of the systems implemented by the case companies.

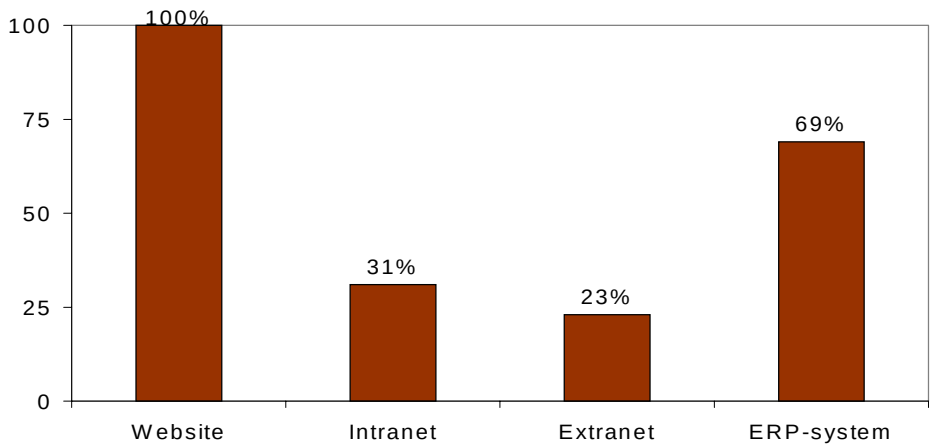
The figure reveals that even SMEs chosen for e-commerce activities in general terms do not show full scale and integrated implementa-

tions of the four major applications. While all 14 cases have e-commerce business models, the sophistication of the solutions is limited – both in terms of ERP integration, e-CRM and e-SCM.

To gain a richer understanding of the solutions underlying the maturity scores, each of the four application forms are analysed in greater detail.

IT–infrastructure: It comes as no surprise that all cases have websites, as the cases were chosen for their e-commerce applications. The high frequency of ERP systems covers a variety of system sophistication ranging from little more than accounting software to integration of multiple forms of planning fields, i.e. sourcing, logistics, store management, order management and accounting (e.g. SAP/ R3). The fact that few of the case companies have intranets reflects the small size of the organisations, as intranets mainly are efficient in large organisations.

Figure 6.5: IT - infrastructure



SME retail chains, however, use intranets for communication platforms among store outlets and headquarters. The low penetration of extranets show that virtual value chain integration still is an issue for the future in SME retail. Many of the case companies was founded within the last three years (some as subsidiaries of well-established

enterprises). Thus, they have implemented several applications at once.

Case focus – ERP systems

ERP (enterprise resource planning) describes the broad set of activities supported by multi-module application software that helps a manufacturer or other enterprise manage important business processes, including product planning, parts purchasing, maintaining inventories, interacting with suppliers, providing customer service, and tracking orders – and sometimes also includes application modules for finance and human resources management. Usually, an ERP system uses or is integrated with a relational database system. Implementing an ERP system can involve considerable business process analysis, employee retraining, and new work procedures. Some ERP providers today offer ERP outsourcing.

Aarstiderne has a rather old ERP-system, Navision Navigator 0356. The website is rather simple – when an order is given at the website an e-mail is generated in Outlook. Thus, the order is passed on as comma-files in e-mails, and the orders files have to be typed in to Navision Navigator manually. The call centre staff does this.
(ERP systems, continued…)

CED GAD achieves integration to book distributors and publishers through a collaborative system for Danish bookstores. All the stores order through this system.

Grow in Life has an ERP system called ERP Light a standard platform from IBM. The system integrates sales, inventory management and payment. Stock is kept in a warehouse run by an external collaborator who is connected to the ERP system. But the stock will soon be kept in-house.

Blue Marx runs a Navision ERP system that integrates website and the accounting system.

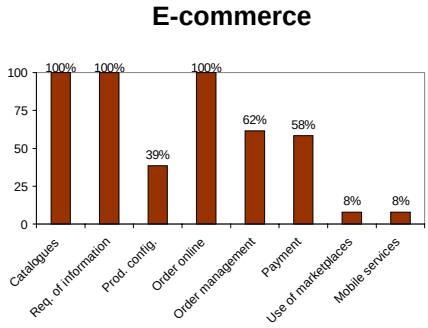
ELFA runs a SAP/R3 implementation from 1998 that replaced an old proprietary logistic system. The SAP-system integrates the process from ordering to delivery. From a customer is ordering an article on the Internet it takes about 15 minutes to find it on the stock and have it ready to be delivered.

Globetrotter Ausrüstung runs a proprietary system: The Globetrotter System. Transfer of data from the web store to the ERP system is done manually, but integration to suppliers is some what automated: E-mails to suppliers are automatically generated when stock levels are low. The system is integrated with other means of ICT: The supplier receives either a fax or an e-mail, as they are not ready for EDI or XML solutions.

Blume2000.de's ERP system features e-commerce service (logistics and fulfilment), warehouse system, and a jet form system for printing invoices.

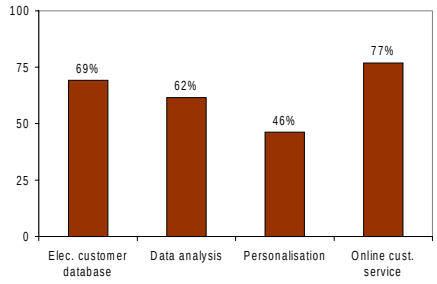
Flashmall does not have an ERP system. The company is evaluating seriously the payback prospects, as it is a large investment to implement one.

E-commerce: As noted all cases have e-commerce applications, as they were chosen as examples of such. The histogram in the figure shows that online catalogues, information request features and ordering functions are basic features of any e-commerce system. Surprisingly, only little more than half the sites allow for online payment. There are several reasons for this: Årstiderne.dk has instead of online payment opted for a subscription-based business model (in home delivery of vegetables, bread and fish). Further, some cases are based on marketplace-type models focusing on connecting supply and demand parties (e.g. Ask-Smith.dk, Bluemarx.se) while others have experienced problems developing this feature. A barrier here can be the lack of enabling organisations in the financial system. The financial institutional set-up in different countries supports different methods of payment. Another finding is that some business model features remain a trend for the future: online product configuration, use of market places for sourcing and m-commerce (mobile commerce).



E-CRM

Electronic customer relationship management carries great potential for e-tailers, as data gathering is very easy in e-commerce with the necessary applications in place. The case studies show, however, that the main barrier to adopting the practice is not lack of barriers, but lack of skill in data analysis. Only few cases companies use sophisticated forms of data analysis, though 2/3 do some form of analysis. The cases also point to hesitation in using cookies for fear of violating the customer's need for experienced privacy. Related to this, personalisation features adopted remain somewhat primitive. It seems both companies and consumers lack knowledge for creating better services on win-win terms. Instead companies turn from personalisation to other forms on online service: newsletters, question answering, and free information services.



Case focus: CRM

Blume2000.de stores every transaction and analyses order history to segment customers in active and not active. Hence, direct mails are focused on active customers. Data is analysed in terms of all relevant aspects of (customer behaviour, profitability), customer behaviour and profiles: product types, locations of buyers, time of day of orders, means of ordering (online or telephone), gender, method of payment.

Globetrotter.de: "We have just begun using customer cards allowing us to implement a discount system. But it is our chosen policy not to store a lot of information. We will not personalize to level of e.g. Amazon. But this might change, should the customers want it". So far, the company only does log file analysis. Other forms of CRM include sending e-mail newsletter with special offers to customers and mailing catalogues to all customers that have bought anything within the last three years. "We have statistics, but we don't use them a lot".

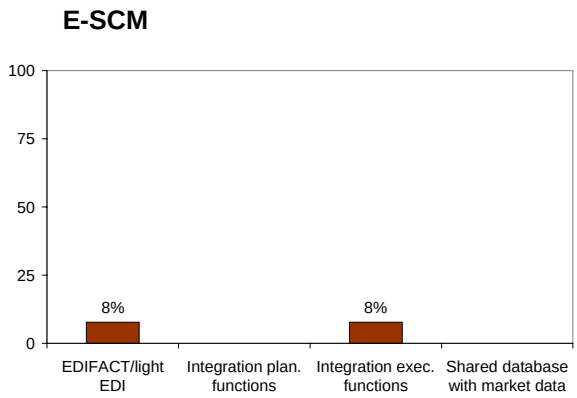
Pays de France has not got started yet, but "we are working on it. It is our main target in these days".

Case examples – cookie or not to be?

The well-known customer recognition of amazon.com is based on cookies. A cookie is information that a website puts on a customers hard disk so that it can remember something about the customer at a later time. A cookie allows the information provider to store information about a user on the user's own computer. Cookies are commonly used to rotate the banner ads that a site sends so that it doesn't keep sending the same ad as it sends the user a succession of requested pages. Cookies can also be used to customise pages based on the users browser type or information the user may have provided the Website. Web users must agree to let cookies be saved for them, but, generally, it helps Websites to serve users better.

The cases companies take different stances on the use of this technology. Quite a few companies find cookies "too aggressive", "a bad communication practice" or "unwanted surveillance of customers". Thus, GrowinLife, ELFA, Globetrotter.de, Blume2000.de, Deus' Cheveau have decided not to implement cookies. BlueMarx, however is planning to use them, and Globetrotter is ready to do so should customers want them.

E-SCM carries four promising potentials to retailers: Reduced costs following automating of business processes entailed in integration of planning functions, minimising inventory (and binding of capital funds) by just-in-time delivery also entailed in the integration of planning and logistics; customisation following integration of execution functions; and customer service following local and real time access to information about product availability and delivery times. The cases, however, indicate that so far, only automating of internal processes is widely used – but mainly without the other potential benefits. Thus, the figure shows, that the SME e-tail case companies do not yet use the ICTs available for integration supply chains, i.e. EDI, XML and exchange systems. The big players have taken the lead in adopting these technologies.



Reference focus: Exchanges and e-SCM
Speaking at the 2nd Annual Global Retail Technology Forum, Gerard Van Breen, Sr. Vice President of Global Sourcing at Royal Ahold, expressed his views of the relationship between e-SCM and The World Wide Retail Exchange (WWRE). Costumers have become unpredictable, asking for an enormous amount of different products, so retailers cannot any longer simply put goods on their shelves and wait for them to sell. Instead, Ahold is implementing a pull system replenishing what is being sold. For this, retailers need highly responsive supply chains, handling an enormous amount of data made available in real time. By using the WWRE, Ahold expects to increase the speed of transaction making tender processes faster than the couple of months they last today. The company also expects lower costs through sharing information in the supply chain. The major focus on exchanges by leading players is driving the process at high speed, but Mr. Van Breen sees a need for the enterprises to resolve unproductive standard issues quickly. Source: www.snpcom.com/amsterdam/vanbreen.ram

6.3 Collaborative commerce: ICTs in the value chain

As noted in the introduction, phenomena described as virtual value networks, business webs or collaborative commerce, are central to the present study, because such networks preset the opportunity for SMEs to acts as big while staying small. While building close relations to the consumer through CRM can be considered part of such networks, virtual value networks should also integrate other parties 'be-

hind the customer scene' provided by the front office system. By selecting case companies who have implemented e-commerce, we have chosen technology frontrunners and we therefore expected to find business networks in operation at the back office But as shown, the SME case companies still can not be considered part of full blown virtual value networks due to limited ICT sophistication in relation to suppliers and business partners. A general profile of typical business networks in the retail sector is presented in table 6.6 below.

Figure 6.6: General network profile for the retail sector

	Number	Closeness	ICT sophistication
Suppliers	Medium	High	Low
Partners	Low	High	Medium
Customers	High	Medium	Medium

Suppliers: The number of suppliers is typically relative to the number of products featured in the store or catalogue. Retailers sourcing from manufacturers will have more suppliers than retailers sourcing from wholesalers who bundle offered products in assortments. As dynamic marketplaces rarely are used yet for sourcing, relationships to suppliers generally tend to be close. Instead of dynamic markets (virtual auctions) some retailers form collective sourcing organisations in order to achieve discounts following collective buying power (similar to the C2C trend seen in e.g. letsbuyit.com). Conversely, individual close ties to suppliers are also sought by retailers as means of keeping costs down – both by integrating execution and planning functions and by discounts achieved through loyal sourcing practices, i.e. economies of scale reached over time. However, ICT sophistication in relationships to partners is still low – major rewards are possible by dealing with this problem both in terms of creating value networks (close relations to a few suppliers) and dynamic markets (procurement at virtual auctions).

Reference focus: E-SCM calls for standards

The Collaborative Planning, Forecasting and Replenishment (CPFR) Committee is a VICS committee, made up of retailers, manufacturers, and solution providers. This group has developed a set of business processes that entities in a supply chain can use for collaboration on a number of buyer/seller functions, towards overall efficiency in the supply chain.

CPFR implementations can send each other eight different types of messages:
Forecast, Forecast Revision, Product Activity, Performance History, Exception Notification, Exception Criteria, Event Description and Item Information Request.

Not all message types are required, depending upon the deployment scenario. The CPFR XML specification defines conformance groups that solutions can use to specify which messages they support.

Randy Mott, Senior Vice President and Chief Information Officer of Wal-Mart, one of the pilot study participants, has stated about the initiative: "CPFR is the single largest opportunity to move inventory management forward in the next five years. We plan to implement collaborative relationships with well over one hundred suppliers in the next twelve months. We believe that CPFR is the driver for moving into the next era of buyer-seller relationships."

The mission of the VICS Association (Voluntary Interindustry Commerce Standard) is to take a global leadership role in the ongoing improvement of the flow of product and information about the product throughout the entire supply chain in the retail industry. The organization's overall objective is to improve product availability to the consumer by providing leadership and encouragement in the identification, development, and implementation of voluntary standards, protocols, guidelines and other mechanisms, which might be required to support their mission.

Partners in retail are often introduced through outsourcing of business processes such as IT-management and IT-development; call centres; logistics management and distribution and marketing. The retailer's number of this kind of partners is typically limited to the number of outsourced business functions. Using partnerships allow SMEs to implement cost effective business practices at the industry standard, hence meeting competition from large enterprises. In this sense, the strategic trend towards outsourcing and focus on core competencies carry great potential for SMEs. Indeed, some American retail organisations (e.g. ebay.com) consider themselves no more than marketing organisations (with some in house IT-functions) as anything else is outsourced, in some cases even to consumers. The partnerships most often seen in SME cases include transport/logistics, IT-functions and marketing. Logistics and transport often involves IT facilitated communication, sometimes extended all the way to the consumers as with web based track and tracing functionalities, while services marketing are facilitated by regular meetings, phone conversations and email.

Customers: Retailers generally aim at achieving customer loyalty. As witnessed in the 14 cases, e-commerce, and more specifically CRM, is one way of achieving this. Use of ICT network technology is widespread in customer relationships, as all case companies have e-commerce sites. E-commerce solutions, however, generally feature neither integration to back office systems (ERP), nor upstream integration in the supply chain. As noted several times already, great potential for improvements are available here, and at present constitutes a threat to SMEs, as large enterprises have been faster at achieving virtual integration.

The ICT sophistication (figure 6.6) is determined by the use of network technologies in three levels of advancement. The typology of network technologies below constitutes a basic understanding of the nature of ICT use in external relations. Based on three generations of networks covered by the cases, the model describes the characteristics of the relations.

Table 6.3: Three generations of ICT use in networks

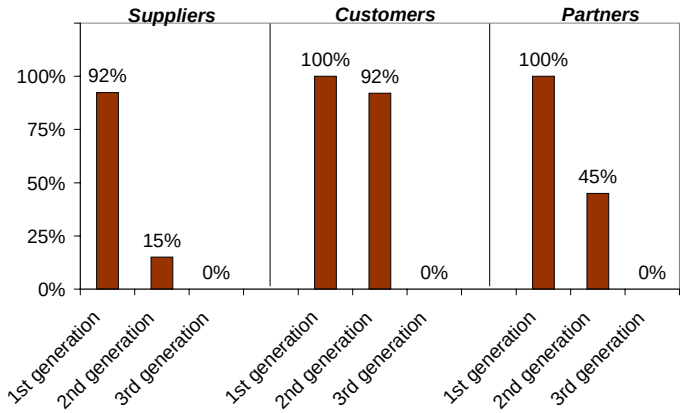
Generation	IT-solution	Automation level	Integration
First generation: Unstructured e-mails / Internet communication	E-mails: Person-to-person	No automation	No integration with back-end systems
Second generation: Structured e-mail and Internet communication	E-mail and e-commerce Internet commerce, request forms at web page, e-mails Person-to-machine or machine-to-person	Internal automation	Low integration in back-end systems
Third generation: Standardised communication (e.g. EDI and XML)	Internet & EDI communication Machine-to-machine	External and collaborative automation	Full integration of back-end systems (prices, products, etc)

The table shows that reaping the benefits of increased automation requires closer integration made possible by more advanced ICT systems. The labelling of three generations reflects a tendency towards joint development in sophistication of automation, ICTs and integration. The three generations are ideal types, as combinations diverging

from this general trend do appear in practice (for a more elaborated description of the three generations of network, see section 3.3).

Figure 6.7 below shows that the retail case companies are prime examples of first generation solutions in connection to both suppliers, costumers and partners, but while costumers have been the focus in moving on to second generation solutions, the more advanced systems are not used for partners and more evidently suppliers. None of the case companies feature third generation solutions as of yet.

Figure 6.7: ICTs in networks



The limited use of automation, integration and advanced forms of network ICTs affects the benefits from ICTs reaped by the case companies as shown in the following section.

6.3.1 Benefits of using ICT (in networks)

Table 6.4 below shows the benefits incurred from ICT usage by the case companies.

Table 6.4: Benefits from using ICTs

	Not at all	Low	Some	High	Very high	Cases
Improved customer satisfaction	-	8%	-	83%	8%	12
Reduction of product-to-market lead time	-	17%	33%	50%	-	12
Reduction in labour costs	-	25%	58%	8%	8%	12
Reduction of procurement costs	30%	17%	33%	17%	8%	12
Better information collection	-	15%	46%	23%	16%	13
Better match of production level to demand	11%	33%	25%	17%	8%	12
Extension of distribution and marketing channels	-	8%	11%	25%	42%	12

Not surprisingly, a major benefit of the e-commerce applications has been the extension of distribution and marketing channels. E-commerce has proven to be an effective way to attract new customers and sell in different ways to existing customers resulting in greater turnover.

Another main benefit is improved customer satisfaction. This reflects the focus on CRM in retail e-business.

Thirdly, a majority of case companies are benefiting from reduced product-to-market lead times as a consequence of ICT-facilitated automation of business processes. For instance, improved communication with suppliers and distributors makes order handling faster and reduces delivery times. Also, the e-commerce sales channel including marketing channels such as e-mail newsletters allow retailers to accept attractive offers on one-of batches of products from suppliers and market them as special offers available for a limited time only. The new channel is used to experiment with choice of product line, which means that new offers are made more often. In theory, such special offers are also possible in offline channels, and they are indeed practised here also, but the cases do reveal a tendency towards e-commerce inspiring SMEs to be more innovative in product offers.

It is also interesting to note that the SME retailers have only experienced key benefits to a low degree. Most noticeably, e-commerce has not led to lower costs of procurement – a clear indication of the downstream focus in the e-business strategies of the case companies. The lack of benefits in reduced labour costs and improved match of production and demand levels can be read as yet another symptom of this trend. Consequently, SMEs are improving sales by e-commerce, but not cutting costs.

Case examples – Main benefits of using ICTs
Improving business operations, services and channels: Peck.it: The Internet expands our market reach - It allows get much more clients Deus' Cheveau: "In our case, we get a bigger market, access to more customers" Flashmall: Work distribution. You get the right person, balancing the load of work. Aarstiderne: Operating an Internet subscription service on vegetables, bread and fish is cheaper than selling from traditional shops CED GAD: Better, faster and more secure services Blume2000: Improved marketing channels, customer satisfaction, cost reduction Flashmall: Better time management. **Creating and benefiting from increased market efficiency:** Grow in Life: Gathering a geographically widespread demand for a niche product (pregnancy clothes) BlueMarx: Gathering demand electronically is an efficient way of increasing buying power for consumers. ELFA: "Efficiency - it is faster and therefore we can faster services". Globetrotter Ausrüstung: Fast information flows and automation of processes: E-mails to suppliers are automatically generated when stock levels are low. Pays de France: Building loyalty by connecting supply and demand parties in an efficient way.

Again the examples in table above, show that the main benefits experienced from ICTs reflect e-commerce and CRM more than e-SCM.

When it comes to measuring the cost/benefit ratio in the retail SMEs, the case companies prove reluctant to answer. Many cone-commerce revenue and even e-commerce systems costs confidential information and choose not to disclose any figures even when promised anonymity. Others are unable to provide specific figures for cost and benefits, as they simply do not know. Examples of costs and benefits are provided in the tables below.

Case examples – Quantitative benefits of e-commerce
20% increase in turnover, 10% increase in employees
2% increase in turnover, 2% increase in revenue, 1% increase in employment
Grew from 6 to 18 employees in 2000
Grew from 3 to 4 employees in 2000
Grew from 3 to 4 employees in 2000
16% increase in overall turn stemming from e-commerce.
Grew from 8 to 36 employees in 2000, but has now been closed.

Naturally all the pure players have experienced a 100% increase in turnover and employment, as everything stems from e-commerce. The pure-plays are Aarstiderne, Ablewood, Bluemarx, Deus' Cheveau, Flashmall, GrowinLife, Pays de France and Ask-Smith. Many of these companies still have not turned a profit, making the cost/benefit negative so far. However, ICT investments are indeed considered an investment in future revenue and several of the case companies show remarkable growth.

Indications of the costs involved in buying e-commerce systems are presented below.

Case examples – Quantitative costs of e-commerce (in euro)
E-commerce: 400,000 (estimate)
E-commerce: 380,000
E-commerce: 120,000
E-SCM: 40,000
Collaborations tools: 10,000
E-commerce: 134,000
E-SCM: 110,000
E-commerce: 100,000 (estimate)

In addition to these costs it is important to consider the many internal man-hours spend implementing and managing the e-commerce applications. For instance, Globetrotter.de has employed an IT-specialist who has spend the last ten years full time developing the proprietary ERP system. For many of the case companies, is to early to say, whether or not the ICT investments made are justified or not, but the companies do feel confident about their business prospects.

6.3.2 Barriers towards using ICTs

Table 6.5 below points to barriers to using ICT experienced by the 14 retail case companies.

Table 6.5: Barriers to using ICTs in business networks

	Not at all	Low	Some	High	Very high	Cases
Too high cost	8%	25%	17%	42%	8%	13
Too few people/too little time	8%	50%	8%	25%	8%	13
Management is against	58%	25%	17%	-	-	13
Employees are against	50%	17%	33%	-	-	13
We are bound by present systems	8%	31%	39%	15%	8%	13
We don't know which system is best	25%	8%	58%	8%	-	12
Any system will too quickly be outdated	25%	50%	17%	8%	-	13

As shown, the principle barrier is lack of resources – first and foremost in terms of the high cost of ICT applications, but also in terms of staff and time. This problem appears to be partly one of knowledge, as a majority of the companies at least to some degree do not know which system to get and what price to expect to pay for it. With standard systems being developed and qualified technology providers readily available, it seems that the companies could be helped by easy-to-use guides or guidelines about technology options.

Case examples – main barriers to using ICTs in business networks

Peck.it: The "offline" or "bricks" part of the organisation, which is the sole supplier, is not ready to implement e-SCM.

Flashmall: IT knowledge of users and finding qualified employees.

Pays de France: 1) Financial problems due to lack of risk taking investors as investors resist the company fearing a long payback time. 2) French agricultural organisations are too conservative and farmers lack technical skills.

Deus-Cheveau: "The same as in all the cases in France, the individualist spirit of French entrepreneurs. The real problem is that we are very far from advanced ICT-based collaboration between French SMEs. First we should speak about networks, then about simple communication between the actors, and finally we could implement complex systems."

Ablewood: The French customers are used to Minitel, so having them change to the web is difficult.

ELFA: It is expected that the business always are open - 24 hours at day. Payment - there is no confidence to the systems among the customers

Case examples – main barriers to using ICTs in business networks
Grow in Life: Payment – there is no confidence to the systems among the customers. Get traffic. It is very expensive to buy traffic – try to use publicity! It can be difficult to choose technology – learned that it is not important to be tech-front-runner Blue Marx: to get traffic - to get people to visiting the site. Import problems – the Swedish customs and the EU-law makes is an administrative burdens. Payment on the Internet is not working in Sweden. Globetrotter Ausrüstung: Supply side: The suppliers are not ready. Demand side: Customer use of ICTs and consumer cost of Internet use.

The case examples reflect the fact that there can be many barriers in play when adopting ICTs. Yet the case companies are all examples that there barriers can be overcome.

6.4 Conclusion and policy recommendations

This section concludes the report by summarising main points, by presenting a SWOT-analysis of ICT use by retail SMEs and finally by outlining policy recommendations inspired by the sector analysis.

6.4.1 Summary of main points

Through the retail study, the following main points have been made:

ICT Trends

E-commerce, or **e-tailing**, is the major trend in SME retailers' use of ICTs. The **e-commerce applications** generally feature catalogues, product information, possibilities of requesting additional information, and facilities for ordering online. Systems for **online payment** are not yet a standard element of e-commerce solutions and still pose a challenge in some countries as the financial service infrastructure is under development.

While order management is a service well underway in SME e-tail, product configuration and m-commerce are still trends for the future. Developments in use of **ERP** and **CRM** systems are promising. Two thirds of the SME case companies already have these systems in place, and further development is placed high on the ICT-agenda.

Thus, the **current investment focus** is on further developing e-commerce, CRM and ERP applications and associated business practices. The **future investment focus** (2-3 years) includes further automation of downstream business processes and integration of front end and back end systems. Investment in m-commerce is also been considered by some SME e-tailers.

Strategic trends

SMEs are increasingly turning to multi-channel and **clicks-and-bricks** strategies. Retail SMEs seek **competitive advantages** in niches, brands, service excellence and operational excellence. Service excellence comes mostly in the form of e-commerce (which often is considered a service) and information add-ons on web pages. Operational excellence is so far a matter of streamlining internal processes more than a matter of full-blown virtual value chain integration.

E-tailing can be a driver of **internationalisation**, but most of the SMEs studied take a precocious roll-out approach rather than a born-global strategy. The SME e-tailers generally seem focused on their home market with a view to future expansion to neighbouring countries, even though a few do opt for international niche strategies.

While the SMEs are **innovators** by being early adopters of e-commerce, the case studies only suggest limited evidence that ICTs lead to increased innovation.

SMEs are laggards in creation of virtual value networks

SMEs lack behind big players in use of virtual market places and e-SCM. It seems SMEs await the moves of bigger players I order to follow suit. Thus, advanced forms of ICTs are not used for procurement as of now, but SMEs are showing an increased interest in doing so. However, some pass on the responsibilities by pointing out that manufacturers and wholesalers are less ready and technology savvy, thereby slowing down the drive to automation and virtual integration of the value chain.

Furthermore, SMEs seem to be slow at implementing **new forms of marketing** (affiliate marketing as with non-exclusive partnerships, referrals, hyperlinks). The case companies do not exhibit advanced forms of such marketing innovation.

Cost-benefits

Cost-benefits of ICTs investment are unclear for SME e-tailers as many e-commerce operations still have not tuned a profit. Investments are made with a view to growing sales more than cutting costs. Thus, the **main benefits** incurred by using ICTs are extension of distribution and marketing channels, improved customer satisfaction and partly also reduction of product-to-market lead time and better information collection. The case companies show an increasing focus in return on investment (moving away from burn rate strategies).

The main barriers to ICTs investments are high costs of ICTs, shortage of personnel and track dependency, as SMEs feel bound by present systems.

The analysis presented in the report give rise to the **SWOT-analysis** presented below:

Strengths:		Weaknesses:
The Internet is a low cost marketing opportunity.	But…	Though the Internet provides relatively low cost opportunities, ICT investments can be too expensive to some SMEs.
The specialised focus and niche approach of many SMEs is suitable for building brands – both online and off line.	But…	On the internet, the winner often takes it all, and it is difficult and expensive for SMEs to build brands online
With e-SCM fewer people are needed to provide better service and control, i.e. small can act as big	But…	Big players have the capital enabling and economy of scale justifying investments in e-SCM. And SMEs have been slow at implementing e-SCM.
With CRM, fewer people are needed to provide better service, i.e. small can act as big	But…	Many SMEs lack ICT skills and experience difficulties hiring qualified ICT-skilled staff.
SMEs with local presence often have close customer contact and customer loyalty. This can be transferred to the web in clicks-and-bricks strategies. Conversely, SME pure play front-runners can open physical stores to leverage the online brand.	But…	Once consumers get used to shopping online, local presence is no longer as big a competitive advantage. Big retail portals like Amazon.com or Buy.com can offer discount prices and have more funds for marketing. SMEs without a clear brand are threatened.
SMEs are less restricted by "old economy dead weight" such as physical outlets or large sales forces.	But…	Fixed cost of implementing e-commerce applications (e.g. software and hardware purchase) is a heavier burden to SMEs than to large enterprises.
Opportunities		**Threats:**
Sourcing from virtual marketplaces allows SMEs to find suppliers at low cost	But…	B2B retail market places and exchanges like World Wide Retail Exchange are open only to large players or at least players big enough to support necessary investments solving ICT-integration issues.
Virtual shopping centres/ electronic malls allow SME retailers to operate a store at low cost, while benefiting from the brand of the centre (e.g. Yahoo!).	But…	The centre is branded, not the small e-tailer. Thus, the centre can choose to launch a fully integrated supply chain of its own taking over the role of the SMEs.
E-commerce can be a driver of internationalisation	But…	Again the big players often have bigger brands
Tag on to e-SCM systems of large manufacturers and wholesalers	But…	Manufacturers and wholesalers can become e-tailers themselves.

In the off line world, retail brands are partly build by physical presence in a number of spots. In the early Internet days, the online and offline worlds were considered worlds apart, and early adopters like Amazon.com could create big brands by being first. Now, however, clicks-and-bricks bring together the online and offline worlds, and the big chains regain the competitive advantage of having a distributed physical appearance. Such presence does not only force the clicks-and-brick brands into the minds of prospects, but also create new opportunities for combining both channels, as seen with show rooms for physical product contact and outlets for picking up or returning goods ordered online.

6.4.2 Policy recommendations

The main influence of ICTs in the retail sector comes in the form of e-commerce. While e-commerce should not be favoured policy wise at the expense of traditional commerce, the global span of e-commerce does raise the issue of how to secure the competitiveness of European enterprises vis-à-vis the rest of the world. Furthermore ICTs are changing the workings of the business world and Europe must be up to date to enjoy the benefits of better products, better services and better lives facilitated by ICTs. By implication, furthering the up take of ICTs in SMEs does seem to be a worthy cause for enterprise policy.

In the rush to save the riches, many countries are adopting e-policies, where the furthering of e-commerce is a main concern. Typical policy challenges and suggested measures to further e-commerce are oriented to the consumer as outlined in table 6.6 below.

Table 6.6: Business oriented policy challenges

Problems	Policy oriented actions
Consumer resistance to e-commerce	Facilitate trust by standardisation, codes of conduct, special seals and other 'co-regulation'.
Consumer ICT skill shortage	Provide more and better ICT-education.
Consumer ICT costs are too high. Studies have shown, that consumer online expenditure is inversely proportional to the cost of Internet access. The cost barrier is greater in B2C than B2B.	Facilitate faster and cheaper Internet connections. Liberalisation of the telecom industry is well underway and should solve the cost barrier problem.

Though these issues have not been central to the present study the focus on consumers in the retail sector does make them relevant in a policy perspective and lead to the first recommendation.

Recommendation 1:
Continue benchmarking the ICT infrastructure available to and used by consumers and businesses in European countries as compared to other front running countries. Adopt policy measures to secure a world class ICT infrastructure.

The consumer-oriented suggestions are also in line with some of the suggestions made by the case companies in the present study as shown in the table below.

Case examples – Policy comments and recommendations
German company: “The German and European law should make it easier to shop online. Today, conditions in e-commerce are complex. It is inconvenient for customers having to read and accept complex terms of agreement. We also experienced having to change delivery terms following a new law. Generally, we need improved education making it easier to find qualified personnel in IT. But also ICT costs are a barrier to SMEs. They do not have to develop systems in house, but then they need help finding the right standard system”. Another German company: “We need common taxation of e-commerce in the EU and programs to increase availability of qualified IT-labour” Italian company: “in order to get more people to buy online, we need faster Internet connections for consumers” Another Italian company: “The state should provide for better IT education”. French company: “In order to stimulate IT-based business networks, you need to show French entrepreneurs the advantages, but i think that will be difficult, because the French spirit is very individualistic. The French companies want to control all the steps of the value chain themselves instead of outsourcing and collaborating with network partners”.

However, the overall perspective of the present analysis has taken a focus different from consumer issues. The SWOT analysis in the previous section points to several challenges to SMEs that can be addressed by policy initiatives. By analysing how SME implement e-commerce strategies, new business oriented policy issues appear as shown in the table overleaf.

Table 6.7: Business oriented policy challenges

Challenges	Policy oriented actions
Lack of skilled ICT staff. SMEs and business partners are not ready to use ICT in collaboration.	Facilitate ICT training and education at relevant levels and from relevant suppliers.
SMEs are less visible in an online world	Facilitate marketing training and education at relevant levels and from relevant suppliers. Facilitate a B2C retail portal were SMEs can market their products at low cost.
Administrative burdens to companies and consumers related to e-commerce	Reduce complexity of rules and provide for common rules in the EU
Financial system is insufficient	Facilitate pan European forms of online payment and e-business services available to SMEs.
Fixed costs of e-commerce adoption favour large enterprises over SMEs	Provide tax or other incentives for SME adoption of ICTs
Prejudice about costs of implementation being too high. Policy implication:	Facilitate access to information about availability of low cost standard solutions and cost benefit calculations.
Taxation differences intra-EU and between EU and non-EU countries create an uneven playing field. Also, e-tailers may create loopholes in tax laws and other industry regulation.	Provide for common rules in the EU – e.g. in taxation of e-commerce
Too little time	Facilitate ICT information service centres in order for SMEs to have easy access to unbiased advice

Evaluating these challenges and possible actions lead to policy recommendation 2-8 (se table).

Recommendation 2- 8
Recommendation 2: *Benchmark the up take of e-commerce, e-CRM, virtual market places and e-SCM by retail SMEs in European countries as compared to other front running countries.* ***Recommendation 3:*** *Asses conditions available to retail SMEs in EU countries in terms of ICT infrastructure, service provision and work force.* ***Recommendation 4:*** *Further the process of harmonising EU rules and regulation for e-business considering marketing, consumer rights, product safety, taxation and online payment.* ***Recommendation 5:*** *Promote enterprise clusters, partnerships between large firms and SMEs at a local level, virtual value networks and international alliances.* ***Recommendation 6:*** *Explore the need for Technology Information Centres and test the possibilities of facilitating them. Such centres could provide information and training in relevant ICT, marketing and business strategy skills.* ***Recommendation 7:*** *Explore the need for a pan European B2C retail portal on which SMEs can market their products at low cost.* ***Recommendation 8:*** *Explore the possibilities of facilitating virtual value integration of SMEs.*

While the policy challenges seem to call for straightforward policy actions (as indicated in the table), a real issue is whether finding solutions should rather be left to the market. Indeed, the challenge of bringing companies (SME or not) online has created numerous new businesses, while also providing many opportunities for existing companies in the advertising, software, and consulting industries. So while the present study demonstrates a need in SMEs to know more about what ICTs to implement and the nature and scale of the associated costs, publicly funded technology information service centres may not be necessary, as consultants and media companies may well be able to covers needs for even unbiased advice. But facing the fact that many European retailers are micro sized or SMEs, does point to a lack of knowledge and information search capacities as a main challenge. Many small players may not have the time or the trust needed to turn to market sources for information. Therefore, information activities flowing though the personal network of SME managers should be considered.

A key finding of the present study is the fact that low ICT use in business networks and lack of virtual value chain integration with suppliers prevent certain benefits from being realised by retail SMEs. Again, remedies call for education of companies along the supply chain. Cost and benefits need to be clearly demonstrated. Technology information centres could perhaps succeed in educating and informing SME managers by leveraging a free service approach and image.

Also, common standards could be considered, but market forces should be able to take a lead here and indeed, they already have supported by organisational initiatives such as the Collaborative Planning, Forecasting and Replenishment Committee.

Another option is to consider facilitating virtual market places aimed at SMEs to counter balance the market places aimed at large enterprises. Such market places could be both B2B and B2C. These points lead to the forth and final policy recommendation following from the analysis in the present sector report:

Recommendation 9:
Explore the need for virtual market places specifically aimed at SMEs and test the possibilities of facilitating them.

7. The Tourism Sector

The Tourism sector analysis is structured in 4 sub-sections:

Subsection 7.1 Provides a sector outline featuring general trends and the role of SMEs in the tourism sector.
Subsection 6.2 analyses the use of business network ICTs in the SME case studies.
Subsection 6.3 analyses ICT facilitated business networks.
Subsection 6.4 concludes the report by a SWOT analysis and policy recommendations.

7.1 Sector outline

The World Tourism Organization defines tourism as the activities of persons travelling to and staying in a place outside their usual environment for not more than one consecutive year and for leisure, business, and other purposes.

Following main sub-sectors constitute the tourist industry:

- Transportation
- Intermediaries
- Attractions and destinations
- Accommodation.

Sector definition

The tourist sector does not have its own NACE code and spreads across several sectors. The most important NACE sectors are:

- NACE 55: Hotels and restaurants
- NACE 63: Auxiliary transport activities (travel agencies)
- NACE 92: Recreational, cultural and sporting activities

7.1.1 Characteristics of the sector and general trends

The tourist industry has a great (and still growing) importance in direct economical terms, contributing to 5.5% of GDP in the EU. It is currently estimated that tourism-related activities directly account for 6% of total employment and more than 30% of external trade in EU member states.

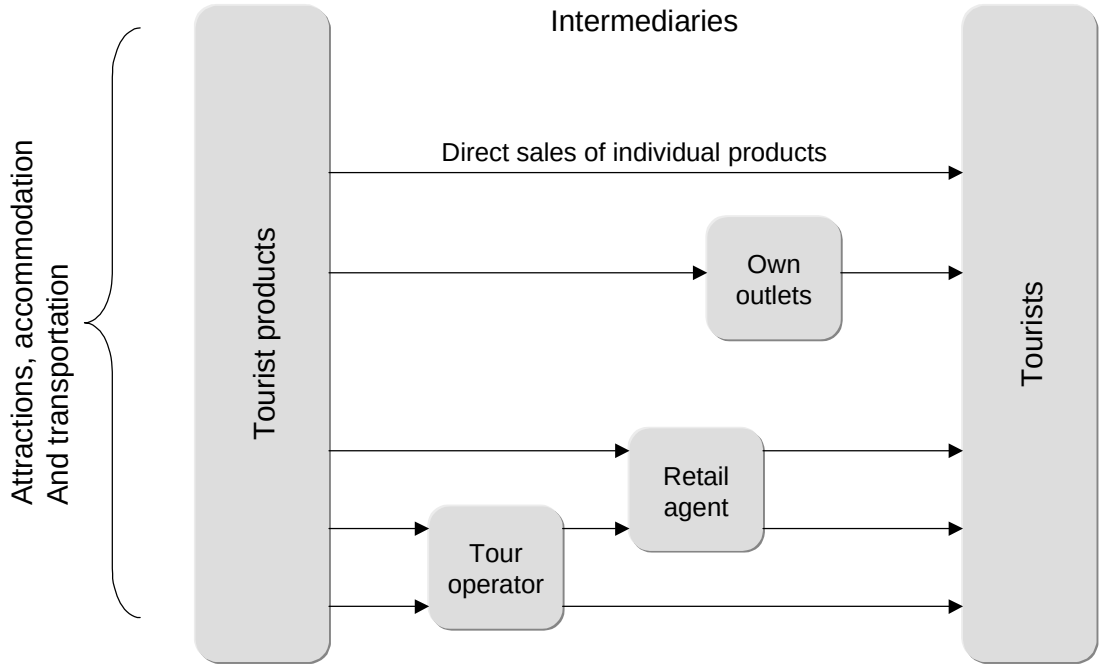
Tourism is an essential element of regional development strategies for many countries. This is especially true for marginal agricultural or

industrial areas in the EU where small tourism companies are the foundation for growth in future employment.

There are some 2.7 million SMEs in European tourism sector (West, Central and Eastern Europe), employing some 17 million people and accounting for 99% of all companies in the tourist sector. Most of the SMEs are micro-operators with less then 10 employers. By comparison there are only a few hundred large organisations defined as employing more than 250 people each.

Complex linkages exist between the individual sub sectors of tourism. A simplified model of interrelationships in the industry is presented below.

Figure 7.1: Tourism supply chain formats



The industry is very fragmented and diversified, with many relatively small and different enterprises[14].

[14] This includes (among others): travel agencies, tour operators, hotels and other accommodations, restaurants and other F & B services, transport companies, incoming agencies, health enterprises, tourist information centres, leisure-, theme-, adventure parks, sports facilities, associations of the tourist industry, souvenir industry, travel equipment outfitters, mee-

At the same time, the tourist sector is traditionally dominated by large organisations and players, defining (and almost regulating) the 'fundamental rules'. The big players include (among others) supplier reservation systems and airlines in the transportation sub-sector, major hotel chains in the accommodation sub-sector, and brand name tour operators in the intermediation sub-sector.

Case focus – Vejle Rejser **A classic travel agent with a niche product**
One of most important competitive parameters of the company is their specialised way of communicating with customers. Vejle Rejser builds their IT systems and educates the sales staff in using the CRM functionality in their ERP system. In this way, things will only be asked once and based on the customer pattern build on each customer only relevant offerings and alternatives. The only IT system currently used is the financial system Concorde XAL. This system is used as primary sales system, financial system and CRM system. The company participates in the ITP to strengthen their international position. Furthermore the company has provided knowledge for developing general travel industry systems, making the agents able to transfer negotiated fare rates to the reservation systems. The investments in e-commerce enabled IT systems has significantly improved efficiency and revenues.

General trends

The situation in the whole sector is far from static. The industry is per definition very information dependent and its products - by nature - very complex and network-based. The rise of Internet has therefore a great influence and impact on dynamics in the sector, its structure and interrelationships. Some of the most important are:

Increasing competition

Competition in the tourist sector is becoming fiercer as Internet transparency makes it increasingly difficult for traditional companies to keep their offers proprietary. At the same time, Internet technology allows end-customers to gather extensive information about different tourist products increasing thus their bargaining power. Both of these trends erode profitability in the industry, increase focus on costs and lead to very sharp price competition.

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ting/conventions, etc., event industries, airports, travel insurance, artisans, culture and entertainment enterprises, global distribution systems and reservation systems, publishers and distributors of travel literature and maps, and bureaux de change.

New players

The increasing number of competitors, especially in the intermediary sub sector, amplifies this development. Internet technology reduces greatly the entry barriers for the newcomers in this sub sector. It is not necessary to have a trained sales force or invest in costly physical assets. Many traditional tourist companies find themselves under pressure and have to match offerings from new dotcom competitors with small fixed costs.

Disintermediation?

The existing participants, especially in the travel and destination sub sectors, are broadening their market and geographical reach. Internet constitutes a convenient way to bypass existing intermediary channels (agents, operators) and to establish a relatively cheap channel for direct sales and transactions.

This disintermediation process, (and the following re-intermediation with new players like digital marketplaces – not necessarily stemming from the industry itself) greatly threaten established intermediary players, many of them being SMEs.

But Internet (or IT in general) is by no means only a threat for the SMEs in the tourism sector – it is also an enabling technology and an opportunity. It provides an opportunity to promote SMEs brands, to offer value-added services in addition to basic products (flights, hotels), to customise and tailor services to individual tourist (based on the gathered information) and to establish new and innovative co-operation structures with other SMEs.

7.1.2 Implications and issues for SMEs

Existing SMEs will have to respond to above trends and developments, and adapt to new and more competitive market situations in the tourism industry. They will have to rethink their business models and reassess their future positioning in the customer value chain - their interactions and co-operation with other players within the value chain - suppliers and business partners. They will have to redesign their products and offers to increase value proposition to their end-

customers and thus shift the competition from the price. And consequently, they will have to redesign many of their business processes.

SME flexibility and ability to innovate and respond to a rapidly changing environment is a great advantage here but many operational and practical issues still remain to be resolved. The level of know-how can be insufficient, the integration of systems can be very complicated and development cost or marketing costs are often prohibitive for small enterprises.

7.2 Impact of ICT in the sector

In order to understand the trends of ICT in the tourist sector, it is very important to recognise that the travel industry was very early in adopting large scale information systems to handle sales, product management, procurement, business logic and related transactions.

For almost 30 years, virtually all players in the tourist and travel market have been connected to and have used Computerised Reservation Systems (CRS).

There are four major CRS in the world:

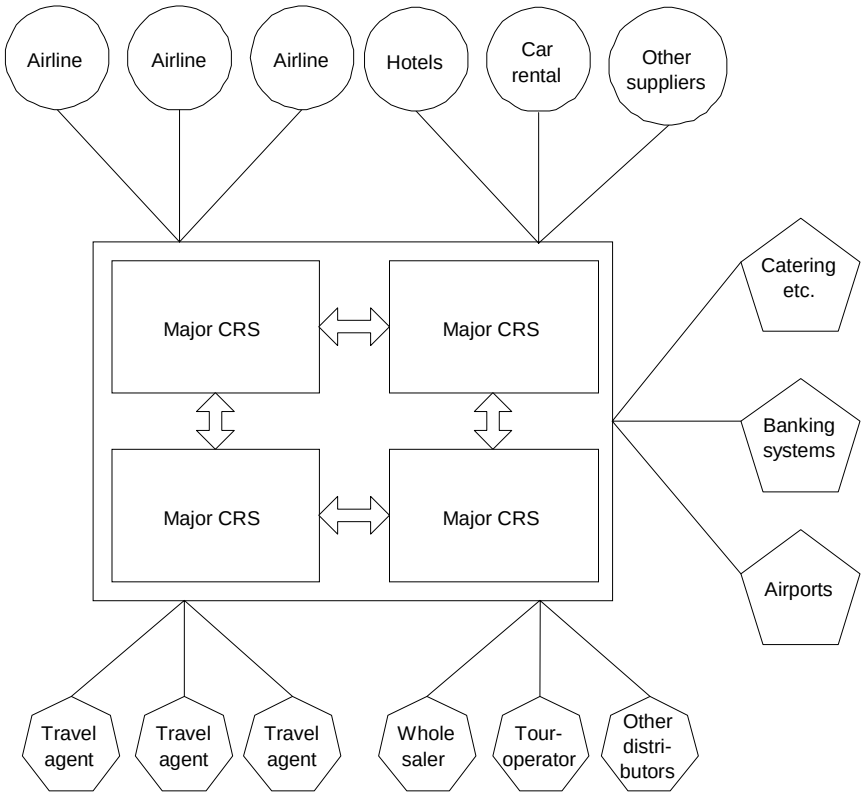
- Amadeus (Spanish origin)
- Galileo (American origin) (Also covers ‘Apollo’)
- Sabre (American origin)
- Worldspan (American origin).

Virtually all travel agents, wholesalers, airlines, hotels, banking systems, governmental institutions and many others players in the travel business have computer connections to at least one major CRS. For three decades, these organisations has been using the CRS for selling tickets, procurement, financial transactions, issuing visas, issuing travel insurances and almost all other business procedures involved in the tourist business.

Because so many of business procedures in the industry has been executed by large scale computer systems for so many years, the evolution of modern ICT systems has not significantly changed the business networks in the industry. However the quick adoption of fast Internet connections has created new ways of communicating with suppliers, partners and customers.

Since a significant percentage of products, some retail prices and other business functions are already stored and organised in the CRS; the industry was quick in making the content available for commercial use on the Internet.

Figure 7.2: Traditional information flows in the travel industry



All participants in the travel and tourist industry are connected to the CRS. All major CRS are interconnected and update each other at a high frequency. The airlines and other similar companies often have their own reservation systems keeping exact records of which seats are reserved by whom. The airline then updates the major CRS and this illustrates one of the classic travel industry problems:

How to ensure that a specific seat in a specific aircraft, leaving a specific airport at a specific hour is only sold one time?

This means that the millions of worldwide travel agents selling airplane tickets, who all have access to be able to reserve the same seat, will then be able to find out as soon as the seat has been sold.

7.2.1 Technology overview

The sector reports include a 'scoreboard' of ICT maturity and a benchmarking of ICT use in network relations. The content of the each of these are explained below.

The analysis of ICT maturity in the sector case companies includes four dimensions: IT infrastructure, E-commerce, Customer Relationship Management and Supply Chain Management. Maturity in each of the four dimensions is determined by the frequency of a number of functionalities as described below.

IT infrastructure is evaluated on four dimensions:
1) Internet homepage – can be for information and marketing purposes only as e-commerce is dealt with elsewhere. 2) Intranet: A private network within the company using an Internet protocol (e.g. TCP/IP). Intranets enable file sharing and message posting within an organisation but may well bind together geographically dispersed entities. 3) Extranet: A closed external network connecting a company to suppliers, partners or customers using an Internet protocol. An extranet requires security, often provided by firewalls. 4) ERP-system: An internal IT-system for handling of production planning, logistics, sales, accounting and human resources. To put it simple, ERP is the back-office and E-commerce is the front-office.

E-commerce is evaluated on eight dimensions:
1) Catalogues with price information, product data and pictures available at web page. 2) A feature for costumers to make requests through the web page in more or less interactive ways. 3) Product configuration – products are made to order and costumers are given the option to specify product options at website, thus participating in the design of their individual products. 4) A feature for ordering online 5) Order management including shopping cart, order notification, and order status (track and tracing) 6) Payment online 7) Use of marketplaces for procurement 8) Mobile services (e.g. M-commerce, SMS messages, WAP features)

E-customer Relationship Management (CRM) is evaluated on four dimensions:
1) Electronic customer database (storing historical data on customers) 2) Data analysis / data mining (analysing and grouping customer behaviour, profitability etc.) 3) Personalisation (using password, cookies etc.) 5) Online customer service
E-Supply Chain Management (e-SCM) is evaluated on four dimensions:
1) Use of EDIFACT / light EDI connection with partners. Using DEI (electronic data interchange) is a way of automating communication between network parties (trading partners). EDIFACT is a standard for such data exchange. An EDI message contains a string of *data elements*, each of which represents a singular fact, such as a price, product model number, etc. Thus, EDI is the exchange of business data using an understood data format and is a predecessor of today's Internet. EDI involves data exchange among parties that know each other well and make arrangements for one-to-one (or point-to-point) connection, usually dial-up. EDI is expected to be replaced by one or more standard XML formats, such as ebXML. **2) Integration of planning functions** These processes include shared access to information across companies by integration of information on demand forecasting, distribution, transportation and manufacturing planning and scheduling **3) Integration of execution functions** Here, not only planning information is shared, actual production and fulfilment is automated by integrating companies by automating procurement, manufacturing and distribution. For instance, when stocks are low in a (automatic order planning, production and distribution) **4) Shared databases with market data** Here, full integration in supply chain is achieved by joint access to databases.

7.2.2 ICT trends in the sector

The companies in the study have been asked about the current ICT trends in the sector as well as future ICT trends.

The respondents have indicated the following concerning current trends:

Current trends

The main trend in the industry is to find ways of making the CRS content available on the Internet.

All major CRS provide web front-ends and integration facilities for use by the travel and tourist companies. SMEs use many resources to transform their website so that their business models fit the standard CRS integration facilities. A popular example is the Expedia website by Microsoft. This is an online travel shop as a front-end to the Worldspan CRS.

Future trends

Concerning future trends the respondents have indicated the following:

Transforming public CRS content (availability, etc.) to blend with product prices stored in the SME back-end systems.

Case examples: ICT projects planned for the next two years
Go to Scandinavia AB: Consolidating regional database structure to central on-line databases. **Travel Select:** Front-end: Development and XML enabling of website. Modular approach to future developments. Back-end: CRM system and replacement of telephone system. **Hostelworld.com:** Aims primarily to link more hostels to the side. Also plans to expand solution to hotels and flights and to improve website and booking features. **Interpub LTD:** Wants to increase level of use of online booking to 80%. Is currently booking at a system for smart cards for hostel reservation, which can be used at check in and as a key to rooms (self service). A similar system is used by French hotel chain Formula One. The benefit achieved is less need for personnel. **Cofman.com:** Won't necessarily implement new systems. Plans to have invoicing from suppliers sent directly to customers.

Most used flight information such as information about seat availability needs on-line access to the CRS in order to keep constantly updated. More static information such as prices, fare rules, etc. can be obtained directly from SME product databases or ERP systems.

However, for the smaller SMEs, this blend requires very high skills in ICT systems. Some companies choose to let a third party company transform the product prices to a format understood by the CRS and to upload the content into the CRS.

'Go to Scandinavia' described as a case example, has developed such a product. The larger SMEs often use already developed middle-tier applications developed for call centre usage to publish fares on the Internet. Functionality for availability search and booking of airline flights can only be handled by the CRSs or by the airline itself.

To summarise, the following future trends is expected:

- <u>Making product portfolio, booking facilities and other retail/call-center functions available on the Internet.</u>
  It is essential for most SMEs in the sector to have a full product portfolio and related features available on the Internet. However this is also one of the major barriers to product differentiation since product comparison by the customer becomes much easier on the Internet.

- <u>New ways of reserving and procuring products.</u>
  The larger SMEs see a trend towards establishing direct communication facilities with the suppliers avoiding the use of the CRS. Also, new small-scale specialized reservation systems are emerging on the Internet. This is specially seen for smaller hotels and other suppliers too small for participating in the global CRS.

- Cross-sector organised Internet portals.
  Outside the scope of the major CRS, Internet portals organised by e.g. interest groups containing competitive suppliers within the sectors are arising. One example of a portal is created by the 'Danish Tourist Board' new website to be launched this summer.

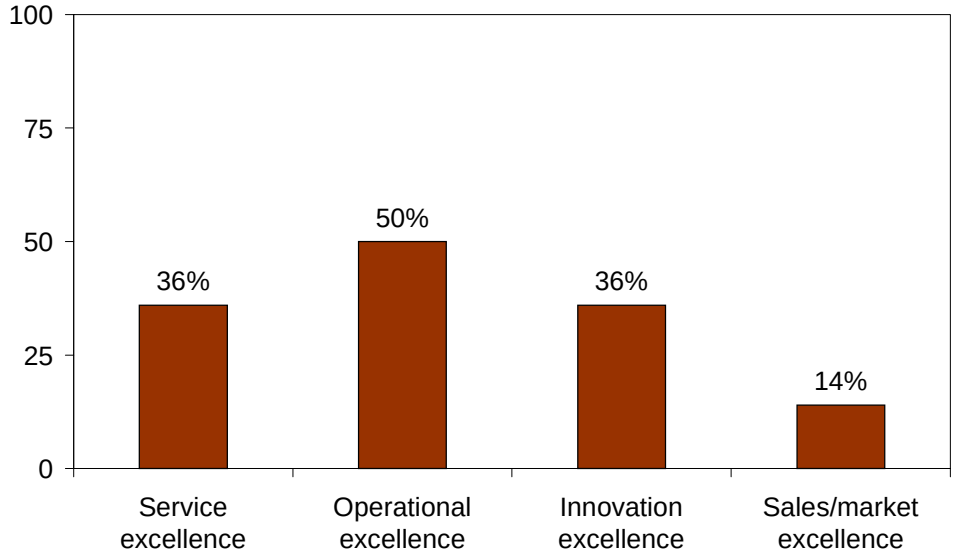
Case focus – Go to Scandinavia **Selling adventures on-line**
The company is working towards being the leading "on-line travel agent" in Scandinavia. The financial system used is called "Visma" and is used for customer registration and for CRM functionality. A self-developed system called "Rös" is used for connecting the financial system, the Amadeus reservation system and self-developed database systems. B2B ordering and invoicing has been on-line for some time now, and most customer payments are done with credit card.

7.2.3 Emerging ICT-facilitated business models

The companies in the study have been asked about the most important differentiation strategies. The respondents have indicated importance of:

- Service excellence: the delivery of superior value services
- Operational excellence: high quality products for a reasonable price
- Innovation excellence: continuous delivery innovative products
- Sales excellence: marketing driven products and company.

Figure 7.3: Strategic differentiation adopted by the case companies



50% finds operational excellence as one of the most important way of differentiating from competitors. The high share of 'operational excellence' emphasising that the travel industry in general is a low-margin industry and strict cost efficiency is mandatory.

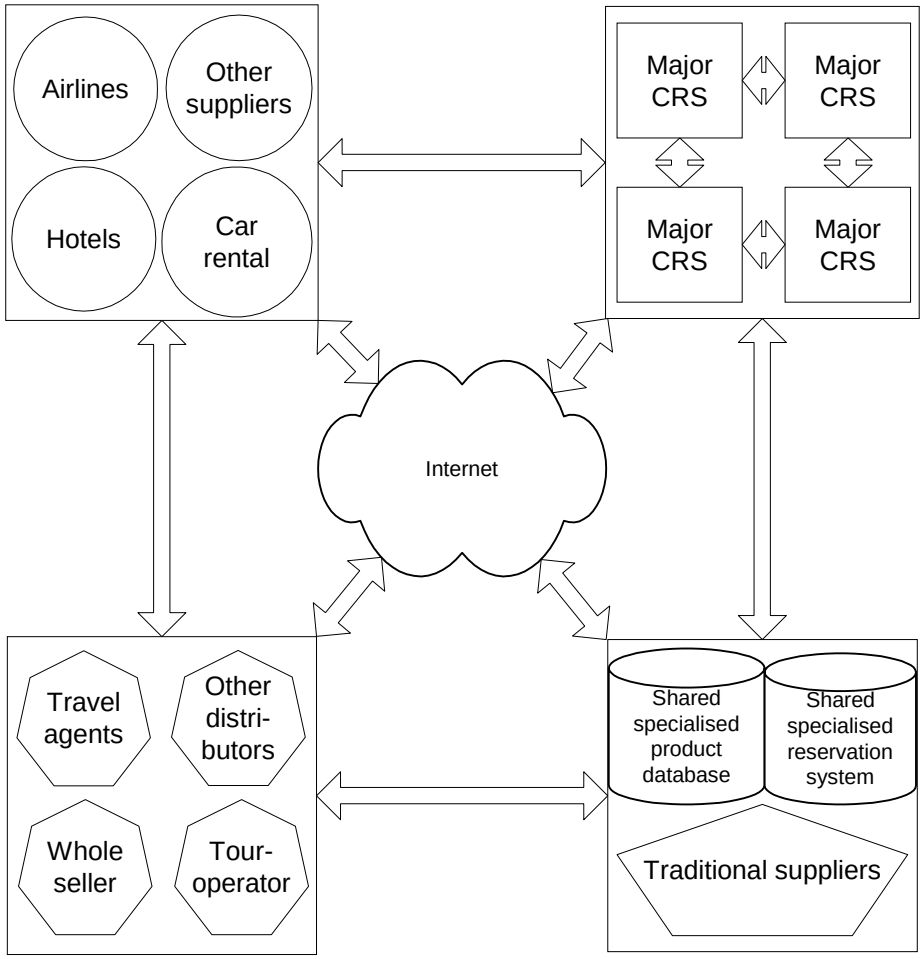
Service excellence and innovation excellence has been identified as being an important ways of differentiation. This indicates that the products in the industry are very comparatively transparent and therefore substitutable. The SMEs keeps and gains market shares by combining sales efficiency with high level of innovation and service.

Case examples: Competitive advantages achieved through ICTs
Go to Scandinavia AB: Unique combination of content and on-line booking. Mercian Travel: Uses proprietary database to search for price and availability information. Travel Select: Reduces information search time. Product development. Constant Innovation. Quick interaction with customers. Hostelworld.com: The business model is entirely based on the use of ICT. Bienvenue a la ferme: 1.To reach international customers. 2 to develop our brand, and make it more well know 3. Office closes very early and is not open in the weekend, but with e-commerce the company is open 24 hours 7 days a week. Accor Hotels: To expand market and allowing people that speak another languages to book Accor hotels services. Digitravel: Strategic focus on presenting knowledge and distributing software more than selling products directly, since the margins are very small for travel agencies. Net Reserve s.r.l.: 1.Good prices 2. Book trough Net Reserve is one option but the accommodations can deal with other systems. 3. Company software allows them to be very well located in search engines when someone is making a query about Tuscany. 4.easily manageable web site 5. If the accommodation provider doesn't use IT, the company develops a web site for the client.

Future business networks

Many of the interviews in the study revealed that the business networks are in a rapid change. Up until a few years ago, CRS suppliers were the platform for almost all business networks in the industry. However the quick penetration of especially high speed Internet access in all links of the supply chain changes the business networks to a mesh structure where all suppliers and customers communicate with each other.

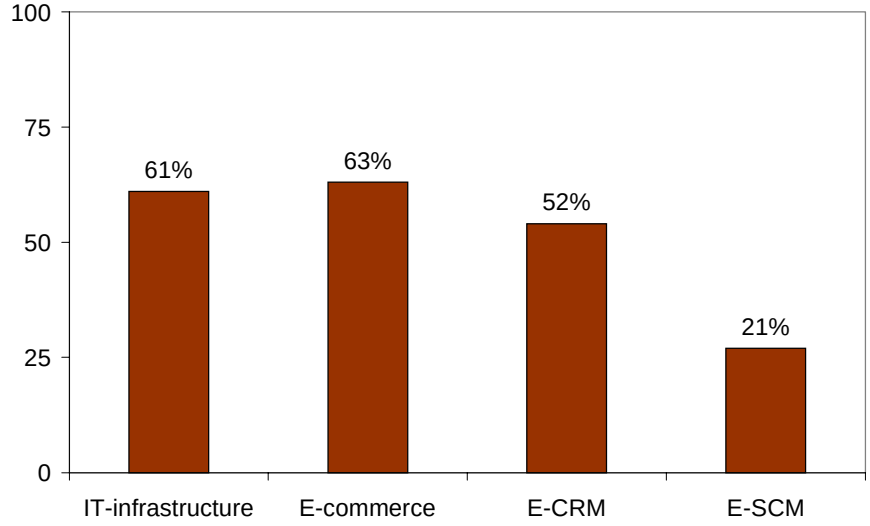
Figure 7.4: Future information flows in the travel industry



7.2.4 ICT infrastructure in SMEs

When measuring the IT maturity of the tourist sector, it covers four overall aspect of ICT use: IT infrastructure, e-commerce, e-customer relationship management and e-supply chain management. The ICT maturity of the sector, based on the 13 cases, is illustrated below.

Figure 7.5: IT maturity – Tourism sector



Before interpreting the maturity scores for the tourist sector, the earlier mentioned tight constraining of ICT maturity progress caused by the CRS usage should be kept in mind.

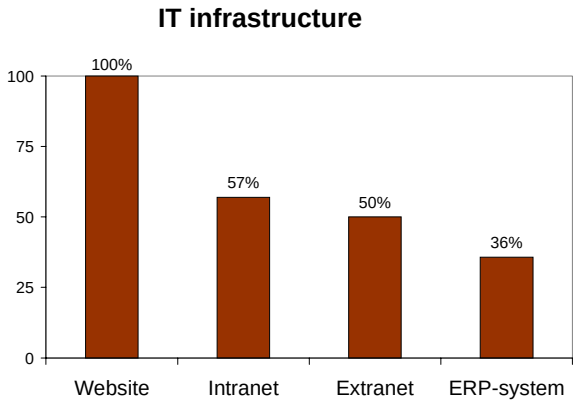
IT infrastructure in the sector, including web enabling, connectivity and ERP systems scores 61% in maturity level. This is quite high, considering the above-mentioned CRS constraints kept in mind.

E-commerce and E-CRM solutions are well adopted in the sector. Most of the SMEs in the study indicated that large customer databases have been created through the years because customers have always registered with name and address, etc.

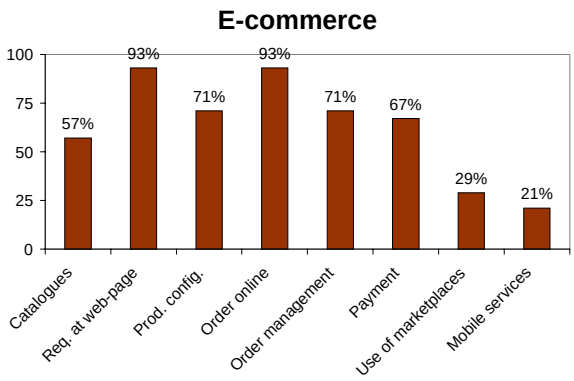
This information combined with knowledge of prior travel destinations etc. is now being used as a platform for E-CRM systems, which has shown significant effects on revenue.

All SMEs participates in the study are present with a commercial website on the Internet.

Approximately half of the SMEs have established an intranet for e.g. internal knowledge management. The same amount of SMEs has established extranet partnerships for communicating with e.g. suppliers and partners. A relatively small amount of the SMEs have established an ERP system. One reason for this is that the CRS contains simple facilities, which, to some extent, make investments in ERP systems difficult to justify. The share of installed ERP systems will probably increase in the future because the larger SMEs will have to support a multi-channel sales system with transparent price and product information and related services for retail, call centre and web-based sales.



Virtually all SMEs have implemented a facility for conducting sales on the Internet. This figure includes also the simple version allowing customers to send a message containing instructions about the purchase.

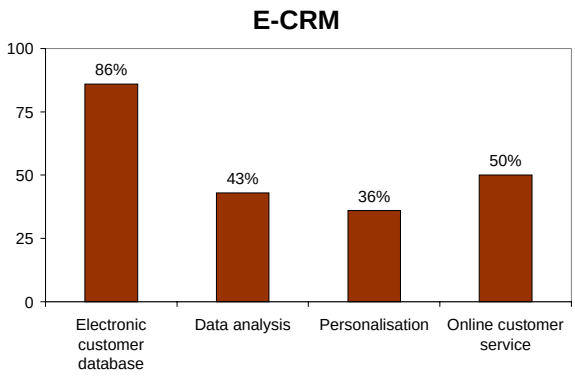


Almost 75% of these SMEs have added e-commerce functionality enabling the customer to perform product configurations, payment by credit card and the facility to buy several products in a 'shopping-basket' before confirming the order or making payments.

For a retail-class sector, the share of implemented catalogue products for storing and present products are relatively low. Most SMEs without an implemented catalogue product argued that the basic catalogue facilities offered by the CRS were sufficient for simple business models.

The tourist sector has, as already mentioned, a widely adopted habit of registering customers in databases either tailor-made for the purpose or as an integrated part of an ERP system.

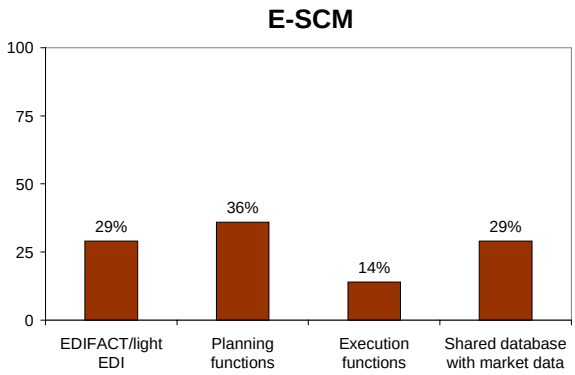
The registration has been performed in more than 85% of the SMEs. A significantly lower share of the SMEs utilises the information for customer sales or service purposes. This figure is expected to greatly increase in the coming years due to current investments made in CRM systems.



In general, the adoption of Supply Chain Management system in the sector is weak. Remarkably low is the usage of execution functions which are the ability to automatic order planning, production and distribution.

This is, without comparison, the best indication of the powerful SCM processing facilities in the Computerised Reservation Systems. CRS has facilities product availability, price setting, stock handling and full-chain distribution.

Most of the SMEs asked, stated that the low usage of EDI-based B2B mechanisms was due to the proprietary ways of electronic communication in the sector in general.



7.3 Collaborative commerce: ICTs in the value chain

Use of ICT in business relations can facilitate sharing of information, business transactions, operational planning and strategy development. To SMEs, the optimal use of ICT makes entirely new supply chain networks possible, resulting in a much stronger market position. There is conducted an analysis of the network profile of each company, indicating the number of partners, the degree of close relations and the level of ICT sophistication. The overview is presented in the table below.

Table 7.1: General network profile for the tourism sector

	Number	Closeness	ICT sophistication
Suppliers	Medium	High	Medium
Partners	Low	Medium	Medium
Customers	High	High	Medium

The number of partnerships in the sector is low and the number of suppliers is rated as medium. The main reason for this is that the airlines which stands for the, without comparison, most sold product in the sector does not count as a supplier – but the CRS do.

The sector has a remarkably high rate of supplier/customer loyalty.

The measurement of ICT sophistication in the table above shows that suppliers, partners and customers scores 'medium' in ICT sophistication. The main reason for this is the lack of ICT systems integration and use of advanced information exchange technologies such as EDI and XML, which is explained in detail hereafter.

Case focus – Cofman.com **Efficient Internet based rental of summerhouses**
The company uses the Internet as its only sales channel. All Internet development and hosting of operations systems is outsourced to a nearby placed company. All business logic, accounting and telephone support is done by cofman.com. Suppliers enter a special page on the Internet site and update availability information on a regular basis. This makes cofman.com a small-scaled reservation system for summerhouses throughout Denmark.

The ICT sophistication is determined by the use of network technologies in three levels of advancement. The typology of network technologies below constitutes a basic understanding of the nature of ICT use in external relations. Based on three generations of networks covered by the cases, the model describes the characteristics of the relations.

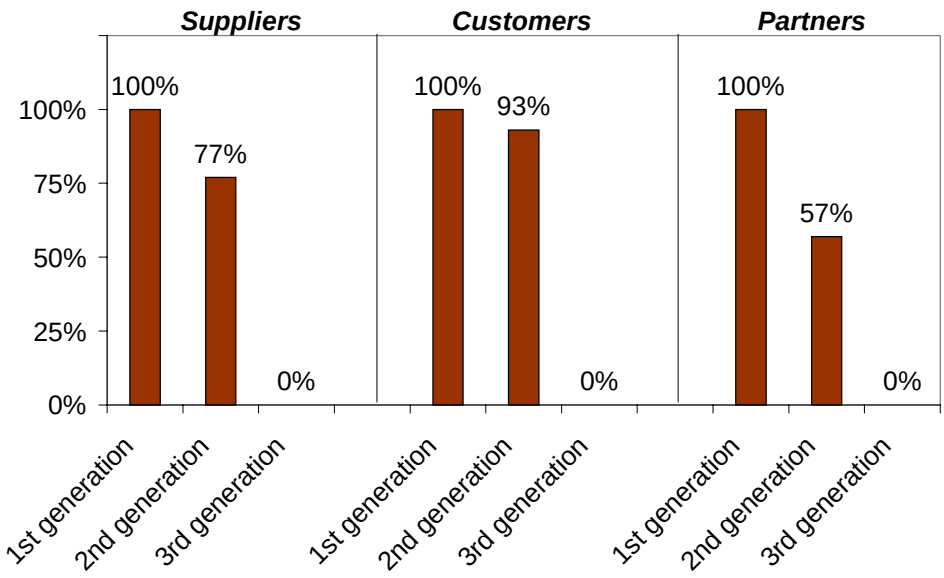
Table 7.2: Three generations of ICT use in networks

Generation	IT-solution	Automation level	Integration
First generation: Unstructured e-mails / Internet communication	E-mails: Person-to-person	No automation	No integration with back-end systems
Second generation: Structured e-mail and Internet communication	E-mail and e-commerce Internet commerce, request forms at web page, e-mails Person-to-machine or machine-to-person	Internal automation	Low integration in back-end systems
Third generation: Standardised communication (e.g. EDI and XML)	Internet & EDI communication Machine-to-machine	External and collaborative automation	Full integration of back-end systems (prices, products, etc)

The table shows that reaping the benefits of increased automation requires closer integration made possible by more advanced ICT systems. The labelling of three generations reflects a tendency towards joint development in sophistication of automation, ICTs and integration. The three generations are ideal types, as combinations diverging from this general trend do appear in practice (for a more elaborated description of the three generations of network, see section 3.3).

The use of these three levels of ICT technologies in the tourist sector are shown below:

Figure 7.6: ICTs in networks



The figure above indicates that all suppliers, partners and customers have got the possibility to use 1st generation of ICT networks for conducting business. With regards to 2nd generation ICT networking and integrations, the share decreases slightly for customers, 23% for suppliers and 43% for partners. For both 1st and 2nd generation the usage and maturity of the information systems to support it if quite high.

As a clear contrast to the usage of the 1st and 2nd generation ICT, is the usage of 3rd generation ICT networking and integration. No SMEs in the study has currently implemented full integration of ICT systems with suppliers, partners or customers. The sector has despite the lack of 3rd generation integrations a high level of automation in the sales and procurement processes. However this integration is mainly based on batch processes and proprietary ways of systems updates.

Case focus – Travelselect.com **More innovative customer service on the Internet**
Almost all IT systems used for doing business are developed in-house. Through a tight integration with the reservation system Worldspan, most travel products, prices and special customisation integrate seamlessly in Travelselects website. Furthermore, Travelselect was the first company in the UK to adopt mobile services to its customers. As most travel agents, Travelselect is tightly bound to existing IT systems and interfacing to the reservation system. Through investments in new and open technology, this issue will hopefully be solved in the future.

7.3.1 Benefits of using ICT

The cost/benefit ratio and payback time are important indicators in relation to ICT investments. All the cases have been asked to indicate the total cost / benefits of network-focused ICT applications implemented during the last 3 years. The cost side includes both direct cost of software, external consultancy and the internal work hours invested in implementation. The benefits are measured in terms of a subjective indication of changes in turnover, revenue and cost efficiency. The results are shown in the table below.

Table 7.3: Cost and benefits of ICT

Case company nr.	E-application	Cost (software and man-hours)	Benefit type
1	E-Commerce	14,500	Cost reduction: 5%
2	E-Commerce	20,000	Cost reduction Revenue: up
3	E-Commerce	150,000	For establishment!
4	E-Commerce	35,000	Cost reduction Turnover, Revenue: up
5	E-Commerce	140,000	Gross mg: up 20% Efficiency: up 30%
6	E-Commerce	1,600,000	Cost reduction: 50% Turnover: +35%
7	E-Commerce	3,000,000	Turnover up 10 mill / year
8	E-Commerce	270,000	Efficiency: up 30%
9	E-Commerce	250,000	Effect not available
10	E-Commerce	2,900,000	Effect not available
11	E-Commerce	13,000	Effect not available
12	CRM	100,000	Turnover: up Cost reduction
13	Collaboration software	20,000	For establishment!
14	Collaboration software	40,000	Cost reduction Turnover, Revenue: up
Total		8.552.500 euro	

The realised benefits of using ICT in networks are presented below.

Table 7.4: Benefits from using ICT

	Not at all	Low	Some	High	Very high	Cases
Improved customer satisfaction	-	-	8%	62%	31%	13
Reduction of product-to-market lead time	-	-	15%	69%	15%	13
Reduction in labour costs	8%	8%	8%	46%	31%	13
Reduction of procurement costs	39%	15%	15%	23%	8%	13
Better information collection	-	31%	8%	46%	15%	13
Better match of production level to demand	8%	8%	23%	39%	23%	13
Extension of distribution and marketing channels	-	-	23%	46%	31%	13

The table shows a significant (more than 75% in 'high' and 'very high' categories) improvement for these areas:

- Improved customer satisfaction
- Reduction of product-to-market lead time
- Reduction in labour costs
- Extension of distribution and marketing channels

Furthermore an average improvement (50% - 75% in 'high' and 'very high' categories) is found these areas:

- Better information collection
- Better match of production level to demand

Finally a low improvement (less than 50 % in 'high' and 'very high' categories) are found in this area:

- Reduction of procurement costs

Conclusively, a high return rate of investments is found in the tourist sector. The main areas of investment returns are found in product management and staff salaries, which can be explained by old and manual work processes.

7.3.2 Barriers towards using ICT

The table below shows the benefits incurred from ICT usage by the case companies.

Table 7.5: Barriers towards using ICT

	Not at all	Low	Some	High	Very high	Cases
Too high cost	31%	15%	31%	15%	8%	13
Too few people/too little time	23%	31%	23%	8%	15%	13
Management is against	46%	54%	-	-	-	13
Employees are against	39%	46%	15%	-	-	13
We are bound by present systems	23%	54%	15%	8%	-	13
We don't know which system is best	23%	54%	8%	8%	8%	13
Any system will too quickly be outdated	31%	62%	8%	-	-	13

The barrier picture is confirming the trend from the ICT benefits, because so few barriers towards using new ICT have been identified. However the main barriers are found in these areas (between 10% and 25% in 'high' and 'very high' categories):

- Too high cost
- Too few people/too little time
- We don't know which system is best

Conclusively virtually no barriers except some minor cost and staffing reasons, towards implementing ICT are found. This fact helps explain the investment rates identified in section 2.5 and the general ICT maturity of the sector identified in section 2.3.

flybillet.dk - online reservations as far as you like!
The company is supplying one of the most extensive non-paper product catalogues on-line today. TravelCom, which is a subsidiary of flybillet.dk, develops the IT systems used at Flybillet.dk. The development in the business software and information exchange with other companies is very constrained to the way communication has been done with the reservation systems for many years. However, standards such as XML will certainly make the process towards more open communication between companies and other reservation systems much easier.

7.4 Conclusion and policy recommendations

The tourist sector adopted ICT at a very early stage in technology maturity. This adoption supported the sector to become what it is today but certainly also has constrained the possibilities for generating business networks through the years.

The tourist sector faces two main challenges in the future:

1. Further investments in ICT supporting new business networks

New technologies are emerging and price levels for especially data communications lines are decreasing. Combined with the need for a more fine-grained business networks because of the historic bounds to the CRS companies are intensifying investments in new technology, which has proven to have an attractive return-rate.

Furthermore, a trend towards all parties in the sector communicates with each other will have to be supported by appropriate ICT systems. The sector will have to begin to consider investing in 3rd generation of back-end integration of business systems to handle the new business networks.

2. Product innovation and cost efficiency

The tourist sector is a low-margin sector and therefore needs to be very cost efficient. With greater competition within the sector and from the suppliers who are in an increasingly scale selling travel products directly to customers, the revenue will decrease forcing the sector to be even more cost efficient.

Also, the sector needs to be able to add more value to its products by making innovative products in order to decrease some of the product transparency in the travel sector.

Below is presented a SWOT table highlighting the most significant findings in how the sector is dealing with these issues.

Table 7.6: SWOT of ICT business networks in SMEs

Strengths	Weaknesses
Well-organized way of managing supply chain and financial transactions.	Very transparent and comparative product portfolio.
Many travel agents has a large-scale customer database including historic events, generating a great platform for implementing CRM systems	Requires high ICT skills/education to take full advantage of CRM and related ICT products.
Great investments in ICT solutions are being made.	Working with the CRS as the current anchor-point in business networks is reducing the full potentials of ICT investments
Opportunities	**Threats**
The creation of more innovative products, adding more value.	Greater focus from especially the airlines on selling travel products directly to consumers.
The presence of new and open standards for data interchange such as XML completely fits into the sectors general proprietary systems.	Requires high ICT skills/education in the sector to take fully advantage of new data interchange technologies.
The CRS are providing facilities for Internet-enabling important reservation and sales processes.	The content and facilities are regulated by the CRS and not the SMEs and suppliers.

7.4.1 Policy recommendations

The participating SMEs were asked to point out policy recommendations in order to promote the use of new information technologies, and the companies identify a number of key issues. The key issues are standards and competences within new technologies. Each of the issues is dealt with below.

ICT education

Many of the SMEs find the level of IT education unsatisfactory. This includes both staff education and customer education. The companies would like to see better possibilities for good education programs, which could enhance the utilisation of the ICT investments made. Up until last year, the Danish employers had the possibility to

offer a computer to its employees with a tax deduction possibility, called the 'Home-PC' concept. Many Danish employers want to re-establish the possibility, which motivated the employees to learn and use the computer in their spare time.

Another issue that is highlighted by the SMEs is the general mistrust in using credit cards for payments on the Internet. This is seen as prohibitive for using the full potential of selling products on the Internet.

Recommendation 1
Better possibilities for staff and general public ICT education. Support of 'Home-PC' concepts in Europe would probably make staff and customers better educated. Higher IT education in general. *Raise trust in e-commerce by European consumers. Europe has great potential here; they have an industry of very skilled travel agents, and some very strict rules of e-commerce. As a consequence of the European data protection act, EU companies are much more trustworthy than U.S and other companies regarding e-commerce and payments on the Internet. A marketing campaign to increase the awareness of the European data protection act could have a significant impact on SMEs opportunities in e-commerce. The U.S. has a more deregulated approach. EU should set standards promoting e-commerce security and reliability, and promote this common set of laws and rules.*

Case examples: Policy suggestions as how to increase the use of ICTs in SMEs
Italian company: Change tax system for companies that use IT. Demonstrate the benefits of using IT. **Another Italian company**: Provide faster Internet connections in Italy. Improve IT knowledge in the Italian society. **Danish company**: Business associations need to be more progressive towards use of ICT. ATA is a barrier to cross border trade. There should be a common EU travel guarantee for all travel agents in Europe. That would increase customer trust of e-commerce in the sector. The sector must become more professional, needs to be able to attract more academics; sector needs to become more attractive for employees. **Another Danish company**: Technological overview will help the SME's ability to utilize ICTs better. **UK company**: Raise trust in e-commerce of European consumers. Europe has a great potential here; they have an industry of very skilled travel agents, and some very strict rules on e-commerce. The Commission should start a marketing campaign to increase the awareness of the European data protection act, which means that EU companies are much more trustworthy than US and other companies in regard to E-commerce. **Another UK company**: Form: a group of experts for advice to tourism companies on IT strategies, promoting best practice use of IT, recommendations about systems. Also form body who could be looking into the IT-development in the sector, and make suggestions for policy initiatives. **Irish company**: EC/ National governments should make better networks, maybe even provide public ICT infrastructure. ICT Infrastructure is very bad in the business: ISDN takes long time to get, and especially ADSL. Maybe due to slow former public owned telephone companies. **French company**: Provide IT education to the different business players. Favor creation of networks. Explain to the business players that Internet is a tool that needs continuous work - you are not going to improve your benefits only to have a website. **Another French company**: Facilitate cheaper and better Internet access.

IT infrastructure

Virtually all SMEs in the sector have pointed out that the most significant technical barrier towards greater ICT integration and usage of innovative IT products are the problems surrounding data communications lines.

Several problem areas are pointed out:

- The high cost of wide band technology/High bandwidth cost
- Long delivery time
- Need for European high-speed infrastructure and standards.

'Wish-list' with regards to standards:

- Proprietary airport information systems should have a standardized way of communicating with travel agent back-end systems
- Internet portals should have a standardised layout and structure.
- An European secure standard for clearing credit card transactions

Recommendation 2
Ensure the availability of European standardised data communications lines, which must be low-cost, fast, reliable and quickly installed. *Promote increased development and use of open standards for ICT systems integrations. To promote and ensure interoperability between systems in the EU could become an important task for the Commission.*

Other areas discussed:

In several cases in the study, the business associations has been pointed out as being weak in seeing the potentials in the use of ICT and e-commerce. As a direct derivation of this, some SMEs point to the lack of encouragement in investing in companies utilising ICT. Business associations can and do often play a central role in raising awareness of the possibilities of and promoting investment in new technology in with SMEs. The SMEs in the studied cases does not see the associations realising their potential in this respect.

Recommendation 3
Encourage the business associations in the sector to understand and promote investments in ICT in the sector.

8. *The Transport Sector*

The present analysis of the transport sector is structured in 4 subsections:

Subsection 1 provides a sector outline featuring general trends and the role of SMEs in the transport sector.
Subsection 2 analyses the use of business network ICTs in the SME case studies.
Subsection 3 analyses ICT facilitated business networks.
Subsection 4 concludes the report by a SWOT analysis and policy recommendations.

8.1 Sector outline

The transport & logistics sector is made up of companies involved in three different stages of the transport process: planning and organisation (e.g. shippers), storage and packaging (e.g. warehouses and packing-departments) and finally, the physical transport of traded goods moving from one point to another (e.g. carriers). The sector covers a range of different transport modes by land, air and water.

Sector definition
The B2B transport & logistics sector include activities of a number of different NACE sectors. The sector includes companies from following four sub sectors: Land transport (NACE 60), water transport (NACE 61), air transport (NACE 62) and auxiliary transport activities (NACE 63).

The companies included in this analysis are mainly business-to-business (BtB), and the main services included are:

- Transporters of freight by road, rail, air and sea
- Freight forwarding services, including e-transport exchanges.

8.1.1 Characteristics of the sector

In 1996, the transport sector (both passenger and goods) in the European Union accounted for 934,000 enterprises and employed nearly 6 million people – of a total of 112 million persons (5.3%). The

sector generated a turnover of nearly 600 billion euro – 3.4% of the total turnover in European enterprises[15].

Land transport accounts for a large part with nearly 65% of the employees and 42% of the turnover in the transport sector. Air transport has a small number of enterprises, just above 3,000 (0.3%), but represents nearly 11% of the turnover of the sector. Auxiliary transport activities, including handling and storage services, management of transport infrastructure and organisation of freight management, accounts for 26% of the employees and 41% of the turnover[16].

According to most projections, the sector will face continuing strong and stabile growth in production. Forrester research estimates the BtB transport and logistics market will grow from 470 to 690 billion euros from 2000-2005, representing a rise of 33%. Under the European Environmental Agency 'business as usual' scenario a 50% increase in tonne-km by 2010 is expected (over 1994).

Transport is a 'mature' sector in the sense that operational and business principles have been developed through many years. Several companies among the 14 selected cases have existed for many years, and two of the companies in the study started business in 18th century, with simple carrier transport from A to B. This also means that the attitude towards new technologies and new pattern of work are relatively conservative.

Another important characteristic of the sector is that the products often involve *many transactions* between a number of different participants: freight forwarders, logistic companies, shippers and customers. A average transport service product include following list of messages between transport service provider and transport service buyer:

- Booking
- Booking confirmation
- Freight ticket

[15] Eurostat, 2001: Enterprises in Europe

[16] Eurostat, 2001: Enterprises in Europe

- Status reports
- Delivery message
- Debiting message
- Invoice

8.1.2 The role of SMEs in the sector

SMEs account for 63% of the employees in the transport sector, which is close to the average of 66% for all sectors in the European Union. Land transport and auxiliary transport services in particular hold a large share of SMEs (67% and 64%), whereas air transport is clearly predominated by large enterprises – only 10% of the companies in air transport are SMEs[17].

The transport sector is currently experiencing fundamental changes in political framework, competition, technology and products, which fuels a number of developments. The SMEs in this study have pointed to a number of consequences outlined in the table below.

Table 8.1: Overall trends for transport SMEs in Europe

	BEFORE	FUTURE
Product focus	Transportation and logistics	E-services
Strategy	Operational and service excellence	Provider of innovative logistics solutions
Geographical coverage	Local and national	European and global
Competences of employees	Transportation and manual freight matching	E-logistics consultancy and development

The 14 European transport SMEs case studies reveal four major trends:

[17] Eurostat, 2001: Enterprises in Europe

Products focus is changing

Low margins and increased international competition drive companies to look for new product opportunities. The study has revealed that some of the most innovative transport companies have discovered that they can use their knowledge of business processes in the sector to develop new services. Innovative SMEs are currently looking for ways to add value to existing products by offering e-services such as electronic handling of orders and invoices, and electronic customer access to tracing of the goods. These products can increase margins considerably, and can often result in large savings for the customer, as administrative procedures can be improved.

Strategy is reformulated

In order to increase turnover and profit, it is necessary to be one step ahead of the customers. Most transport SMEs in the survey are still maintaining a strategic focus on operational and service excellence. Some, however, have increasingly discovered that operational and service excellence are only a necessary precondition for being in business, but are not sufficient in order to stay in business. Thus the expertise of the companies is used to develop new IT-solutions for customers, and thereby increase customers value proposition for customers. Examples of new products are e-logistics solutions, warehouse solutions, e-freight exchanges and even IT-consultancy.

Geographical coverage

Many SMEs in the transport sector are deeply rooted in the local or regional area, with a large part of turnover realized by local customers. As the demand for international transport is growing, transport SMEs are trying to deal with this in different ways. Some are simply trying to expand transport operation to a much wider area than earlier, but the most frequent solution seems to be the establishment of Europe-wide partner networks. The structure of

Case examples:
Europe wide collaborative commerce

EHJ: Has established a network of 50 independent partners all over Europe for groupage shipments, and internal communication is based on the EDI-platform, which enables online order notification, booking and invoicing.

Italia de Navigazione: Internal communication in d'Amico Group is handled by EDI network.

Pracht: EDI based network linking Pracht with German and European partners.

Rudolph Logistik: Has a close network for freight throughout Germany and Western & Eastern Europe based on EDI and Internet technology.

these networks is interesting, as the network often means that **markets are divided** between the participants in the network. This construction obviously could have consequences for competition, which will be commented later on in this chapter.

Qualifications of employees

The technological development calls for whole new qualifications among employees. As the use of ICT-tools becomes more and more important for employees, they need to change old working procedures and learn how to use IT-tools for supply chain management and make use of e-exchanges and electronic procurement.

The abovementioned trends in the transport sector involve significant challenges to the individual company, calling for a more network and value-chain oriented perspectives for both management and employees in the companies. Moreover each SME needs to take advantage of new technologies both as a means of optimising existing procedures, and in order to discover new business opportunities.

8.2 Impact of ICT in the sector

ICT is a major driver in the development of new strategies and products in the sector. The best practise large companies in the study are increasingly defining themselves as service companies and developers of logistic systems, rather than just freight forwarders. For large best practise companies, ICT is not only a tool for operational efficiency but also a way to create entire new business opportunities. These companies are investing heavily in e-commerce, supply chain management and transport information systems. The question is: how does ICT impact transport SMEs?

8.2.1 Technology overview

The sector reports include a ‘scoreboard’ of ICT maturity and a benchmarking of ICT use in network relations. The content of the each of these are explained below.

The analysis of ICT maturity in the sector case companies includes four dimensions: IT infrastructure, E-commerce, Customer Relation-

ship Management and Supply Chain Management. Maturity in each of the four dimensions is determined by the frequency of a number of functionalities as described below. The evaluation criteria provide implicit definitions of the technologies in question:

IT infrastructure is evaluated on four dimensions:
1) Internet homepage – can be for information and marketing purposes only as e-commerce is dealt with elsewhere. 2) Intranet: A private network within the company using an Internet protocol (e.g. TCP/IP). Intranets enable file sharing and message posting within an organisation but may well bind together geographically dispersed entities. 3) Extranet: A closed external network connecting a company to suppliers, partners or customers using an Internet protocol. An extranet requires security, often provided by firewalls. 4) ERP-system: An internal IT-system for handling of production planning, logistics, sales, accounting and human resources. To put it simple, ERP is the back-office and E-commerce is the front-office.

E-commerce is evaluated on eight dimensions:
1) Catalogues with price information, product data and pictures available at web page. 2) A feature for costumers to make requests through the web page in more or less interactive ways. 3) Product configuration – products are made to order and costumers are given the option to specify product options at website, thus participating in the design of their individual products. 4) A feature for ordering online 5) Order management including shopping cart, order notification, and order status (track and tracing) 6) Payment online 7) Use of marketplaces for procurement 8) Mobile services (e.g. M-commerce, SMS messages, WAP features)

E-customer Relationship Management (CRM) is evaluated on four dimensions:
1) Electronic customer database (storing historical data on customers) 2) Data analysis / data mining (analysing and grouping customer behaviour, profitability etc.) 3) Personalisation (using password, cookies etc.) 4) Online customer service

E-Supply Chain Management (e-SCM) is evaluated on four dimensions:
1) Use of EDIFACT / light EDI connection with partners. Using DEI (electronic data interchange) is a way of automating communication between network parties (trading partners). EDIFACT is a standard for such data exchange. An EDI message contains a string of *data elements*, each of which represents a singular fact, such as a price, product model number, etc. Thus, EDI is the exchange of business data using an understood data format and is a predecessor of today's Internet. EDI involves data exchange among parties that know each other well and make arrangements for one-to-one (or point-to-point) connection, usually dial-up. EDI is expected to be replaced by one or more standard XML formats, such as ebXML.

E-Supply Chain Management (e-SCM) is evaluated on four dimensions:
2) Integration of planning functions These processes include shared access to information across companies by integration of information on demand forecasting, distribution, transportation and manufacturing planning and scheduling **3) Integration of execution functions** Here, not only planning information is shared, actual production and fulfilment is automated by integrating companies by automating procurement, manufacturing and distribution. For instance, when stocks are low in a (automatic order planning, production and distribution) **4) Shared databases with market data** Here, full integration in supply chain is achieved by joint access to databases.

8.2.2 ICT trends in SMEs

The transport sector is a traditional sector, with many established routines and with many employees who have worked in the sector for a number of years. The average SME is conservative in the implementation of ICT, which can be illustrated by a couple of examples. A great number of employees in transport companies do not have access to PC / Internet and many of the companies have very simple Internet websites, e.g. with only basic information about the company.

The table below is a list of the most frequently implemented ICT-applications in the companies in this study.

Table 8.2: Applications that are implemented in transport SMEs

APPLICATION	TYPE
E-commerce	Simple order systems on web page and EDI Order systems Electronic invoicing
Internal communication	Fleet Management Satellite navigation systems (GPS) On board computers in lorries Barcodes for easy notification of goods
Partner communication	EDI and Internet-based communication systems
Customer information	Web pages (2nd generation) Track and tracing of goods Information systems via Internet or EDI (status messages etc.) Customer availability by password
Freight matching tools	Internet exchanges

The applications above aim at more efficient internal and external communication. The main motivation for implementing these applications is to improve working routines and provide better services for customers, often by upgrading processes involved in receiving orders, handling orders internally and sending invoices. The applications implemented do not, however, demonstrate a very innovative perspective on the use of ICT. This means that there is a gap to the largest best practise companies in regard to business- and IT-strategies.

Future trends

The main investments the next 3 years in transport SMEs are:

Freight order systems	E-commerce systems will be implemented in the majority of the remaining companies, which do not have any systems today. Most of the solutions will use simple, standard web-based order systems, which is primarily a request form that can be send by Internet, and which is not integrated with back-end systems.
Integrated e-commerce systems	Existing simple e-commerce (order systems) will be developed further. They will be more integrated with back-end ERP systems making a set of new functionalities possible, e.g. access to online price, capacity, payment, online confirmation, etc.
Further development of BtB-marketplaces	Transport marketplaces will be further developed, with more functionalities and more integration in users resource-planning systems. Increased integration will demand development of standards and interfaces with ERP systems, which some marketplaces already offer, e.g. SAP interfaces. This could make the whole working process with exchanges more efficient. Another development area for some BtB exchanges includes personalisation-tools for the individual user.
E-procurement	The dissemination of e-procurement will increase from the current minimal level to being implemented in more innovative companies. The main part of freight companies' turnover is secured by long-term contracts, and these will increasingly be organized in electronic tender processes.
Mobile commerce	Mobile systems (GPS) have primarily been established for internal communication in freight companies. Many freight forwarders and e-exchanges are currently planning to introduce mobile connections to provide lorries with the possibility of using the e-exchanges more dynamically.

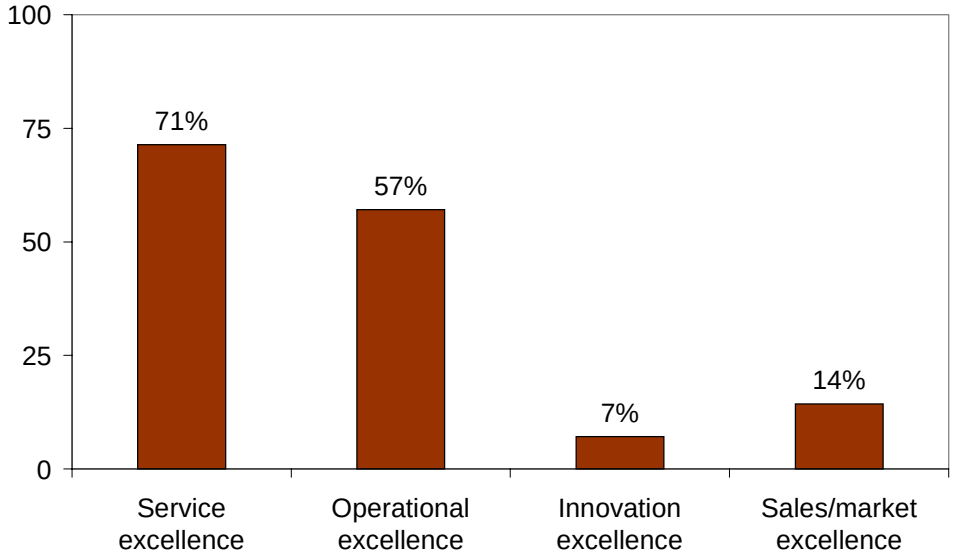
In terms of future investments, the priorities are more efficient internal and external communication and transactions with the purpose of cost reductions. Another main priority is to improve customer service.

8.2.3 Emerging ICT facilitated business models

The companies in the study have been asked about the most important differentiation strategy. The respondents have indicated the importance of:

- Service excellence: the delivery of superior value services
- Operational excellence: high quality products at a reasonable price
- Innovation excellence: continuous delivery of innovative products
- Sales excellence: market-driven products and company.

Figure 8.1: Strategic differentiation adopted by the case companies



Service excellence (71%) and operational excellence (57%) are clearly the most important ways to differentiate from competitors. Only 7% of the companies see innovation excellence as the most important way of differentiating. Other strategies (36%) applied are focus on niches in sectors, differentiation on price structure (exchanges) or offering multi-modal transport.

SMEs clearly see the sector as low margin - most companies emphasise that costs always play a role, but they also indicate that quality, service and flexibility are very important issues.

Case examples – service excellence:	
- without ICTs	- through ICTs
NB Olsson: Focus on personal service and being there for the customer anytime.	NB Olsson: Delivery of services within e-logistics and e-services to optimise customer satisfaction.
Case examples – operational excellence:	
- without ICTs	- through ICTs
GSI: Efficient operation and low prices is the strategic focus and considered a very important competitive parameter.	**GSI**: Implementation of a satellite-tracking system allows mapping and communication with the fleet and optimising workflow.
Case examples – Innovation excellence:	
- without ICTs	- through ICTs
Teleroute: Establishment of one of the first marketplaces in Europe in 1988.	**Teleroute**: Various technical platform established to handle real time consultation of 35.000 users

The strategy practised and the use of ICT are relatively traditional in transport, but the case studies in the sector *have* revealed that ICT is facilitating the development of new business models and strategies in SMEs. Especially three new innovative business strategies are emerging:

- E-logistics service provider and developer
- Network builder
- E-intermediary.

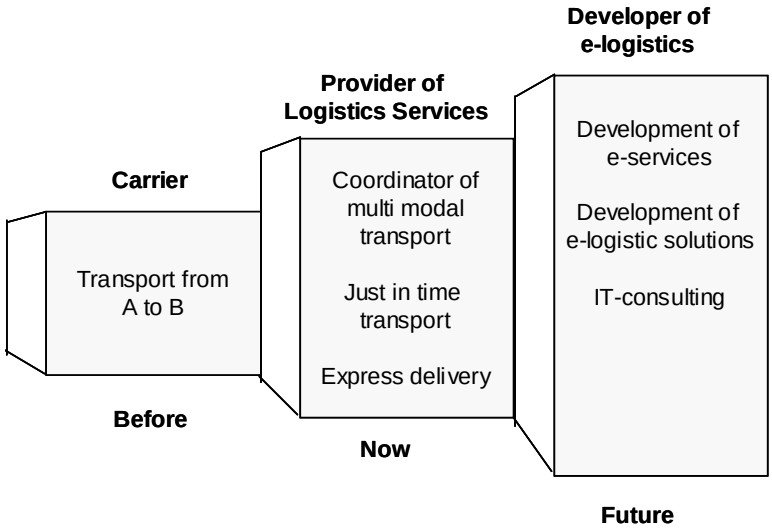
Each of the strategies represents possible ways of using ICTs as a tool in transforming organization and products of traditional transport companies, turning them into more profitable ones.

Each of the three strategies are presented below:

E-logistics service provider and developer

Innovative SMEs are learning new ways of adding value to traditional products. The strategy is to integrate ICT in the product or service delivered by the transport company. The development could be illustrated by the figure below.

Figure 8.2: Freight forwarders changing strategies



The figure shows a development in strategies where new e-services are playing an increasing role in the total business of freight forwarders. Most of the products offered today are simple software solutions, e.g. electronic handling of orders, connection interfaces for customers to e-commerce systems, electronic track and tracing and electronic invoicing. Seen from a buyer perspective, these small e-service solutions can mean large savings. One example of this is NB Olssons who have implemented an electronic invoice system. They estimate that by introducing the system, the customer's costs in handling an invoice have been reduced from approximately 40 euro to 10 euro.

Network builder

Collaboration has always been important among transport SMEs, but ICT is currently changing many aspects of networking. The tendency among cases is to participate in Europe-wide networks, linked by more or less advanced EDI and Internet technologies. The handling of all facets of collaboration is based on ICT, e.g. all transactions related to ordering, status on deliveries and invoicing. One example is a Pracht Spedition und Logistik GmbH, which has established networks throughout most of Europe, and which enables its customers integrated transportation, logistics and supply chain applications.

The network builder needs to optimise all external transactions through the use of ICT. They need to change old working procedures, and make sure that all employees make use of e-supply chain management and e-procurement applications.

E-intermediary

A third business strategy emerging in the transport sector involves e-intermediaries offering products or services which challenge or supplement traditional intermediaries in the sector. The new intermediaries are at present trying to capture market shares in the planning and optimisation part of the supply chain, i.e., from traditional transport intermediaries in shipping and freight forwarding.

The successful strategy of the e-intermediary is to take advantage of new technologies in order to provide new and valuable services, and the e-marketplace is a clear example of that. Marketplaces are webpages, where multiple suppliers and multiple buyers can make transactions. Transport marketplaces can be independent, aimed at gaining revenues from buyer / seller transactions, like Teleroute. They can also be technology-driven marketplaces like Elogistics.com, which does business in IT-related services. The electronic marketplace is not exactly a new business model, and one of the first, and currently one of the largest, Teleroute, was established in 1991 using EDI technology. However the development and diffusion of web technology has fundamentally changed the picture. Marketplaces are emerging with strong pace in Europe, and every month sees a launch of new transport marketplaces. One respondent estimates, according to their own market research, that there are approximately 250-300 transport exchanges or marketplaces in Europe at the moment. It should be added that many of these exchanges operate within different transport modes, different European countries and different focuses in the supply chain (shippers, carriers).

The cases in the study underlines that the development of e-intermediaries could be especially beneficial to SMEs, because large companies can easily invest in the necessary technology, whereas SMEs can get access to the same information and technology just by using a small fee.

8.2.4 Further findings on transport BtB marketplaces

The use of marketplaces and e-commerce is considered to hold a large potential for developing market-based relationships between companies, and relations are, according to theory, very short-lived[18]. Benefits of marketplaces are further economic dynamics increasing flexibility and lowering prices.

The findings in the study disclose some important findings in relation to these common understandings on BtB marketplaces. These are summarised in the following:

Areas of use

The main product of European exchanges is freight matching on spot markets. They are used for the purpose of filling up surplus capacity, which is often a minor part of the total production. Half of the freight forwarders report that an important reason for using marketplaces is to create more long-term partnerships.

Effect on competition

The freight forwarders in the study reports that exchanges have not yet had the effect of reducing prices on the market (they are already as low as they can be). This is underlined by the indications by the all the marketplaces that they do not have a price-cutting strategy, but are much more focused on delivering service and optimisation of the logistics value chain. The aim of the exchanges is to minimize transaction costs by making contacts with external partners much easier.

However, Cargonow.com finds that the key reason why no price reductions have taken place is because they operate on a spot market. But when exchanges start to include e-procurement for long-term contracts, and renewal of contract begins to be included in exchanges, it could drive the prices down.

[18] Paul Timmers, 1999: Electronic Commerce, Wiley

Effect on jobs

On-line marketplaces are intermediaries, and many transport companies fear that they will take over their jobs. One exchange manager believe that the number of jobs in the traditional functions of transport companies, e.g. freight matching and planning, will be reduced be cause the use of ICT will make working procedures more efficient. Instead new jobs will arise in the cross-over between the ICT and transport sector, e.g. in developing new systems and integrating system as exchanges and ERP/SCM.

Consolidation

The survey confirms the viewpoint that BtB e-marketplaces face a major consolidation process. but also that there is a need for a number of exchanges aimed at specific niches.

Freight forwarders in the study have stressed that an open exchange should have as many transactions and as much volume as possible, to be able to fill their specific needs. Thus the existence of more than 250 exchanges in

Case focus:
Virtual market places in transport

Teleroute.com **E**-marketplace and e-commerce solution provider established in France in 1988. Main service is an e-marketplace, which was one of the first in Europe, and used by almost all of the companies in this study. Every year more than 120 million tons are transported thanks to Teleroute. 35.000 regular users, 40.000 freight offers daily and a total turnover of 50 million Euro per year.

CargoNow.com Real dotcom with less than 10 employees, but international coverage through a network of partners. Internet based independent marketplace, which have processed 5 million tons of cargo and 5,500 quotations.

Thinks that e-marketplaces are very beneficial for especially small transport companies, because they give access to advanced freight matching services for a very small fee.

Believes than in the new economy: *The big won't eat the small, but the fast will eat the slow*

Elogistics.com Technology provider e-marketplace. Started out as an open public marketplace, but is now focusing much more on, *often buyer / seller focused*, local communities of shippers and carriers. The UK market is highly fragmented, which means that customers are often more supportive to private communities of longer and deeper relationships.

Nolis.net Freight marketplace started in 1996 with 25.000 quotation request processed daily. Started as satellite based, and in order to receive the signal each user need to install a receiver, a decoder and a modem. The company is moving to an Internet platform, but Internet users do still not have access to all functionalities.

Transportagency.com Small Italian newcomer, but with high-flying ambitions of being a leading transport sector community. A neutral marketplace with focus on freight matching, and has lately developed a new offer: marketplace services via mobile phone.

the sector means that a sufficient volume will be difficult to achieve, and alliances and mergers will be the strategy for many. At the same time it should be stressed that there are large differences between the 250 exchanges (country, transport mode, supply chain focus) and that there is a demand for different exchanges for different needs.

Specialization

Specialising strategies are a natural follow of the large amount of marketplaces emerging in Europe. Several specialisation strategies are identified among the cases:

- Focus on IT-solutions (technology provider e-marketplace)
- Focus on establishing e-marketplaces for private communities of companies.
- Focus on special sub segments of the transport sector, e.g. different modes of transport

Future

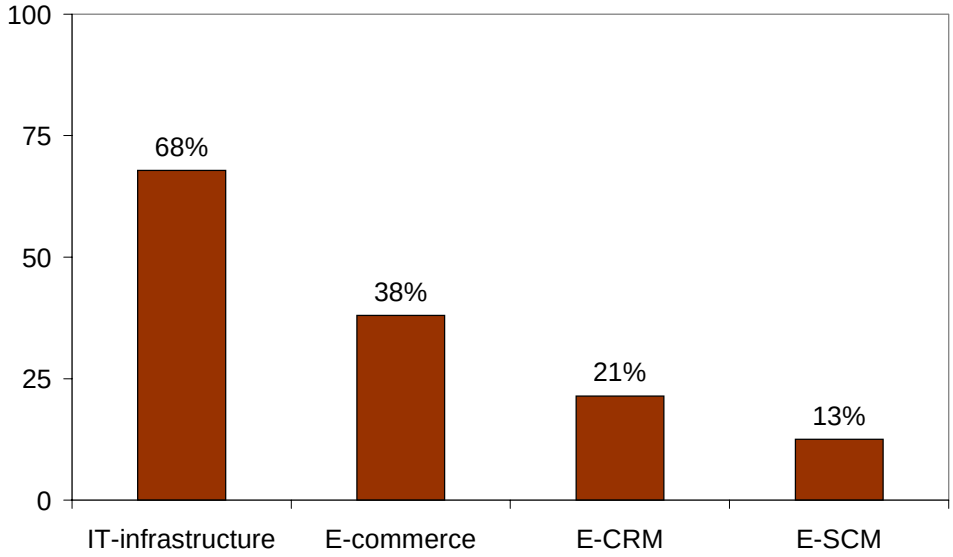
The future of the successful transport exchanges seems to hold the following development trends:

- Development of portal functionalities or even transport communities. They will try to combine a range of useful tools for transport providers and users, including track & tracing, news, transport schedules and financial information on network partners.
- Integration of marketplaces with supply chain management, so that booking and planning will be completely automated.
- Integration of e-procurement systems so that long term contract can be part of exchanges.

8.2.5 ICT infrastructure in SMEs

IT-maturity is a term covering four overall aspects of ICT-use: IT-infrastructure, e-commerce, e-customer relationship management and e-supply chain management. The IT-maturity of the sector, based on the 14 cases, is illustrated below.

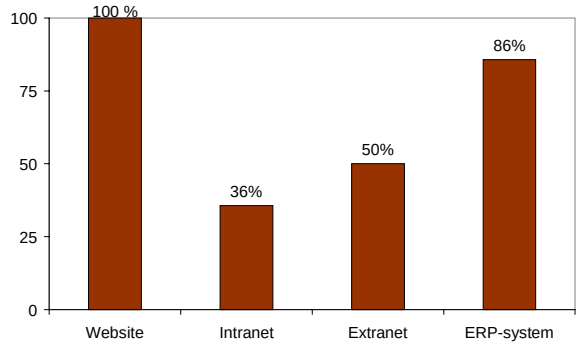
Figure 8.3: IT maturity – transport (%)



The general picture of the use of ICT in the sector is that basic ICT-infrastructure is implemented in most transport SMEs, E-commerce is used to a medium degree, E-CRM is used to some degree, but e-supply chain is only used in very limited extent. Thus, investments in ICT in transport are mainly a question of efficient internal working procedures and increasing direct sale channels.

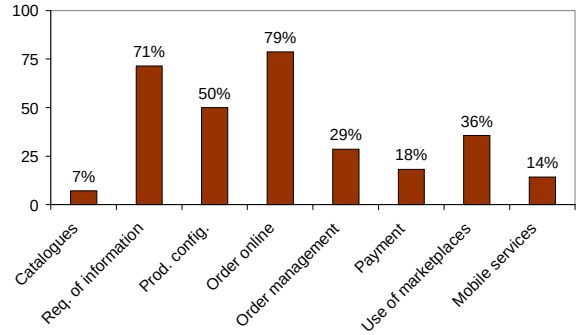
Internet web pages and ERP systems are implemented in the majority of the companies. However, a fundamental tool for close network relations, extranet, is only implemented in 50% of the companies. Intranet is used very limited in transport SMEs.

Figure 8.4 IT-infrastructure – transport (%)



The use of e-commerce is relatively high in transport, thanks to early adoption of EDI, e-marketplaces and, lately, seller-side Internet booking systems. However, the amount of turnover generated at the pages is very limited. The figure shows that the main functionalities of the e-commerce solutions are products configuration and online ordering. Payment is possible at 18% of the pages.

Figure 8.5: E-commerce- transport (%)

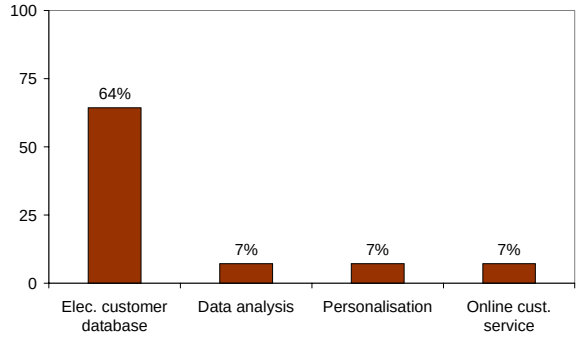


Even though mobile commerce is very relevant in the sector, few companies use it (14%).

Generally, the e-commerce solutions implemented are simple ordering request forms, with limited functionalities of product configuration, and nearly none of the solution provides online access to price, order confirmation and expected execution of order. This is due to the low degree of integration of front-end solutions and back-end systems.

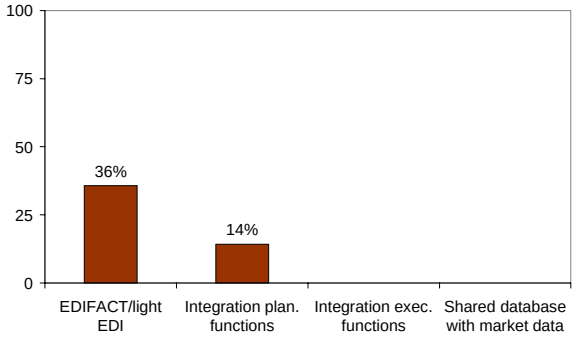
Transport SMEs are run on the philosophy of close personal relations to customers. They use customer databases, but only very seldom advanced CRM tools like analysis and personalisation. This is surely not a feasible strategy in a future, which brings increased internationalisation and an increase in the number of network partners.

Figure 8.6 E-CRM



The penetration of EDI in the transport sector is only modest, despite the fact that the technology has been used for many years. E-supply chain management would enable much more automatisation of processes as planning of new orders and execution of orders from partners. The conclusion is that e-SCM offers large potentials for cost minization, but nearly not practised.

Figure 8.7 E-supply chain management



The large best practise companies, and one of the SMEs, do have plans for implementing e-SCM. This will allow customers to send orders directly into the companies order and planning system, and the internal execution of the product flow will be much more automatic. This will provide customers much better service and closer relations.

8.3 Collaborative commerce: ICTs in the value chain

Use of ICT in business relations can facilitate sharing of information, business transactions, operational planning and strategy development. To SMEs the optimal use of ICT makes entirely new supply chain networks possible, resulting in a much stronger market position. There is conducted an analysis of the network profile of each company, indicating the number of partners, the degree of close relations and the level of ICT sophistication. The overview is presented in the figure below.

Table 8.3: General network profile for the transport sector

	Number	Closeness	ICT sophistication
Suppliers	Low	Medium	Low
Partners	Medium	High	Medium
Customers	High	Medium	Medium

The network profile shows a sector with few relations to suppliers, more partners and many customers. For most carriers, the important suppliers are transport equipment providers (e.g. lorries, diesel), but many transport companies actually regards IT-providers as important

suppliers. Partners are often companies with a similar position in the transport supply chain, e.g. other carriers or logistic service providers.

Transport companies keep very tight relations to partners, but the level of ICT use is still not very advanced. The same medium level of ICT-sophistication also counts in relations with customers, while the ICT sophistication level in supplier relations are low.

The network profile, and comments from interviews, forms a picture of a sector, with SMEs focusing on the sale side. Large emphasis is put in building and maintaining good relations to IT providers and transport service companies, and strong emphasis is laid in customer relations.

The ICT sophistication is determined by the use of network technologies in three levels of advancement. The typology of network technologies below constitutes a basic understanding of the nature of ICT use in external relations. Based on three generations of networks covered by the cases, the model describes the characteristics of the relations.

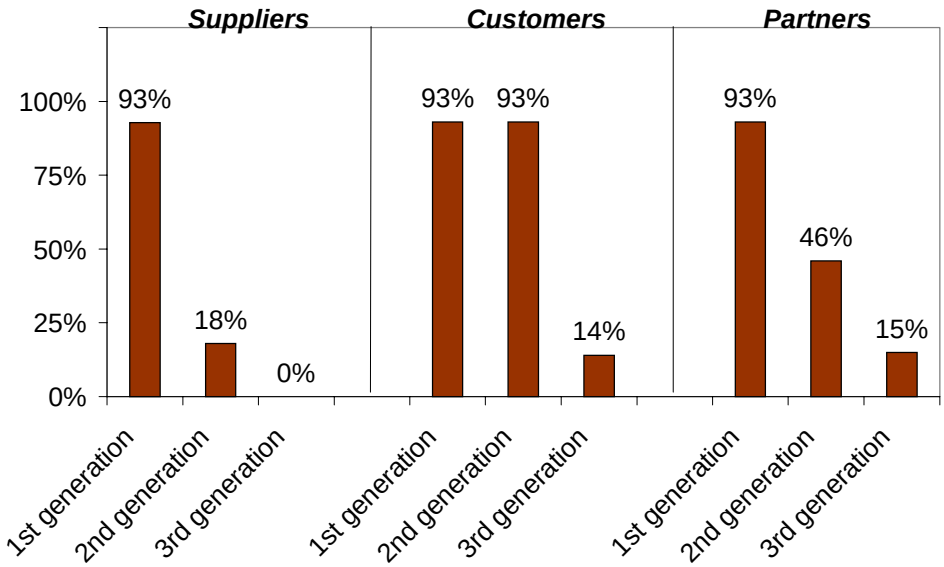
Table 8.4: Three generations of ICT use in networks

Generation	IT-solution	Automation level	Integration
First generation: Unstructured e-mails / Internet communication	E-mails: Person-to-person	No automation	No integration with back-end systems
Second generation: Structured e-mail and Internet communication	E-mail and e-commerce Internet commerce, request forms at web page, e-mails Person-to-machine or machine-to-person	Internal automation	Low integration in back-end systems
Third generation: Standardised communication (e.g. EDI and XML)	Internet & EDI communication Machine-to-machine	External and collaborative automation	Full integration of back-end systems (prices, products, etc)

The table shows that reaping the benefits of increased automation requires closer integration made possible by more advanced ICT systems. The labelling of three generations reflects a tendency towards joint development in sophistication of automation, ICTs and integration. The three generations are ideal types, as combinations diverging from this general trend do appear in practice (for a more elaborated description of the three generations of network, see section 3.3).

The use of these three levels of ICT technologies is shown in the figure below.

Figure 8.8: ICTs in networks



Most transport SMEs has implemented simple network communication solutions, and uses unstructured means of communication, which always requires a manual handling before further action is taken. The relations to suppliers are clearly the less advanced. A relatively large number of companies have implemented 2nd generation communication towards partners and customers. Especially EDI network and simple e-commerce solutions are used towards these. The figure shows very clearly that the large potential of more integrated and automated communication throughout the value chain remains nearly unused towards suppliers (0%), partners (14%) and customers

(15%). The conclusion is that transport companies lacks to exploit the significant possibilities for automation in the value chain.

Case focus – EHJ Transport and Spedition - Best practise use of collaborative commerce
During the 90s, medium sized EHJ implemented an ERP solution and an open IT platform with integrated EDI, electronic invoicing, POD (Proof of Delivery) and status messages. In recent years, EHJ has developed additional features within E-commerce, E-CRM and E-SCM. The E-commerce facilities include an interactive order system via web with online confirmation of orders, web-invoice and status communication. Each customer can be provided with track and tracing facilities, and with an individual password getting access to specific information on the deliverance of the transport services. EHJ has established a network of approximately 50 partners all over Europe for groupage shipments, and internal communication is based on the EDI platform, which makes the interaction dynamic, and allows the company to act on a Europe wide basis despite the size of the company.

8.3.1 Benefits of using ICT in networks

The cost/benefit ratio and payback time is important indicators in relation to investments in ICT, and all the cases have been asked to indicate the total cost / benefits of network focused ICT applications implemented during the last 3 years. The cost-side includes both direct cost of software, external consultancy and the internal work hours invested in implementation. The benefits are measured in terms of yearly cost reduction and increased revenue. The results are shown in the table below.

Table 8.5: Costs and benefits of ICT investments

Company	E-application	Cost of application (incl. software & man-hours)	Benefits per year (cost reduction / increased revenue)
Elogistics.com	E-commerce, CRM, e-logistics	4,800,000 euro	2,000,000 euro
Rudolph Logistik Gruppe	E-commerce, E-logistics	2,500,000 euro	2,500,000 euro
CargoNow.com	E-commerce exchange, website, ERP	400,000 euro	200,000 euro
AB N.B. Olssons Transportservice	E-commerce, E-SCM, E-logistics	360,000 euro	250,000 euro
Pracht Spedition	E-commerce	100,000 euro	20,000 euro
EHJ Transport & Spedition A/S	E-commerce (incl. ordering and POD)	80,000 euro	40,000 euro
GSI Europa Express	Satellite navigation system	40,000 euro	16,000 euro
Märsta Förenada Åkeriföretag A/B	E-commerce	11,000 euro*	20,000 euro
Bonnier Bud	E-commerce	11,000 euro*	20,000 euro
Total		**8,302,000 euro**	**5,066,000 euro**
Average payback time			**1.6 years**
Italia de Navigazione	E-commerce	100,000 euro	n.a.
2 Net Servizi Telematici	E-commerce	26,000 euro	n.a.

* Excl. own man-hours invested. The number of man-hours are estimated to be a minor part of the total sum.

It is clear from the table that the investment level varies significantly between the different companies dependent on size and type of company. The following main findings emerge from the indicated cost / benefits:

Fast payback ratio The average payback time of the IT investments is 1,6 year. The best payback ratio is close to 6 months, which is obtained in the small enterprises investing in standard e-commerce applications. Especially development oriented ICT investments seem to have a relatively longer pay-back time, e.g. investments in establishing Internet marketplace platforms.

Focus on e-commerce Investments in ICT network technologies is very focused on commerce and procurement. The establishment of a new sales channel seems to be a main driver for implementing new technology.

Focus on cost reductions The benefits realized in the small enterprises are mainly obtained by cost reductions of personnel in sale and administrative functions, e.g. receiving of orders by telephone and administration of orders and payment.

Focus on low cost e-commerce systems For small shippers and carriers of below 100 employees the investment possibilities are limited, and they will usually prefer investments in standard systems with minor adjustment to own systems. The investment level for many small enterprises is often around 10.000 Euro.

E-marketplaces invest heavily in ICT platforms and establishment of Europe-wide marketplaces. The estimations of the companies themselves are that the investments have a cost / benefit ratio of 1-3 years, which is a reasonable, but not very good the risk taken into consideration.

The realized benefits of using ICT in networks are presented below.

Table 8.6: Benefits from using ICTs

	Not at all	Low	Some	High	Very high	Cases
Improved customer satisfaction	7%	-	29%	50%	14%	14
Reduction of product-to-market lead time	14%	21%	29%	36%	-	14
Reduction in labour costs	-	-	21	71%	7%	14
Reduction of procurement costs	14%	-	50%	29%	7%	14
Better information collection	7%	21%	36%	21%	14%	14
Better match of production level to demand	14%	14%	36%	29%	7%	14
Extension of distribution and marketing channels	-	21%	29%	36%	14%	14

To a large extend (78% very high or high) the benefits obtained by using ICT is reduction in labour costs. A large part of the companies (64% very high or high) have achieved improved customer satisfaction.

Very few companies have gained benefits in areas, which typically requires implementation of more advanced e-procurement or supply chain management systems: reductions in procurements costs (36%),

reduction in product-to-market lead time or better match of production level to demand.

Examples of benefit strategies are presented in the table below.

Case examples: Trend – implementing simple e-commerce solutions
Bonnier Bud: Have implemented a simple, standard e-commerce solution. So far Internet orders amounts for less than 1% of the turnover, but within 2-3 years this is expected to increase to 30%. This will enable savings of administrative costs of handling orders. **Märsta Förenade Åkerifortag AB**: Simple standard e-commerce solution has been implemented. Is basically just a structured e-mail with fixed fields for information on pick-up and delivery address, freight type and weight. The solution is expected to save Marta for approximately one employee, when the expected half of the customers uses it.

8.3.2 Barriers towards using ICT in networks

The companies have been asked to assess the barriers in their company towards implementation and gaining the most of ICT in networks relations. It is the barriers specific to costs (35% very high and high) and internal implementation resources (31%) that seem to have the widest attention among the organisations in the survey.

Table 8.7: Barriers of using ICT

	Not at all	Low	Some	High	Very high	Cases
Cost is too high	14%	21%	29%	21%	14%	14
Too few people/too little time	8%	23%	39%	23%	8%	14
Management is against it	36%	29%	36%	-	-	14
Employees are against it	21%	36%	36%	7%	-	14
We are bound by present systems	36%	43%	21%	-	-	14
We don't know which system is best	43%	36%	14%	7%	-	14
Any system will too quickly be outdated	43%	36%	14%	7%	-	14

Resistance among management and employees seems to be a surprisingly low barrier, and in opposition of the normal picture of the sector as very traditional.

The lack of knowledge of which systems to implement does only seem to be a barrier in the participating companies, but it should be noted that the IT-knowledge of the participating companies is higher than average.

8.4 Conclusion and policy recommendations

Transport SMEs faces two major challenges with regards to ICT development:

Establishing 3rd generation ICT business network: Transport SMEs are increasingly competing as business networks rather than individual and independent companies. Third generation business network are linked by XML or EDI technologies, and the networks are fully integrated in back-end systems of the partners, thus providing dynamic access to information on price and capacity.

Creating new innovative business models: ICT are often used by SMEs to improve operational and service excellence, but there is a lack of focus on innovative excellence, i.e. the creation of new, more innovative business models and strategies. The possibilities of developing new, more innovative products are many, and are often found in the cross field between IT-services and transport & logistic management.

So how is transport SMEs handling these two challenges? The SWOT table below summarises the key findings in relation to this question.

Table 8.8: SWOT of ICT business networks in SMEs

Strengths:		Weaknesses:
Strong tradition of using EDI and other B2B network technologies.	But…	Slow transformation of existing EDI platforms to open source Internet / XML platforms.
Innovative transport SMEs are investing in implementing new e-commerce solutions.	But…	No Internet / XML sector standards have emerged to provide an alternative to EDI.
The emergence of simple and sector specific standard e-commerce solutions make the technology affordable for even small companies.	But…	Most e-commerce solutions are very simple solutions, with low back-end integration. The result is a lack of functionalities and few cost reductions.
	But…	Lack of IT-skills among employees and management. Psychological barriers towards the use of Internet.
	But…	Limited use of future technologies: supply chain management and customer relationship management.
Opportunities		**Threats:**
New innovative business models and products are emerging and can be adopted by other companies in the sector.	But…	Lacking strategic qualifications to realize business opportunities in ICT.
Development of 2nd generation e-commerce solutions with high level of back-end integration.	But…	Lack of e-commerce standards and thus high IT-development costs prevents many SMEs from developing advanced e-commerce solutions.
Much more advanced usage of collaborative ICTs, and movement towards 3rd generation business technologies.	But…	Lack of collaboration perspective and trust in partners. Result is slow adoption of close, ICT based networks.
Much more integration of new technologies in working processes to increase efficiency, i.e. freight matching and minimization of transaction costs.	But…	Lack of IT-skills and resistance towards ICT slow down adoption of IT as a working tool.
Supply chain management and customer relationship management becomes largely used technologies.	But…	Integration of e-marketplaces in daily working routines remains low.

The study points out a number of other key findings, which is listed below:

Current ICT adoption The main ICT-investment areas for transport SMEs are solutions for optimisation of existing internal and external communication. Main application types are e-commerce, fleet management and navigation systems, EDI and Internet partner network, customer information and freight matching tools.

Standardization problems The main part of the companies plan to move from an EDI to an open source Internet / XML platform. This is a step forward seen from a competition point of view, because XML provides more advanced functionalities and better opportunities of price comparison. However, the lack of standards means that many companies find the technology difficult and expensive to implement.

Future investment focus (2-3 years) in most SMEs is expected to be investments in simple e-order systems. More advanced SMEs will focus on 2. generation of e-commerce, with much higher integration of back-end systems, providing better customer service (payment and transparency) and internal efficiency. Other main areas will be the movement from EDI to an Internet platform for collaborative commerce, including integrated e-procurement and e-commerce solutions, and further integration of e-marketplaces and mobile commerce.

Good cost benefit of ICT investments The study indicates that cost benefit of e-commerce investment are quite good with a payback rate of 1-2 years in average. This does also indicate that the typical SME investment perspective is usually no more than 2 years, which is a relatively short perspective for many ICT projects.

Networks can limit competition Many SMEs deals with the challenge of increased globalisation by establishing Europe-wide partner networks. The structure of these networks is interesting, as the network often means that each participant is focusing on local area transport. This can mean that **markets are divided** between the par-

ticipants in the network, and this construction obviously can have consequences for competition.

Changing strategies There are a number of examples of new emerging strategies and products among the companies in the study. A number of the companies in the study have developed new ways of adding value to traditional products, e.g. by developing e-services and logistics solutions.

E-marketplaces are mainly a partner identification tool Internet based marketplaces does not seem to impact the transport rates in a downward direction. They are primarily used as spot markets for filling up surplus capacity, and for identifying new potential (long-term) partners.

8.4.1 Policy recommendations

The best possible usage of ICTs are becoming an increasingly important and critical to the competitiveness of transport SMEs. Two important challenges identified are: establishing 3rd generation ICT business network and creating new innovative business models. The policy recommendations below deals with the establishing the best possible conditions for promote the use of new information technologies. The recommendations are based on suggestions from the companies of the study.

Table 8.9: Policy issues in regard to ICT

	Challenges	Policy oriented actions
1.	Lack of Internet / XML standards for e-commerce	Supporting pilot projects and analysis within standardisation
2.	Shortage of ICT skills to meet challenge of new technologies	Promote better and more ICT education
3.	Lack of knowledge on ICT	Promote more objective and facts oriented information through public-private cooperation and support to networking activities.
4.	Increase competition in business network	Initiate studies of competition internally in business network
5.	Increase advantages for implementation of ICTs	Make investments in ICT more favourable to SMEs by e-governance services
6.	Not sufficient supply of fast and cheap Internet connections	Support to diffusion of broad-band Internet in Europe, and continuation of policy of liberalization of telecommunication law

Each of these issues is dealt with below.

1. Lack of e-commerce standards

Standards for electronic commerce and communication between transport companies exist on the EDI platform, but not on Internet / XML - neither on a Europe-wide or national basis. Pilot projects at national level have investigated the possibility of establishing standards, but have so far not reached a usable stage.

Most of the SMEs reveal that the lack of e-business standards represents a large problem in regard to diffusion of ICT. The lack of standards is especially a problem for SMEs, because the development of own standards, and the development of systems to different platforms, is very expensive, and customers usually do not cover these costs. Large companies have the resources to develop their own standard, and can necessitate their own standard on business partners.

The following areas lack standards, according to the companies:

- E-commerce on mobile phones (WAP). Logistic language protocol needed within WAP to cover shipping requests, etc.
- E-commerce on Internet (XML). Standards needed for marketplaces, seller / buyer driven booking systems etc.

Recommendation 1:
Investigate the possibilities of national, regional and European standards within e- & m-commerce in the transport sector. Support pilot projects for establishing standards in the sector.

2. Shortage of ICT skills

Most companies emphasise the lack of ICT-skills among employees in the sector, and not only among IT-employees, but also among all other employees, and especially the old generation. There are a large number of employees in the sector, which need better qualifications in the use of PCs and IT–tools, e.g. e-marketplaces. The problem also seems to apply for middle management. The problems reported seem to exist on several levels:

- General fear of using computers among a broad part of employees and management.
- Lack of basic IT-skills, e.g. using PCs.
- Lack of skills in using specific IT-tools as a natural part of the working process, e.g. the use of e-marketplaces.

Recommendation 2:
Support for initiatives in EU aimed at increasing IT-skills among employees and management in the sector. Important to increase the supply of sector specific ICT curses and improve the quality. Important that the EU Commission and national authorities team up with transport associations to support ICT-transport education.

3. Lack of information on ICT

As investment in ICT are increasing, and the area has increased importance for the companies, objective information about ICT solutions, functionalities and costs increases too. The quality of IT-providers as advisers in the process of choosing IT-systems is rated low by several of the companies, and the alternatives are not many for SMEs with relatively few resources.

Providing objective and fact oriented information about ICT can be an important tool to increase the use of ICTs in companies, and be considered a task for cooperation between public and private institutions.

Recommendation 3:
Promote more objective, independent and facts oriented information about ICT, especially in relation to possible benefits, system functionalities and integration issues. Initiatives to be taken goes through public-private cooperation and support to networking activities.

4. Increase competition in business network

The establishment of ICT facilitated business network for SMEs are an important process to be promoted. However, it is important to ensure that the effect is more competitive business structures. Case studies indicate that the formation of partner networks, including electronic-based networks, often means that each company are geographically limited in operation. This can have a competition limiting effect.

Recommendation 4:
Initiate studies of the effect of marketplaces and electronic partner networks on competition in electronic networks.

5. Increase advantages of implementing ICT

The use of e-governance among administrative authorities could increase the advantages of investing in new technologies.

A case company emphasised the importance of minimizing administrative burdens of public regulation by the use of ICT. One example is the movement of goods across borders, which is today administrated in each member state, and largely based on paper fill in, and different information is required in each member state. Each country in Europe has own standards regarding what freight information to provide. This process could be handled much more efficiently by the use of e-government technology, by making it possible to forward all in-

formation electronically in advance, with the same standard information for all borders.

Recommendation 5:
Support activities to promote the development and use of digital e-government services for freight companies.

6. Fast Internet infrastructure

More advanced collaboration applications, including e-procurement and track & tracing, require fast Internet connections. Only few countries offer the possibility of quick establishment of broadband Internet access, and if they do, they are quite expensive.

Recommendation 6:
Increase support initiatives to speed up the establishment of broadband Internet in Europe, and continuation of policy of liberalization of telecommunication law.